SCS ENGINEERS

May 14, 2021 File No. 25220091.00

Ms. Ann Bekta Wisconsin Department of Natural Resources South Central Region 2514 Morse Street Janesville, WI 53545-0249

Ms. Carolyn Cooper Wisconsin Department of Natural Resources South Central Region 3911 Fish Hatchery Road Fitchburg, WI 53711-5367

Subject: Feasibility Report – Eastern Vertical Expansion Dane County Landfill Site No. 2 (Rodefeld) Madison, Wisconsin (License #3018)

Dear Ms. Bekta and Ms. Cooper:

On behalf of Dane County, SCS Engineers is submitting four copies of the enclosed Feasibility Report (FR) for the proposed Eastern Vertical Expansion of Dane County Landfill Site No. 2 (Rodefeld). The required review fee will be paid by Dane County on receipt of an invoice from the Department.

The FR was prepared in accordance with the requirements of NR 512. To assist in your review of the report, we have included a copy of the Department's NR 504 and NR 512 Completeness Checklists with the report, identifying the locations of the required information.

If you have any questions or comments regarding the FR, please call Betsy at 608-333-5408. We look forward to receiving your comments on the proposed Eastern Vertical Expansion.

Sincerely,

overs

Betsy Powers, PE Senior Project Manager SCS Engineers

Sherren Clark, PG, PE Vice President SCS Engineers

BLP/Imh_ajr/SCC

cc: Per attached distribution list

Encl. Feasibility Report

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Feasibility Report

Eastern Vertical Expansion Dane County Landfill Site No. 2 (Rodefeld) 7102 US Hwy 12 & 18 Madison, Wisconsin 53718

Prepared for:

Dane County Department of Waste & Renewables 1919 Alliant Energy Center Way Madison, Wisconsin 53713

SCS ENGINEERS

25220091.00 | May 14, 2021

2830 Dairy Drive Madison, WI 53718-6751 608-224-2830

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- 1 Title Sheet
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- 3 High Water Table Map (June 2008)
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- 5 Geologic Cross Section B-B'
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- Appendix B Correspondence
- Appendix C Alternative Geotechnical Investigation Program
- Appendix D Existing Facility Evaluation Data
- Appendix E Private Well Information
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- Appendix M Figures from Eastern Expansion Feasibility Report
- Appendix N Local Approvals and Report Submittal to Municipalities
- Appendix 0 Dane County Compliance Letter
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- Appendix R Clay/Barrier Soil Layer Borrow Sources

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CERTIFICATIONS

"I, Betsy Powers, hereby certify that I am a licensed professional engineer in the State of Wisconsin in accordance with the requirements of ch. A-E4, Wis. Adm. Code; that this document has been prepared in accordance with the Rules of Professional Conduct in ch. A-E8, 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."

Signature

Senior Project Manager, PE 32933 Title

<u>5/14/2021</u> Date



"I, Sherren Clark, 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."

Signature

<u>Vice President, PG 853</u> Title

<u>5/14/2021</u> Date



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1.0 INTRODUCTION

1.1 PURPOSE

The Feasibility Report (FR) for the proposed Eastern Vertical Expansion (hereinafter referred to as the Eastern Vertical Expansion or vertical expansion) of Dane County Landfill Site No. 2 (Rodefeld) has been prepared in response to, and in accordance with, the requirements of ch. NR 512, Wisconsin Administrative Code. The FR presents information required to determine the potential for development of the proposed vertical expansion. The vertical expansion is located entirely within the limits of the Eastern Expansion area approved in 2014.

Where noted, text from the Eastern Expansion FR (TRC, 2013) and FR Addendum No. 1 (TRC, 2013a) and No. 2 (TRC, 2013b) is provided verbatim, where the same information, request and/or justification applies to the proposed Eastern Vertical Expansion. NR 504 and 512 completeness checklists identifying the locations of all of the required information in the report are provided in **Appendix A**.

1.2 BACKGROUND

Dane County Department of Waste and Renewables owns and operates the existing Dane County Landfill Site No. 2 (Rodefeld) Landfill, Wisconsin Department of Natural Resources (WDNR) License No. 3018, located on a 220- acre parcel in the City of Madison. The proposed Eastern Vertical Expansion will be located entirely in the footprint of the Eastern Expansion permitted in 2014. Additional general site information and information on the proposed Eastern Vertical Expansion is included in **Section 3.0**.

A general overview of the site development permitting is provided below:

- Original landfill
 - Approved by WDNR in August 1984
 - Began operations in January 1985
 - Approximately 50.5-acre footprint
 - Design capacity of 3,800,000 cubic yards
- Expansion to west
 - Approved by WDNR in March 1994
 - Approximately 25.5-acre horizontal expansion and vertical overlay
 - Design capacity of 3,271,400 cubic yards
- Eastern Expansion
 - Approved by WDNR in August 2014
 - Approximately 28.6-acre horizontal expansion and vertical overlay
 - Design capacity of 3,837,900 cubic yards

1

Key documents related to the proposed Eastern Vertical Expansion that were previously submitted to WDNR are outlined below, along with corresponding responses.

- Initial Site Inspection (ISI) request dated May 7, 2020.
 - WDNR did not conduct an in-person inspection of the site, but instead completed a desktop review of the submittal. WDNR concluded that, because the proposed Eastern Vertical Expansion area would not change the existing horizontal limits of waste for the currently permitted active landfill (Eastern Expansion), the lack of a field inspection for the proposed Eastern Vertical Expansion is not considered significant to the WDNR findings.
 - WDNR issued the ISI response letter on June 10, 2020 (see Appendix B).
- Initial Site Report (ISR) dated September 8, 2020.
 - WDNR issued the ISR Opinion letter on November 20, 2020 (see Appendix B).
- Alternative Geotechnical Investigation Program (AGIP) dated January 8, 2021 (Appendix C).
 - WDNR issued the AGIP acceptance letter on February 15, 2021 (see Appendix B).

Additional correspondence regarding the Eastern Vertical Expansion as well as reports pertinent to the history of the existing Eastern Expansion are provided in **Appendix B**.

1.3 WDNR ISR COMMENTS AND RESPONSES

The ISR Opinion letter was issued by WDNR on November 20, 2020 (see **Appendix B**). Based on the review of the documents included with the ISR, WDNR concluded that the proposed vertical expansion has the potential for development as a solid waste facility.

The ISR Opinion letter identified items to be addressed in the FR. The requested information and associated responses are provided below.

1.3.1 Existing Conditions Map

"The ISI letter noted the presence of two navigable ponds within 1,000 feet of the existing limits of waste filling both located to the south of the landfill on the Yahara Hills Golf Course. An exemption from NR 504.04(3)(a), Wis. Admin. Code was granted for Ponds A and B in the department's February 3, 2014 Determination of Site Feasibility – Eastern Expansion. Dane County anticipates requesting a similar exemption as part of the permitting for the proposed Eastern Vertical Expansion. The department also noted the presence of three ponds located approximately 300 feet southeast of the existing limits of waste filling; however, the ISR indicated that those three ponds are manmade storm water ponds designed for flow control and sediment removal. Exemptions for those three manmade ponds will not be required. The existing conditions plan drawing should clearly identify all waterways that are considered under the locational criteria of s. NR 504.04 and waterways that were constructed for the purpose of storm water management."

Response: The Existing Conditions drawing (**Plan Sheet 2**) depicts Ponds A and B within 1,000 feet of the limits of waste, as well as the three manmade ponds within 1,000 feet that were constructed for the purpose of storm water management.

1.3.2 Federal Aviation Administration (FAA) Communications

"The ISI letter noted the presence of Blackhawk Airfield in Cottage Grove, as well as two other small private airstrips located within approximately 5 miles of the proposed vertical expansion. The ISR included notification letters sent by Dane County to the FAA, Little Wheel Field, Blackhawk Airfield, and Quale Airport. The FAA's official response to Dane County's notification letter and any further communication with the FAA regarding notices of construction or airspace review, as well as any further communication with the above listed airports, should be included in the feasibility report."

Response: Refer to Section 7.1.5.

1.3.3 Private Wells

"The ISI request noted the presence of two private water supply wells located within 1,200 feet of the existing limits of waste filling: Dane County's biogas well (YZ391) and the Michael Niebuhr well (PW-51). Exemption requests should be included in the feasibility report for YZ391 and PW-51, and variance applications should be submitted to the department in accordance with NR 812.43 for wells that have not been granted variances in the past."

Response: Section 1.4.2 includes an exemption request from NR 504.04(3)(f) for wells YZ391 and PW-51 located within 1,200 feet of the limits of waste. Variance requests were previously approved for these wells (Appendix E).

1.3.4 Navigable Ponds

"There are two manmade navigable ponds located less than 1,000 feet from the proposed vertical expansion. Exemptions were approved for these ponds during prior site permitting. A new exemption from the requirements of s. NR 504.04(3)(a), Wis. Admin. Code, will need to be requested in the feasibility report."

Response: Section 1.4.2 includes an exemption request from NR 504.04(3)(a) for the two manmade navigable ponds located less than 1,000 feet from the proposed vertical expansion.

1.3.5 State Highway 12 & 18 and Public Parks

"The proposed landfill expansion boundary is located about 300 feet from State Highway 12 & 18, about 450 feet from the boundary of Yahara Hills Public Golf Course to the south, and about 350 feet from the boundary of Hope Park to the north. Both the Yahara Hills Public Golf Course and Hope Park are public parks. The required setback to a state trunk highway and to a public park is 1,000 feet. That setback can be replaced by appropriate screening used so that the waste filling operation cannot be viewed from the highway, the park of the golf course within 1,000 feet. A new exemption from s. NR 504.04(3)(d) may need to be requested for the proposed vertical expansion if adequate screening cannot be provided. The feasibility report should include line of sight drawings from the various locations within all of these areas where the waste may most likely be visible as the waste height increases to show the visual effect of screening."

Response: Section 1.4.2 includes an exemption request for the setback from State Highway 12 & 18 and from the two public parks. Screening measures such as protecting as many existing mature trees as possible, planting additional trees, and where necessary, constructing soil core berms within the waste mass are planned to provide screening from the southern, northern, and eastern boundaries of the vertical expansion. Line-of-sight drawings showing views from US Highway (USH)

12 & 18, from County Highway (CTH) AB and from the park area north of the vertical expansion are included in $\ensuremath{\text{Appendix J.}}$

1.3.6 Local Approval Notifications and Applications

"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. 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. Admin. Code."

Response: On May 29, 2020, Dane County notified the affected municipalities (i.e., Town of Blooming Grove, Town of Cottage Grove, City of Madison, Dane County) of the proposed Eastern Vertical Expansion. The notification was sent by written request and included the required notice to each affected municipality for the specification of applicable local approval requirements in accordance with NR 512.06(1). The notification, certified mail receipts and response letters are included in **Appendix N**. The only municipality requiring local approvals was the City of Madison, and the only municipalities who opted into the negotiation process were the City of Madison and Town of Cottage Grove.

1.4 EXEMPTION REQUESTS

The following exemptions are requested for the proposed Eastern Vertical Expansion. Many of the requested exemptions have been previously granted.

1.4.1 Exemption Requests Included in AGIP

On January 8, 2021, Dane County submitted a request to WDNR for an AGIP (**Appendix C**), in accordance with NR 512.085, Wis. Admin. Code. The AGIP requested several exemption requests for allowing existing information from previous subsurface/geotechnical investigations conducted at the landfill and noted if there were deficiencies with that information. The exemptions requested in the AGIP are repeated below. In a letter dated February 15, 2021, WDNR accepted the AGIP (**Appendix B**).

- Dane County requests an exemption from NR 507.05(1)(c) requiring collection of soil samples at 5-foot intervals at existing borings M28 and M29. This exemption was requested in the Eastern Expansion AGIP (TRC, 2012b) and FR (TRC, 2013), although the administrative code reference was listed as NR 507.04(c). The boring logs contain no record that samples were collected; however, a description of the soil is provided. The available existing subsurface information from other borings near these borings supports this request.
- 2. Dane County requests an exemption from NR 507.05(1)(d), which requires collection and testing of a soil sample from the screened interval of a monitoring well, for existing wells M6A, M6C, and M9B. This exemption was requested in the Eastern Expansion AGIP (TRC, 2012b) and FR (TRC, 2013). These borings were completed during previous permitting processes and at the time of boring, it was not a standard practice to collect and test soil samples from the screened interval of a monitoring well. Additionally, significant amount of geotechnical data exists from the units in which these wells are screened.

- 3. Dane County requests an exemption from NR 507.05(1)(e), which requires retention of soil samples until the department approves the report that included documentation of the soil samples. This exemption was requested in the Eastern Expansion AGIP (TRC, 2012b) and FR (TRC, 2013). The soil samples from the existing borings utilized for the Eastern Vertical Expansion AGIP as summarized in Table 1 in Appendix C have not been retained. The borings were completed during previous permitting processes and approved by WDNR.
- 4. Dane County requests an exemption from NR 507.06(1)(b) for borings M1C, M28, and M29, requiring standard penetration tests performed at each boring. This exemption was requested in the Eastern Expansion FR (TRC, 2013). Sufficient information exists at borings surrounding these locations and in the geologic units within which these borings were drilled to warrant this exemption.
- 5. Dane County requests an exemption from NR 507.14(5), which requires submission of information on the most current version of WDNR forms. This exemption was requested in the Eastern Expansion AGIP (TRC, 2012b) and FR (TRC, 2013). The boring log and monitoring well construction forms used for the existing borings and wells noted in Table 1 in Appendix C are on older WDNR or non-WDNR logs or forms. We believe the required information is presented sufficiently on these existing forms (see Attachments A and B in Appendix C). In the Eastern Expansion FR, TRC also stated that they believed that water was removed from wells M6A, M6B, M9A, M18A, and M17B following their installation/well development, despite the lack of documentation/development forms for these wells. These wells have been purged and sampled on numerous occasions since the mid-1980s and documented in the WDNR database.
- 6. Dane County requests an exemption from NR 512.09(1) and NR 512.09(2) to utilize existing borings, water table wells, and piezometers as shown in Table 1 in Appendix C. No new borings, wells, or piezometers will be installed. This exemption is justified because of 1) the number of available borings and wells previously installed in this area of the site, and 2) the consistency of the site geologic and hydrogeologic conditions previously interpreted and documented at the site. This exemption was requested in the Eastern Expansion AGIP (TRC, 2012b) and FR (TRC, 2013).
- 7. Dane County requests an exemption from NR 512.09(1)(a) and (2)(d), which require borings and wells, respectively, to be located within 300 feet of the proposed limits of filling. As documented in Table 1 in **Appendix C**, some borings and wells used to define geotechnical properties of the proposed vertical expansion are located more than 300 feet from the proposed Eastern Vertical Expansion limits. Since the proposed expansion is a vertical expansion over a portion of the existing Eastern Expansion with no changes to the previously constructed, and approved liner and base grades, Dane County believes the previous investigations adequately characterize the location of the landfill. Additional investigation within 300 feet of the proposed expansion limits is not warranted nor feasible.
- 8. Dane County requests an exemption from s. NR 512.09(4)(a), Wis. Admin. Code, which requires conducting five geotechnical grain-size tests on each major soil unit. Difficulty collecting the samples during the Eastern Expansion permitting, as described in Sections 1.4.1 and 6.1.1 of the Eastern Expansion FR (TRC 2013), and the fact that geotechnical data was gathered at the site for the previous feasibility studies justify an exemption to this requirement. WDNR granted an exemption to s. NR 512.09(4)(a) as part of the Eastern Expansion Feasibility Determination dated February 3, 2014.

- 9. Dane County requests an exemption from s. NR 512.09(4)(b), Wis. Admin. Code, which requires conducting two laboratory hydraulic conductivity tests for each fine grained unit. Difficulty collecting the samples during the Eastern Expansion permitting, as described in Sections 1.4.1 and 6.1.1 of the Eastern Expansion FR (TRC, 2013), and the fact that geotechnical data was gathered at the site for the previous feasibility studies, justify an exemption to this requirement. WDNR granted an exemption from s. NR 512.09(4)(b), Wis. Admin. Code, as part of the Eastern Expansion Feasibility Determination dated February 3, 2014.
- 10. Dane County requests exemptions from s. NR 512.09(4)(e), Wis. Admin. Code, and NR 512.09(4)(f), Wis. Admin. Code, which require monthly and quarterly water level measurements at monitoring wells and surface water bodies including streams, lakes, ponds, drainage ditches, and wetlands located within 1,000 feet of the proposed limits of filling. There is a long history of water level measurements from the site monitoring wells and surface water bodies, and the Eastern Expansion design was based on the highest water levels measured in the 21 years prior to the design. WDNR granted an exemption from ss. NR 512.09 (4)(e), and NR 512.09 (4)(f), Wis. Admin. Code, as part of the Eastern Expansion Feasibility Determination dated February 3, 2014. Dane County will include the semiannual water level data collected under the routine monitoring program in the FR, and will update the high and low water table maps and cross section water levels, as necessary.
- 11. Dane County requests an exemption from s. NR 512.09(4)(g), Wis. Admin. Code, requiring at least four rounds of baseline groundwater monitoring be performed on all observation wells and piezometers located outside the proposed limits of filling which were installed to evaluate the proposed property in accordance with s. NR 507.18 and submitted along with the FR. The baseline groundwater monitoring was performed and submitted as part of previous permitting for the site; therefore, baseline monitoring data will not be included in the FR for the Eastern Vertical Expansion. Recent groundwater monitoring results from the existing monitoring network will be discussed in the context of the evaluation of existing facility performance required under NR 512.13(4).
- 12. Dane County requests an exemption from s. NR 512.09(6)(b) and (c), Wis. Admin. Code, which requires conducting consolidation testing on samples collected from each geologic unit in each landfill phase. Difficulty collecting the samples during the Eastern Expansion permitting, as described in Sections 1.4.1 and 6.1.1 of the Eastern Expansion FR (TRC, 2013), and the fact that geotechnical data was gathered at the site for the previous feasibility studies, justify an exemption to this requirement. WDNR granted an exemption from s. NR 512.09(6)(b) and (c), Wis. Admin. Code as part of the Eastern Expansion Feasibility Determination dated February 3, 2014.
- 13. Dane County requests an exemption from NR 512.11(2), which requires that geologic cross-sections of a contiguous expansion extend to include all previous borings for the existing landfill. This exemption was requested in the Eastern Expansion AGIP (TRC, 2012b) and FR (TRC, 2013). Based on this exemption request from the Eastern Expansion, WDNR concurred that the following cross sections through the existing site borings be prepared:
 - Two east-west oriented cross sections prepared that extend through the entire length of the existing landfill and Eastern Expansion area, which also includes the proposed Eastern Vertical Expansion area.
 - The remaining east-west oriented cross sections extended to a point approximately 300 feet or greater beyond the western extent of the Eastern Expansion vertical overlap.

• Additionally, north-south oriented cross sections prepared that extend through each existing boring in the vertical overlap area, as well as through one additional set of north-south oriented borings immediately west of the Eastern Expansion overlap.

The remaining cross sections prepared for the 1992 FR sufficiently documented the geologic conditions beneath the existing site including the area beneath the vertical expansion. The geologic cross sections for the existing site that were prepared for the Eastern Expansion and the 1992 FR will be provided with the Eastern Vertical Expansion FR.

14. Dane County requests an exemption from s. NR 512.14(2)(b), Wis. Admin. Code, which requires geologic cross section sheets for the feasibility report to show the present topography, the proposed subbase, base, and final cover grades and the liner configuration. Issues regarding the depth of borings to be depicted, final grades, and the scale necessary to produce such a cross section make it difficult to fit on a standard plan sheet without distorting scales. WDNR granted an exemption from s. NR 512.14(2)(b), Wis. Admin. Code, as part of the Eastern Expansion Feasibility Determination dated February 3, 2014. As part of the granted exemption, WDNR required that the final grades be shown on the Plan of Operation cross sections (Condition of Approval 8). The proposed Eastern Vertical Expansion Plan of Operation cross sections will similarly show the final grades.

Most of the requested exemptions were previously approved by WDNR in the February 3, 2014 Feasibility Determination letter for the Eastern Expansion.

1.4.2 Locational Criteria

Dane County requests exemptions from specific locational criteria in NR 504.04(3) as described below. Each locational criterion for which an exemption is requested is listed, followed by the justification for granting the exemption.

- 1. NR 504.04(3)(a) Within 1,000 feet of any navigable lake, pond, or flowage not including landfill drainage or sedimentation control structures.
 - There are no navigable ponds identified within 1,000 feet of the proposed Eastern Vertical Expansion footprint; however, there are two man-made navigable ponds (Pond A and Pond B) within 1,000 feet of the existing landfill footprint. Both ponds are located on the public golf course (Yahara Hills) south of the existing landfill (see **Plan Sheet 2** and **Figure 1-1**). Exemptions from the setback distance requirements for these ponds have previously been approved by WDNR for prior site permitting. Three additional ponds are located approximately 300 feet southeast of the existing limits of waste filling; however, these three ponds are manmade storm water ponds designed for flow control and sediment removal and therefore do not require an exemption.
- 2. NR 504.04(3)(d) Within 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 by natural objects, plantings, fences or other appropriate means so that it is not visible from the highway, park, or natural area.
 - An exemption is requested from the requirement for the limits of filling to be set back at least 1,000 feet from the right-of-way of US Highway (USH) 12 & 18 and recreational areas to the south and north of the vertical expansion. Dane County is proposing a design that protects as many existing mature trees as possible and includes constructing

soil berms within the waste mass to provide screening from the southern, northern, and eastern boundaries of the vertical expansion. The proposed vertical expansion design will continue to provide visual screening and does not change the setbacks to USH 12 & 18 or the recreational areas. Line-of-sight drawings showing views from USH 12 & 18, from CTH AB and from the park area north of the Expansion are included in **Appendix J**.

- 3. NR 504.04(3)(f) Within 1,200 feet of any public or private water supply well.
 - An exemption is requested from the requirement for a minimum 1,200-foot setback for the biogas facility well (YZ391) and Michael Niebuhr well (PW-51). Well YZ391 is located within 1,200 feet of the proposed limits of waste for the Eastern Vertical Expansion, on the landfill property, and is owned by Dane County. Well PW-51 is located within 1,200 feet of the approved 2014 Eastern Expansion limits of waste. An exemption for PW-51 was previously granted for the Eastern Expansion (ref. Granting of Exemption 2 of WDNR's February 3, 2014 Determination of Site Feasibility). Variance approval for YZ391 was given on May 31, 2018, and a subsequent approval was given on August 14, 2018. Variance approval for PW-51 was granted on February 3, 2014.

1.4.3 Separation from Water Table

An exemption from the required separation distance to seasonal high groundwater was approved for the Eastern Expansion and is requested again for the Eastern Vertical Expansion. The code reference and justification included in the FR for the Eastern Expansion are provided below. The Vertical Expansion does not affect the subbase grade design, and the seasonal high water table has not changed since the Eastern Expansion was approved.

- 1. NR 504.06(2)(b) Separation to seasonal high groundwater table and bottom of the clay component of the composite clay liner.
 - [*From Section 1.4.1 of the Eastern Expansion FR]:* An exemption is requested for the requirement of a minimum 10-foot separation from the top of the seasonal high water table to the bottom of the clay component of a composite liner. In place of the 10 foot separation requirement, Dane County proposes to include with the landfill liner design a gradient control system to intercept groundwater (refer to Subsection 9.7 [of the Eastern Expansion FR] for a description of the proposed gradient control layer design). The purpose for requesting this exemption is to reduce the fill that will be needed to achieve the liner subbase grades within the Expansion, and to maximize excavation of soil that can be used in fill areas and for construction of design components associated with the landfill Expansion (i.e., perimeter berms, final cover systems).

1.4.4 NR 140 Exemptions

Exemptions are requested under NR 140.28 to allow construction of the proposed Eastern Vertical Expansion at a location where a preventive action limits (PALs) or enforcement standards (ESs) established under NR 140 for a public health or welfare parameter has been exceeded. Wells and parameters for which NR 140 exemptions are requested are summarized in **Table 1-1**.

The NR 140 exemptions previously granted in the feasibility determination for the Eastern Expansion are listed in **Table 1-1**, along with the current status of the well and/or recent results affecting the need for the exemption. Exemptions are requested for these wells and parameters again for the

Eastern Vertical Expansion unless there are more recent results indicating that current concentrations no longer exceed the PAL.

Table 1-1 also includes exemption requests for additional wells and parameters with confirmed PAL exceedances since the Eastern Expansion approval, based on a review of sample results from June 2014 through December 2020. Exemptions are requested for wells and parameters with PAL exceedances unless the PAL exceedance has not been confirmed (new replacement well or isolated PAL exceedance) and/or is a likely laboratory contaminant. More detailed information on PAL exceedances for public health and welfare parameters in the last 3 years is provided in the discussion of existing facility performance in **Section 7.5.3** and in **Table 7-1**.

For the public health parameters other than nitrate, the requested exemptions are justified under NR 140.28(3)(b) and (4)(b) because:

- The proposed facility is designed to achieve the lowest possible concentrations that are technically and economically feasible for the substances with exemptions requested.
- For any parameters with baseline concentrations above the PAL but below the ES, the proposed facility will not cause the concentration of the substance to exceed the ES at a point of standards application.
- For any parameters with baseline concentrations above the ES,
 - The existing or anticipated increase in the concentration of the substance will not cause an increased threat to public health or welfare, and
 - The proposed facility will not cause an incremental increase in the concentration of the substance that exceeds the PAL.

For the public welfare parameters and nitrate, the requested exemptions are justified under NR 140.28(3)(a) and (4)(a) because:

- The proposed facility is designed to achieve the lowest possible concentrations that are technically and economically feasible for the substances with exemptions requested.
- The existing or anticipated increase in the concentration of the substance due to the proposed facility does not present a threat to public health or welfare.

For purposes of this evaluation, the proposed facility is the Eastern Vertical Expansion, but the design of the existing Dane County Landfill and Eastern Expansion are part of the justification for the requested exemptions. The design features of the proposed and existing facility that justify the NR 140 exemptions include the composite liner system, leachate collection system, landfill gas collection system, final cover system, underdrain system, and the associated monitoring systems.

Additional discussion of the performance of the existing Dane County Landfill is provided in the evaluation of existing facility performance in **Section 7.5**.

1.4.5 Existing Conditions Plan Sheet

An exemption is requested from the requirement in NR 512.11(1) to show all areas within 1,500 feet of the proposed limits of filling on the existing conditions plan sheet (**Plan Sheet 2**) at a minimum

scale of 1 inch equals 200 feet. It is not possible to cover this area while also meeting the requirements for drawing scale and sheet size. Existing conditions are shown at a scale of 1 inch equals 300 feet on **Plan Sheet 2** to show the full 1,500-foot radius for the surrounding area. The other plan view drawings in the plan set, including the revised final grades for the vertical expansion, are at a scale of 1 inch equals 200 feet.

2.0 PROCEDURAL REQUIREMENTS

2.1 LOCAL APPROVALS

For the purposes of the proposed vertical expansion, municipalities meeting the definition of "affected municipality" under s. 289.01(1), Wis. Stats. Include the Town of Blooming Grove, Town of Cottage Grove, City of Madison, and Dane County. Notification to affected municipalities regarding the proposed vertical expansion were sent out on May 29, 2020. Copies of the letters sent to the affected municipalities are included in **Appendix N**.

Dane County received responses from the City of Madison and Town of Cottage Grove. The correspondence from the municipalities summarized the local approvals required and are included in **Appendix N**.

The City of Madison and Town of Cottage Grove took the required steps to participate in the local siting process as defined in ch. 289, Wis. Stats. Dane County is not allowed to negotiate as an affected municipality. A letter from the State of Wisconsin Waste Facility Siting Board dated November 24, 2020 (**Appendix N**) documents that these municipalities adopted and filed a siting resolution and appointed members to the local negotiating committee within 60 days of receiving the notification from Dane County. Dane County has subsequently been participating in a negotiation process with the affected municipalities.

2.2 **REPORT SUBMITTALS**

As part of the landfill siting process, Dane County is required to submit an FR in accordance with s. NR 512.05. The appropriate number of copies of the report has been sent to the WDNR and affected local municipalities (see cc list in FR cover letter). Copies of the ISR were also sent to the affected municipalities along with the FR, as required by s. NR 512.06(2), and the WDNR's ISR Opinion letter is included in **Appendix B** of the FR.

2.3 ADVISORY AND PUBLIC OPINION PROCESS

According to ss. 289.241(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. To meet this requirement, Dane County has:

- Held three public meetings on December 8, 2020, February 23, 2021, and April 29, 2021, for the Landfill Local Negotiated Agreement Committee. All of these meetings have been publicly posted and open to the public. Members of the public have attended and spoken at these meetings.
- At the April 29, 2021 public meeting, the Committee voted to approve the agreement and is anticipate to be fully executed in June 2021.

2.4 OWNERSHIP INFORMATION AND COMPLIANCE WITH PLANS OR ORDERS

Section 289.34, Wis. Stats., and s. NR 512.19, Wis. Admin. Code, require:

- Identification of all persons owning a 10 percent or greater legal or equitable interest in the applicant or assets of the applicant, including shareholders of a corporation which is an applicant and partners of a partnership which is an applicant.
- Identification of 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 the WDNR.
- Identification of other Wisconsin solid or hazardous waste facilities which 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
 or not all plan approvals and orders relating to all identified facilities are being complied
 with.
- Submit a certification or affidavit that the applicant is in compliance with all WDNR orders and conditions at each waste facility owned.

Appendix O includes a letter from Dane County identifying all persons owning a 10 percent or greater legal or equitable interest in the applicant or in the assets of the applicant, along with a statement that they are in compliance with all WDNR plans and orders for the waste facilities they own.

2.5 COUNTY SOLID WASTE MANAGEMENT PLANS

In accordance with Wisconsin statute 289.24(1)(c), available solid waste management plans that were developed by counties within the proposed Dane County Landfill Site No. 2 expansion service area were evaluated to determine how the solid waste management plans relate to the expansion.

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." Dane County does not have a solid waste management plan. Expansion of Dane County Landfill Site No. 2 will not conflict with current county solid waste management plans.

3.0 GENERAL FACILITY INFORMATION

Project Title:	Eastern Vertical Expansion Dane County Landfill Site No. 2 (Rodefeld)
Facility Owner and Operator:	Dane County Department of Waste & Renewables 7102 US Highway 12 & 18 Madison, WI 53718

Owner and Operator Contact:	Mr. John Welch, PE Director
	Dane County Department of Waste & Renewables
	1919 Alliant Energy Center Way
	$\begin{array}{c} \text{Mauson, wissing} \\ \text{Cell: } 608-516-4154 \end{array}$
	Welch@countyofdane.com
Consultant:	SCS Engineers
	Madison, WI 53718
Consultant Contact:	Betsy Powers, PE
	Project Manager
	Office: 608-216-7347 Coll: 608-233-5408
	bpowers@scsengineers.com
Facility Location:	N $\frac{1}{2}$ of Section 25 and NE $\frac{1}{4}$ of SE $\frac{1}{4}$ of Section 25, Township 7 North, Range 10 East, City of Madison, Dane County, Wisconsin
Present Land Use:	The property is used for an existing landfill and ancillary landfill infrastructure.
Property Acreage:	Total acreage owned: 220.4 acres
	Proposed Eastern Vertical Expansion footprint: 21.3 acres (all within the currently permitted footprint)
Service Area:	Municipalities and industries within Dane County and minimal municipalities and industries outside of Dane County.
Eastern Vertical Expansion Design Capacity:	990,300 cubic yards
Vertical Expansion Site Life:	3 to 3.5 years
Anticipated Date of Closure:	2031
Anticipated Waste Types	Non-hazardous municipal, industrial, and commercial solid waste
and Volumes:	(97 percent of total volume).
	Special permitted waste (3 percent of total volume).
	approximately 20 to 30 percent more waste by volume
Anticipated Total Waste Intake:	Approximately 300,000 cubic yards per year.

Anticipated Cover Frequency:	Final cover will be constructed in phases as each cell is filled to final approved waste grades. Waste will be covered daily with 6 inches of soil or an approved alternative daily cover.
Mode of Operation:	Phased area fill.
Hours of Operation:	Monday through Friday: 6:00 a.m. – 5:00 p.m.
	Saturday: 7:00 a.m. – 12:00 p.m., with hours allowed to extend to 7:00 a.m. – 5:00 p.m. following either a week within which New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving, Christmas Day or other legal holidays occur, or a week within which adverse weather conditions (such as high winds, rain, ice or heavy snow) have prevented the County from operating the landfill for an aggregate period of more than 5 hours in any 1 day.
	These hours do not apply during periods of construction and may be extended to accommodate construction schedules.
Base/Subbase Grades:	As approved for the Eastern Expansion.
Final Grades:	Proposed conceptual final grades are as shown on Plan Sheet 17 . The proposed Eastern Vertical Expansion would bring the Eastern Expansion's final cover grades to a peak elevation of 1065 with a maximum slope of 4 horizontal to 1 vertical (4H:1V) and a minimum slope of 5 percent within the existing landfill footprint.
Final Cover (from top to bottom):	 Native vegetation as detailed in a Plan Modification approved by WDNR on August 23, 2018 0.5 foot of topsoil 2.5 feet of rooting zone Geocomposite drainage layer 40-mil linear low density polyethylene (LLDPE) geomembrane 2 feet of compacted clay or geosynthetic clay layer (GCL) with 2 feet of barrier soil per NR 504.07(4)
Daily Cover:	 General fill to waste at a ratio of approximately 7:1 Working face will be covered at the end of each day. Cover material will consist of general fill daily cover soil or approved alternate daily cover (ADC).
Need for the Vertical Expansion:	The Eastern Vertical Expansion will allow Dane County to continue to handle waste following the existing landfill reaching capacity, which is estimated to occur in 2028. The Eastern Vertical Expansion will serve the disposal needs of
	Dane county.

4.0 LAND USE INFORMATION

4.1 LOCATION

The site is located approximately 1 mile east of the Interstate 90/39 and U.S. Highway (USH) 12 & 18 interchange (**Figure 1-1**). USH 12 & 18 abuts the southern side of the landfill and CTH AB abuts the eastern side of the landfill. The primary access route to the site is via USH 12 & 18.

The proposed Eastern Vertical Expansion is located within the City of Madison on a parcel of land owned by Dane County that is approximately 220.4 acres. The proposed expansion is located within the currently approved limits of waste from the Eastern Expansion.

4.2 ADJACENT LANDOWNERS

Figure 4-1 shows the landowners for property located within 1,200 feet of the approved limits of waste. Property ownership information was obtained from the online data portal developed by Dane County's Land Information Office. A list of landowners corresponding to the number labeling on **Figure 4-1** can be found in **Table 4-1**.

4.3 ZONING

Figure 4-2 shows current land use zoning obtained from the online data portal developed by Dane County's Land Information Office. Since the proposed expansion is located entirely within the approved Eastern Expansion limits, the proposed expansion will not require an agricultural impact statement and is not located in an area designated as floodplain, conservancy, shoreland, or wetland.

4.4 LAND USE

Figure 4-3 shows current general land use type in the vicinity of the landfill based on information obtained from the online data portal developed by Dane County's Land Information Office. Because the proposed Eastern Vertical Expansion is located entirely within the approved Eastern Expansion limits, the proposed expansion will not alter land uses. Other areas on the property are used for additional solid waste and recycling activities (e.g., shingle storage, construction & demolition waste processing area, household hazardous waste and electronics drop-off site, wood yard, and tire storage area) and ancillary landfill support activities and infrastructure (e.g., roll off box storage, offices, maintenance buildings, scale, access roads, soil stockpiles, and landfill gas handling and processing facilities).

The majority of land surrounding the landfill property includes land uses of right-of-way, woodlands, open land, single family, and agriculture. Additional land uses include the following:

 Commercial: Ho-Chunk Gaming Madison, Harley-Davidson of Madison, Magnuson Grand Madison, ABC Supply Company, BP gas station, and Reverend Jim's Roadhouse, all located southwest of the landfill. Americas Best Value Inn located west of the landfill. File 13 E-Waste Solutions, Femrite Auto & Tire, WeConnect, Consolidated Electrical Distributors, and Rihm Leasing-Madison, all located northwest of the landfill. Suter's Speed Shop, Hickory Hills Kennel, and Country Corners, located north of the landfill (Country Corners has recently been acquired by Dane County). Farwell Pools & Spas and Mathews Tent Rental located northeast of the landfill and, finally, Nelson's Bus Service located southeast of the landfill.

- Multi-family: Holiday Apartments located southwest of the landfill.
- Institutional or Governmental: Hope Lutheran Church located northwest of the landfill.
- Cemetery: Hope Lutheran Cemetery located northwest of the landfill and Hope Evangelical Cemetery located north of the landfill.
- Outdoor recreation: Yahara Hills Golf Course located south of the landfill.
- Under construction: Dane County's Highway Garage and Medical Examiner's office.
- Industrial: GE Healthcare and Mallinckrodt located northwest of the landfill, Suter's Self Storage and Gypsum Floors located north of the landfill, and Safeguard Storage of Wisconsin located east of the landfill.
- Transportation: Parking lots associated with Ho-Chunk Gaming Madison and Holiday Apartments both located southeast of the landfill.

4.5 ENDANGERED RESOURCES AND HISTORIC AND ARCHAEOLOGIAL USE

As documented in the June 10, 2020 ISI response letter (Appendix B):

- Archaeological issues and historical structures for the site were cleared by Richard Kubicek, Departmental Archaeologist/Departmental Historic Preservation Officer, on May 13, 2020.
- Based on a review of the Natural Heritage Inventory, no endangered resources were identified in the project area. Additionally, a vertical landfill expansion is covered by the No/Low Impact List for All Species at All Times of the Year category under the department's Broad Incidental Take Permit/Authorization, as provided under ss. 29.604. An Endangered Resources (ER) Review Verification form pertaining to the Eastern Vertical Expansion was submitted by the department on May 13, 2020. Further review for endangered resources is not anticipated for the proposed project.

4.6 TRANSPORTATION AND ACCESS

Traffic routes are anticipated to remain the same as currently used for the landfill property. Access to the proposed Eastern Vertical Expansion will be similar as access to the existing landfill operations. The current access route is from USH 12 & 18 to the landfill access road, which is located on the south side of the landfill. This is subject to approval through the Local Negotiated Agreement process.

The Eastern Vertical Expansion will continue to use the following existing facilities: the landfill access road that has been extended to the Eastern Expansion area, the scale, the administration building, the landfill gas process system, and the entrance gate. The maximum weight of the trucks hauling waste will be in compliance with the limits set by the Wisconsin Department of Transportation (WisDOT).

WisDOT is planning changes to the USH 12 & 18 and County AB interchange. These changes would impact traffic and access to the landfill. The proposed changes may also impact existing screening and storm water features. Dane County and WisDOT will continue to work together as the proposed interchange improvement project progresses. Dane County has made WisDOT aware that any changes impacting the landfill will need to be approved by WDNR in advance. As appropriate, the proposed Eastern Vertical Expansion permitting documents will provide design modifications needed to accommodate the impacts of the interchange improvements to site access, screening, and storm water.

5.0 REGIONAL AND SITE-SPECIFIC GEOTECHNICAL INFORMATION

Regional and site-specific geotechnical information has been collected and reported on for various phases of landfill activity in the vicinity of the Eastern Expansion since 1982 (RMT, 1982, 1984; Donohue, 1992, 1993, and 1994; and TRC, 2014). These investigations, reports, and the results of routine groundwater, surface water, leachate, and gas monitoring performed at the landfill have resulted in a comprehensive body of geologic and hydrogeologic data for the site. Because the proposed Eastern Vertical Expansion does not change the footprint of the landfill or the design of the subbase grades, base grades, liner system, or gradient control system, additional site-specific geotechnical investigation was limited in scope as described in **Sections 5.1** and **5.2**. The subsurface data analysis provided in **Section 5.3** is largely based on the previous investigations.

5.1 ALTERNATIVE GEOTECHNICAL INVESTIGATION PROGRAM

An AGIP was submitted to the WDNR on January 8, 2021, and accepted by WDNR on February 15, 2021. The AGIP is included in **Appendix C** and the acceptance letter is included in **Appendix B**. The geotechnical investigation program completed for the Eastern Expansion FR has sufficiently characterized the site as required by NR 512, subject to the exemptions granted in the Determination of Site Feasibility for the Dane County Rodefeld Eastern Landfill Expansion issued by WDNR on February 3, 2014 (**Appendix B**). Since the Eastern Vertical Expansion lies completely within the area of the approved Eastern Expansion, SCS Engineers (SCS) concluded in the AGIP that the requirements of NR 512 have also been satisfied for the Eastern Vertical Expansion.

As noted in **Section 1.4.1**, exemptions are requested with detailed justification for an AGIP to site the proposed Eastern Vertical Expansion above the Eastern Expansion. Geotechnical data from past WDNR approved permitting events that were performed for the siting of the underlying landfill expansions, including geotechnical investigations performed under NR 512.09 and NR 512.10, and baseline groundwater monitoring (NR 507.18), were used to generate the geological cross sections, prepare groundwater flow plan sheets, and to generally summarize the subsurface conditions. This data has been previously accepted as baseline data for the Eastern Expansion footprint, within which this proposed vertical expansion is located. The AGIP for the Eastern Expansion was approved by the WDNR in October 26, 2012 (**Appendix B**).

5.2 SITE FIELD INVESTIGATION

Additional geotechnical data collection performed since permitting of the Eastern Expansion includes the following:

• Semiannual groundwater monitoring, including water level monitoring

- Monitoring well installation to replace abandoned wells, including the following:
 - Well nest M9AR/M9BR installed to replace M9A/M9B (2014)
 - Well nest M17AR/M17BR installed to replace M17A/M17B (2020)
 - Well M28R installed to replace M28 (2014)
 - Well WT208ARR installed to replace WT208AR (2018)
 - Well nest M302AR/M302BR installed to replace M302A/M302B (2014)
 - Well M303AR installed to replace M303A (2020)
- Gas probe installation to replace abandoned gas probes, including the following:
 - Gas probe G-4R installed to replace G-4 Shallow and G-4 Deep (2020)
 - Gas probe G-5R installed to replace G-5 Shallow and G-5 Deep (2014)
 - Gas probe G-6R installed to replace G-6 Shallow and G-6 Deep (2014)
 - Gas probe GP25R installed to replace GP25 (2014)
 - Gas probe GP26R installed to replace GP26 (2014)
 - Gas probe GP27R installed to replace GP27 (2014)

The AGIP (**Appendix C**) includes soil boring logs and monitoring well construction forms for the borings and wells used to characterize the site geotechnical conditions for the Eastern Expansion in accordance with NR 512. Soil boring logs and monitoring well construction forms for replacement wells M17AR, M17BR, and M303AR are also included in the AGIP (**Appendix C**). Soil boring logs and well construction forms for the remaining replacement wells are provided in **Appendix Q**.

Baseline monitoring of replacement wells M17AR, M17B, and M303AR is currently in progress, with the first round sampled in December 2020. Routine groundwater monitoring is occurring at remaining wells as outlined on the Environmental Monitoring Plan included in **Appendix L**.

5.3 SUBSURFACE DATA ANALYSIS

This section presents the findings of previous geotechnical investigations and includes a discussion of the site geology, the site hydrogeology, and the groundwater quality as required in NR 512.10. Appendices, tables, and plan sheets referenced in this subsection contain the information required by NR 512.11. The information in this section is largely taken from the Eastern Expansion FR (TRC, 2013), with updates as appropriate based on the limited additional geotechnical data collection completed since the FR was submitted.

5.3.1 Site Soil and Geology

The following information is reproduced from Section 6.2.1 of the Eastern Expansion FR. The previous FR text is reproduced in italics, with notes added in brackets to indicate the location of referenced information within the current FR. Text specific to the current FR is provided in standard text format.

Regional and Site-Specific Soil Types

Surficial soils in the vicinity of the site have been mapped by the United States Department of Agriculture (USDA), National Resource Conservation Service and are shown on Figure 6-1 [see **Appendix M** for Eastern Expansion FR Figures]. Specific surficial soils in the vicinity of the site range from well drained silt-loam to poorly drained muck and consist primarily of the following: Dodge silt

loam, Ringwood silt loam, Sable silty clay loam, Houghton muck, and St. Charles silt loam. A brief description of the soils is as follows:

- Dodge silt loam, 2-6% slopes, not hydric, well drained, and prime farmland. Most commonly found on moraines and is formed from loess overlying sandy loam glacial till.
- Ringwood silt loam, 2-6% slopes, not hydric, well drained, and prime farmland. Most commonly found on moraines and is formed from loess overlying sandy loam glacial till.
- Sable silty clay loam, 0-3% slopes, all hydric, poorly drained, and prime farmland if drained. Most commonly found in depressions of stream terraces and is formed from silty alluvium.
- Houghton muck, all hydric, poorly drained, and prime farmland statewide. Most commonly found in depressions of stream terraces and is formed from organic deposits.
- St. Charles silt loam, 0-2% slopes, not hydric, well drained, and prime farmland. Most commonly found on till plains and is formed from deep loess overlying glacial till.

Regional Glacial Geology

The proposed Eastern Expansion is located in an area underlain by a thick sequence of unconsolidated glacial drift of the Horicon Formation deposited over dolomite bedrock of Ordovician age. The Horicon Formation generally consists of brown sandy till, but also includes sand and gravel deposited by glacial meltwater and clay, silt and sand deposited in glacial lakes. This till was deposited by the Wisconsin Valley Lobe during the Wisconsin Stage of continental glaciations. Subsurface investigations performed in the area of the proposed Eastern Expansion encountered glacial sediments that extended down to at least 95 feet below the land surface. The sediments encountered in these investigations consist of silty clay (glacial lacustrine deposits), silty sand glacial till with scattered pebbles, cobbles, boulders (poorly sorted ice contact deposits), and sand and gravel (outwash and lacustrine sand deposits).

Site-Specific Glacial Geology

The geotechnical data compiled for this section comply with the requirements of NR 512.09(1) and NR 512.09(4). The laboratory soil testing results for the Eastern Expansion borings and for the existing borings used to meet NR 512 requirements are summarized in Table 1 of the AGIP included in **Appendix C**. The laboratory data sheets and soil testing results for the Eastern Expansion feasibility report borings are summarized in Attachment C of the AGIP included in **Appendix C**. The boring logs were completed in accordance with NR 512.09(1), and are contained in Attachment A of the AGIP included in **Appendix C**, along with WDNR borehole abandonment forms. Complete documentation of the geotechnical investigation procedures, data, and findings for the Eastern Expansion is in the Eastern Expansion FR (TRC, 2013).

As noted in the AGIP and as discussed with the WDNR, the original geologic cross sections prepared for the Eastern Expansion FR that pass through the vertical expansion area are provided on **Plan Sheets 5** through **14**. Cross section locations are depicted on each plan sheet. The limits of the proposed Eastern Vertical Expansion have been added in red to the Eastern Expansion cross sections and the cross section locator maps. **Plan Sheet 5** includes descriptions of the unconsolidated glacial deposits illustrated graphically on the cross sections. Additional supporting information for the site geology was included in the Eastern Expansion FR (TRC, 2013).

The following description of the site-specific geology was provided in Section 6.2.1 of the Eastern Expansion FR. The previous FR text is reproduced in italics, with notes added in brackets to indicate the location of referenced information within the current FR.

The glacial deposits encountered in the borings advanced during the Eastern Expansion geotechnical investigation can be divided into four major geologic units. The four major units from the surface downward consist of surficial fine-grained loess and glaciolacustrine deposits, silty sand till, sand outwash, and an isolated fine-grained clay and silt lower lacustrine deposit. The till, outwash, and isolated lower lacustrine deposit are overlapping in some areas of the site and are derived from the Horicon Formation.

The horizontal and vertical extent, and the physical properties of the unconsolidated deposits, were defined as part of the geotechnical field investigation by preparing Geologic Cross Sections A-A' through L-L' presented as Plan Sheets 6 through 19 [see **Plan Sheets 5 through 14**].

The surficial lean clay (CL) soil encountered beneath portions of the site is consistent with the presence of loess deposits and fine-grained lake deposits and correlates well with previous investigations. For purposes of definition on the cross sections, this unit is labeled as a loess deposit. Due to landfill activities (grading, sedimentation pond, etc.) and normal heterogeneity in the area of the Eastern Expansion, this layer is not present in all of the recently installed borings. Where it is present, it will be removed during the construction of the project. This formation was also identified as a major soil unit during 1982, and 1992 FR investigation at the Dane County Landfill (RMT, 1982, and Donohue, 1992). This unit was commonly described as a silty clay or lean clay with little to moderate plasticity. Color of the clay ranged from brown to yellow brown, with thicknesses up to 6.5 feet, and the density ranged from medium stiff to hard. The distribution of grain size is similar to the results of the grain-size analysis for samples collected as part of the Existing Landfill geotechnical investigations. Donohue & Associates (1992) also combined near-surface deposits of silt and clay (loess) with associated glaciolacustrine and meltwater deposits for the purposes of soil grain-size analysis. The average grain-size distribution reported for loess and glaciolacustrine and meltwater deposits collected at the Eastern Expansion site, and as reported in the Eastern Expansion Feasibility Report, is as follows: 8.3 percent gravel, 12.0 percent sand, 48.2 percent silt, and 29.9 percent clay. A laboratory hydraulic conductivity test of this unit yielded a value of 2.0 x 10-8 cm/sec. The soil properties are summarized in Table 6-2 [see Table 1 of the AGIP included in Appendix C].

A second major geologic unit was encountered in all borings at varying depths depending on thicknesses of the upper clay and surficial soils. This unit was commonly identified as a silty sand (SM) with gravel (till) that varies in thickness from a few feet where it is interbedded with outwash up to greater than 61 feet at boring M-302B. This unit is generally brown to red in color and ranges in density from loose to very dense, particularly at depth. The water table generally occurs with the till unit under the Expansion.

Six soil samples of the till member were selected from the November 2012 geotechnical borings for laboratory analysis of grain-size distribution. The results of these analyses were combined with the results of six previous grain-size analysis of till to provide geotechnical data for this major geologic unit. The results of grain-size analysis of the till samples within the Eastern Expansion area contain an average of 9.3 percent gravel, 67.1 percent sand,13.2 percent silt, and 9.7 percent clay. These

data are similar to data collected during the geotechnical investigation of the Existing Landfill as summarized on the table from the 1992 Feasibility Report included in Attachment K [see Attachment C of the AGIP included in **Appendix C**].

The third major unit encountered consists of a poorly graded sand (SP), poorly graded sand with gravel, or sand with silt (SP-SM). The outwash unit is present with highly varying thickness and density in most areas underlying the expansion. The greatest thickness was encountered at borings across the center of the Eastern Expansion area. Thicknesses ranged from 35 to 70 feet. The outwash unit was not observed at boring M-302B. Samples from two soil boring locations were selected for grain-size analysis. The results of the analysis of these samples were combined with the results of the analysis performed on five samples collected during the Existing Landfill geotechnical investigations. Based on the results of the grain-size analysis of these seven samples, each within the Eastern Expansion area, the outwash member contains an average grain-size distribution as follows: 21.5 percent gravel, 72.1 percent sand, 2.3 percent silt, and 1.5 percent clay. (Note that the average P200 content of the outwash is 6.2 percent. Several preexisting samples were only analyzed for P200 content and not silt and clay individually, thus the average clay and silt percentage may be skewed slightly.) These results are similar to data collected during the previous site investigations (see Appendix K) [see Attachment C of the AGIP included in **Appendix C**].

In the northwestern portion of the Eastern Expansion area (e.g., M-6C, M-9B, B311, and B-304B) a fourth unit of glaciolacustrine origin, consisting of lean clay/ silty clay (CL) and silt (ML), was present at depths up to 60 feet bgs (M-304B) and thicknesses up to 28 feet (M-9B, located outside the Expansion footprint). The unit thinned to 3 feet at M-304B. This unit was grayish brown to brown in color and was generally stiff. Soil samples of glaciolacustrine silt and clay were selected from two soil borings advanced as part of the November 2012 geotechnical investigation. The results of these analyses were combined with the results of the grain-size tests performed on two samples of glaciolacustrine silt and clay in the Eastern Expansion area is as follows: 5.0 percent gravel (only at one boring), 16.1 percent sand, 48.5 percent silt, and 46.1 percent clay. Overall, this unit is most predominant in this area of the entire landfill site as defined by these four borings and is considered to be an isolated deposit.

Regional Bedrock Geology

Regional information suggests that bedrock in the vicinity of the site consists of dolomite of the Prairie du Chien group, and in the eastern most portion of the site, sandstone of the Trempealeau, Tunnel City, and Elk Mound groups, however, subsequent subsurface investigations/well logs indicate the bedrock in the immediate vicinity of the Expansion consists of the Galena-Platteville dolomite of the Sinnipee Group.

Logs from local water wells along CTH AB immediately east and north of the Expansion indicate that Galena-Platteville dolomite bedrock of the Sinnipee Group ranges in depth from 70 feet below ground surface (bgs) near the USH 12 & 18 intersection with CTH AB (PW-37) to 153 feet bgs just to the east of the Expansion footprint to 110 feet bgs in the park to the north of the footprint (PW-48). To the west of the Expansion logs from previously abandoned onsite water supply wells indicate dolomitic or shale bedrock ranges in depth from 194 feet bgs to 90 feet bgs. Thus, the surface of the bedrock beneath the Expansion is expected to be greater than 50 feet below the lowest subbase grade elevation. The regional bedrock topography is depicted on figures in the ISR (TRC, 2012a) [figures included in **Appendix E** of Eastern Vertical Expansion ISR (SCS, 2020)].

In the area of the site there is also a fault complex, informally called the "Yahara Hills Complex" (Donohue, 1991), where the disturbed area is subdivided into discrete blocks separated by normal faults. The faults are not part of any currently active geologic process and are therefore considered inactive.

5.3.2 Site Hydrogeology

The following information is reproduced from Section 6.2.2 of the Eastern Expansion FR. The previous FR text is reproduced in italics, with notes added in brackets to indicate the location of referenced information within the current FR. Text specific to the current FR is provided in standard text format.

Regional Hydrogeology

Three major aquifers and one aquitard exist in Dane County (Bradbury et al, 1999). The aquifers consist of the Mount Simon (Cambrian sandstone), the Upper Paleozoic and the unlithified aquifers, while the aquitard is the Eau Claire Formation. The unlithified aquifers are further divided into three types, the proposed and existing landfill is underlain by Types 2 and 3. Type 2 – Unconfined Poorly sorted sand, gravel and silt deposited as diamicton or well sorted offshore glacial lake sediment and Type 3 – Confined or partially confined well to moderately well sorted sand and gravel overlain by silty or clayey lake sediments. The unlithified sand and gravel aquifers can yield economically useful quantities of water in some areas of the county. However, the Cambrian sandstone units are considered to be the principal aquifer in the County.

The elevation of the regional water table in this area is approximately 870 feet M.S.L., based on actual measurements taken at the site. In the area of the proposed Eastern Expansion, the groundwater system consists of two distinct hydrostratigraphic units, a bedrock aquifer, and the surficial glacial deposits. According to regional sources, the flow direction in the bedrock aquifer is generally to the southwest (Figure 6-2) [see **Appendix M** for Eastern Expansion FR Figures]. The uppermost hydrostratigraphic unit in the vicinity of the Eastern Expansion generally occurs within the till and outwash glacial deposits.

Site-Specific Hydrogeology

Horizontal Flow

The hydrogeologic data for this section meets the requirements of NR 512.09(2), NR 512.09(4), 512.11(3), and 512.11(5). Water levels measured at the on-site monitoring wells and off-site staff gauge are summarized in **Table 5-1**. High water table elevation and low water table elevation contour maps are presented on **Plan Sheets 3** and **4**, respectively. The high and low water table maps are the same as those included in the Eastern Expansion FR. Based on review of the semiannual water level monitoring performed since the Eastern Expansion FR was completed, the June 2008 and December 2012 monitoring events still represent the highest and lowest seasonal water table conditions for the site.

The direction of groundwater flow during both of these periods was generally to the north under the Eastern Expansion area. Flow trends toward the north and northwest under the footprint of the approved landfill. The directions of flow are consistent with configurations observed during the previous landfill expansions. No perched water was encountered during drilling activities for the Eastern Expansion in November 2012.

In the Eastern Expansion FR, horizontal hydraulic gradients for the water table were calculated across the Eastern Expansion area based on the high and low water table elevation data and the corresponding water table contour maps. The calculated gradients across the Eastern Expansion area ranged from approximately 0.002 during the low water table conditions in December 2012 to approximately 0.003 during the high water table conditions in June 2008.

Vertical Flow

In the Eastern Expansion FR, water level data from June 2008 and December 2012 were used to calculate the vertical gradients between water table wells and the piezometers. The calculated vertical gradients between the water table and the piezometric surface in December 2012 ranged from -0.014 (upward flow) to 0.004 (downward flow) in wells near the Eastern Expansion. Gradients were variable at the well nests with a slightly higher number of wells exhibiting upward gradients. In June 2008, vertical gradients ranged from -0.026 (upward flow) to 0.006 (downward flow) at wells in the Eastern Expansion area.

Vertical gradients calculated for the June and December 2020 monitoring events are shown in **Table 5-2**. The calculated gradients ranged from -0.042 (upward flow) to 0.063 (downward flow). The strongest upward gradient was at the M6A/M6B well nest near the northern wetland/drainage ditch. The strongest downward gradient was at the WT108A/P108B well nest at the east end of the landfill.

Cross Section I-I' (**Plan Sheet 12**) shows the vertical component of groundwater flow during high water conditions.

Hydraulic Conductivity, Flow Velocity, and Discharge

In-field hydraulic conductivity tests were performed as part of the Eastern Expansion AGIP and previous site investigations. Calculated hydraulic conductivity values for each well within 300 feet of the Eastern Expansion footprint are shown in Table 1 of the AGIP included in **Appendix C**, and the raw test data and analyses are provided in Attachment D of the AGIP. Hydraulic conductivity values for existing wells across the entire contiguous Existing Landfill are summarized in Attachment D of the AGIP included in **Appendix C**.

The Eastern Expansion FR provided the following characterization of hydraulic conductivity and flow velocity in the expansion area:

The geometric mean hydraulic conductivity of the till deposit is 9.4×10^{-4} cm/sec. The geometric mean of the underlying sand outwash is 9.1×10^{-3} cm/sec. The lacustrine deposit in the northwest portion of the Expansion area exhibits a geometric mean of 1.7×10^{-5} cm/sec.

The Eastern Expansion site is hydraulically located primarily sidegradient, but slightly upgradient of the Existing Landfill. As indicated by generally flat vertical hydraulic gradients, horizontal flow conditions generally control the shallow groundwater flow system beneath the Eastern Expansion area until reaching the drainage ditch north of the site. The average linear velocity for groundwater flowing within the Horicon silty sand till aquifer is estimated to be on the order of 30 feet per year or 0.08 foot per day. This estimate of average linear velocity was calculated using the mean hydraulic conductivity values listed above, the highest observed horizontal hydraulic gradient across the Eastern Expansion between selected wells, and an estimate (0.25 percent) of effective porosity. The resulting average linear velocity represents the average rate at which groundwater moves between two points within the aquifer.

To estimate the daily volume of groundwater flowing beneath the Eastern Expansion within the unconfined silty sand till, the average linear velocity is multiplied by the cross-sectional area of the aquifer. The unconfined portion of the sand and gravel aquifer is assumed to have, at a minimum, at least 30 feet of saturated thickness beneath the Eastern Expansion, and the Eastern Expansion is approximately 650 feet in length perpendicular to flow at the northern edge of the proposed limits of waste. Based on these assumptions, a minimum of approximately 4 million gallons/per year or 10,000 gallons per day of water discharge from the till formation beneath the Eastern Expansion to portions of the aquifer and wetland located immediately north of the site.

Calculations of average linear velocity and discharge from the Eastern Expansion FR are included in Attachment D of the AGIP in **Appendix C**. Given the consistent water level monitoring results since the Eastern Expansion FR was prepared, these estimates appear to continue to be representative of site conditions.

5.3.3 Baseline Water Quality Monitoring

The proposed vertical expansion overlies the Eastern Expansion area. Since the AGIP relies on existing monitoring wells, no additional monitoring wells were installed for the Eastern Vertical Expansion. Baseline groundwater monitoring at these existing wells as required by NR 507.17 and NR 507.18 was performed at the wells as part of the previous permitting process. A discussion of the background groundwater quality monitoring is provided in the Eastern Expansion FR (TRC, 2013 and 2013a) and the Eastern Expansion Plan of Operation (TRC, 2014).

Data from these wells and other wells installed at the landfill can be accessed at the WDNR GEMS database (<u>https://dnr.wisconsin.gov/topic/Landfills/gems.html</u>), using License No. 3018.

Three monitoring wells were abandoned in 2020 (M-17A, M-17B, and M-303A) in preparation for the Phase 11 and Phase 12 liner construction. Replacement wells were installed in June 2020 (M-17AR, M-17BR, and M-303AR). Table 1 in the AGIP included in **Appendix C** includes the replacement wells. Baseline monitoring is being conducted on the replacement wells, with the December 2020 monitoring completed to date.

Baseline monitoring for replacement well WT-208ARR, installed in 2018, was performed in 2019 and 2020 and results were submitted to WDNR along with the routine semiannual monitoring results and can be accessed at the WDNR GEMS database address above.

The replacement wells installed in 2014, M9AR, M9BR, M-28R, M-302AR, and M-302BR, have been sampled as part of the routine semiannual monitoring program but have not been analyzed for supplemental baseline parameters as indicated in a letter dated March 12, 2015 (**Appendix B**). Within this letter, it states "it is understood since monitoring wells (M-9AR, M-9BR, M-28R, M-302AR, and M-302BR) were installed as replacement wells, that specific NR 507 requirements were met by the data collected at previously installed wells."

Because the ongoing baseline monitoring is being performed for replacement wells, not wells that were installed to evaluate the proposed expansion, completion of the baseline monitoring is not required prior to submittal of the feasibility report.

Section 7.5 provides additional discussion on the existing groundwater and surface water monitoring.

5.4 WATER SUPPLY WELLS

Since the approval of the Eastern Expansion in 2014, five water supply wells near or within the 1,200-foot setback zone have either been abandoned without replacement or abandoned and replaced outside the 1,200-foot setback zone (Hope Park Well, Hope Lutheran Church Well, Julie Acker Well, Community Well, and Country Corners Well). In addition, the Dane County Public Works Well was installed just outside the 1,200-foot setback zone

The well abandonment reports are included in **Appendix E** for the five water supply wells located near or within the 1,200-foot setback zone that have been abandoned without replacement (Hope Park Well) or abandoned and replaced outside of the 1,200-foot setback zone (Hope Lutheran Church Well, Julie Acker Well, Country Corners Well, and the Community Well). The Dane County Public Works Well is a high capacity well installed in 2015 outside of the 1,200-foot setback for the new highway garage located east of the landfill.

Section 1.4.2 includes exemption requests for YZ391 and PW-51 located within 1,200 feet of the limits of waste. WDNR previously approved variances for these wells under NR 812.43 (Appendix E).

6.0 WASTE AND LEACHATE CHARACTERIZATION

6.1 WASTE CHARACTERIZATION

The average waste types and volumes of solid waste that will be accepted from within Dane County and minimal municipalities and industries outside of Dane County service area over the anticipated life of the expansion are as follows:

- **Municipal solid waste (MSW):** MSW is the primary waste to be disposed of at the landfill and consists mainly of household and commercial wastes. Based on a 3-year average from 2017 to 2019, MSW is projected to be approximately 73.8-percent of the total waste volume disposed at the landfill (see **Table 6-1**).
- Industrial and special wastes: The volume of industrial, construction and demolition, and special wastes (non-MSW) is projected to be approximately 14.3 percent of the total waste volume disposed at the landfill. No individual industrial waste stream is anticipated to be more than 5 percent of the total waste accepted. Special wastes that are accepted at Dane County must follow the site's landfill disposal criteria.
- Alternate daily cover (ADC): The volume of shredder fluff, contaminated soil, and other waste exempt from fees and approved as ADC is projected to be approximately 11.9 percent of the total volume disposed at the landfill. ADC materials are also subject to the site's landfill disposal criteria. Additional daily cover material will be obtained from on-site stockpiles and other sources, as necessary.

Waste type as a percentage of the overall intake for the past 3 years at Dane County is indicated in **Table 6-1**. **Table 14-7** presents the annual waste intake by category for years 2017 to 2019.

6.2 LEACHATE CHARACTERIZATION

Leachate resulting from the Eastern Vertical Expansion is expected to be similar in chemical composition and concentration to leachate resulting from the existing Dane County Landfill Site No. 2 and other municipal solid waste landfills throughout Wisconsin. Leachate generated within the

Eastern Vertical Expansion will be collected and treated off-site at a wastewater treatment facility or recirculated in the active landfill as described in **Section 8.3.4**. The leachate quantities that are expected to be produced from the Eastern Vertical Expansion are discussed in **Section 6.3**. Recent leachate quality monitoring results from the existing landfill are in Table 3 in **Appendix D**.

Currently, Dane County disposes of leachate at the Madison Metropolitan Sewerage District (MMSD) publicly owned treatment works (POTW). It is expected that this arrangement for leachate treatment off-site will continue with the Eastern Vertical Expansion. The current MMSD Industrial Wastewater Discharge Permit (Permit IR-44.01) is included in **Appendix F**. The current MMSD Permit expires on December 19, 2023, and Dane County will apply for reissuance at least 180 days prior to the expiration date. Dane County will also comply with MMSD's requirements regarding significant changes, defined as an increase or decrease of volume by 25 percent, which requires a Request to Discharge Form per SUO § 6.1.3.

6.3 LEACHATE GENERATION

Leachate generation rates have been calculated as indicated in NR 512.12(3)(a)(b), which requires the following generation rates:

- Six inches per year for unclosed areas that have a composite liner
- Three inches per year for closed areas without a composite cap
- One inch per year for areas that have composite cap installed

Based on these generation rates, the calculated leachate generation rates are:

- Maximum during operation: 25,278 gallons per day when all of the Eastern Expansion area is open, assuming no intermediate cover is in place.
- Following closure: 9,135 gallons per day.

Appendix G includes the detailed calculations.

Leachate collected in the landfill will be pumped from the landfill and recirculated back into the waste mass in areas that have composite liner system installed or treated off-site at a wastewater treatment plant. See **Section 8.3.4** for additional information on the leachate collection and removal system.

7.0 CONSTRAINTS ON LANDFILL DEVELOPMENT

7.1 LOCATIONAL CRITERIA

Locational standards specified in NR 504.04(3) are addressed as follows.

7.1.1 Navigable Lake, Pond, or Flowage

There are no navigable ponds identified within 1,000 feet of the proposed Eastern Expansion footprint; however, there are two man-made navigable ponds (Pond A and Pond B) within 1,000 feet of the existing landfill footprint. Both ponds are located on the public golf course (Yahara Hills) to the south of the existing Rodefeld Landfill (see **Figure 1-1**). Exemptions for setbacks to these ponds have previously been approved by WDNR for prior site permitting. An exemption for the ponds and lakes
located within 1,000 feet is requested in **Section 1.4.2**. Exemptions for setbacks to these ponds have previously been approved by WDNR for prior site permitting.

There are three manmade storm water ponds designed for flow control and sediment removal for the Dane CTH Garage and Medical Examiner's office. It is our understanding that an exemption request is not be required for these ponds.

7.1.2 Navigable River or Stream

The vertical expansion is not located within 300 feet of a navigable river or stream.

7.1.3 Floodplain

The vertical expansion is not located within a 100-year floodplain. Flood Insurance Rate Maps (FIRM) are provided in **Figure 7-1**.

7.1.4 Highways and Parks

The existing limits of waste are located within 1,000 feet of Highway 12 & 18, Hope Park, and Yahara Hills Golf Course. Similar to the Eastern Expansion, Dane County will incorporate screening through the use of strategically placed plantings, screening berms along the perimeter, and where necessary, soil core berms within the waste mass constructed in conjunction with the filling sequence. While screening measures are planned, Dane County is requesting an exemption to this criteria in **Section 1.4.2**, understanding that the screening measures will not completely screen the landfill. An exemption to this criteria was granted as part of the Eastern Expansion.

7.1.5 Airports

The Eastern Vertical Expansion is not located within 10,000 feet of an airport runway used by turbojet aircraft, nor within 5,000 feet of an airport runway used by piston-type aircraft. There is one privately owned airport (Blackhawk Airfield in Cottage Grove) for public use that is located approximately 4.8 miles from the Eastern Expansion. The Blackhawk Airfield is also the only public use airport within the 5- and 6-mile radius of the proposed site, per Title 49 of the United States Code, and per the Title 48 amendment established in 2000. The next nearest public airport is the Dane County Regional Airport located approximately 7 miles northwest of the proposed Eastern Expansion. There are two privately owned, not for public use, airstrips within 6 miles of the proposed Eastern Expansion. One airstrip is Little Wheel Field located approximately 2.8 miles east of the proposed Eastern Expansion and a second airport is Quale Airport located approximately 3.5 miles southeast of the proposed Eastern Expansion.

Based on WDNR's ISI response, Dane County notified the FAA of the proposed vertical expansion on June 26, 2020. Dane County also sent notification letters to Little Wheel Field, Blackhawk Airfield, and Quale Airport on June 26, 2020 (see **Appendix B**). Two letters were sent to Little Wheel Field and both were returned to Dane County as undeliverable. Upon further research, it appeared that the property had been recently sold. Dane County sent a notification letter to the new landowner on September 3, 2020, and a copy is included in **Appendix B**.

On August 26, 2020, Dane County sent a follow-up email to the FAA to inquire about any questions or concerns regarding the proposed vertical expansion. On August 31, 2020, we received a response from Deb Bartell, Manager of the Chicago Airports District Office of the FAA, indicating that their environmental protections specialist, Bobb Beauchamp, would be reviewing the notification.

On October 5, 2020, Dane County received a response from the FAA indicating that since the proposed expansion is a vertical expansion to an existing landfill, the limitation on construction within 6 miles of a qualifying airport do not apply (**Appendix B**). FAA also confirmed no airports within 5,000 feet (piston aircraft) or 10,000 feet (turbojet aircraft) of the proposed expansion. Therefore, the limitations of 40 CFR 258.10 also do not apply. FAA indicated that other aspects of the project may still apply, such as notice of construction and airspace review.

Based FAA's response, Dane County used the FAA web-based tool to determine if a notice of construction is required It was determined that the project required a notice of construction be filed with the FAA. Dane County submitted a notice of construction to FAA on December 1, 2020. Following notifications by FAA on December 14, 2020, and January 22, 2021, that there were issues with the application, Dane County submitted a revised notice of construction on December 23, 2020, and again on January 27, 2021. In a letter dated February 12, 2021, the FAA indicated that the aeronautical study revealed that the proposed vertical expansion does not exceed obstruction standards and would not be a hazard to air navigation (**Appendix B**). Dane County then submitted FAA Form 7460-2, Part 1 on April 8, 2021, to ensure the determination does not expire prior to the criteria outlined in the letter.

7.1.6 Water Supply Wells

Two private wells, the biogas facility well (YZ391) and Michael Niebuhr well (PW-51), are located within 1,200 feet of the limits of filling. Well YZ391 is located within 1,200 feet of the proposed limits of waste for the Eastern Vertical Expansion while PW-51 is located within 1,200 feet of the approved 2014 Eastern Expansion limits of waste. An exemption for PW-51 was previously granted for the Eastern Expansion (ref. Granting of Exemption 2 of WDNR's February 3, 2014 Determination of Site Feasibility). Well YZ391 was installed after the 2014 Eastern Expansion approval, and installation of this well was approved by WDNR. **Section 1.4.2** includes an exemption request from NR 504.04(3)(f) for wells YZ391 and PW-51 located within 1,200 feet of the limits of waste. Variance requests were previously approved for these wells (**Appendix E**).

Since the approval of the Eastern Expansion in 2014, six private water wells near or within the 1,200-foot setback zone have either been abandoned without replacement, abandoned and replaced outside the 1,200-foot setback zone, or installed just outside the 1,200-foot setback zone. The well abandonment reports are included in **Appendix E** for the five private wells located near or within the 1,200- foot setback zone that have been abandoned without replacement (Hope Park Well) or abandoned and replaced outside of the 1,200-foot setback zone (Hope Lutheran Church Well, Julie Acker Well, Country Corners Well, and the Community Well). The Dane County Public Works Well is a high capacity well installed in 2015 outside of the 1,200-foot setback for the new highway garage located east of the landfill.

7.1.7 Fault Areas, Unstable Zones, and Seismic Impact

The vertical expansion is not located within 200 feet of a known Holocene fault or within a seismic impact zone, nor within an unstable area.

7.2 PERFORMANCE STANDARDS

7.2.1 Wetland Areas

The expansion is a vertical expansion above and within the existing approved waste limits. Therefore, the vertical expansion will not impact wetlands. The discharge of gradient control water from the

existing Eastern Expansion will continue as approved in the Eastern Expansion feasibility and Plan of Operation approvals. The vertical expansion should not increase the volume of water discharged to the northern wetland from the existing operating gradient control system. Since quarterly observations began in 2014, there has never been a discharge of water observed from the gradient control system.

The design of the Eastern Vertical Expansion includes storm water runoff and erosion control measures to control impacts to the water quality and aquatic species near the landfill. The design of surface water controls presented in this report are preliminary and show that measures can be implemented for collecting surface water from the existing landfill and the Eastern Vertical Expansion and directing it to the perimeter sedimentation basins for removal of sediment before being released to the nearby wetland areas. Detailed design and supporting calculations of the surface water management features will be included with the Plan of Operation.

7.2.2 Endangered or Threatened Species

Reviews of impacts to endangered and threatened species or historical, scientific, or archeological areas have been performed multiple times throughout the years at this property. The results of the reviews performed as part of the Eastern Expansion are summarized below:

- Based on a review of the Natural Heritage Inventory and subsequent consultations with conservation biologists Emma Pelton, Mike Mossman, and Adrian Wudeven, it appeared unlikely that there would be any significant adverse impact on critical habitat areas or endangered or threatened resources (ref: WDNR's July 5, 2012 ISI Response for the Eastern Expansion).
- There is no suitable habitat for the Prairie Vole based on a June 27, 2012 email from Mike Mossman, WDNR Forest and Community Ecologist (ref: Findings of Fact 13.n. from WDNR's February 3, 2014 Determination of Site Feasibility for the Eastern Expansion).
- Archaeological issues and historical structures for the site were cleared by Mark Dudzik, WDNR Archaeologist, based on his review of a report dated September 29, 2012, titled "An Archeological Survey of a Proposed Expansion Area for the Rodefeld Landfill in Madison, Dane County, Wisconsin" by Philip H. Salkin of Archeological Consulting and Services, Inc. (ref: Findings of Fact 13.0. from WDNR's February 3, 2014 Determination of Site Feasibility for the Eastern Expansion).

7.2.3 Surface Water

Surface water will be managed in a similar manner used for surface water runoff from the existing site and consistent with the approach approved for the Eastern Expansion. Detrimental effects on the surface water adjacent to the landfill are not expected. The design for control of surface water runoff from the Eastern Vertical Expansion will include berms, swales, and ditches located adjacent to and on the final cover of the vertical expansion that will collect and divert water through downslope flumes to perimeter sedimentation basins (**Plan Sheet 17**). The sedimentation basins will limit the discharge of sediment to adjacent properties and wetlands in accordance with applicable soil erosion regulations and/or state and federal storm water runoff regulations. The potential for impacts due to surface water runoff is further discussed in **Section 8.8**. The Eastern Vertical Expansion will be designed, constructed, and operated in a manner that will not have a detrimental effect on surface water.

7.2.4 Groundwater Quality

Detrimental effects to groundwater quality as defined in NR 504.045 are not expected as a result of the construction or operation of the Eastern Vertical Expansion. The vertical expansion is located entirely within the footprint of the Eastern Expansion, which includes a composite 4-foot-thick low-hydraulic conductivity clay layer with a geomembrane liner and leachate collection and removal system. The facility will also include a composite final cover system, which will limit infiltration through closed portions of the vertical expansion. The Eastern Expansion also includes a gradient control system that restricts groundwater from reaching the liner (TRC, 2014).

7.2.5 Explosive Gases

The existing landfill gas collection and control system will be expanded to collect gas from the vertical expansion. The landfill gas collection system prevents the migration and concentration of explosive gases. A detailed landfill gas collection system design to control the migration and concentration of explosive gases in accordance with NR 504.08 will be developed during the preparation of the Plan of Operation. Additionally, the existing system of monitoring points will be used to routinely monitor for landfill gas migration.

7.2.6 Hazardous Air Contaminants

The existing landfill gas collection and control system will be expanded to collect gas from the vertical expansion. The landfill gas collection and control system controls emissions of hazardous air pollutants in accordance with state and federal air pollution control requirements. A detailed landfill gas collection system design will be developed during the preparation of the Plan of Operation.

Dane County will submit an air pollution control construction permit and operation permit revision application to WDNR Air Quality Division. Construction of the Eastern Vertical Expansion will not proceed until the air permit is obtained by Dane County.

7.3 GEOTECHNICAL INFORMATION

The geotechnical setting at the Dane County landfill is conducive to landfill development. The evaluation of existing facility performance (**Section 7.5**) indicates that the existing landfill has performed well. The Eastern Expansion FR documented that site-specific geology includes soils consisting of silty sand till, fine-grained (clay/silt) meltwater deposits (glaciolacustrine), and sand outwash. The low permeability of the tills serves to limit the movement of groundwater. The groundwater generally flows to the north/northwest in the area of the Eastern Vertical Expansion. The landfill has been designed to account for settlement of the liner as discussed in **Section 8.5**.

The Eastern Expansion gradient control system is designed control the shallow water table in relation to the liner system and base grades under high water table conditions. The liner system, base grades, and gradient control system were approved in for the Eastern Expansion. Refer to the Eastern Expansion Plan of Operation (TRC, 2014) for a full description of the base grades and gradient control system.

7.4 CONSTRUCTION AND OPERATION

As was concluded for the Eastern Expansion, there are no constraints with regard to design, materials, or support services necessary to construct and operate the Eastern Vertical Expansion. Soils needed to construct the final cover have been excavated from within the Eastern Expansion footprint or are available from other Dane County borrow sources.

The Eastern Vertical Expansion lies entirely within the footprint of the Eastern Expansion and uses the gradient control, liner and leachate collection, and removal systems and materials described in the Eastern Expansion Plan of Operation (TRC, 2014). Supporting design calculations for these systems are included in the Eastern Expansion Plan of Operation. The key Eastern Vertical Expansion design component not relying on the approved Eastern Expansion design is the final cover system, although the proposed final cover system for the vertical expansion is the same as that approved for the Eastern Expansion.

A GCL cap is currently accepted as an alternative design under the current Eastern Expansion Plan of Operation and is proposed for the Eastern Vertical Expansion to reduce the amount of clay soil required for construction. Barrier soil layer material meeting the minimum requirements of NR 504.07(4)(a) will be obtained from an off-site borrow source. If a clay cover is constructed, select clay material meeting the minimum requirements of NR 504.06(2)(a) will also be obtained from an off-site borrow source. A discussion of borrow sources for these materials is included in **Section 12.0**.

Leachate treatment is not a constraint on landfill development and is discussed in **Section 8.3.4**. The County will continue to use MMSD for leachate disposal or will recirculate the leachate into the landfill in areas where there is a composite liner system installed. An agreement between the county and the MMSD is provided in **Appendix F**. An existing sewer line will convey the collected leachate to the MMSD. MMSD presently accepts leachate from the County landfill. The County will work with MMSD to evaluate the need for additional leachate disposal capacity as construction of future phases progress.

Operation of the Eastern Vertical Expansion will be provided by the County landfill personnel and equipment consistent with current operations. The site will be operated in accordance with NR 506. Waste operations and support functions to be performed at the landfill include waste compaction, placement of daily cover, road construction, snow removal, dust and litter control, gate and fence checking, security, monitoring and maintenance, and grounds maintenance. On-site facilities to assist in the landfill support services include an office, shop, truck scale, leachate collection system, sedimentation basins, landfill gas extraction system, and renewable natural gas facility and flare.

7.5 EXISTING FACILITY PERFORMANCE

NR 512.13(4) requires the FR contain an evaluation of the compliance status and performance of a contiguous existing landfill. To address this requirement, an evaluation of the existing landfill based on recent monitoring results is provided in the following sections.

Monitoring data for the existing facility can be also accessed at the WDNR GEMS database (<u>https://dnr.wisconsin.gov/topic/Landfills/gems.html</u>), using License No. 3018.

7.5.1 Existing Facility Description

Dane County owns and operates the existing Dane County Landfill Site No. 2 (Rodefeld), WDNR License No. 3018. The original 3,800,000 cubic yards licensed for the site was approved by the WDNR in March 1994. A Western expansion that added 3,271,400 cubic yards was approved by the WDNR in March 1994. The Eastern Expansion, which is currently being filled, has an approved capacity of 3,837,900 cubic yards (refer to **Section 8.2** for a modification to approved waste capacity). The landfill accepts municipal solid waste, fee exempt waste, treated contaminated soil, construction/demolition waste, and other nonhazardous special wastes. Daily cover consists of WDNR-approved petroleum-contaminated soil (C-soil) and on-site clean soils.

Annual reports are submitted to the WDNR that summarize the facility monitoring data. The 2019 annual report was reviewed to evaluate the existing facility performance. The annual reports were prepared by Dane County and were submitted to WDNR.

7.5.2 Hydrogeology

Groundwater flow is generally to the north under the Eastern Expansion area. Flow trends toward the northwest under the remaining landfill area. Seasonal water table fluctuation is consistent across the site and does not significantly change the flow pattern across the site throughout the year. The existing monitoring points supply a sufficient network of data points for monitoring and evaluating the water table elevation, horizontal hydraulic conductivity and vertical hydraulic conductivity throughout the year and from year to year.

7.5.3 Groundwater Quality Monitoring Data

Groundwater monitoring wells are sampled semi-annually in June and December as outlined in the environmental monitoring tables included in **Appendix L**. Groundwater quality data from the existing landfill indicate that the landfill liner and landfill gas control system are effectively preventing groundwater contamination. Recent groundwater monitoring results are summarized in tables prepared for the 2020 fourth quarter monitoring event in **Appendix D**, including:

- Table 1 NR 140 Exceedance Summary
- Table 2 VOCs Detected
- Table 3 Historical Monitoring Results

NR 140 PAL and ES exceedances for monitoring wells in the period from 2018 through 2020 are summarized in **Table 7-1** for public health and welfare parameters and in **Table 7-2** for indicator parameters. NR 140 exceedances for the last 3 years are discussed below.

Public health parameters: The only NR 140 PAL exceedances for public health parameters during the last three years were as follows.

- Cadmium levels above the PAL but below the ES were reported for samples from wells M17AR, M303AR, and WT208ARR. All of the results were below the laboratory's limit of quantitation (LOQ) and are not considered confirmed PAL exceedances.
- Lead was detected at an estimated concentration above the PAL but below the ES in one sample from well WT208ARR. The result was below the laboratory's LOQ and is not considered a confirmed PAL exceedance.
- Benzene was detected at a concentration above the PAL but below the ES in one sample from well M303A in June 2018, but was not detected in the June 2019 sample or duplicate, or in the December 2020 sample from replacement well M303AR.
- Chloroform was detected at concentrations above the PAL but below the ES in the June 2019 samples from wells M302AR and M302BR, but was not detected in the June 2020 sample or in in previous results from these wells.
- Dichloromethane was detected at concentrations above the PAL but below the ES in the June 2018 samples from wells M303A and P103B and the June 2019 sample from WT201AR, and at a concentration slightly above the ES in the December 2019 sample

from WT208ARR. None of these exceedances were confirmed in subsequent sampling. Dichloromethane is a common laboratory contaminant.

Public welfare parameters: The only NR 140 PAL and ES exceedances for public welfare parameters during the last 3 years have been for chloride and manganese. Chloride exceeded the PAL and/or ES at wells MW14A, M14B, M17AR, M17BR, M23, M28R, M29, M302BR, WT113A, WT201A, WT202AR, and WT207AR.

Chloride levels reported for samples from MW14A, M14B, M17AR, M17BR, M23, M28R, M29, M302BR, and WT207AR are located south and/or east of the landfill and are most likely related to road salt use on Highway 12 & 18 and/or CTH AB. Based on the north-northwest groundwater flow direction, these wells are not downgradient from the landfill. Chloride levels above the PAL at WT113A, WT201AR, and WT202AR may be related to road salt use on the on-site paved roads. Other parameters indicating likely landfill impacts, such as volatile organic compounds (VOCs), have not been detected at these wells.

Manganese exceeded the public welfare ES in the first sample from replacement well M17BR, which was collected in December 2020. Manganese at this upgradient well likely reflects natural background.

Indicator parameters: Well-specific PALs established for indicator parameters have been exceeded for specific conductance, alkalinity, and hardness during the last 3 years at several wells, as shown in **Table 7-2**. Indicator parameters are not contaminants, but are indicators of general water quality. Changes in indicator parameter concentrations can reflect changes in hydrologic conditions, such as groundwater flow direction or surface water infiltration amounts and locations. PALs for indicator parameters are generally calculated based on samples collected over a relatively short time period (eight monthly samples), and this time period is often not long enough to capture the natural variability in indicator parameter concentrations. PAL exceedances for indicator parameters can potentially be caused by a release from a landfill, but are often either due to baseline monitoring not capturing the full extent of natural variability or due to changes in site hydrology or hydrogeology related to site construction.

The significance of the indicator parameter PAL exceedances has been evaluated in conjunction with the results for public health and welfare parameters as part of the routine semiannual monitoring program reporting. Based on this evaluation, none of the PAL exceedances for indicator parameters appear to be due to a release from the existing landfill. As indicated by the chloride PAL exceedances, one of the primary non-landfill causes of indicator parameter PAL exceedances appears to be road salt use on Highway 12 & 18, CTH AB, and the landfill roads/paved area.

In summary, the groundwater quality monitoring data indicate that the existing landfill is performing well with respect to protection of groundwater quality.

7.5.4 Water Supply Well Monitoring Evaluation

Water supply wells are sampled quarterly in March, June, September, and December, with annual sampling for a longer list of analytical parameters occurring during the June sampling event, as outlined in the environmental monitoring tables included in **Appendix L**. Recent water supply well monitoring results are summarized in tables prepared for the 2020 fourth quarter monitoring event in **Appendix D**, including:

• Table 1 – NR 140 Exceedance Summary

• Table 3 – Historical Monitoring Results

Most of the wells sampled are located more than 1,200 feet from the landfill and the water supply well monitoring results do not indicate impacts from the landfill. NR 140 PAL and/or ES exceedances have been reported for public health parameters including arsenic, lead, and nitrate+nitrite. Arsenic exceedances appear to be due to natural background. Lead exceedances may be related to lead in the plumbing system. Nitrate+nitrate exceedances likely reflect impacts from agriculture and/or septic systems. Cadmium has been detected at estimated concentrations exceeding the PAL but below the laboratory's limit of quantitation. Cadmium at these low concentrations likely reflects natural background in the bedrock aquifer.

NR 140 PAL and/or ES exceedances have been reported for public welfare parameters including chloride, iron, and manganese. Chloride exceedances are likely related to road salt use and/or septic systems. Iron and manganese are naturally occurring in the bedrock aquifer.

7.5.5 Surface Water Monitoring Evaluation

Surface water monitoring is conducted semi-annually for water surface elevation at a staff gauge as outlined in the environmental monitoring tables included in **Appendix L.** Elevation results are included in **Table 5-1**.

In addition, quarterly visual monitoring is conducted at each of the four on-site sedimentation basins in accordance with the facility's Tier 2 Industrial Storm Water Permit and associated Storm Water Pollution Prevention Plan (SWPPP). An annual inspection is conducted by site personnel to verify that the site drainage best management practices are being implemented and properly maintained. Documentation of these inspections are recorded and kept on file at the facility, and submitted with the annual reports for the landfill. Review of the 2019 annual report indicates that the site is operating in accordance with the SWPPP. Any visual signs of discoloration have been attributed as temporary due to disturbance/construction events. There is no evidence of discharge of contaminated runoff to waters of the state.

7.5.6 Landfill Gas Monitoring Evaluation

Landfill gas monitoring at the gas probes around the facility is performed quarterly and indicates that landfill gas is not migrating laterally from the landfill. The only methane detection at a gas probe in the 3-year period from 2018 through 2020 was an isolated detection of 0.3 percent methane at gas probe GP14 in September 2019.

Surface emission monitoring is performed in accordance with the facility's air pollution control permit (Construction Permit No. 18-POY-56/Operation Permit 113127300-P20). The surface emission monitoring results are included in the Annual Report prepared by Dane County in accordance with Condition 29 of the Eastern Expansion Plan of Operation approval.

Recent gas monitoring results for the gas probes and gas extraction wells are summarized in Tables 6A and 6B in **Appendix D**.

7.5.7 Leachate Head Evaluation

Leachate head monitoring is performed monthly. Leachate head monitoring data for the period from 2016 through 2020 is summarized in Table 4 in **Appendix D**. The head monitoring results for the horizontal leachate head wells installed in the drainage blanket (LHW6N/S through LHW10N/S)

indicated that the leachate collection system in Phases 6 through 10 is effectively maintaining leachate head levels below 1 foot over the liner.

The vertical head wells (LHW1 through LHW4) have historically indicated higher head levels, but the reported head levels for these wells may not represent the true head on the liner, because these wells are terminated above the leachate drainage blanket. The leachate head has historically been calculated by subtracting the liner elevation from the leachate elevation measured in the vertical well, but this calculation may overestimate the head on the liner if leachate is perched within the waste above the drainage blanket. LHW-1 and LHW-2 could not be monitored in 2020 due to tar in well LHW-1 and a bent casing at LHW-2.

Leachate collected is either recirculated or discharged to the MMSD sanitary sewer system. The annual reports summarize the leachate volumes collected, including a breakdown of leachate recirculated and leachate discharged to MMSD. Maintenance activities are also described in the reports.

7.5.8 Lysimeter System Evaluation

Dane County Landfill Site No. 2 has five lysimeters (LS-1 through LS-4 and LS-6) located outside of the Eastern Expansion limits (**Plan Sheet 2**). Lysimeter monitoring includes monthly monitoring for discharge volume pumped and annual monitoring for select parameters as outlined in the environmental monitoring tables included in **Appendix L**. The lysimeters are not subject to NR 140 standards; lab results are reviewed for changes in water quality. Review of the historical results of the lysimeters have been generally consistent.

7.5.9 Gradient Control System Evaluation

The 2019 Annual Report assessment of the condition and operation of the gradient control system indicates that the gradient control system is operating as expected. The gradient control system discharge point has been dry during all inspections. The gradient control monitoring point GCM-1 has also been dry during semi-annual monitoring. Groundwater elevations at monitoring wells near Phases 9 & 10 confirm that the water table appears to be below both the gradient control system and the gradient control monitoring point.

7.5.10 Conclusions

Review of the performance of the existing Dane County Landfill Site No. 2 indicates that the facility is performing well. This information supports the proposed Eastern Vertical Expansion over the existing Eastern Expansion footprint using engineering and design concepts similar to those previously permitted for and incorporated into the Eastern Expansion.

8.0 ENGINEERING AND DESIGN

8.1 GENERAL

The vertical expansion of the landfill is being pursued as a municipal development to fulfill the need for landfill disposal capacity within the Dane County service area. This additional disposal capacity is vital for the economic stability and welfare of the communities and industries to be served by Dane County Landfill Site No. 2.

The vertical expansion is designed to meet or exceed local, state, and federal performance requirements, including NR 500 and Subtitle D regulations. Construction operations and long-term care will be conducted to minimize or eliminate impacts to the surrounding environment and to provide economic solid waste disposal for the service area. The proposed design will not cause or exacerbate existing NR 140 groundwater quality exceedances. The proposed design is considered preliminary and will be further detailed in the Plan of Operation.

8.2 DESIGN CAPACITY/SITE LIFE

The Eastern Vertical Expansion has a design capacity of approximately 990,300 cubic yards (see **Appendix H**). The design capacity is based on the revised final grades for the Eastern Expansion, as approved by WDNR in a plan modification dated May 13, 2020, for a reduction in the Eastern Expansion capacity by approximately 16,700 cubic yards. The Eastern Vertical Expansion design capacity includes waste, daily cover, and intermediate cover. Proposed final grades for the Eastern Vertical Expansion are shown on **Plan Sheet 17**.

The proposed vertical expansion will accept nonhazardous municipal, commercial and industrial wastes, and special wastes from the surrounding area. Refer to the Needs Analysis in **Section 14.0** for information on available waste disposal capacity in the service area. The vertical expansion is estimated to provide an additional 3 years of capacity at Dane County Landfill Site No. 2.

8.3 DESIGN CONCEPTS

The Eastern Vertical Expansion consists of approximately 21.3 acres located entirely within the Eastern Expansion footprint.

Because this is a vertical expansion and located entirely within the Eastern Expansion footprint, the following design components will remain as approved by the Eastern Expansion:

- Gradient control system
- Subbase grades
- Liner system and base grades
- Leachate collection and removal system

8.3.1 Gradient Control System

The Eastern Vertical Expansion is located within the existing lined area of the Eastern Expansion, which includes a gradient control system. No changes to the gradient control system are proposed as part of the vertical expansion.

8.3.2 Subbase Grades

The proposed Eastern Vertical Expansion is located within the existing lined area of the Eastern Expansion footprint as shown on **Plan Sheet 15**. No changes to the existing subbase design are proposed as part of the vertical expansion.

8.3.3 Liner System

The proposed Eastern Vertical Expansion is located within the existing lined area of the Eastern Expansion footprint. No additional liner is proposed as part of the vertical expansion. Base grades will be as approved for the Eastern Expansion (**Plan Sheet 16**). The existing liner system has been

designed in accordance with NR 504 and consists of 4 feet of compacted clay followed by a 60-mil high density polyethylene (HDPE) geomembrane, a geotextile cushion and leachate drainage layer.

8.3.4 Leachate Collection System

The Eastern Vertical Expansion will use the existing leachate collection system in place for the Eastern Expansion. The existing leachate collection system is designed in accordance with NR 504.06(6) for landfills with collection lines exceeding 1,200 feet. The leachate collection system consists of a select aggregate drainage layer, leachate collection pipes, collection sumps, inclined riser piping containing submersible pumps, perimeter access vaults, leachate forcemain, and transfer manholes. As is done presently with leachate from the existing landfill, the collected leachate will be discharged into the existing MMSD sanitary sewer system, or recirculated back into the waste mass within the landfill. Dane County has an agreement with the MMSD to accept leachate from the landfill that includes the Eastern Expansion and the Eastern Vertical Expansion. Refer to **Appendix F** for the leachate treatment agreement.

The base of the Eastern Expansion includes a herringbone design with ridges and valleys having minimum slopes of 2 percent towards the perforated leachate collection pipes (see **Plan Sheet 16**). The approved leachate collection system for the Eastern Expansion was designed to provide effective collection and removal of leachate from the landfill. The leachate collection system was designed to maintain less than 12 inches of hydraulic head at the hydraulically most distant location of the liner system throughout the operating life and the post-closure care period of the facility. In order to monitor the performance of the leachate collection system, leachate headwells are included in each liner phase to measure leachate head on top of the liner.

Dane County Landfill Site No. 2 follows the Leachate Recirculation Plan approved as part of the Eastern Expansion Plan of Operation (TRC, 2014). The proposed vertical expansion will use the previously approved plan.

Appendix I contains pipe strength calculations for the existing leachate collection lines below the Eastern Vertical Expansion. The existing pipes are Schedule 80 PVC in Phases 1 through 4 and SDR 11 HDPE in Phases 9 through 12. The maximum final grades above the leachate collection lines within the limits of the vertical expansion will be present above Phases 4 and 10. This will result in a new maximum final fill height over the leachate collection lines of approximately 183 feet in Phase 4 and 152 feet in Phase 10 given the proposed vertical expansion final grade elevation of 1,065 feet above mean sea level (amsl). The calculations in **Appendix I** show that the existing pipe strengths are suitable to prevent excessive pipe deflection and pipe wall crushing below the Eastern Vertical Expansion. The Eastern Vertical Expansion will not result in increased loading above the cleanout pipes or sideslope riser pipes at sumps so the pipe strength calculations in the 2014 Eastern Expansion Plan of Operation (TRC, 2014) are still suitable for those pipes.

8.3.5 Final Cover System

No final cover has been placed within the limits of the Eastern Vertical Expansion. Waste accepted in the vertical expansion will be placed directly over waste/daily cover/intermediate cover.

The proposed final cover system consists of the following, from the top down:

- Native vegetation as detailed in a Plan Modification approved by WDNR on August 23, 2018 (Appendix B)
- 0.5 foot of topsoil

- 2 and a half feet of rooting zone
- Geocomposite drainage layer
- 40-mil LLDPE geomembrane
- 2 feet of compacted clay or GCL with 2 feet of barrier soil per NR 504.07(4)

The proposed vertical expansion would bring the Eastern Expansion's final cover grades to a peak with a maximum of 4H:1V and minimum 5 percent slopes within the existing footprint.

The design is consistent with the design outlined in the Eastern Expansion FR, as described below.

[From Section 9.3 of the Eastern Expansion FR]: Surface water that percolates through the topsoil and general fill layers and enters into the geocomposite drainage layer will flow toward the perimeter of the landfill where it will be collected by interceptor trenches located below each diversion berm on the final cover and at the base of the final cover in the landfill perimeter berm. These collection trenches will have 4-inch-diameter perforated polyethylene pipes for collecting the water from the geonet. The pipes located under the diversion berms will discharge into the downslope flumes or will drain down to the landfill perimeter berm. The pipes in the perimeter berm will discharge the collected water to daylight at several locations around the perimeter of the landfill. On the eastern end of the landfill, where the top perimeter berm slopes to the north and south, the pipe trenches will run at the same slope as the berm and will discharge through pipes located at the northeast and southeast corners of the expansion. The trenches on the northern and southern sides of the Eastern Expansion, where the berms are flat, will slope at a minimum 0.5 percent to outlet discharge pipes that drain to daylight at approximately 200-foot intervals.

The collector trenches/pipe for the final cover geocomposite drainage layer will be bedded within an envelope of aggregate material and a geotextile filter wrap. The outlets for discharge pipes around the perimeter of the landfill will have riprap aprons to disperse the water into the perimeter ditches or sedimentation basins.

The final cover will be seeded, fertilized and mulched to limit erosion.

Detailed design of the final cover system, including tie-ins, will be presented in the Plan of Operation.

8.3.6 Intermediate Waste Grades

The maximum intermediate waste grades are proposed to be up to 10 percent higher than the final waste grades to allow for settlement. Prior to placing final cover, waste grades will be verified and established as to not exceed the final cover grades. A maximum intermediate waste grades plan sheet will be provided with the Plan of Operation.

8.3.7 Active Gas Management System

The existing active gas management system will be advanced in the vertical expansion area. The County's existing system includes a series of vertical gas extraction wells connected to gas header piping placed in the waste mass that transports the collected gas to the County's existing renewable natural gas (RNG) processing system located on the south side of the landfill, just east of the site entrance. The RNG processing system converts the landfill biogas into a pipeline quality natural gas. Additional information on the landfill gas system is provided in **Section 8.7**.

8.4 MATERIAL BALANCE

No changes to the Eastern Expansion liner or final cover system are proposed as a result of the Eastern Vertical Expansion. Because the vertical expansion falls entirely within the footprint of the Eastern Expansion, the final cover area does not change, just the slopes. Refer to the preliminary materials balance prepared for the Eastern Expansion (Table 9-1, TRC, 2013).

Materials for construction will be obtained from the following sources:

- Select clay fill for final cover construction: WDNR approved clay borrow source. Additional discussion on this clay borrow source is provided in **Section 12.0**.
- Select aggregate fill for pipe bedding: Local commercial source.
- Synthetic materials (e.g., piping, geomembrane and geocomposite for final cover): Reputable manufacturers and suppliers.

A more detailed volume calculation for the required final cover soil materials and available source materials will be provided in the phasing and closure plan of the Plan of Operation for this proposed Eastern Vertical Expansion.

8.5 SUBBASE CONSOLIDATION AND SETTLEMENT EVALUATION

Appendix I contains the soil settlement calculations below the existing leachate collection lines in the Eastern Vertical Expansion area. The leachate collection lines in Phases 4 and 10 will have the largest load increases due to the proposed vertical expansion final grades that peak at elevation 1,065 feet amsl. The calculations include settlement of the clay liner, and native clay and sand layers above bedrock. As required by NR 504.06(6), settlement was calculated for 100 percent of primary consolidation and 100 years of secondary compression following closure of the landfill. Using the conservative assumption that no pipe settlement will occur at the pipe toes along the landfill perimeter berms, the calculations show that the existing leachate collection lines in Phases 4 and 10 will maintain a minimum required pipe slope of 0.5 percent under the loading from the Eastern Vertical Expansion.

8.6 SLOPE STABILITY EVALUATION

Appendix I contains the results of a waste global slope stability analysis. The analysis was performed to evaluate the final 4H:1V waste slope at the highest waste grade and longest slope length in the area of the proposed Eastern Vertical Expansion (vertical expansion) at Dane County Landfill Site No. 2. The results confirm that the vertical expansion final waste slope of 4H:1V peaking at an approximate elevation of 1,065 feet amsl will be stable. SCS recommends a minimum safety factor of 1.5 for the final waste slope. The results indicate that the 4H:1V waste slope with the assumed parameters has an acceptable minimum safety factor of approximately 2.2, which exceeds the minimum recommended safety factor of 1.5. The slope stability analysis of the proposed vertical expansion final cover system will be included with the Plan of Operation.

8.7 LANDFILL GAS MANAGEMENT SYSTEM

NR 504.08 requires that facilities accepting waste with the potential to generate gas be designed to prevent the migration of explosive gases generated by the waste fill. The Eastern Expansion landfill gas collection system design will be modified as needed to address the vertical expansion as well as

other changes needed to address current conditions. The landfill gas collection system design will be provided with the Plan of Operation submittal. Consistent with the existing system, the design of the proposed landfill gas management system will include vertical gas extraction wells connected by header pipes that will carry collected gas to the existing RNG plant located on the southern end of the landfill (**Plan Sheet 2**).

As outlined in the Eastern Expansion FR, the construction of these wells will consist of 36-inch-diameter boreholes drilled through the waste and extend within 10 feet vertically of the leachate collection system. The pipe in the borehole will be a minimum 6-inch-diameter (Schedule 80) PVC or an approved alternate. The wells will be spaced assuming a maximum radius of influence of 125 feet around the perimeter of the Eastern Expansion and 150 feet for the remainder of the Eastern Expansion and Eastern Vertical Expansion. Gases from the landfill will be transferred through a header pipe, which will be sloped at a minimum of 2 percent so that the condensate within the gas system can be collected and treated with leachate.

Existing gas monitoring probes around the perimeter of the landfill will allow for monitoring for subsurface migration of landfill gas (**Plan Sheet 2**).

Dane County will submit an air pollution control construction permit and operation permit revision application to the WDNR Air Quality Division. Construction of the Eastern Vertical Expansion will not proceed until the air permit is obtained by Dane County. Additional details of the landfill gas monitoring plan are included in **Section 11.4**.

8.8 SURFACE WATER MANAGEMENT

The surface water management system will be designed to meet the requirements of NR 504.09, NR 216 and NR 151. Based on an email from Eric Rortvedt, WDNR storm water engineer, on August 3, 2020, since the proposed vertical expansion should have similar hydrology coming off the vertically expanded landfill area, so long as the runoff drainage areas will continue to flow to the existing storm water facilities, additional peak flow or total suspended solids analysis for the existing storm water facilities that will continue to serve the proposed vertical expansion are not required (**Appendix B**).

The drainage patterns established for the Eastern Expansion have been maintained for the proposed vertical expansion. The preliminary storm water diversion berm layout shown on **Plan Sheet 17** provides the same drainage areas to the wetlands north and south from the existing Northeast and Southeast Sedimentation Basins, respectively.

The site currently has an approved surface water management system approved for the Eastern Expansion. This system consists of diversion berms, downslope flumes, energy dissipators, perimeter berms, culverts, and sedimentation basins.

During operations, diversion berms and intermediate cover will be used to divert surface water away from waste or active filling operations. Surface water that comes in contact with open waste fill areas or areas of exposed waste will be collected and treated as leachate.

As part of the Plan of Operation, surface water control systems will be evaluated to confirm if features in unchanged areas will adequately manage storm water runoff from the vertical expansion area due to increases in slope length and slopes. Future design aspects conducted as part of the Plan of Operation will consider the diversion berm spacing along the vertical expansion,

reinforcement of ditch flow lines, inlet and outlet structures, sedimentation basin sizing and vegetation establishment and maintenance.

8.8.1 Storm Water Management Features

The key features of the storm water management system include:

- Diversion berms to collect and route runoff from the final cover system to downslope flumes. The berms reduce the runoff slope length along the final cover, reducing the potential for erosion of the cover system. The current diversion berm design is a 2 percent minimum slope. The proposed diversion berms within the vertical expansion will maintain a similar slope. The diversion berms are designed for a 25-year, 24-hour storm event.
- Downslope flumes to collect and convey surface water from the diversion berms to the perimeter ditches. Downslope piping consists of either 12- or 18-inch diameter, smooth walled piping. The downslope flumes are designed for a 25-year, 24-hour storm event.
- Perimeter ditches to route surface water to the sedimentation basins. Velocities for grass-lined ditches will be limited to 4 feet per second (fps). In areas where velocities exceed 4 fps, erosion matting or riprap will be proposed to reinforce the surface and prevent erosion and washouts. The perimeter ditches are designed for a 25-year, 24-hour storm event.
- Culverts to route surface water from the ditches at the entrances to the sedimentation basins. Existing culvert capacities will also be evaluated as part of the vertical expansion. The existing culverts are sized for the 25-year, 24-hour storm event.
- Sedimentation basins to provide treatment for the collected storm water before discharging to existing nearby wetlands. The sedimentation basins are designed as wet detention basins to settle 80 percent of the total suspended solids (TSS) for post-construction conditions. The emergency spillway are designed for a 100-year storm event, and the principal outlet are designed for a 25-year, 24-hour storm event.

Appropriate sizing of the features with the vertical expansion in place will be evaluated as part of the Eastern Vertical Expansion.

8.8.2 Wetland Water Balance

During site development and following site closure, surface water from disturbed areas will be collected from the landfill and surrounding areas and routed to two existing sedimentation basins, identified as the Northeastern Basin and Southeastern Basin, before discharging to two wetlands (Wetland 1 and 4) located adjacent to the proposed Eastern Vertical Expansion (**Plan Sheet 15**). Surface water balances for pre- and post- development conditions were evaluated as part of the Eastern Expansion FR (TRC, 2013). The evaluation showed approximately 20 acres of the approximate 500-acre watershed that drains into Wetland 1 draining to Wetland 4 as a result of the proposed Eastern Vertical Expansion development. The pre- and post-development analysis of surface water flow to the wetlands show that flows to the north wetland will be reduced slightly, while the flow to the south wetland will increase nominally. The storm water management system features for the proposed Eastern Vertical Expansion will be designed to maintain this same approximate water balance to the wetlands. The detailed design will be presented with the Plan of Operation.

8.9 VISUAL SCREENING

Similar visual screening techniques as approved for the Eastern Expansion will be implemented for the Eastern Vertical Expansion.

Visual screening from the vertical expansion's waste disposal activities to Hope Park, the Yahara Hills public golf course, to USH 12 & 18, and to CTH AB will be provided by:

- Preserving as many existing mature trees around the perimeter of the Eastern Vertical Expansion as possible.
- Replacing trees that did not survive and were required as part of the 2014 Plan of Operations approval.
- Planting additional trees in select areas of the site.
- Placing a waste berm with intermediate cover on the exterior slope, then placing waste behind the berm.
- Constructing soil berms, as necessary, at the outside edge of the waste mass around the perimeter.

The waste or soil berms will provide a visual barrier from the areas surrounding the vertical expansion to the waste placement operations and will continue to be constructed upward until they are no longer needed for screening. Line-of-sight drawings showing the effectiveness of leaving existing trees in-place, planting additional trees, and the use of soil berms for screening from USH 12 & 18, CTH AB, and from the recreation areas are included in **Appendix J**. The line-of-sight drawings show the approximate location and heights of the existing trees and include examples of the typical positioning used for soil screening berms within the waste mass. The waste berms will look similar to the soil berms, except that the interior area will consist of waste rather than soil. An exemption request from the requirements of NR 504.04(3)(d) for setback to highway and public parks is included in **Section 1.4.2**.

9.0 CLOSURE

9.1 FINAL COVER

The Eastern Vertical Expansion is designed with a final cover that meets the requirements of NR 504.07. The top of the final cover grades will consist of a 25 percent (4:1) and 5 percent slope to a peak along the previously approved 5 percent final cover slope of the Eastern Expansion.

The final cover system for the Eastern Vertical Expansion will consist of the following:

- Native vegetation as detailed in a Plan Modification approved by WDNR on August 23, 2018
- 0.5 foot of topsoil
- 2 and a half feet of rooting zone
- Geocomposite drainage layer
- 40-mil linear LLDPE geomembrane
- 2 feet of compacted clay, or GCL with 2 feet of barrier soil per NR 504.07(4)

A grading layer, of 0.5 feet, will be placed above the waste, below the 2-foot compacted clay or barrier soil layer.

Material compaction specifications for the final cover clay will meet the requirements of NR 504.06(2)(a) and will be constructed in accordance with NR 504.06(2)(f).

Similar to the Eastern Expansion, drainage layer collection pipes will be located in the trenches at each surface water diversion berm on the final cover. These pipes will collect and route infiltrated water from the geocomposite drainage layer to a series of outlet pipes that will discharge into the flow line of the diversion berm ditches, which will transport the water to the existing Northeastern and Southeastern Sedimentation Basins. The outlet discharge pipes that drain to the diversion berm ditches will be spaced a maximum of 300 feet apart and will slope at the same slope as the diversion berm flow lines. The perforated pipes will be placed in trenches filled with aggregate wrapped in geotextile. The solid wall discharge pipes will have riprap apron outlets to minimize erosion. Further details on the drainage collection system will be presented in the Plan of Operation.

The rooting zone material will provide a layer for establishing plant root systems and protection to the underlying layers. The rooting zone will be constructed with soil stockpiled from previous site subbase excavations or other general fill. The rooting zone layer and the topsoil layer provide freeze/thaw protection to the underlying clay or GCL, if used, and geomembrane. The geomembrane will also limit desiccation of the clay. The final cover will be seeded with consisting of 65 percent native grasses and 35 percent forbs and legumes with a mature height of 4 to 6 feet as approved by WNDR in a Plan Modification dated August 23, 2018 (**Appendix B**).

Dane County may explore the option to plant trees on the stormwater diversion berms, consistent with other permitted landfills in Wisconsin that do this. If Dane County proceeds with this option, it will be addressed in the Plan of Operation.

9.2 FINAL USE

The current final use plan for the Eastern Vertical Expansion is open green space, consistent with City of Madison zoning requirements and Local Negotiated Agreement. Other uses may be proposed in the Plan of Operation for areas surrounding the landfill. Deed restrictions will be used as institutional controls to prevent future agricultural use, building construction, and excavation of final cover or refuse.

9.3 FINANCIAL RESPONSIBILITY

The cost estimate and demonstration of financial responsibility for closure and long-term care will be included in the Plan of Operation as required under NR 514.

9.4 LONG-TERM CARE AND MAINTENANCE

The long-term care and maintenance program for the proposed Eastern Vertical Expansion will be consistent with the long-term case and maintenance program for the existing landfill and will include:

- 1. Environmental monitoring (landfill gas, groundwater, leachate, and surface water)
- 2. Leachate collection and treatment provisions after site closure
- 3. Land surface care and maintenance

A discussion of the proposed monitoring program is presented in **Section 11.0**. Long-term care items 2 and 3 will be presented in the Plan of Operation.

10.0 OPERATING PROCEDURES

The development and operation of the Eastern Vertical Expansion will meet or exceed local, state, and federal requirements, including NR 500. Operational practices will be carried out to minimize impacts to the surrounding environment and to provide cost-effective solid waste disposal for the service area.

10.1 SITE ACCESS

Traffic to the site predominantly utilizes USH 12 & 18. The existing entrance will be utilized for the Eastern Vertical Expansion, which is controlled by an access gate that is open only during hours of operation. The hours of operation are as listed in **Section 3.0**. The existing office, scale, and operations building will also be used for the vertical expansion as shown on **Plan Sheet 2**. From the entrance, access to the active working face will be on all-weather access roads. Existing site access roads on the County's property will be used for getting to the development area. Perimeter access roads have been constructed around the Eastern Expansion footprint areas to the lines and grades shown on **Plan Sheet 16**. No additional perimeter roads are proposed as part of the proposed Eastern Vertical Expansion. Access to the site is restricted by existing gate and fencing and natural barriers. No unauthorized scavenging of waste will be allowed.

On-site traffic will be routed by a combination of signs and directions provided by the scale operator. Speed bumps located on the site access road will control speed and remove mud from disposal vehicles prior to accessing USH 12 & 18.

10.2 SITE OPERATIONS

The Eastern Vertical Expansion will be operated according to the provisions of NR 506 and the conditions of approval of the Plan of Operation.

In general, daily landfill operations are confined to as small an area as possible. Filling will proceed from the low point on the base of each phase, with waste placed and compacted in approximately 10- to 15-foot lifts. 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. **Section 8.9** presents additional information on site screening, including the construction of waste and soil berms, as necessary.

Intermediate waste grades and slopes for each phase and cell vary from the final design waste grades and slopes. Final waste grades will be 5 feet below the final cover grades shown on **Plan Sheet 17**, excluding the 0.5-foot grading layer. Intermediate waste grades may at times be as much as 10 percent 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 final grades. It is not uncommon to cut back or fill slight variations in intermediate waste grades just prior to final cover placement. Establishing final waste grades in this manner will help reduce differential settlement of the final cover.

Upon completion of reaching final waste grades, the final cover and surface water control features will be constructed, vegetated, and maintained as soon as practicable. Storm water control feature maintenance may include removal of sediment from storm water sedimentation basins, maintaining

vegetation in on-site ditches, mowing, and possible regrading of the site storm water management features if eroded during rain events. Erosion mat or riprap will be placed and maintained as needed.

Dust, odor, and noise will be minimized in accordance with generally accepted standard operating procedures. Dust will be controlled by minimizing the open area and with a water truck as needed. Operational activity will occur during normal business hours, not during evening hours. As such, the relative noise level owing to the vertical expansion is expected to be similar to that from the existing operations. Odors will be controlled through minimizing the area open for waste placement, placement of daily cover at the end of each day, operation of the active gas extraction system, and utilizing odor making agents when appropriate. Windblown paper will be controlled by proper landfill operational procedures including compaction and placement of daily cover, perimeter fencing, and the use of portable litter fencing when needed. Paper and other wind-blown debris will be collected daily.

10.3 DEVELOPMENT AND PHASING

The proposed Eastern Vertical Expansion will be developed and operated as a basic vertical overlay on top of constructed cells in Phases 9 through 12. Full build out of an individual cell will need to be completed prior to the vertical overlay of that cell. All horizontal expansion liner areas of the Eastern Expansion have been constructed. Each phase will be filled to its approved final waste grades and covered with final cover or a 1-foot-thick layer of intermediate cover. Capping is estimated to commence in the phasing shown on **Plan Sheet 17.** Details of the filling plan and site closure will be shown in the Plan of Operation.

10.4 SITE MAINTENANCE

Maintenance at the site is ongoing and will be performed throughout the development and operation of the landfill, and during the long-term care period. Storm water control structures are checked and sediment removed as needed. Final cover and other seeded areas are inspected on a regular basis and repaired if necessary to maintain proper vegetative growth.

The leachate collection system is inspected regularly for proper operation. The leachate collection lines are cleaned annually and the pump and accessories maintained according to manufacturer's recommendations. The gas extraction system is checked regularly and maintained per manufacturer's recommendations. Access and haul roads are maintained to provide proper access to the active fill areas as well as around the site.

11.0 ENVIRONMENTAL MONITORING PROGRAM

Environmental monitoring will continue as currently approved, except as noted in the following sections. **Appendix L** includes the current Environmental Monitoring Plan for Dane County Landfill Site No. 2 and a Sampling and Analysis Plan is provided in **Appendix K**.

In addition to the items noted in the following sections, there is a potential that some monitoring points may need to be relocated due to CTH AB interchange construction. Any changes made to the monitoring network will be coordinated between Dane County, WisDOT, and WDNR prior to construction.

11.1 GROUNDWATER MONITORING

The existing groundwater monitoring network approved in the Eastern Expansion Plan of Operation will be maintained as part of the proposed Eastern Vertical Expansion. The monitoring program includes wells which were originally installed to monitor the existing landfill. No additional groundwater monitoring wells are proposed as part of the vertical expansion.

The existing monitoring plan is designed to provide water quality information for key chemical parameters, at locations both upgradient and downgradient of the landfill. Water levels measured before sampling will be used to evaluate groundwater flow patterns and gradients at the site. Parameters and monitoring frequencies will continue as outlined in the approved Eastern Expansion Plan of Operation approval and subsequent modifications.

Water supply wells will continue to be sampled as in the current monitoring program. Water supply wells currently sampled are listed in the environmental monitoring program included in **Appendix L**, along with the list of parameters analyzed.

11.2 LEACHATE MONITORING

Leachate monitoring will be performed at the existing leachate headwells and leachate lift station in accordance with the monitoring program included in **Appendix L**. Monitoring includes analysis of leachate quality, monitoring of leachate head on the liner, and monitoring of leachate volumes managed. Additional leachate drainage basin monitoring related to leachate recirculation and additional liquids application will be performed as required under the leachate recirculation plan.

11.3 SURFACE WATER MONITORING

Storm water discharge at Dane County Landfill Site No. 2 is currently regulated by the Wisconsin Pollutant Discharge Elimination System (WPDES) Tier 2 General Permit for the Discharge of Storm Water Associated with Industrial Activity No. S067857-4 (General Permit) issued to the facility. Coverage under this General Permit will continue for the proposed vertical expansion. Surface water monitoring will be performed in accordance with the WPDES permit requirements for the facility, which is also outlined in the monitoring program included in **Appendix L**. The storm water monitoring program elements, including monitoring locations, are outlined in the landfill's existing SWPPP. A revised SWPPP will be submitted with the Plan of Operation to address the expansion. The revised SWPPP will also incorporate construction events so that separate Construction Site Storm Water Permit coverage will not be required for each construction event.

11.4 LANDFILL GAS MONITORING

An active gas extraction system is in place at the existing landfill and will be expanded for the proposed Eastern Vertical Expansion. The specific number and location of gas extraction wells for the proposed vertical expansion will be detailed in the Plan of Operation. The gas extraction wells and gas plant will be monitored to optimize operations and document compliance with the facility air permit. Gas probes located around the perimeter of the landfill will be monitored to confirm that subsurface gas migration is not occurring.

The current gas and gas condensate monitoring locations, parameters, and frequencies are shown on the environmental monitoring tables included in **Appendix L**.

11.5 LYSIMETER MONITORING

The existing lysimeter system will continue to be monitored for volume of discharge and for quality as outlined on the environmental monitoring tables included in **Appendix L**. No additional lysimeters are proposed for the proposed vertical expansion.

12.0 SOIL BORROW SOURCES

12.1 CLAY BORROW SOURCE

Similar to the 2014 Eastern Expansion, Dane County would like to have the option to construct the final cover using clay but will only use this option if a cost effective opportunity presents itself. Approximately 40 acres of final covered areas used the barrier layer and GCL option, and Dane County anticipates the Eastern Vertical Expansion will as well.

If clay is the most cost effective option during the time of final cover construction, clay will be imported from off-site sources. Dane County owns a parcel adjacent to a previously approved clay borrow source, known as the Link Borrow Site. The Link Borrow Site has been identified and documented in reports separate from this FR, as a source of liner quality clay. A portion of the Link Borrow Site was used in the construction of Phase 6 of the landfill. The following documentation is provided in Appendix R for the Link Borrow Site:

- 1. Conditional Use Permit dated May 24, 1994,
- 2. Initial Site Inspection (ISI) Approval Letter dated December 6, 1994,
- 3. Plan Modification Request dated March 3, 1995, and
- 4. Plan Modification Approval dated June 6, 1995.

Dane County no longer owns the property associated with the ISI approved site (Parcel # 018/0711-334-8600-0) but owns the parcel directly south (Parcel #018/0711-334-9235-0), shown in the Conditional Use Permit, that has not been mined for clay. Based on USDA maps, there is sufficient amounts of clay to meet the requirements for the first phase of closure. The southern parcel is leased to a local farmer for growing crops and is anticipated to be harvested in the fall. **Dane County requests a condition of approval for the Link Borrow Site based on conducting the ISI and subsequent sampling and testing in Fall of 2021 after crops have been harvested.**

12.2 FINAL COVER BARRIER LAYER BORROW SOURCES

If the GCL final cover design option is used, the barrier layer material will consist of either imported or on-site material. Imported material would be sourced from an awarded Contractor, with sampling and testing results submitted prior to construction, while on-site material would be sourced from the rooting layer of Phase 10, Cell 3. Additional sampling and testing is needed to determine if Phase 10, Cell 3 rooting layer qualifies under NR 504 as a barrier layer material.

12.3 BORROW SOURCE VOLUMES AND QUALITY CONTROL MEASURES

An estimated 33,200 cubic yards of clay or barrier soil is needed for the first phase of closure as shown on **Plan Sheet 17**. The Link Borrow Site is estimated to have approximately 145,200 to 174,240 CY. The volumes are estimated based on the assumption of 5 to 6 feet of clay over 18 acres, within the 32 acres parcel, similar to the approved Link Borrow Site in 1994. The volume will be verified upon sampling and testing in the Fall of 2021.

Dane County estimates approximately 36,400 cy of barrier layer soil in Phase 10, Cell 3. That estimated volume is based on the assumption that 2.5 feet of rooting layer, over 9.03 acres, meets the requirements as barrier layer soil under NR 504.

Stockpiling of soils obtained from clay borrow sources and soil barrier layer sources for landfill final cover construction will be conducted in an organized manner that minimizes mixing of dissimilar soil types. Soils will be segregated into stockpiles based on similar USCS soil type, soil gradation, Atterberg limits, and compaction specifications.

Clay and barrier soil excavation procedures will be carefully monitored by qualified Dane County personnel to assure the segregation of suitable soils from materials not meeting project specifications. Quality control will be performed by visually observing clay/barrier soil and non-clay/non-barrier soil materials and their transition with depth as the usable material is removed. In cases where visual differentiation is uncertain, soil samples will be obtained for laboratory testing.

13.0 ENVIRONMENTAL ASSESSMENT

The environmental review describes and summarizes the development of the Eastern Vertical Expansion in accordance with NR 512.16. The focus of this section is to identify areas that may be affected by the Eastern Vertical Expansion and to describe what is being done through the design, construction, and operations to minimize or eliminate potential impacts. Overall, the proposed Eastern Vertical Expansion is expected to have no negative impacts to the site or surrounding areas.

13.1 PROJECT SUMMARY

A request for an ISI for the proposed vertical expansion was submitted to the WDNR on May 7, 2020. Due to the COVID-19 pandemic, WDNR did not conduct an in-person inspection of the site, but instead completed a desktop review of the submittal. WDNR concluded that, because the proposed Eastern Vertical Expansion area would not change the existing horizontal limits of waste for the currently permitted active landfill (Eastern Expansion), the lack of a field inspection for the proposed Eastern Vertical Expansion is not considered significant to the WDNR findings. A copy of the ISI Opinion Letter is provided in **Appendix B**.

The ISR for the Eastern Vertical Expansion was reviewed by the WDNR, who deemed it has potential for development as an MSW disposal facility. The WDNR ISR Opinion Letter, dated November 20, 2020, is included in **Appendix B**.

13.1.1 General Description

The Dane County Landfill Site No. 2 (Rodefeld) is located in the North $\frac{1}{2}$ of Section 25 and NE $\frac{1}{4}$ of SE $\frac{1}{4}$ of Section 25, T7N, R10E, City of Madison, Dane County. The locations of the existing landfill and proposed expansion are shown on a United States Geological Survey (USGS) topographic map base on **Figure 1-1**.

The proposed vertical expansion is approximately 21.3 acres and overlays the previously approved Eastern Expansion. The landfill's previously approved limits of waste occupy approximately 104.6 acres of the approximately 220.4-acre property owned by Dane County. The design capacity of the vertical expansion is approximately 990,300 cubic yards, including daily and intermediate cover. Based on an annual projected waste volume of 300,000 cubic yards, including waste and daily cover, the vertical expansion will provide additional capacity for approximately 3 years of waste filling.

The proposed vertical expansion would continue to accept non-hazardous municipal, industrial, and commercial solid waste, as well as special wastes. The sources and types of waste disposed of at the proposed vertical expansion are not projected to change significantly from what is disposed of at the present landfill.

13.1.2 Purpose and Need

The purpose of the proposed Eastern Vertical Expansion is to extend the site life of the landfill, providing future disposal capacity for the service area. Based on current filling rates, the approved landfills for the service area are expected to reach capacity by 2025 (refer to the Needs Analysis in **Section 14.0**). The development of the proposed vertical expansion will add approximately 990,300 cubic yards of landfill capacity for the disposal of waste from residential, commercial, and industrial sources, which will provide approximately 1 additional year of capacity to the service area (**Table 14-6**).

If the proposed vertical expansion is not approved, when the existing landfill capacity is consumed, waste will have to be diverted from Dane County Landfill Site No. 2 to other disposal facilities in or near the Dane County Landfill Site No. 2 service area. This will deplete the remaining disposal capacity in the service area sooner than anticipated and affect the solid waste disposal needs of Dane County.

The need for the expansion is further discussed in Section 14.0.

13.1.3 Statutory Authority and Approvals

Following is a list of statutory authorities/approvals required for the Eastern Vertical Expansion project:

Statute	Statute Authority	General Description
1989 Wisconsin Act 335	WDNR	Recycling laws
s. 289, Wisconsin State Statutes	WDNR	Solid waste
Wisconsin Act 31	WDNR	40-year period for closure and
		long-term care costs
Wisconsin Act 93	WDNR	Landfill needs
NR 406, Wisconsin Administrative	WDNR	Air Construction Permit
Code		
NR 407, Wisconsin Administrative	WDNR	Air Operating Permit
Code		
NR 445, Wisconsin Administrative	WDNR	Control of Hazardous Pollutants
Code		
NR 500 through NR 520, Wisconsin	WDNR	Feasibility Report and Plan of
Administrative Code		Operation approval
NR 140, Wisconsin Administrative	WDNR	Groundwater Quality
Code		
NR 141, Wisconsin Administrative	WDNR	Groundwater Monitoring Well
Code		Requirements
NR 216 and NR 151, Wisconsin	WDNR	Storm water discharge and quality
Administrative Code		
NR 812, Wisconsin Administrative	WDNR	Drinking water
Code		

Statute	Statute Authority	General Description
40 CFR 60, Subpart XXX	US Environmental Protection Agency (USEPA)	Standards of Performance for Municipal Solid Waste Landfills That Commenced Construction, Reconstruction, or Modification After July 17, 2014
40 CFR 63, Subpart AAAA	USEPA	National Emission Standards for Hazardous Air Pollutants: Municipal Solid Waste Landfills
40 CFR s. 258.71, 258.72	USEPA	Financial assurance for closure and post-closure
40 CFR S. 258.10	FAA	Airport Safety
Local	Various	Standing Committee agreement and zoning variances

Dane County is requesting WDNR approval of the feasibility report under ch. NR 512, Wis. Admin. Code. Exemption requests are listed in **Section 1.4**.

13.1.4 Exemptions, Zoning Changes, and Special Permits

The ISR Opinion letter did not recommend any changes to zoning or applications for special permits. **Section 1.4** lists exemption requests associated with the proposed Eastern Vertical Expansion.

13.1.5 Locational Criteria and Performance Standards

13.1.5.1 Locational Criteria

Locational criteria for landfills includes prescribed setbacks from navigable surface waters, floodplains, state trunk highway rights-of-way, state parks or other natural areas, airports, public or private water supply wells, fault lines, seismic impact zones, and unstable areas. The proposed Eastern Vertical Expansion meets the locational criteria with the exception of:

- Setbacks from two private wells as discussed in Sections 1.4.2 and 7.1.6;
- Setbacks from state trunk highways and public park, as discussed in **Sections 1.4.2** and **7.1.4**; and
- Setbacks from navigable lakes, ponds and flowages as discussed in **Sections 1.4.2** and **7.1.1**.

The proposed Eastern Vertical Expansion does not decrease the setbacks already approved and provided by the existing landfill.

13.1.5.2 Performance Standards

Performance standards for landfills include wetland impact assessment, review of known endangered or threatened species, potential for surface water and/or groundwater impacts, risk of landfill gas migration and potential for any hazardous air contaminants release. **Section 7.2** discusses each of these in more detail. The proposed Eastern Vertical Expansion ISR Opinion letter did not document any performance criteria that may limit the potential for site development.

13.2 PROPOSED PHYSICAL CHANGES

The proposed Eastern Vertical Expansion will marginally change the physical environment from what was discussed in the Eastern Expansion FR (TRC, 2013).

13.2.1 Terrestrial Resources

The proposed Eastern Vertical Expansion will involve filling waste to a higher elevation over areas already approved for landfill development. The proposed vertical expansion is located in areas that have already been disturbed and that are currently used for landfilling. The anticipated peak elevation of the proposed vertical expansion is 1,065 feet amsl, which is approximately 65.4 feet higher than the approved maximum final grade for the existing landfill.

Soil used in development of the proposed vertical expansion will be obtained from both on-site and off-site sources. Refer to **Section 12.0** for additional information on the final cover clay or fine grained soil borrow sources. Topsoil will be used from on-site stockpiled topsoil, approved off-site borrow sources, or additional off-site borrow sources as approved through a Plan Modification.

All material and placement methods will be required to meet standards established in a quality assurance and quality control plan.

13.2.2 Aquatic Resources

Aquatic resources with the potential to be affected by the proposed vertical expansion include surface water. Various design features are included in the proposed design to minimize impacts to surface water (see **Section 7.2.3**).

13.2.3 Groundwater

The proposed Eastern Vertical Expansion lies within the existing footprint of the Eastern Expansion footprint and will not increase the potential for groundwater impacts. The existing landfill is designed and constructed with a composite liner system (i.e., HDPE geomembrane and clay liner system), with an overlying leachate collection system. These features protect groundwater.

A groundwater gradient control system is included below the clay liner, in the horizontal expansion portion of the Eastern Expansion, to prevent groundwater from contacting the liner during periods of high water table elevation.

13.2.4 Surface Water

The proposed Eastern Vertical Expansion lies within the existing footprint of the Eastern Expansion footprint and will not increase the potential for surface water impacts. Surface water will be managed in a similar manner to that used for surface water runoff from the existing landfill. This includes a series of diversion berms, downslope flumes, perimeter ditches and sedimentation basins. The sedimentation basins will limit the release of soil to adjacent properties and wetlands in accordance with applicable soil erosion regulations and/or state and federal storm water runoff regulations. Additional information on surface water management is presented in **Section 8.8**. Best management practices will be implemented to minimize and control erosion.

As shown on **Plan Sheet 2**, wetlands are located southeast and northeast of the landfill. The Eastern Vertical Expansion will not have direct impacts on the wetlands. The Eastern Expansion FR stated that the surface water drainage patterns to the wetlands would be slightly altered by the Eastern

Expansion and would result in minimal diversion of surface water from the northern wetland to the southern wetland. Collected surface water, not in contact with waste, will be directed to the sedimentation basins before discharging to the wetlands. After final closure, the total runoff to surrounding wetlands will be similar to that of the runoff prior to landfill development. **Section 8.8.2** presents a discussion on pre- and post-development storm water runoff to the wetlands.

There are two manmade navigable ponds located less than 1,000 feet from the proposed vertical expansion. Exemptions were approved for these ponds during prior site permitting. **Section 1.4.2** includes an exemption request from the setback requirements of s. NR 504.04(3)(a).

13.2.5 Buildings, Roads, and Other Structures

Existing buildings, roads, and landfill gas processing facility structures will be used for the proposed Eastern Vertical Expansion. Access to the landfill property is currently controlled using gates at the primary entrance points. Natural barriers also limit access to the property. No additional fencing, perimeter roads, ditches, or sedimentation basins are required for the proposed vertical expansion.

13.2.6 Emissions and Discharges

All landfills produce emissions and discharges. The landfill emissions and discharges expected from the proposed vertical 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. No significant increase in vehicular traffic is expected during landfill operation over what 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 quality will vary based on the number of vehicles/equipment in operation, weather conditions, and the amount of exposed area. Dust will be controlled with the application of water or commercial dust suppressants to access and haul roads as needed during dry weather conditions and stabilizing disturbed areas as soon as practicable. Dane County has developed a Dust Control Plan for the existing landfill that will be used for the proposed vertical expansion.

Noise – During final cover construction events, noise impacts will occur from earth moving equipment. During operation, noise will be generated from waste hauling trucks and landfill equipment. Noise impacts will occur during the hours of operation and are not expected to increase over the existing noise levels during similar activities for the existing landfill. Hours of operation are determined in the local agreements with the host communities.

Leachate – The proposed vertical expansion will generate leachate that will be managed by the existing leachate collection system approved for the Eastern Expansion. Leachate is produced from the decomposition of waste and from precipitation infiltrating into the waste. Leachate will flow into the highly permeable drainage blanket to leachate collection pipes that route the leachate to sumps at the lowest base elevation of each phase. From these sumps, the leachate will either be pumped via an existing forcemain into an existing MMSD sanitary sewer system, or recirculated back into the waste mass within the landfill. Dane County has an agreement with the MMSD to accept leachate from the landfill that includes the Eastern Expansion and the Eastern Vertical Expansion. The quality and characteristics of the leachate are expected to remain similar to those of the leachate that is

currently collected. Leachate characterization is further discussed in **Section 6.2**, and leachate generation is discussed in **Section 6.3**.

Landfill Gas – Landfill gas from the decomposition of organic waste will be generated during operation of the proposed vertical expansion. The chemical composition of the landfill gas is not expected to change. The proposed vertical expansion overlies the existing composite liner system and includes a final cover system with an active gas extraction system. These controls will prevent any significant subsurface gas migration from the proposed vertical expansion. Existing gas monitoring probes installed around the landfill perimeter are monitored for signs of gas migration. Landfill gas generated by the expansion will be treated at the existing RNG processing facility that converts landfill biogas into a pipeline quality natural gas. As part of the permitting process for the proposed vertical expansion, Dane County will submit an air pollution control construction permit and operation permit revision application to the WDNR Air Quality Division. Construction of the Eastern Vertical Expansion will not proceed until Dane County has obtained the air permit.

Odors – Odors will be controlled through minimizing the area opened for waste placement, placement of daily cover at the end of each day and operation of the active gas extraction system. Highly putrescible waste will be covered immediately after placement. Masking agents may be used on an as-needed basis.

Surface Water Runoff – The proposed expansion has been designed to maintain a close surface water balance to the existing wetlands between the pre- and post-development conditions. **Section 9.8** provides additional information on storm water management.

Collected Groundwater – Groundwater collected in the gradient control system will be discharged to the Northern Wetland No. 1. Since quarterly observations of the gradient control system began in 2014, there has not been a discharge of water observed from the gradient control system.

13.2.7 Other Anticipated Changes

No other changes are anticipated with the proposed Eastern Vertical Expansion.

13.2.8 Maps and Other Descriptive Materials

Maps and other descriptive materials are presented in the figures and appendices listed in the Table of Contents. Site area soils and regional piezometric surface figures from the Eastern Expansion FR (TRC, 2013) are included in **Appendix M**.

13.3 EXISTING ENVIRONMENT

The existing environment of the proposed Eastern Vertical Expansion is an existing landfill or existing features and facilities to support landfill operations. The proposed vertical expansion will not alter the existing environment other than increasing the future elevation/topography of the landfill. Refer to the ISR for further information regarding the existing environment.

13.3.1 Physical Environment

13.3.1.1 Topography

The proposed Eastern Vertical Expansion is located in an area of flat to gently rolling terrain. Within the property boundaries, the natural land surface elevation varies from approximately 870 feet mean

sea level (M.S.L.) in the northern portion of approximately 900 feet M.S.L. in the southern portion near USH 12 & 18. Overall, natural on-site relief is approximately 30 feet. The predominant topographic surface feature within sight of the proposed vertical expansion is the existing landfill, which has an approved final elevation of 999.6 feet M.S.L., or about 120 feet above predevelopment grades. The proposed Eastern Vertical Expansion will increase the final elevation to 1065 feet M.S.L., or about 185.4 feet above predevelopment grades.

The proposed vertical expansion will not affect the current surrounding topography of the site.

13.3.1.2 Regional Geology

The proposed Eastern Expansion is located in an area underlain by a thick sequence of unconsolidated glacial drift of the Horicon Formation deposited over dolomite bedrock of Ordovician age. Regional information suggests that bedrock in the vicinity of the site consists of dolomite of the Prairie du Chien group, and in the eastern most portion of the site, sandstone of the Trempealeau, Tunnel City, and Elk Mound groups. However, subsequent subsurface investigations/well logs indicate the bedrock in the immediate vicinity of the Eastern Expansion consists of the Galena-Platteville dolomite of the Sinnipee Group. Further information regarding the regional geology is presented in **Section 5.3**.

13.3.1.3 Site-Specific Geology

Geologic cross-sections of the vertical expansion area as presented with the Eastern Expansion FR are shown on **Plan Sheets 5** through **14**. Logs of previous borings used to meet the FR requirements are included Attachment A of the AGIP included in **Appendix C**. Laboratory soil test results are contained in Attachments C and D of the AGIP included in **Appendix C**.

The surficial soils in the area of the site are mapped as well drained silt-loam to poorly drained muck and consist primarily of Dodge silt loam, Ringwood silt loam, Sable silty clay loam, Houghton muck, and St. Charles silt loam.

Further information regarding the site geology is presented in Section 5.2.

13.3.1.4 Water Quality

Surface Water – The proposed vertical expansion is located within the Yahara Watershed. The Yahara River is located about 3.5 miles west of the site and ultimately drains to the southeast into the Rock River near Fulton, Wisconsin. The Yahara River flows through four lakes – Mendota, Monona, Waubesa, and Kegonsa – of which Lake Waubesa is the closest to the landfill, located approximately 4 miles to the southwest. The watersheds can be further divided into the northern half of the site which is drained by ditches and unnamed streams to the east and eventually contributes to Door Creek, which flows into Lake Kegonsa. The southern half of the site is drained by ditches and unnamed streams into Mud Lake (a widening of the Yahara River at the north end of Lake Waubesa). The drainage system of the Yahara River watershed is generally poorly developed with many lakes and wetland, and poorly drained areas.

Several wetlands exist within the immediate vicinity of the existing landfill. Wetlands in the vicinity of the proposed vertical expansion were delineated in 2012 as part of the Eastern Expansion permitting. Wetlands within the vicinity of the proposed vertical expansion are shown on **Plan Sheet 2**. The existing northeast and southeast sedimentation basins discharge to areas adjacent to two of the wetlands (No. 1 and No. 4). The functional values of these two wetlands are considered low based on the wetland delineation reports and functional assessment reports for these two wetlands, which were included with the Eastern Expansion FR (TRC, 2013).

The Eastern Vertical Expansion is not expected to impact the wetlands.

Hydrogeology – The uppermost hydrostratigraphic unit in the vicinity of the proposed vertical expansion generally occurs within the till and outwash glacial deposits. In general, the groundwater flow direction in the glacial unit in the area of the vertical expansion is to the north with a slight northwesterly component based on historical water table maps. Previous hydrogeological investigations show that the elevation of the water table ranges from about 857 feet M.S.L. to 874 feet M.S.L. Seasonal fluctuations in the groundwater are apparent at the site – generally higher in the spring and lower in the fall. Shallow groundwater generally discharges to a drainage ditch located within the southern portion of the wetland that parallels the north side of the existing landfill. Groundwater flow within the underlying bedrock is generally toward the southwest near the landfill. A detailed discussion on the hydrogeology is provided in **Section 5.3**. Water supply wells in the vicinity of the landfill withdraw water from the bedrock unit.

13.3.1.5 Air Quality

Air pollutants from the existing landfill and operations include methane, carbon dioxide and monoxide, sulfur dioxide, nitrogen dioxide, and nonmethane organic compounds (NMOCs). The pollutants are generated through the decomposition of organic refuse and the volatilization of organic compounds in the absence of oxygen and through the use of operations equipment on site. The gas generated by the existing landfill is controlled by an active gas extraction system. The gas extracted from the landfill is treated at the existing RNG processing system located at the southern end of the site, just east of the site entrance. The RNG processing system converts the landfill biogas into a pipeline quality natural gas. Site operations will be consistent with current operations at the landfill.

Odors will be controlled through minimizing the area opened for waste placement, placement of daily cover at the end of each day, and operation of the active gas extraction system. Highly putrescible waste will be covered immediately after placement. Masking agents may be used on an as-needed basis.

13.3.1.6 Soil Borrow Sources

The soil materials needed to construct the proposed vertical expansion final cover system will be obtained from both on-site and off-site sources.

General fill will be obtained from on-site stockpiles created from excavation performed during the horizontal portion of the Eastern Expansion. Granular materials will be obtained from off-site quarries. Topsoil stripped from the horizontal portion of the Eastern Expansion area was stockpiled for use in the final cover. Topsoil within Phase 10, Cell 3 will also be stockpiled for use in the final cover.

Clay materials for construction of the final cover will be obtained from off-site clay borrow areas. Barrier soil for the GCL final cover alternative will be obtained from either on-site or off-site sources. **Section 12.0** discusses the borrow sources in more detail.

13.3.2 Biological Environment

As documented in the June 10, 2020 Eastern Vertical Expansion ISI response letter (**Appendix B**), based on a review of the Natural Heritage Inventory, WDNR concluded that no endangered resources were identified in the project area. Additionally, a vertical landfill expansion is covered by the No/Low Impact List for All Species at All Times of the Year category under the department's Broad Incidental Take Permit/Authorization, as provided under ss. 29.604. An ER Review Verification form pertaining to the Eastern Vertical Expansion was submitted by the department on May 13, 2020. Further review for endangered resources is not anticipated for the proposed project.

13.3.3 Land Use

Figure 4-2 shows current general land use type in the vicinity of the landfill based on information obtained from the online data portal developed by Dane County's Land Information. Because the proposed Eastern Vertical Expansion is located entirely within the approved Eastern Expansion limits, the proposed expansion will not alter land uses. Other areas on the property are used for additional solid waste and recycling activities (e.g., shingle storage, construction & demolition waste processing area, household hazardous waste and electronics drop-off site, wood yard, and tire storage area) and ancillary landfill support activities and infrastructure (e.g., roll off box storage, offices, maintenance buildings, scale, access roads, soil stockpiles, and landfill gas handling and processing facilities).

The majority of land surrounding the landfill property includes a mix of rural wooded land and wetlands to the north, a mix of commercial and residential development to the east, a mix of commercial and wooded land to the west, and a large golf course to the south, across USH 12 & 18. Additional discussion on surrounding land use is provided in **Section 4.4**.

13.3.4 Socioeconomic Conditions

The proposed Eastern Vertical Expansion is located in a rural area that contains a mix of agricultural, industrial, and residential land uses. The neighboring property to the south is a publicly owned golf course; to the east is the Dane CTH garage and medical examiner's building, a self-storage business, residences, a construction contractor's materials yard; to the north is Hope Park and the approximately 150-acre northern wetland; and to the west is the existing landfill and a hotel.

There are two designated state, county, or town recreational areas (e.g., parks, public forests, state natural areas, public hunting or fishing areas, or trails) within a 1,000-foot radius of the site: 1) Hope Park, a Dane County park, located just north of the property, and 2) the City of Madison Yahara Hills Golf Course located just south of US HWY 12 & 18. These two recreational areas currently exist within 1,000 feet of the existing landfill, no impacts to ethnic or cultural groups are expected to occur from the proposed vertical expansion.

13.3.5 Other Special Resources

As documented in the June 10, 2020 ISI response letter (**Appendix B**), archaeological issues and historical structures for the site were cleared by Richard Kubicek, Departmental Archaeologist/ Departmental Historic Preservation Officer, on May 13, 2020.

13.4 ENVIRONMENTAL CONSEQUENCES

13.4.1 Physical Impacts

13.4.1.1 Topography and Visual Impacts

The topography and drainage in the immediate vicinity of the proposed vertical expansion have been previously altered by landfill activities. The proposed vertical expansion will alter the topography further by increasing the overall height.

The proposed expansion final cover will extend to a maximum elevation of approximately 1,065 feet M.S.L., which is approximately 65.4 feet higher than the approved maximum final grade for the existing landfill.

Dane County will incorporate screening measures including maintaining existing vegetation, planting new trees, and where necessary, use soil core berms in the waste mass to provide screening from the southern, northern, and eastern boundaries of the vertical expansion

13.4.1.2 Surface Water

Construction and operation of the proposed vertical expansion is not expected to impact surface water. Water that comes into contact with waste will be contained by the composite liner system and associated perimeter berms placed around active fill areas. Collected leachate will be discharged into an existing MMSD sanitary sewer system, or recirculated back into the waste mass within the landfill.

As part of closure, a final cover system consisting of the designs described in **Section 8.3.5** will be constructed. The final cover system will reduce the infiltration of precipitation, and the volume of leachate generated will gradually diminish over time. Surface water runoff from the final cover system will be managed as described in **Section 8.8**.

13.4.1.3 Groundwater

Impacts on groundwater are not expected as a result of the proposed Eastern Vertical Expansion. To protect groundwater, the currently approved design beneath the vertical expansion includes:

- A gradient control system to intercept groundwater in high groundwater conditions before reaching the bottom of the liner system.
- A composite liner system to minimize the potential for leachate to leave the landfill.
- A leachate collection system so that leachate does not accumulate on the base of the landfill.

Routine groundwater monitoring around the landfill will continue to be performed during operation and after closure (minimum of 40 years after closure).

13.4.1.4 Air Quality, Windblown Paper, and Dust

No significant impacts to air resources are expected to occur due to the construction and operation of the expansion. The proposed vertical expansion includes a cover system with an active gas

extraction system along with the existing liner system of the Eastern Expansion. These controls help prevent surface and subsurface gas migration. Existing gas monitoring probes will continue to be monitored throughout operation and closure (minimum of 40 years after closure) to monitor for gas migration. The extracted gas will be treated by the existing RNG processing system located at the southern end of the site, just east of the site entrance. The RNG processing system converts the landfill biogas into a pipeline quality natural gas. Air quality will be monitored to comply with Federal Title V regulations. A detailed landfill gas management system design will be included with the Plan of Operation.

Odor will be controlled by use of daily cover, keeping the gas collection and control system in working condition, and utilizing odor making agents when appropriate. Dane County has an Odor Control Plan that they will continue to follow.

Windblown paper will be controlled by proper landfill operational procedures including compaction and placement of daily cover, perimeter fencing, and the use of portable litter fencing when needed. Paper and other wind-blown debris will be collected daily.

Temporary increases in fugitive dust levels could occur periodically due to site truck traffic on unpaved road surfaces. Dust will be controlled with the application of water or commercial dust suppressants to access and haul roads as needed during dry weather conditions and stabilizing disturbed areas as soon as practicable. Dane County has developed a Dust Control Plan for the existing landfill that will be used for the proposed vertical expansion.

13.4.2 Biological Impacts

Because the site is already used for landfilling operations, no significant adverse biological impacts are expected to result from the operation of the proposed Eastern Vertical Expansion. As documented in the June 10, 2020 Eastern Vertical Expansion ISI response letter (**Appendix B**), based on a review of the Natural Heritage Inventory, WDNR concluded that no endangered resources were identified in the project area. No State Natural Areas will be impacted by the development of the proposed vertical expansion.

13.4.3 Land Use Impacts

The proposed Eastern Vertical Expansion is located entirely within the approved Eastern Expansion limits. The proposed expansion is therefore consistent with existing land uses in the site vicinity and will not require displacement of residents, public land withdrawal, or condemnations. Traffic patterns are not proposed to change from the present landfilling activities at the existing landfill. The levels of noise, odor, dust, and windblown debris are also not expected to increase above current levels from existing operations. A detailed discussion on land use is provided in **Section 4.4**.

13.4.4 Socioeconomic Impacts

Adverse socioeconomic impacts are not expected from the proposed Eastern Vertical Expansion. The operation of the landfill will contribute to the local economy, as a source of economic waste disposal and employment. The vertical expansion would not result in significant changes in the waste filling operations. Thus, impacts on adjacent neighbors would be similar to those of the existing landfill.

Operational activity will occur during normal business hours. As such, the relative noise level owing to the vertical expansion is expected to be similar to that from the existing operations. The filling rate is expected to remain similar to the current filling rate, so there is not expected to be an increase in

truck traffic. The waste types accepted and the landfill operations will be similar to current, so there is not expected to be an increase in odors.

The proposed vertical expansion provides efficient disposal capacity in an environmentally responsible manner. As a result, residential, commercial, and industrial users in Dane County can continue to be served.

13.4.5 Other Special Resources

No special resources, including state or local natural areas, archaeological or historical areas, or prime agricultural land will be impacted by the proposed Eastern Vertical Expansion.

13.4.6 Probable Adverse Impacts that Cannot be Avoided

Certain environmental impacts from the proposed vertical expansion cannot be completely avoided. These impacts will be minimized to the maximum extent practicable through the proposed engineering design and the use of good management practices in the operation of the facility. The proposed Eastern Vertical Expansion would extend the period of time landfilling will occur; thus, odor, noise, dust, and track traffic associated with landfilling activities would be extended.

Potential impacts that cannot be avoided include the following:

- After the landfill is closed, there will be limitations on the use of the site. For example, construction of buildings on the landfill may be prohibited.
- Truck traffic, noise, dust, and engine emissions will exist to some degree at and around the site. However, these conditions can be minimized using good operational practices. These impacts are expected to be similar to the impacts from the current landfilling activities. Furthermore, although development of the proposed vertical expansion may extend the period of time these impacts will occur, it is not expected to result in an increase over impacts from current landfilling activities.
- The appearance and topography of the site will be altered during operation of the landfill and after the landfill is closed. The alteration will be consistent with the current land uses in the area.
- Odors can periodically occur, but with the use of daily cover, minimizing the active waste disposal area and operation of the active gas collection and control system, these issues should be limited in duration and intensity.

13.5 ALTERNATIVES

There are several alternatives to landfilling; however, the alternatives do not eliminate the need for solid waste landfills. Alternatives are discussed in **Section 15.0**. An expansion that uses land already dedicated to landfilling activities, with environmental controls already in place and activities already accepted by the local communities makes sense to develop for continued solid waste landfilling.

Alternatives to the proposed vertical expansion include; no action; enlarge, reduce, or modify the project to mitigate impacts; other locations or other landfills; another location on the property; and other waste management methods. Each of these alternatives are discussed below.

13.5.1 No Action

This alternative assumes that the proposed vertical expansion would not be developed. The No Action alternative will result in little environmental benefit and negative impacts to socioeconomic factors as discussed in **Section 13.4.4**. The existing landfill is expected to reach capacity in 2028. If the proposed vertical expansion is not constructed, nearly 240,000 tons per year of waste currently received and expected to be received will have to be disposed of at other landfills. This would require waste to be hauled longer distances to be disposed of responsibly, resulting in increased emissions, higher disposal costs for residents, and loss of local resources. This would also shorten the life of other landfills and increase the need for additional waste disposal facilities in the area. There would be additional cost for transportation to the facilities, as well as wear on the roadways. There is no guarantee that the disposal capacity replacement required under the No Action alternative could be approved at a site where potential impacts can be minimized to the same extent that they are by the proposed vertical expansion.

The No Action alternative results in little environmental benefit, but would have significant negative consequences. Therefore, the No Action alternative is not feasible.

13.5.2 Enlargement/Reduction/Modification

The proposed Eastern Vertical Expansion has been designed to optimize the disposal volume within the constraints of the site conditions and regulatory requirements. The proposed vertical expansion falls entirely within the footprint of the existing landfill, thereby optimizing existing landfill area. This would be the final expansion permitted at the current landfill site, due to site, regulatory, and environmental constraints for further landfill development horizontally and vertically. Enlarging the expansion is not feasible.

If the proposed vertical expansion were reduced or modified, another landfill or landfill expansion elsewhere would have to be developed sooner. Developing the same amount of landfill capacity in an undeveloped location would increase the costs and forgo the efficiencies of using the same liner, leachate and gas collection and control systems, access roads, and monitoring network.

Reducing, enlarging, or modifying the proposed vertical expansion would not significantly reduce environmental impacts, but would have negative consequences as described above. As a result, these alternatives are not considered feasible.

13.5.3 Alternative Locations/Other Landfills

The alternative would involve developing a new landfill at another location or providing equivalent expansion capacity at another landfill in the service area. As indicated in **Section 14.0**, no other landfills, in the Dane County Landfill Site No. 2 service area, have received Feasibility Determinations for proposed expansions. There is a need for additional disposal capacity in the service area. This option is similar to the No Action alternative presented above, and will result in little environmental benefit and will have significant negative consequences compared to the proposed Eastern Vertical Expansion. Another location or landfill would likely have greater environmental impacts because it would not be in an area currently used for waste disposal. Consequently, these alternatives are not considered feasible.

13.5.4 Other Methods

Alternative technologies are available for the management of solid waste, including recycling, composting, incineration, and processing. Many of these waste reduction and recycling technologies are mandated or being voluntarily implemented in Wisconsin and within the service area. **Section 15.0** discusses these alternatives in detail. Although activities like waste reduction and recycling can be and have been effective at reducing the quantity of waste entering the waste stream, the quantity is not enough to eliminate the future need for landfills. Additionally, waste reduction and recycling technologies have residual waste that requires the need for landfilling.

14.0 DETERMINATION OF NEED

14.1 INTRODUCTION

This evaluation of need and site life for the Dane County Landfill Site No. 2 (Rodefeld) has been prepared as part of the permitting process for the proposed Eastern Vertical Expansion. An evaluation using the most recent data available is included for the Dane County facility and for the anticipated service area. NR 512.17 requires that a FR contain an evaluation to justify the need for the facility, in accordance with Wisconsin Statutes, s. 289.28. In assessing the need for the facility, the WDNR is to consider the following issues:

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

NR 512.17 also requires that an FR contain an evaluation to demonstrate the design capacity of the proposed landfill is in accordance with Wisconsin Statutes, s. 289.29. In determining the design capacity and site life of the facility, the WDNR is to consider the following issues:

- The annual volume of waste anticipated to be accepted at the proposed facility based on previous in-take volumes at the disposal facility.
- Compelling evidence of plans for competing facilities to enter or exit the service area.
- 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.

The remainder of this analysis addresses these items and provides information to evaluate the need for the vertical expansion of the Dane County Landfill Site No. 2.

14.2 NEEDS ANALYSIS BASED ON THE WASTE INTAKE FOR THE SERVICE AREA

The proposed Eastern Vertical Expansion will be owned and operated as a municipally owned solid waste disposal facility open to the public. The service area for the Eastern Vertical Expansion includes only Dane County. The service area of Dane County Landfill Site No. 2 and the other landfills located within or near Dane County are shown on **Figure 14-1**.

Overlapping service areas of nearby landfills may divert some of the waste that is generated in Dane County to landfills other than Dane County Landfill Site No 2. To utilize service area boundaries other than the county boundaries would require an analysis of individual communities, rural residences, industries, and commercial establishments served by each landfill competing for waste from that area. This information changes constantly and is not readily available, since it is found only in customer lists of haulers, usually controlled by competing landfills. **Table 14-1** indicates the estimated percentage of waste, from the Dane County Landfill Site No. 2 service area, that was disposed at competing landfills. The percentage of overlap for different landfills estimated in **Table 14-1** was determined by using county populace in each landfill service area as recommended in the WDNR's "A Guide for Applicants, DNR Staff and the Public," dated September 2004 (WDNR, 2004). The service area for each landfill, within or near the Dane County Landfill Site No. 2, was confirmed by representatives from each landfill.

Waste disposal rates for the landfills included in **Table 14-2** are based on Solid Waste Disposal Records from the WDNR. Waste disposal rates are projected into the future to determine what the available disposal capacity will be for the Rodefeld Landfill service area during the year 2022 (the anticipated approval timeframe for the proposed Eastern Vertical Expansion and therefore the earliest the proposed Eastern Vertical Expansion might begin to accept waste).

14.2.1 Waste Disposal Rate

The estimated rate of waste disposed within the projected Dane County Landfill Site No. 2 service area is shown in **Table 14-3**. Based on statewide waste disposal rates, approximately 735,482 tons (980,643 in-place cubic yards at 1,500 pounds per cubic yard [lb/cy]) of solid waste generated from the Rodefeld Landfill service area are expected to be disposed at MSW landfills in the year 2022 (the anticipated approval timeframe for the proposed Eastern Vertical Expansion and therefore the earliest the proposed Eastern Vertical Expansion might begin to accept waste). Taking into account a
daily cover ratio of 1 part daily cover to 7 parts waste, the anticipated landfill capacity required for disposal of the solid waste is 1,103,223 cubic yards per year. As the population increases in the service area after the year 2022, the volume of solid waste generated and disposal capacity required is expected to increase also. The overall waste disposal rates at the existing Rodefeld Landfill and other landfill facilities in the area are expected to continue to increase at a rate similar to the actual rate recorded at the Rodefeld Landfill during the past 3 years which is consistent with the Wisconsin Department of Administration 2010 through 2019 population estimates for Dane County.

The estimated waste volume disposed within the service area (as shown on **Table 14-3**) assumed an in-place waste density of 1,500 lb/cy. This was based on a state-wide density for in-place waste for Wisconsin landfills as referenced in the Department's draft guidance document for preparing landfill needs assessments (WDNR, 2004).

The solid waste disposal rate identified in **Table 14-3** for the County Landfill service area was determined using the WDNR's Solid Waste Landfill Tonnage/Capacity Reports for 2017 to 2019 (**Appendix P**) and Wisconsin Population Records for 2017 through 2020. Recycled or Land Ban items were not included in the disposal rate since they are banned from landfill disposal. The average waste disposal rate at MSW landfills in Wisconsin was determined to be 4.06 lb/capita/day for municipal waste and 3.20 lb/capita/day for industrial/commercial waste, for a combined disposal rate of 7.26 lb/capita/day. **Table 14-4** summarizes the data used to generate the Wisconsin waste disposal rate.

The use of the WDNR Tonnage Reports for determining the waste disposal rate at MSW landfills for the Wisconsin portion of the County Landfill service area assumed the following:

- Future solid waste disposal practices will remain similar to recent trends.
- The Rodefeld Landfill service area is representative of the state's average waste disposal rates

The data used to project the population of the Rodefeld Landfill service area was based on the Wisconsin Department of Administration-Demographic Services Center's projected population for each county. On the basis of these projections, the population in the service area is expected to increase by a prorated average of approximately 1.08 percent per year (based on projected growth rates for Dane County). This population increase is also expected to increase the waste disposal rates at the existing active County Landfill and other landfill facilities accepting waste generated from within the service area.

Recycling efforts have impacted waste disposal rates in Wisconsin. Wisconsin Act 335 (Recycling Law) established prohibitions on landfilling certain types of waste.

The prohibitions took effect in 1991, 1993, and 1995. The prohibitions for 1991 and 1993 were for white goods (large appliances), car batteries, waste oil, and yard waste. The most significant prohibition (s. 159.07), which took effect in January 1995, involved cardboard containers and packages, magazines, glass, plastics, newspaper, office paper, and tires. Electronics such as televisions, computers, and cell phones were banned from landfill disposal in Wisconsin in 2009. Dane County Ordinance section 41.25 bans landfill disposal of grass clipping and leaves, electronic devices, and oil filters and oil absorbent materials. **Table 14-2** excluded items as a result of the recycling laws implemented. Since these recycling laws have been in effect for an extended period, they are not expected to have further impacts on waste disposal rates.

14.2.2 Design Capacity

The design capacities of facilities located within or near the service area of the proposed vertical expansion, including other proposed disposal, recycling, and recovery facilities, and solid waste incinerators, are discussed in the following subcategories.

Approved Facilities

An "approved facility" is defined under s. 289.01 as "a solid or hazardous waste disposal facility with an approved Plan of Operation under s. 289.30, or a solid waste disposal facility initially licensed within 3 years prior to May 21, 1978, the owner of which successfully applies within 2 years after May 21, 1978, for a determination by the WDNR that the facility's design and POO comply substantially with the requirements necessary for plan approval under s. 289.30." This category discusses approved facilities within or near the landfill service area and facilities providing disposal capacity in the areas of overlap.

Proposed Facilities

It is necessary to discuss the proposed facilities for which FRs have been submitted and determined to be complete by the WDNR when assessing the need for a proposed facility. Based on the proposed feasibility reports posted on the <u>WDNR website</u>, as of February 16, 2021, no other FRs for proposed facilities or expansions of existing facilities have been submitted.

Wisconsin Waste Disposal Facilities

The following facilities were evaluated in the analysis of need using conditions as they are known to currently exist. Information provided on Wisconsin MSW disposal facilities within or near the service area is from the WDNR Tonnage Report for 2019 (**Appendix P**). The actual disposal capacity and remaining site life may vary, depending on changes in site-specific disposal rates. The counties representing the approximate service area for each site are listed. The counties listed are those areas in which the majority of waste to each site originates.

Dane County Landfill Site No. 2, Dane County

2020 disposal capacity:	2,457,758 cy
2019 fill rate:	319,081 cy/yr
Percent of waste from Dane County Landfill service area:	100%
Service area included:	Dane County

Waste Management of Wisconsin, Inc. (WMWI) Deer Track Park Landfill, Jefferson County 2020 disposal capacity: 3540,483 cv

	3,3+0,+03 Cy
2019 fill rate:	329,379 cy/yr
Percent of waste from Dane County Landfill service area:	31.9%
Service area included:	Dane, Columbia, Crawford, Dodge, Grant, Green, Iowa, Jefferson, Lafayette, Richland, Rock, Sauk, Vernon Walworth, and Waukesha Counties in Wisconsin

Glacie	^r Ridge Landfill, Inc., Dodge County 2020 disposal capacity:	4,388,437cy
	2019 fill rate:	887,836 cy/yr
	Percent of waste from Dane County Landfill service area:	31.0%
	Service area included:	Dane, Columbia, Dodge, Fond du Lac, Green Lake, Jefferson, Milwaukee, Ozaukee, Washington, Waukesha, and Winnebago Counties in Wisconsin
Mallarc	Ridge Landfill, Walworth County	
	2020 disposal capacity:	1,659,734 cy
	2019 fill rate:	350,760 cy/yr
	Percent of waste from Dane County Landfill service area:	60.9%
	Service area included:	Dane, Jefferson, Rock, and Walworth Counties in Wisconsin
Janesv	ille City Landfill, Rock County	- 40- 00-
	2020 disposal capacity:	5,195,237 cy
	2019 fill rate:	281,968 cy/yr
	Percent of waste from Dane County Landfill service area:	58.5%
	Service area included:	Dane, Green, Jefferson, Rock, and Walworth Counties in Wisconsin

Nonapproved Facilities

Nonapproved facilities, as defined under s. 289.01, are to be discussed when determining the need for a proposed facility. It is assumed that a nonlicensed, nonapproved facility is not environmentally sound unless evidence to the contrary is provided. No nonapproved facilities are currently operating in the service area, nor are any expected to operate in the service area during the life of Dane County's Eastern Vertical Expansion.

Existing and Proposed Recycling and Resource Recovery Facilities

The Wisconsin Recycling Law, Act 335, was followed by NR 544 (WDNR, January 1987), which came into effect on January 1, 1995. The promulgation of Act 335 has reduced the volume of waste disposed at landfills located in Wisconsin. NR 544, the "Effective Recycling Programs" Code, provides detailed guidance to responsible units on how to develop and maintain an effective recycling program.

Many waste recovery programs are currently operating in the Dane County Landfill Site No. 2 service area (see **Sections 15.1** and **15.2**). These programs have been in place for the past several years as a result of recycling laws, economic incentives, and voluntary programs. Future recycling efforts are

expected to fluctuate, along with the prices being paid for recycled materials and as less waste becomes suitable for recovery.

Licensed and Proposed Solid Waste Incinerators

There are no WDNR-licensed or proposed municipal solid waste incinerators within the Rodefeld Landfill service area.

14.2.3 Analysis

The proposed Eastern Vertical Expansion will be a publicly owned and operated solid waste disposal facility, which will primarily serve Dane County Wisconsin. Dane County requests approval for the Eastern Vertical Expansion in order to continue to provide efficient and environmentally sound waste management services for residents within the service area.

An analysis was performed to determine the need for the Eastern Vertical Expansion, based on the waste disposal rates at the existing active Rodefeld Landfill and other landfill facilities in the area. The analysis compared waste disposal rates with the disposal capacities of those facilities that provide waste disposal services to the Rodefeld Landfill service area. **Table 14-2** was developed to estimate the annual disposal rate and the projected capacity of the respective sites that provide disposal services to the Dane County Landfill service area.

The need for the Eastern Vertical Expansion was evaluated based on the approved MSW landfill capacity within the service area, the capacity of the proposed Dane County Landfill Site No. 2 vertical expansion in the service area (prorated for the service area), and the capacity of the Dane County Landfill Eastern Vertical Expansion. Available capacity at competing landfills was prorated based on the percentage of overlap of service areas with the Dane County Landfill as shown in **Table 14-1**.

NR 500 regulations require that all proposed expansions for which FRs have been submitted and determined to be complete, be included in the needs analysis. Presently, there are no other FRs submitted to the WDNR for siting a new or expanding an existing landfill in the Rodefeld Landfill service area.

The available waste disposal capacity for the projected Rodefeld Landfill service area in the year 2022 (i.e., the first year that the proposed Eastern Vertical Expansion might accept waste), which is currently approved, or which was determined to be in the process of being approved, is approximately 7,830,753 cy (see **Table 14-2**). At a waste disposal rate of 7.26 lbs/capita/day shown in **Table 14-4** (prorated for the expected population growth), the available disposal capacity for the Rodefeld Landfill service area without the proposed vertical expansion will be depleted during early 2028 (see **Table 14-5**).

With the addition of the Eastern Vertical Expansion capacity of approximately 990,300 cy, the site life for the service area would be extended later into the year 2028 (see **Table 14-6**).

14.2.4 Conclusion for Service Area Analysis

Rodefeld Landfill has been servicing the solid waste disposal needs of Dane County, Wisconsin since 1984. The vertical expansion is proposed to provide disposal capacity based on current waste fill rates and anticipated population and waste growth rates within the service area, which justifies the need for this facility.

As shown in **Tables 14-5** and **14-6**, the analysis conservatively indicates a continued need, not only for the vertical expansion of Dane County Landfill Site No. 2, but also for other disposal facilities in the service area. Based on this analysis, additional disposal capacity is needed in the projected service area. Without approval of the Eastern Vertical Expansion or any other landfill in the service area, available disposal capacity for this area would likely be depleted in early 2028 (from **Table 14-5**). The proposed Rodefeld Landfill vertical expansion provides a timely solution for the future waste disposal needs of the service area.

Approval for the construction and operation of the Eastern Vertical Expansion will provide environmentally sound solid waste disposal at competitive prices, which will be beneficial to the communities in the Rodefeld Landfill service area. The approval of the vertical expansion will allow for continued uninterrupted waste disposal services in Dane County, Wisconsin. The need for the Eastern Vertical Expansion has been justified based on information provided in this document.

14.3 SITE LIFE ANALYSIS BASED ON THE WASTE INTAKE FOR DANE COUNTY LANDFILL SITE NO. 2

To determine a design capacity for the proposed Eastern Vertical Expansion, the waste filling dynamics from 2017 to 2019 were assessed. The average intake tonnage (utilizing compounding averaging) from the waste tonnage report was used as the estimated waste intake volume. This equates to an average annual waste intake of 238,421 tons (or approximately 317,894 cy assuming 1,500 lb/cy density) for the years of 2017, 2018, and 2019 (see **Table 14-7**).

An evaluation of the actual municipal solid waste intake at the facility between the years of 2017 and 2019 suggests an annual increase of 2.81 percent. However, an evaluation of the commercial and industrial waste accepted at the facility between 2017 and 2019 suggests a decrease of 4.17 percent per year. Overall, the annual increase is 0.88 percent (see **Table 14-7**). The weighted average increase of 0.88 percent was used to estimate the volume for the site life calculations.

The estimated annual waste intake was converted to a volume using an in-place waste density of 1,500 lb/cy which is consistent with the WDNR allowable in-place waste density in "Landfill Needs and Site Life: A Guide for Applicants, DNR Staff and the Public," (WDNR, 2004). The proposed expansion volume of 990,300 cubic yards is defined as the volume contained between the top of WDNR approved waste grades over the existing landfill in the area of the Eastern Vertical Expansion, and the bottom of the clay layer (or barrier layer if GCL is used) for the proposed final cover of the proposed Eastern Vertical Expansion, and therefore it is necessary and appropriate to include an allowance for daily cover soils in the site life evaluation. A daily cover ratio of 1 part daily cover soil to 7 parts waste was used to determine the volume of airspace consumed by daily cover soils.

Taking into account historical and projected waste intake, and proposed vertical expansion volume consumption due to daily cover soil placement, it is predicted that the proposed Eastern Vertical Expansion at the Dane County Landfill Site No. 2 will be fully consumed by 2030 (see **Table 14-8**).

14.4 CONCLUSION

Approval for the construction and operation of the proposed Eastern Vertical Expansion will provide environmentally sound solid waste disposal at competitive prices, which will be beneficial to the communities in the Rodefeld Landfill service area. The approval of the vertical expansion will also allow for continued uninterrupted waste disposal services in Dane County.

15.0 ALTERNATIVES TO LAND DISPOSAL

15.1 DESCRIPTION OF ALTERNATIVES TO LAND DISPOSAL

Landfilling is a key component of responsible solid waste management. Several other technologies exist for processing solid waste and reducing solid waste disposal volumes. The following discussion is a brief overview of the practical means for reducing the volume of waste to be landfilled, including waste reduction, reuse, recycling, composting, co-composting, and incineration and energy recovery.

15.1.1 Waste Reduction

Waste reduction is the reduction in the quantity of materials used, thereby reducing the volume of waste requiring disposal. It is the most desirable means of managing waste, by not creating it in the first place. Wisconsin State Statute 287.05 cites waste reduction and waste reuse as top priorities in the management of solid waste, whenever possible and practical.

This requires effort by manufacturers to redesign products to use fewer materials and by consumers to choose to use products that have minimal disposal requirements. Waste reduction also involves the development of products with longer useful lives, thereby reducing the need to frequently replace items and reducing the amount of waste requiring disposal.

Waste reduction is more environmentally, socially and economically acceptable than many other management alternatives. It can reduce the costs of waste collection, transportation, processing, and disposal.

Implementing or increasing waste reduction would require changes in manufacturing practices and procedures, which falls in the hands of manufacturers. Industry would be responsible for a significant share of implementing waste reduction; however, industry responds to consumer demands and market place response to products. As such, consumers can influence industry practices through purchasing decisions. Local municipalities can educate people on the need to evaluate the use of products with excess packaging and short useful lives.

15.1.2 Waste Reuse

The reuse of waste items includes the use of multiple-use products, sharing, donating, or repairing and rebuilding of older items. Reuse of waste reduces landfill space consumption and conserves environmental resources.

Industrial implementation of this solid waste management technique could possibly include the reuse of machinery, spare and extra parts, byproducts, liquids, barrels, drums, pallets, and scraps. Due to the limited supply of natural resources, the increasing cost for raw materials and waste disposal will serve as an incentive for implementing waste reuse.

At the consumer level, large-scale reuse of products could be difficult to implement. At the municipal level, mandatory reuse of products could be difficult to enforce. Many domestic waste items can be refurbished and reused. Items such as clothing, appliances and furniture are often donated to charitable organizations and local community groups. Examples on a smaller scale include reuse of paper and plastic bags, gift boxes, packaging, etc. There is more of a shift in society, both from industry and individual levels, to be more sustainable. Working with organizations and providing publicity can encourage increased waste reuse and assistance in promoting collection drives.

15.1.3 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 newspaper, aluminum cans, glass, plastics, and scrap metals, all of which can be used to produce new materials of some kind. The general public is familiar with recycling and understands that there is value to reusing materials and preserving landfill space. These recyclable materials are already legally banned form landfill disposal; therefore, significant waste volume reductions will not be achieved by further recycling efforts. A cost per ton for recycling waste would be difficult to estimate due to the variety of recycled material, variable markets for recyclable material and the varying level of collection effort for the material.

Recycling programs often have an advantage over other methods of solid waste reduction techniques in that they are generally low-technology methods requiring comparatively limited capital investments. In addition, they can often be implemented rather quickly and are adaptable and flexible to program location.

As noted in the 2020 Wisconsin Legislative Audit Bureau report on State Recycling Programs, in recent years, foreign purchasers of recyclable materials introduced limits on the extent to which recyclable materials can be contaminated with inappropriate materials. As a result, the amount of recyclable materials available for sale in the U.S. increased considerably, and the market value of many of these materials decreased. The report further reported that total amount of materials recycled in Wisconsin declined from 833,300 tons in 2014 to 760,000 tons in 2018, which was the most recent year for which this information was available at the time of the audit.

Recycling programs and recycling centers can be managed by local municipalities, community organizations, or private businesses. As previously noted, programs can be implemented by statutory or local requirements or can be completely voluntary.

The types of recycling programs most often implemented can be classified by collection method, including curbside collection, drop-off centers and buy-back centers. Each are discussed below.

Curbside Collection

Curbside collection is the periodic pickup of recyclables at the curbside or at the point of generation. This method involves the periodic collection of recyclable household goods such as paper, aluminum, metal, glass, and plastic. Industrial and commercial collection is also possible. Collection services are generally provided by municipal or private collection agencies. Generators may be required to separate the recyclable materials prior to collection.

Administrative 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.

This type of program is most convenient for the generator as it does not require the transport of materials by individuals. However, unless the program is mandatory on a local basis,

participation rates for household generators can be low. Well-publicized programs, both voluntary and mandatory, that produces a sense of environmental awareness and community effort can be very successful. Participation rates of 45 percent to 95 percent can be expected. Based on the 2020 State of Curbside Recycling Report by The Recycling Partnership, across curbside programs of all types, the average reported participation rate was 72 percent.

Drop-off Centers

Drop-off centers are facilities where people can bring recyclables but are not compensated for them. This method consists of facilities that provide easy disposition of separated recyclable materials, most often household wastes. The types of facilities available can range from unstaffed centers, which provide separate containers for recyclables, to full-scale facilities, which provide disposition, processing, storage and transport of recyclables. In all cases, the generator must transport recyclable materials to the drop-off center and is not compensated for doing so.

This type of program can be voluntary or mandatory. Statutory requirements for Wisconsin require all communities with population of 10,000 or more, and all disposal facilities with an annual solid waste intake of 50,000 tons or more, to provide waste separation and collection facilities. Any business that sells automotive engine oil to consumers is required to either maintain a used oil collection center or post a sign informing customers of the nearest used oil collection center. If adequate used oil collection centers are not available, local or county governments are required to provide them.

It is estimated that participating rates for this method of collection range from 10 percent for voluntary programs to almost 100 percent for mandatory programs. Well-publicized programs typically achieve higher, more consistent participation rates.

Buy-back Centers

Buy-back centers are facilities where people can bring recyclables and be compensated for them. Generators transport recyclables to the buy-back center and are financially compensated for the materials. Participation rates tend to be higher and more consistent owing to the financial compensation. Many buy-back centers handle primarily industrial and commercial recyclable materials. Compensation for household wastes, such as newspaper, glass, and aluminum, is also provided.

The organization and development of recycling programs should include an evaluation of available markets for the use of recyclable goods and the program should accommodate a changing economic marketplace.

The State of Wisconsin through Statute 287.07 has banned certain material from landfills in an effort to reduce the volume of waste disposed of at landfills. Banned materials include most recyclable material, including aluminum, corrugated paper and other container board, foam polystyrene packaging, glass containers, magazines, newspapers, office paper, plastic containers, steel containers, tires, bi-metal steel/aluminum containers, appliances, waste oil, batteries, and electronics.

Wisconsin's electronics recycling law (2009 Wisconsin Act 50) bans electronics such as TVs, computers, and cell phones from Wisconsin landfills and incinerators. The law establishes a statewide program, called E-Cycle Wisconsin. E-Cycle Wisconsin is a statewide, manufacturer-funded

program that recycles certain electronics used in homes and schools. Each year, manufacturers of products covered by Wisconsin's electronics recycling law must pay for electronics to be recycled. This funding makes it easier for individuals and schools to recycle old electronics.

Wisconsin's electronics recycling law covers electronics sold to and used by Wisconsin households, K-12 public schools, and Milwaukee Parental Choice Program schools participating in the program under s. 119.23, Wis. Stats. Only specified electronics used by these groups can be part of E-Cycle Wisconsin recycling efforts. Specified electronics include computers; desktop printers and printer/fax/copier/scanner combinations; and video display devices, including televisions, laptop computers, and computer monitors with displays of at least 7 inches in the longest diagonal direction. There is also a broader category of devices that manufacturers can count toward their recycling obligation, including computer peripherals, keyboards, mice, hard drives and other devices; fax machines; and DVD players, VCRs, and other video players (i.e., DVRs).

The law bans the landfilling and incineration of electronic devices as of September 1, 2010. These bans apply no matter where the devices are from or who used them, including households, schools, businesses, governments, and institutions. Specifically, the bans include:

- Televisions
- Computers (desktop, laptop, notebook, and tablet computers)
- Desktop printers (including those that scan, fax, and/or copy)
- Computer monitors
- Other computer accessories (including keyboards, mice, speakers, external hard drives, and flash drives)
- DVD players, VCRs, and other video players (i.e., DVRs)
- Fax machines
- Cell phones

Since these recyclable materials are already legally banned from landfill disposal, significant waste volume reductions will not be achieved by further recycling efforts. Since recycling is already required by law and as such is not an alternative to land disposal, no estimate of disposal costs for recycling has been conducted.

15.1.4 Waste Composting

Composting is the biodegradation of the organic portion of solid waste materials (food, wood, leaves, grass clippings, etc.). Organic matter is decomposed into a humus-like material (partially or wholly decayed organic matter), which is then generally used as a soil conditioner or mulch. Many different composting processes exist, ranging from simple backyard composting to automated composting in enclosed digesters.

Small-scale composting can be accomplished effectively by private residences, with little investment, and with end products immediately available for use on their own property. 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 salvageable materials from noncompostables, and then shredding and grinding, with the possible addition of sludge's or water. Materials are then digested in open or closed digester systems and finished by regrinding and rescreening the humus to ensure uniform size, consistency, the lack of contaminants,

and the proper water content. Few bulk commercial and specialty markets exist, however, for the sale of composted material.

Yard waste and some food wastes provide some of the greatest waste reduction opportunities for composting. 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. 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.

15.1.5 Waste Co-composting

Co-composting, very similar to composting, mixes various waste types together for composting. Municipal waste and sludge from wastewater treatment facilities may be composted together. If co-composting is done in conjunction with a recycling program, then little or no sorting of the municipal waste is needed. Typically, co-composting is done on a large scale.

Recent experience indicates that, because of the limited demand for the co-compost product, primarily in application to residential lawns, and because of the demand for visually aesthetic product that does not contain nuisance material, to obtain a product that can be sold, most of the co-compost has to be rejected during the final screening process. This results in a product that is not economically viable, and a subsidy is required if the process is going to be maintained.

15.1.6 Food Waste Diversion and Anaerobic Digestion

Anaerobic digestion consists of decomposition of organic material in an oxygen-limited atmosphere. Anaerobic digestions is commonly used to treat municipal solid wastes and high-strength industrial wastes. Diverting food waste for anaerobic digestion is a possibility for reducing the volume of material that requires landfill disposal.

Most commonly, an anaerobic digester is comprised of a single stage reactor vessel that facilitates mixing of the material and effectively converts organic waste to methane which can be captured and converted to energy. More complex systems separate the various reactions that occur during the decomposition process by having reactors in series. Reactor in series can allow for the waste to convert to methane more completely but typically require greater capital investment.

Anaerobic digestion technologies also vary by the liquid content and composition of the waste. A "wet" process is the most widely used in the United States since it is appropriate for the treatment of municipal waste water sludge. The "wet" process requires the waste to have a total solid content of less than 20 percent (i.e., a slurry). In contrast, "dry" digestion, utilizes recirculated leachate for moisture and requires the addition of significantly less water. The recirculation of liquid facilitates chemical processes that resembles those in a landfill; however, digestion can occur more efficiently in the controlled environment.

The diversion of food waste from the landfill requires increased efforts in sorting which can be minimized by enlisting the participation of high volume food waste generators including campuses, hospitals, and food manufacturers.

Dane County and other partners, including the City of Madison, continue to explore the feasibility of constructing an anaerobic digester in the community as another waste reduction resource.

15.1.7 Waste Incineration and Energy Recover

Incineration is the controlled burning of solid waste materials to reduce the volume of materials requiring landfill disposal. 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 and energy recovery systems are mass-burn or refuse-derived fuel (RDF) systems. In a mass-burn system, solid waste materials are placed directly into an incineration chamber with little or no preparation or processing for the removal of unburnables. Mass-burn systems usually incorporate energy recovery features that produce steam or electricity for sale to local industries or utilities. In an RDF system, solid waste materials are transformed into intermediate fuels and are incinerated in boilers. A common mixing rate for the incineration of RDF in a boiler is 10 parts coal to one part RDF.

Many elements of both incineration processes are the same. A storage area for refuse must be provided. Usually up to 3 days of storage are common to allow for continuous use of the facility. Heavy machinery, such as cranes and end-loaders, is needed to feed the incinerators. A system of moving grates is usually used to move the waste through the combustion chamber. Ash residue is collected in bottom quench tanks, and is eventually conveyed to a storage area. Electrostatic precipitators or scrubbers are used to collect particulates in the exhaust. To be operated, incineration systems are required to be licensed.

Exhaust emissions are a function of waste composition, incinerator design characteristics, and operating time. Air emissions are categorized into one of three types: inorganic particulate matter, specific chemical pollutants, and nitrogen oxides. Documentation is required to incorporate stringent measures to control emissions. It should be noted that the incineration of solid waste materials is not a feasible alternative at this time, due to exhaust emission restrictions.

15.2 POTENTIAL WASTE REDUCTION AND RECOVERY PROGRAM

Within the Dane County service area, recycling and resource recovery programs have been implemented as a result of Wisconsin Act 355. These include voluntary and mandatory programs for industrial, commercial, and municipal waste.

Communities throughout Dane County have similar waste reduction and resource recovery practices. A majority of the larger communities have implemented mandatory curbside pickup of recyclables on a regular basis. Other smaller communities have drop-off centers where recyclables are collected. The County also operates the Clean Sweep program which provides a location for residents and business owners to drop off hazardous materials and electronics. The program helps divert hazardous materials and electronics from the landfill and lowers risks associated with their improper disposal.

Other landfilling waste reduction programs Dane County provides or actively supports, include:

- County ordinances that support recycling
- Shingle recycling
- Tire recycling
- Clean wood, brush, and logs processing
- Recycling of electronic equipment
- Mercury and fluorescent bulb recycling

- A directory of site locations for recycling centers
- Financial support for ENACT and ReStore
- Bicycle exchange program
- Clean sweep (and product exchange program)
- Sharps disposal program

Dane County estimates the following waste diversion rates achieved in 2020:

- 657 tons of tires were recycled into playground tile or incinerated for energy
- 46,656 tons of construction & demolition material was processed for recycling
- 870 tons of brush and logs were ground into wood chip to be used as animal bedding and mulch
- 2,568,140 equivalent gallons of gasoline were produced by the renewable natural gas facility
- 2,383 tons of shingles were recycled into asphalt
- 39 tons of products reused through Clean Sweep's exchange program

Thus, substantial amounts of materials are being diverted from landfill disposal through these efforts.

15.3 EVALUATION OF IMPLEMENTING ALTERNATIVES TO LAND DISPOSAL

Alternative technologies are available for the management of solid waste, including recycling, composting, incineration, and processing. Many of these waste reduction and recycling technologies are mandated in Wisconsin and are already being utilized within the service area. Although activities like waste reduction and recycling can be and have been effective at reducing the quantity of waste entering the waste stream, the quantity is not enough to eliminate the future need for landfills. Furthermore, recent reductions in the acceptance of United States recyclables by China has started to increase filling rates as the market for recyclables has decreased.

Dane County has been a leader in waste diversion strategies, and will continue to provide leadership in finding solutions and implementing environmentally sound waste management programs.

16.0 **REFERENCES**

BT², Inc., 2008, Leachate Recirculation Plan and Monitoring Plan Modification Dane County Landfill Expansion Rodefeld Site No. 2, Dane County, WI, August 2008.

Donohue & Associates, Inc., 1991, Initial Site Inspection Report, Dane County Landfill Expansion Rodefeld Site No. 2, License No. 3018, Dane County, WI, August 1991.

Kammerer, P.A., Jr., 1981, Groundwater quality atlas of Wisconsin. Wisconsin Geological and Natural History Survey Information circular 39. 39 pages. Madison, WI, January 1981.

RMT, Inc., 1981, Initial Site Report, Dane County Landfill Expansion Rodefeld Site No. 2, License No. 3018, Dane County, WI, October 1981.

RMT, Inc., 1982, Feasibility Report, Dane County Landfill Expansion Rodefeld Site No. 2, License No. 3018, Dane County, WI, September 1982.

RMT, Inc., 1984, Plan of Operation Report, Dane County Landfill Expansion Rodefeld Site No. 2, License No. 3018, Dane County, WI, February 1984.

RMT, Inc., 1996, Portage County integrated solid waste management plan. 1996. Rust Environment and Infrastructure. 1993. Plan of Operation Report, Dane County Landfill Expansion Rodefeld Site No. 2, License No. 3018, Dane County, WI, November 1993.

SCS Engineers, 2020. Eastern Vertical Expansion Initial Site Report, Dane County Landfill Site No. 2, Madison, WI, September 8, 2020.

SEC Donohue Environment and Infrastructure, 1992, Feasibility Report, Dane County Landfill Expansion Rodefeld Site No. 2, License No. 3018, Dane County, WI, October 1992.

State of Wisconsin Legislative Audit Bureau, State Recycling Programs, Report 20-21, November 2020. <u>https://legis.wisconsin.gov/lab/media/3115/20-21full.pdf</u>

TRC, 2012, Alternative Geotechnical Investigation Program, Dane County Landfill #2 (Rodefeld) – Eastern Expansion, Madison, WI, October 12, 2012.

TRC, 2012a, Alternative Geotechnical Investigation Program – Addendum No. 1, Dane County Landfill #2 (Rodefeld) – Eastern Expansion, Madison, WI, October 25, 2012.

TRC, 2012b, Initial Site Report, Dane County No. 2 (Rodefeld) Landfill – Eastern Expansion, Madison, WI, November 2012.

TRC, 2013, Eastern Expansion Feasibility Report, Dane County Landfill #2 (Rodefeld), Madison, WI, May 20, 2013.

TRC, 2013a, Eastern Expansion Feasibility Report – Addendum No. 1, Dane County Landfill #2 (Rodefeld), Madison, WI, August 2013.

TRC, 2013b, Eastern Expansion Feasibility Report – Addendum No. 2, Dane County Landfill #2 (Rodefeld), Madison, WI, October 2013.

TRC, 2014, Eastern Expansion Plan of Operation, Dane County Landfill #2 (Rodefeld), Madison, WI, April 1, 2014.

TRC, 2014a, Eastern Expansion Plan of Operation – Addendum No. 1, Dane County Landfill #2 (Rodefeld), Madison, Wisconsin, June 9, 2014.

Wisconsin Department of Natural Resources (WDNR), 2004, "Landfill Needs and Site Life: A Guide for Applicants, DNR Staff and the Public."

WDNR, 2012, Proposed Dane County Rodefeld Landfill Eastern Expansion – Alternative Geotechnical Program for Feasibility Study, October 26, 2012.

WDNR, 2014, Determination of Site Feasibility, Dane County Rodefeld Eastern Landfill Expansion, February 3, 2014.

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