February 13, 2024
File No. 25222268.00

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

Mr. Tyler Sullivan
Wisconsin Department of Natural Resources
South Central Region
3911 Fish Hatchery Road
Fitchburg, WI 53711-5367

Subject: Feasibility Report – Dane County Landfill Site No. 3 (FID #113450480)
4402 Brandt Road, Madison, Wisconsin 53718

Dear Ms. Bekta and Mr. Sullivan:

On behalf of Dane County Department of Waste & Renewables, SCS Engineers is submitting three copies of the enclosed Feasibility Report (FR) for the proposed Dane County Landfill Site No. 3. The required review fee will be paid by Dane County on receipt of an invoice from the Wisconsin Department of Natural Resources.

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 Dane County Landfill Site No. 3.

Sincerely,

Betsy Powers, PE
Senior Project Manager
SCS Engineers

Sherren Clark, PG, PE
Vice President
SCS Engineers

BLP/lmh/SCC/BJS

cc: Per attached distribution list

Encl. Feasibility Report

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Dane County Department of Waste & Renewables
Feasibility Report
Dane County Landfill Site No. 3
Distribution List

Delivered at time of Feasibility Report submittal:

Sent to:	Number of Copies:
Mr. John Welch Dane County Waste & Renewables Department 1919 Alliant Energy Center Way Madison, WI 53713	1 (Feasibility Report and Plan Set)
Mr. Tyler Sullivan Wisconsin Department of Natural Resources 3911 Fish Hatchery Road Fitchburg, WI 53711-5367	2 (Feasibility Report and Plan Set)
Ms. Ann Bekta Wisconsin Department of Natural Resources 2514 Morse Street Janesville, WI 53545-0249	1 (Feasibility Report and Plan Set)
Mr. Joe Lourigan Wisconsin Department of Natural Resources GEF2 DNR Central Office Madison, WI 53707-7921 Joseph.Lourigan@wisconsin.gov	1 (Feasibility Report and Plan Set, electronic copy)
Town of Cottage Grove Clerk 4058 County Road N Cottage Grove, WI 53527 clerk@tn.cottagegrove.wi.gov	1 (Feasibility Report and Plan Set/ Initial Site Report)
Madison City Clerk Room 103, City-County Building 210 Martin Luther King Jr. Blvd. Madison, WI 53703	1 (Feasibility Report and Plan Set/ Initial Site Report)
Dane County Clerk Room 106A City-County Building 210 Martin Luther King Jr. Blvd. Madison, WI 53703	1 (Feasibility Report and Plan Set/ Initial Site Report)
Village of McFarland Clerk 5915 Milwaukee Street McFarland, WI 53558 cassandra.suettinger@mcfarland.wi.us	1 (Feasibility Report and Plan Set/ Initial Site Report)

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Feasibility Report

Dane County Landfill Site No. 3 (FID #113450480)
4402 Brandt Road
Madison, Wisconsin 53718

Prepared for:

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

SCS ENGINEERS

25222268.00 | February 13, 2024

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

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Plan Sheets (Bound Separately)

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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

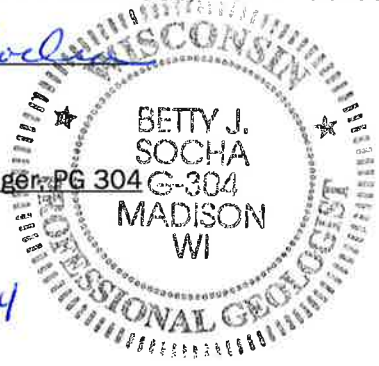
2/13/24
Date

"I, Betty J. Socha, 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

Senior Project Manager, PG 304
Title

Feb. 13, 2024
Date



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1.0 INTRODUCTION

1.1 PURPOSE

The Feasibility Report (FR) for the proposed Dane County Landfill Site No. 3 (Proposed Landfill) 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 Landfill. The ch. NR 504 and 512 completeness checklists identifying the locations of the required information are provided in **Appendix A**.

1.2 BACKGROUND

Dane County Department of Waste & 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. Dane County Landfill Site No. 2 is expected to reach final capacity in approximately 2028.

The Proposed Landfill is located on a parcel of land (Property Parcel No. 251/0710-254-0098-9) totaling approximately 200 acres (**Plan Sheet 2**), within the eastern portion of the existing Yahara Hills Golf Course. **Figure 1-1** shows the location of the Proposed Landfill on a United States Geological Survey (USGS) map.

Dane County purchased the land from the City of Madison through a Purchase and Sale Agreement (Agreement No. 14745). That agreement was executed in June 2022 and closing occurred in February 2023. The site is located south of US Highway (USH) 12 & 18, northeast of Interstate I-90/I-39 and west of Brandt Road/County Highway (CTH) AB. Additional site information is included in **Section 3.0**.

The Proposed Landfill limits of waste are shown on **Plan Sheets 2**, and **23** through **27**) and include approximately 79.0 acres of new waste disposal area.

Key documents related to the Proposed Landfill that were previously submitted to WDNR are outlined below, along with corresponding responses.

- Initial Site Inspection (ISI) request dated March 17, 2022.
  - WDNR performed a site inspection on April 14, 2022.
  - WDNR issued the ISI Response Letter on May 11, 2022 (see **Appendix B**).

- Initial Site Report (ISR) dated September 1, 2022.
  - WDNR issued the ISR Opinion Letter on November 29, 2022 (see **Appendix B**).

1.3 WDNR ISR COMMENTS AND RESPONSES

The ISR Opinion Letter was issued by WDNR on November 29, 2022 (see **Appendix B**). Based on the review of the documents included with the ISR, WDNR concluded that the Proposed Landfill has limited potential for development as a solid waste disposal facility.

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

1.3.1 Proposed Design Capacity, Service Area, and Anticipated Site Life

"The anticipated site life of the proposed landfill is approximately 14 to 15 years based on estimated filling rates. Information on projected waste volume growth, calculations used to convert tons to cubic yards and other factors used to estimate site life must be provided in the anticipated feasibility report."

Response: Refer to **Section 11.0** (Determination of Need) for information related to the projected waste volume growth, conversion factors from tons to cubic yards, and other factors used to estimate site life.

1.3.2 Separation to Bedrock

"The ISR indicates that the county may request an exemption to s. NR 504.06(2)(c), Wis. Adm. Code, which requires a 10-foot separation between the top of the bedrock surface and the bottom of the clay component of a composite liner, because the expected design of the proposed landfill and underlying components would encroach or be within the weathered bedrock surface. The feasibility report must include a discussion of the proposed design and any alternatives considered, using the information from the site-specific geotechnical investigation. The feasibility report should also provide information to support the exemption request in accordance with s. NR 500.08(4), Wis. Adm. Code."

Response: Refer to **Section 1.4.3**.

1.3.3 Separation to Groundwater

"The ISR indicates that the county will request an exemption to s. NR 504.06(2)(b), Wis. Adm. Code, to allow the bottom of the clay component of a composite liner to be constructed within the 10-foot separation distance to the seasonal high groundwater table. A groundwater gradient control system would likely be proposed to underlie the entire landfill. Gradient control systems previously approved by the department for MSW landfills have generally been gravity drained systems designed to maintain a seasonal high groundwater table beneath the site at or below the elevation of the bottom of the clay component of the liner, except for sideslope riser sumps and leachate line undercuts. The feasibility report must provide information to support the exemption request in accordance with s. NR 500.08(4), Wis. Adm. Code."

Response: Refer to **Section 1.4.2**.

1.3.4 Wetlands

"Section NR 504.04(4)(a), Wis. Adm. Code, stipulates that no person may establish, construct, operate, maintain or permit the use of property for a landfill if there is a reasonable probability that the landfill will cause a significant adverse impact on wetlands as provided in ch. NR 103, Wis. Adm. Code. The county's consultants performed wetland delineation studies in November 2021 on the northern property parcel and in April 2022 on the southern parcel. One pond and five wetlands were identified on the northern parcel. An approximate two-acre manmade pond is located in the central portion of the project area, with 0.11 acres of wetlands surrounding the pond. A 3.66-acre wetland is located in a swale in the northeast corner of the site. Two small wetland areas (0.01 and 0.08 acres) are located in a swale in the northwest corner of the site. An isolated wetland (0.18 acres) is

located within a shallow depression on the eastern portion of the site. No wetlands were identified on the southern parcel.

Based on a review of the delineated wetlands, the proposed landfill development may directly impact three of the wetlands, those in the northeast and eastern parts of the site and those around the pond in the central part of the site. Approximately three acres of the 3.66-acre wetland area in the northeast corner of the site will be disturbed in 2022 and 2023 as part of WisDOT's USH 12 & 18 and CTH AB interchange reconstruction. About 0.5 acres of the 3.66-acre wetland area that are outside of the WisDOT project may be impacted by construction related to the proposed landfill.

The county submitted a Jurisdictional Determination request to the U.S. Army Corps of Engineers (USACE) on July 22, 2022. Upon receipt of the determination, the county will initiate the appropriate wetland permitting process for the impacted wetlands as a result of the proposed landfill site. The county would need to obtain a wetland permit for all direct wetland impacts before the department could issue a favorable feasibility determination. The wetland permit information must be provided in the feasibility report submitted to the department, or the feasibility report should contain a proposed design that avoids all direct wetland impacts. The department will consider a wetland permit as meeting the ch. NR 103, Wis. Adm. Code, requirements for direct wetland impacts. Additional information about wetland individual permitting can be found on the department's website at: https://dnr.wisconsin.gov/topic/Wetlands/permits.

The feasibility report and plan drawings must identify the full extent of direct and indirect wetland disturbances and discuss measures that would be taken to minimize indirect wetland impacts. Examples of indirect impacts include disruption to wildlife habitat and wildlife corridors from vehicular traffic, sediment accumulation from surface water erosion during construction and soil movement, windblown dust or waste, and changes in surface water or groundwater balances. The feasibility report must also include a hydraulic assessment to evaluate effects from changes to the surface water drainage patterns or groundwater flow."

Response: In an approved jurisdictional determination letter dated December 20, 2022, USACE concluded that the review area for the proposed Dane County Landfill Site No. 3 did not contain waters of the United States subject to USACE jurisdiction. A copy of the letter is included in **Appendix B**.

In a letter dated March 30, 2023, WDNR concluded that wetlands identified as P-1, portion of W-1 (0.61 acre), W-4, and W-5 lacked a wetland history prior to August 1, 1991, and fulfilled all artificial wetland exemption standards and are therefore exempt from state wetland regulations. Refer to **Plan Sheet 2** for the wetland locations, and **Appendix B** for the WDNR letter.

Because the on-site wetlands are artificial and non-jurisdictional, no additional evaluation of impacts is required.

1.3.5 Setback from a Navigable Pond

"The ISR indicates that the county will request an exemption to s. NR 504.04(3)(a), Wis. Adm. Code, to allow the proposed limits of waste to be located within 1,000 feet of a pond. The unnamed, manmade pond located within the proposed limits of waste would be filled in to construct the proposed landfill.

The feasibility report should contain documentation of the creation of the pond. This information will be shared with department Waterways Program staff for evaluation to determine if the pond is a

public waterway and regulated under ch. 30 or 281, Wis. Stats. The information will also be shared with the USACE to allow the USACE to make a jurisdictional determination. If it is determined that the pond is regulated under Wisconsin or federal water quality laws, this may be a constraint to landfill feasibility.

During the feasibility review process, department Waterways Program staff will be provided the opportunity to review the wetland and surface water information provided in the feasibility report to provide comments to the plan review staff. If storm water features or other design features for the proposed expansion are located outside the proposed landfill footprint, the position of these features relative to wetlands and other surface water bodies will need to be considered."

Response: In an email dated May 18, 2023, WDNR concluded that pond P-1 is artificial in nature and that no regulatory authority regarding Chapter 30 or 281 applies to this wetland/waterbody. Refer to **Plan Sheet 2** for the pond location, and **Appendix B** for the WDNR email. Refer to **Section 1.4.1.2** for the exemption request.

1.3.6 Water Supply Well Setback

"Section NR 504.04(3)(f), Wis. Adm. Code, requires a minimum distance of 1,200 feet to be maintained between the limits of filling and public or private water supply wells. Three private water supply wells located on Hope Hollow Trail east of CTH AB/Brandt Road are approximately 400, 795 and 1,030 feet, respectively, from the proposed limits of waste. As part of the feasibility report, the county must evaluate if exemption requests are applicable for the wells or if the wells need to be abandoned and redrilled farther away from the proposed limits of waste.

The feasibility report would need to include a modified design that maintains the 1,200 foot set-back or a request for an exemption from s. NR 504.04(3)(f), Wis. Adm. Code, for each of the wells that is not relocated. The exemption request must contain the applicable information listed in s. NR 504.04(2)(a), Wis. Adm. Code, for each well and explain why the exemption is warranted, including supporting information showing how the wells would be adequately protected from potential groundwater contamination. The supporting information should outline factors that affect the ability of private water wells less than 1,200 feet away to meet the groundwater protection standards, which include the groundwater flow properties displayed in the site-specific bedrock, the distance to bedrock and groundwater, soil backfill characteristics and the proposed landfill design. Additional factors to consider include the groundwater flow directions, the construction of the water supply wells and the ability to effectively monitor groundwater around the facility.

A variance would also be needed from the locational setback requirement of s. NR 812.08(4)(g)(1), Wis. Adm. Code, for each water supply well located within 1,200 feet of the proposed limits of waste, under the provisions of s. NR 812.43, Wis. Adm. Code.

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

Any NR 812 well variance applications should be submitted to Aaron Kent (aaron.kent@wisconsin.gov) with the department's Drinking Water and Groundwater (DG) program. The NR 812 variance application form can be accessed at the following web page: https://dnr.wi.gov/files/pdf/forms/3300/3300-209.pdf. The email and US Mail addresses for

sending the completed applications are provided on the form. The department must receive the well construction information and a completed NR 812 well variance application for each well before an NR 504 exemption can be issued."

Response: Refer to **Section 1.4.1.3**.

1.3.7 Setback from Highway and Parks

"The feasibility report must include line-of-sight drawings from USH 12 & 18 and any park areas that would be located within 1,000 feet of the proposed limits of waste that depict the visual field from different locations with an emphasis on areas that are closest to the landfill and highest points of the landfill. The line-of-sight drawings should include the proposed screening that would be used and how the visual field may change depending on the type of screening and the seasons of the year."

Response: Refer to **Section 7.1.4**.

1.3.8 Historic Reviews

"The Yahara Hills Golf Course and Clubhouse have been determined to be eligible for the National Register of Historic Places. If any historic properties may be affected by the proposed development, any permits, licenses, or authorizations issued by the department are contingent on resolution of the s. 44.40 Wis. Stats. process."

Response: Refer to **Section 4.4.2**.

1.4 EXEMPTION REQUESTS

The following exemptions are requested for the Proposed Landfill.

1.4.1 Locational Criteria

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

1.4.1.1 Setback from Highway, Public Park or State Natural Area

Section NR 504.04(3)(d) prohibits location of a landfill within 1,000 feet of the nearest edge of 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.

The City of Madison plans to maintain at least 18 holes of the Yahara Hills Golf Course until at least 2042. This will be facilitated through a lease agreement between Dane County and the City of Madison, where approximately 76 acres will be leased back to the City of Madison. The anticipated 18-hole golf course configuration and the lease boundary are shown on Plan Sheet 2. Dane County and City of Madison have a mutual understanding that there may be a need to construct berms and storm water management features within the leased boundary. Dane County, in accordance with the approved neighborhood development plan, will maintain at least a 150-foot buffer around the landfill limits of waste and provide appropriate screening. Additionally, a parcel to the south of the golf

course is owned by the City of Madison Parks Yahara Hills Park South, which is also zoned as Parks and Recreation and approximately 570 feet from the proposed limits of waste.

An exemption is requested to allow the proposed limits of waste to be located within 1,000 feet from the right-of-way of USH 12 & 18 and recreational areas described below.

- Dane County is proposing a design that protects as many existing mature trees as possible and includes constructing waste or soil berms within the waste mass to provide screening from all sides of the Proposed Landfill.
- Planting additional trees in select areas of the site (refer to the Landscape Plan in **Appendix L**).
- Creating a waste berm along the outside edge of the waste mass that includes intermediate soil cover placed on the exterior slope, then placing waste on the interior side of the berm.
- Constructing soil berms, as necessary, at the outside edge of the waste mass around the perimeter.
- Line-of-sight drawings showing the effectiveness of leaving existing trees in-place, planting additional trees, and the use of waste or soil berms for screening from USH 12 & 18, CTH AB/Brandt Road, and from the recreation areas are included in **Appendix L**.
- Refer to **Section 7.1.4** for additional information on screening.

1.4.1.2 Setback from a Navigable Pond

Section NR 504.04(3)(a) prohibits location of a landfill within 1,000 feet of any navigable lake, pond, or flowage, not including landfill drainage or sedimentation control structures, unless an exemption is approved.

An exemption is requested to allow the proposed limits of waste to be located within 1,000 feet of a pond (Pond P-1 on **Plan Sheet 2**). In an email dated May 18, 2023, WDNR concluded that pond P-1 is artificial in nature and that no regulatory authority regarding Chapter 30 or 281 applies to this wetland/waterbody. Refer to **Appendix B** for the WDNR email.

1.4.1.3 Setback from Water Supply Wells

Section NR 504.04(3)(f) prohibits location of a landfill within 1,200 feet of any public or private water supply well. In addition, s. NR 812.08(4) specifies a minimum separation distance of 1,200 feet between a water supply well and the proposed limits of waste, unless a variance is granted under the provisions of s. NR 812.43.

Table 1-1 presents a summary of active water supply wells located within 1,200 feet of the proposed limits of waste.

An exemption from the requirement for a minimum 1,200-foot setback under s. NR 504.04(3)(f) is requested for one water supply well, PW-B, as described below. PW-B is an active water supply well owned by the City of Madison that serves the Yahara Hills Golf Course. Justification for the exemption based on the Proposed Landfill design is outlined below:

- Well PW-B is located approximately 1,170 feet from the southwest corner of the proposed limits of waste.

- The well is located upgradient or sidegradient relative to the Proposed Landfill. Groundwater flow at both the water table and the piezometer level is generally to the north and east, and PW-B is located southwest of the southwest corner of the proposed limits of waste.

- The well is cased to 66 feet and has a total depth of 330 feet. The Well Construction Report for this water supply well is provided in **Appendix C**.

- The Proposed Landfill design includes an underdrain system that will collect groundwater below the liner when the water table is above the underdrain elevation.

- The groundwater monitoring system will include monitoring wells and piezometers around the perimeter of the Proposed Landfill to provide monitoring of groundwater between the landfill and PW-B and early indication of changes to groundwater quality, if any occur.

- The landfill will be constructed with a composite liner including 4 feet of compacted clay and a 60-mil high density polyethylene (HDPE) geomembrane. The liner will be designed in accordance with NR 504, and construction quality assurance (CQA) testing and documentation will be performed in accordance with NR 516. The Construction Quality Assurance Plan will be included in the Plan of Operation.

An NR 812 variance application will be submitted to the WDNR's Drinking Water and Groundwater program for this well prior to the start of the public comment period for the FR.

Additional water supply wells located within 1,200 feet of the proposed limits of waste for which exemptions are not anticipated include the following:

- Three known private water supply wells located east of CTH AB/Brandt Road where four residences are located on Hope Hollow Trail (two residences share a well). These are referred to as the Rathert, Fluke and Rogers wells, as shown on **Plan Sheet 2**.

  – Dane County has purchased the Rathert property and plans to abandon the well prior to landfill construction.

  – Dane County is in discussions with the remaining well owners to obtain permission to abandon the wells and install replacement well(s) outside of the 1,200-foot setback. Negotiations are ongoing, and final documentation of the agreement will be provided with the Plan of Operation.

- Three active water supply wells (PW-C, D, and E) owned by the City of Madison that serve the Yahara Hills Golf Course are located within the proposed limits of waste (**Plan Sheet 2**).

  – PW-C, D, and E are proposed to be abandoned prior to constructing the Proposed Landfill. As noted in the WDNR ISI Response (see **Appendix B**), Dane County

understands that the WDNR may require additional well filling and sealing requirements for the abandonment of these three wells.

  - Well Construction Reports for these wells are included in **Appendix C**.

1.4.2 Separation from Water Table

An exemption is requested from the requirement for 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 under s. NR 504.06(2)(b). In place of the 10-foot separation requirement, Dane County proposes to include an underdrain system to maintain the water table below the bottom of the composite liner system. Justification for this exemption is detailed below.

- Water table elevations are anticipated to decrease in the immediate vicinity of the Proposed Landfill following construction, due to the operation of the underdrain system and reduction in recharge. Local recharge will be reduced due to the landfill liner and final cover. Additionally, discontinuing golf course watering via the existing irrigation system is expected to reduce infiltration and contribute to lowering the water table in the Proposed Landfill footprint.

- The design includes an underdrain system that will maintain groundwater at the following levels:

  - The projected high groundwater elevations, with the underdrain system operating under gravity-drained conditions, will be below the bottom of the clay component of the liner, except at the leachate line undercuts and sumps.

  - The projected high groundwater elevations, with the underdrain system operating under gravity-drained conditions, will be below the top of the clay component of the liner at the leachate line undercuts and sumps.

  - See **Section 8.4** for additional discussion of the underdrain system design. Complete design calculations and details for the underdrain system will be provided in the Plan of Operation.

- Due to the shallow seasonal high water table, a 10-foot separation distance would require establishment of subbase grades several feet above the current ground surface. Based on the soil balance calculations completed for the currently proposed subbase grades, the soil excavated to achieve the subbase grades is needed for the perimeter berms, daily or intermediate cover, rooting zone, and other general fill. Raising the subbase grades to achieve the 10-foot separation would require importing a large quantity of general fill from an off-site source. Using on-site soils for these purposes, by lowering the design elevation of the subbase grades, minimizes the truck traffic and greenhouse gas emissions associated with hauling large volumes of soil from off-site sources.

The underdrain system will consist of groundwater collection pipes located below the composite liner. The design may include a partial sand or geocomposite drainage layer below the liner. The collected groundwater will flow via gravity to a manhole outside the limits of waste near the northwest corner of the Proposed Landfill. From the manhole, groundwater may either be discharged via gravity to existing Golf Course Pond #1, to existing Pond #6, or to a new pond constructed on the

Proposed Landfill property, or pumped to an alternative discharge location at or downstream from the WisDOT Pond B. Discharged groundwater will ultimately flow to the drainage ditch on the west side of the golf course.

The requirement for a 10-foot separation to the water table was first codified in 1988 when the NR 500 series rules were promulgated. During the rule development process, the WDNR's intent in codifying the 10-foot separation distances to groundwater and bedrock was described in their response to comments on the proposed solid waste rule changes (**Appendix B**). In response to a comment from Waste Management that the 10-foot separation distances were inappropriate, the Department's response was as follows:

> "The required separation distances have been used as guidelines for many years and in most cases, are the minimum necessary. The 10-foot separation to groundwater is necessary to ensure that unsaturated zone monitoring devices can be installed above the water table and that a rising water table does not damage the clay liner. There have been several instances where a lessor separation has been approved when groundwater control systems were included with the design. The proposed code contains the flexibility to allow these alternative designs. The bedrock separation is also necessary because the bedrock surface can be highly variable. Problems have occurred at a number of sites where competent rock was encountered above the proposed base grades, resulting in the need for major design changes. Again, the ability to propose alternatives exist."

The first reason given for the separation—to provide clearance for unsaturated zone monitoring devices—is not applicable. Unsaturated zone monitoring devices (lysimeters) are not required if a composite liner is proposed, as is now required for all municipal solid waste landfills. The second reason given—to prevent damage to the clay liner—is addressed through the addition of a gravity drained underdrain system to control groundwater levels.

Exemptions from the requirement for a 10-foot separation to the seasonal high water table have been approved at other sites where the site-specific conditions warranted a lesser separation, including Cranberry Creek Landfill near Wisconsin Rapids, Glacier Ridge Landfill near Horicon, and Dane County Landfill Site No. 2 in Madison. Underdrain systems have successfully controlled groundwater elevations at these sites, as documented by monitoring of water levels beneath the composite liner systems. The design criteria listed above for controlling the water table elevation below the liner system are consistent with the conditions of approval for other sites.

1.4.3 Separation from Bedrock

An exemption is requested from the 10-foot separation distance to bedrock required under s. NR 504.06(2)(c). Based on the depth to bedrock information obtained from the soil boring program and the proposed subbase grades, the average separation to bedrock is more than 10 feet; however, due to the variability of the bedrock surface the proposed separation distance is less than 10 feet in portions of the site. This exemption is justified based on the occurrence of shallow bedrock in portions of the Proposed Landfill site and the need for on-site soil excavation to provide general fill, as discussed in more detail below.

The bedrock surface below the glacial deposits is an erosional surface with higher and lower areas, as shown by the bedrock surface contours on **Plan Sheet 6**. The bedrock surface generally slopes to the north from high points south of the Proposed Landfill (B-228 and B-233); however, the central portion of the site also includes a shallow valley (MW-117 and PW-C) and ridge (MW-114, MW-112, B220). These features in the bedrock surface are also apparent in the geologic cross sections, such

as north-south cross sections L-L' and M-M' on **Plan Sheets 17** and **18**. Given the slope of the proposed leachate collection lines to the north, the areas of the site where the proposed subbase grades are closer to the bedrock surface are primarily in the areas of the bedrock surface ridge in the middle of the site and the high bedrock at the south end of the site. An isopach map of the separation distance between the top of the bedrock and the proposed subbase grades is provided in **Appendix O**.

Justification for this exemption is detailed below.

- As noted above in **Section 1.4.2**, the WDNR's justification for the 10-foot separation was based on a concern with potential variability in the bedrock surface that could cause problems if unexpected high bedrock spots were encountered during construction. The 10-foot separation distance provides a margin of error so even if bedrock is shallower than expected, the liner can still be installed at the design elevation. For the Proposed Landfill site, two factors reduce the potential for bedrock to interfere with installation of the liner as designed:

  - Dane County intends to drill at least 10 additional soil borings in the areas where bedrock is closest to the proposed subbase grades and can modify the proposed subbase grades, if needed, based on the additional information. The findings of the additional geotechnical investigation and modifications to the subbase grades, if needed, will be provided as part of the Plan of Operation.

  - In areas where bedrock is close to the proposed subbase grades, the shallow bedrock includes weathered, layered, fractured, and/or poorly cemented or otherwise poorly indurated rock that can be removed with typical excavating equipment if localized higher areas are encountered during construction. The top-of-bedrock surface was defined conservatively based on the definitions in s. NR 500.03 and the observations during drilling and subsequent soil sample and rock core review; however, in some locations the upper bedrock could be augered and/or sampled with a split-spoon sampler, indicating the potential for limited excavation of shallow rock if needed.

- A separation distance of less than 10 feet is needed in some areas of the site to achieve a reasonable soil balance for the project and avoid impacts associated with hauling soil from off site. To achieve the 10-foot separation everywhere at this site, the subbase grades would have to be very shallow or even above the current ground surface in some portions of the site. With limited excavation within the landfill footprint, soil needed for the perimeter berms, daily or intermediate cover, rooting zone, and other general fill would need to be imported from off site. Using on-site soils for these purposes minimizes the truck traffic and greenhouse gas emissions associated with hauling large volumes of soil from off-site sources.

Exemptions from the requirement for separation to bedrock have previously been granted to other Wisconsin landfills where justified based on site-specific conditions, including Cranberry Creek Landfill near Wisconsin Rapids, La Crosse County Landfill in La Crosse, and Seven Mile Creek Landfill in Eau Claire. The La Crosse County Landfill approval allowed for excavation of bedrock to achieve the subbase grades with backfill to create a 2-foot separation to bedrock.

1.4.4 NR 140 Exemptions

Exemptions are requested under s. NR 140.28 to allow construction of the Proposed Landfill at a location where a preventive action limit (PAL) or enforcement standard (ES) 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 1-2**. Additional discussion of the background monitoring results is provided in **Section 5.4**, and the complete background monitoring results are summarized in **Tables 5-8** through **5-11**.

NR 140 exemptions are requested when the background groundwater monitoring indicates the current pre-landfill groundwater quality exceeds a groundwater standard (PAL or ES). Exemptions are commonly granted for parameters that are naturally present in groundwater, such as arsenic and manganese, or parameters that may be present due to current or prior land use, such as nitrite+nitrate in agricultural areas or chloride due to road salt use. Exemptions for other site-specific parameters, including volatile organic compounds, have been granted based on background monitoring at other proposed landfill sites.

As shown in **Table 1-2**, exemptions are requested for wells and parameters with PAL exceedances unless the PAL exceedance has not been confirmed (isolated PAL exceedance) or is a likely laboratory contaminant.

In accordance with NR 504, the Proposed Landfill will have a composite liner system, leachate collection system, landfill gas collection system, and final cover system. These components are designed to achieve the lowest possible concentrations that are technically and economically feasible for public health parameters present within the landfill and have been demonstrated to be effective in preventing groundwater impacts at similarly constructed landfills in Wisconsin.

For the public health parameters other than nitrate, the requested exemptions are justified under s. 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 s. 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.

As noted above, the design features of the proposed 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 associated monitoring systems.

1.4.5 Geotechnical Investigation

An exemption is requested for the depth of borings below the subbase grades (s. NR 512.09(1)(b)) at three locations. Justification for this exemption is detailed below.

Based on the 79.0-acre footprint of the Proposed Landfill, per NR 512.09(2)(d), 40 borings are required to be located within 300 feet of the proposed limits of waste. Under NR 512.09(1)(b), borings are required to extend a minimum of 25 feet below the anticipated subbase grade. As shown in **Table 5-2**, a total of 41 borings were completed within 300 feet of the proposed limits of waste, but four of the investigation borings extended less than 25 feet below the proposed subbase grades. The interval that was not drilled and sampled in the three borings ranged from less than 2 feet to approximately 5 feet.

The borings that did not meet the 25-foot requirement include B-7 (19.9 feet below subbase), B-8 (20.1 feet below subbase), B-214 (23.5 feet below subbase), and B-215 (22.0 feet below subbase). Both B-7 and B-8 extended into bedrock; therefore, the depth was adequate to define the top-of-bedrock surface and identify the uppermost bedrock units. These two borings were drilled as part of a preliminary site investigation in 2022. Borings B-214 and B-215 were terminated in outwash 23.3 and 22.0 feet, respectively, below the subbase in the northern part of the site, where the bedrock surface is deeper. Boring B-215 is located on the proposed liner sideslope and the boring extends more than 25 feet below the proposed subbase elevation at the boring location, but to be conservative the boring depth was compared to the nearest proposed floor subbase elevation in **Table 5-2**.

The exemption for the minimum depth requirement for these four borings is justified based on the total amount of geologic information obtained from 41 borings within 300 feet of the Proposed Landfill and 14 supplemental borings located more than 300 feet from the Proposed Landfill. The average depth below the subbase for all borings within 300 feet of the proposed landfill limits was approximately 37 feet.

Additional Information on the investigation program is provided in **Section 5.1** and **Table 5-1** and **Table 5-2**.

1.4.6 Baseline Groundwater Monitoring

An exemption is requested from the requirement for baseline monitoring under s. NR 507.18(2)(a) at one monitoring well. Monitoring well MW-1 was not included in the baseline water quality monitoring program because it was within the preliminary proposed limits of waste when monitoring was started; however, it is outside the currently proposed limits and therefore subject to the baseline monitoring requirement.

Justification for this exemption is based on the total amount of baseline monitoring conducted to date for the Proposed Landfill, which exceeds the required minimum number of sample locations, as follows:

- Monitoring well MW-121 was included in the baseline water quality program because it was outside the preliminary proposed limits of waste; however, it is inside the current proposed limits and therefore not subject to the baseline monitoring requirement.

- Baseline groundwater monitoring was performed at the remaining wells outside the proposed limits of waste, including the required wells and piezometers within 300 feet of the limits (11 locations) and supplemental wells and piezometers beyond 300 feet from the limits (5 locations).

Based on the current proposed site plan (**Plan Sheet 27**), monitoring well MW-1 is located more than 150 feet from the limits of waste and in an anticipated traffic area; therefore, it may ultimately need to be replaced with a well in the same general area but closer to the limits of waste. Dane County will either complete 8 rounds of baseline monitoring at MW-1 in accordance with NR 507 or install a replacement well and complete 8 rounds of baseline monitoring at the replacement well. Baseline monitoring at MW-1 or the replacement well will be completed prior to submittal of the Plan of Operation unless an alternative schedule is approved by the WDNR.

2.0 PROCEDURAL REQUIREMENTS

2.1 LOCAL APPROVALS

For the Proposed Landfill, municipalities meeting the definition of an "affected municipality" under s. 289.01(1), Wis. Stats. include the Town of Cottage Grove, City of Madison, and Dane County. Notifications to affected municipalities regarding the Proposed Landfill were sent on April 28, 2023. Copies of the letters are included in **Appendix D**.

Dane County received responses from the City of Madison and Town of Cottage Grove, including the local approvals required, which are provided in **Appendix D**. The Town of Cottage Grove required no local approvals but the City of Madison did. In a letter dated July 19, 2023, the City of Madison clarified that **no applicable local approvals** were needed prior to submittal of the Feasibility Report (**Appendix D**).

The City of Madison and Town of Cottage Grove took the required steps to participate in the local negotiation process as defined in ch. 289, Wis. Stats. The Village of McFarland also filed a request to be included on the Local Negotiated Agreement (LNA) Committee. The affected municipalities and Waste Facility Siting Board allowed the Village of McFarland on the committee as an "Additional Municipal Party," under s. 293.33(7n), Wis. Stat.

Dane County is not allowed to negotiate as an affected municipality but has been participating in the negotiation process with the affected municipalities as the Applicant, as defined under 289.33(3)(a), Wis. Stats.

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 have 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), Wis. Stats., 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 multiple public or stakeholder meetings to discuss the Proposed Landfill and development of a sustainable business park aimed at diverting waste and creating local circular economies, collectively called the "sustainability campus." A list of the various public or stakeholder meetings is provided on the Past Events tab on the Dane County Waste & Renewables Project website. There are over 40 meetings on this list, including three large public information meetings, which were held in early 2022 and were well attended by the general public.

- Held public meetings on October 3, 2023, November 8, 2023, and December 6, 2023, for the Dane County Landfill No. 3 Local Negotiated Agreement Committee. All of these meetings have been publicly posted and open to the public using the Dane County Government Legislative Information Center. Members of the public have attended and spoken at these meetings.

- Send regular emails to local elected officials and other interested parties with updates on the project. This has resulted in eight email updates to elected officials and five email updates to other interested parties in 2023 and early 2024.

2.4 OWNERSHIP INFORMATION AND COMPLIANCE WITH PLANS OR ORDERS

Section 289.34, Wis. Stats., and s. NR 512.19, Wis. Adm. 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 E 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. 3 service area were evaluated to determine how the solid waste management plans relate to the Proposed Landfill.

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 current solid waste management plan. The last solid waste management plan was dated December 1980 and was intended to be a 20-year planning document. The plan states Dane County's commitment to a county-wide solid waste management program, with the first objective being the establishment of a County sanitary landfill. The Proposed Landfill supports this commitment.

3.0 GENERAL FACILITY INFORMATION

Project Title:	Dane County Landfill Site No. 3
Facility Owner and Operator:	Dane County Department of Waste & Renewables 4402 Brandt Road Madison, WI 53718
Owner and Operator Contact:	John Welch, PE Director Dane County Department of Waste & Renewables 1919 Alliant Energy Center Way Madison, WI 53713 Cell: 608-516-4154 Welch@countyofdane.com
Consultant:	SCS Engineers 2830 Dairy Drive Madison, WI 53718
Consultant Contact:	Betsy Powers, PE Project Manager Cell: 608-333-5408 BPowers@scsengineers.com
Facility Location:	Property Parcel No. 251/0710-254-0098-9 SE ¼ of Section 25 and N ½ of NE ¼ of Section 36, Township 7 North, Range 10 East, City of Madison, Dane County, Wisconsin
Present Land Use:	Recreation (Golf Course) and Water (man-made pond), refer to **Figure 4-3**
Lot 2 Parcel Acreage:	Total acreage: 199.2 acres Proposed landfill footprint: 79.0 acres

Service Area:	Municipalities and industries within Dane County. Waste may be accepted from outside Dane County, depending on local negotiations.
Design Capacity:	12,386,300 cubic yards
Site Life:	Approximately 12-13 years
Anticipated Waste Types and Characteristics:	Non-hazardous municipal solid waste: 70 – 80 percent by volume. Other waste, including construction and demolition (C&D) waste, material recovery facility (MRF) residuals, other non-hazardous waste, and alternative daily cover (ADC) materials: 20 – 30 percent by volume. Categories not specifically identified may be accepted under the Special Waste Acceptance Plan (submitted as part of the Plan of Operation), in limited quantities. Waste volumes tend to increase in summer months by approximately 10 percent and decrease in winter months by approximately 15 percent.
Anticipated Total Waste Intake:	Approximately 447,700 – 951,300 tons per year between 2028-2040. The range accounts for an annual increase of 6.48 percent based on an average percent increase recorded between 2018 - 2023 at Dane County Landfill Site No. 2.
Anticipated Cover Frequency:	The working face will be covered with a minimum 6 inches of daily cover soils or approved ADC at the end of each working day, as required under NR 506. Intermediate cover will be placed over portions of the landfill that will not receive additional solid waste for a period exceeding 6 months, as required by NR 506. Final cover will be constructed in phases as each cell is filled to final approved waste grades.
Mode of Operation:	Phased area filling

Hours of Operation:	Monday through Friday: 6:00 a.m. – 5:00 p.m. Saturday: 7:00 a.m. – 2:00 p.m., with hours allowed to extend to 7:00 a.m. – 5:00 p.m. following either: 1. Any legal holiday recognized by Dane County or City of Madison, or 2. A week within which adverse weather conditions (such as high winds, rain, extreme cold, ice or heavy snow) have prevented local municipalities from collecting waste for at least one day or Dane County from operating the landfill for an aggregate period of more than five hours in any one day. These hours do not apply during periods of construction and may be extended to expedite construction schedules. Hours of Operation are subject to change, depending on local negotiations.
Preliminary Design Concepts:	See **Section 8.0**.
Proposed Subbase, Base and Final Grades:	See **Section 8.0** and **Plan Sheets 23, 24,** and **26**.
Need for the Landfill:	Dane County Landfill Site No. 3 will allow Dane County to continue to manage waste following the existing Dane County Landfill Site No. 2 reaching capacity, which is estimated to occur in 2028. The Proposed Landfill will serve the disposal needs of Dane County. See **Section 11.0**.
Alternatives to Land Disposal:	See **Section 12.0**.
Applicable Solid Waste Management Plans:	See **Section 2.5**.

4.0 LAND USE INFORMATION

4.1 LOCATION

The Proposed Landfill is located approximately 1 mile east of Interstate 39/90 and USH 12 & 18 interchange (**Figure 1-1**). USH 12 & 18 abuts the northern side of the site and Brandt Road/CTH AB abuts the eastern side of the site. The primary access route for large haulers to the Proposed Landfill is from CTH AB/Brandt Road off of USH 12 & 18. Additional access is planned off of Millpond Road for residential access (refer to **Plan Sheet 27**). The proposed limits of waste are currently located on land zoned as Industrial General (IG) and Dane County has received a Conditional Use Permit (CUP) from the City of Madison to use the lands for landfilling.

4.2 ADJACENT LANDOWNERS

Figure 4-1 shows the landowners for property located within 1,200 feet of the proposed 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. Areas immediately adjacent to USH 12 & 18 and CTH AB/Brandt Road are right-of-ways owned by the State of Wisconsin (Wisconsin Department of Transportation [WisDOT]).

4.3 ZONING

Figure 4-2 shows current land use zoning obtained from the online data portals as noted on the figure. The property has been rezoned as IG and required a CUP to be used as a landfill. The CUP was approved with conditions on November 13, 2023 (Appendix D).

The existing zoning conditions within 1-mile of the proposed limits of waste are shown on Figure 4-2. Zoning information exists from the City of Madison Zoning Districts, the County of Dane Rural Zoning, and the Village of McFarland Zoning.

4.4 LAND USE

The present land use of the Proposed Landfill property is a municipal golf course (recreation). Dane County has purchased the property from the City of Madison and is leasing portions of it back to the City of Madison for golf course operations (refer to Plan Sheet 2 for the lease line limits and Appendix B for the lease agreement). The existing land use conditions within 1-mile of the proposed limits of waste are shown on Figure 4-3 and are based on information obtained from the online data portal developed by Dane County's Land Information Office.

There are predominantly scattered rural residences, agriculture, woodlands, and open land located to the east and south of the Proposed Landfill. Land uses to the west predominantly include recreation, commercial, woodlands, agriculture, open land, water, and vacant subdivided land. There is a developing and expanding small tract residential subdivision located to the southwest of the Proposed Landfill. To the north there is industrial, commercial, open land, agriculture, some residential, institutional/governmental, and the existing Dane County Landfill Site No. 2 (Rodefeld) which is shown as communication/utilities.

4.4.1 Known Recreation Areas

The Yahara Hills Golf Course immediately to the west and an adjacent property to the south of the Proposed Landfill property are zoned as parks and recreation, both of which are owned by the City of Madison (Figure 4-2). Dane County will be working closely with the City of Madison to mitigate potential impacts to golf as part of the local negotiation process. The adjacent property to the south is currently used for agriculture, open land, and woodlands (Figure 4-3).

4.4.2 Known Historical or Archaeological Areas

Archaeological Consulting Services, Inc. (ACS) reviewed available literature and records on previously reported cultural resources in and around the Yahara Hills Golf Course. The reviewed study area included the proposed limits of disturbance. A Literature and Records Search Report was prepared by ACS in November 2021 which was included in the ISI Request submittal. The results of this study found no previously reported archaeological sites within the study area (refer to the ISI Response included in Appendix B). According to ACS, the closest archaeological site is approximately

350 meters to the north of the Yahara Hills Golf Course, but several Euro-American farmsteads were located within the study area prior to the development of the golf course. No standing buildings or other structures in the study area are listed on the Wisconsin Architecture and History Inventory. The 1967 Club House has been identified as potentially significant and is located to the west (see **Plan Sheet 2**).

ACS performed an archaeological survey of the Proposed Landfill property in April and May 2022. A summary of the results is below:

- No previously reported Native American archaeological sites lie within the project area.
- No Native American artifacts were found, and Euro-American materials were limited to items of recent age.
- A concrete foundation and a concrete slab were found, but no artifacts and no evidence of a house foundation was found.
- Yahara Hills Golf Course and Clubhouse has been determined eligible for the National Register of Historic Places.
- No additional archeological work is recommended for the Proposed Landfill property.

The ACS report on the archaeological survey of the project area, dated May 2022, was submitted to Felipe Avila, with the Wisconsin State Historic Preservation Office (SHPO) on July 22, 2022. On October 20, 2022, Dane County submitted a Request for SHPO Review and Comment on a Local Unit of Government Action (WHS #22-1800).

On October 25, 2022, SHPO completed a review of the property and determined that no National Register of Historic Places will be affected, as none are present, but the Yahara Hills Golf Course and Club House were found potentially eligible. SHPO noted that since no properties are listed on the National Register of Historic Places, then SHPO has no jurisdiction on any work or land transfers taking place that may affect the property under Wis. Stat. 66.1111 but does not exempt the property from state or federal historic preservation reviews or laws.

On October 6, 2023, Dane County submitted documents regarding the Yahara Hills Golf Course and Club House potential eligibility to Richard Kubicek, WDNR Departmental Archaeologist / Departmental Historic Preservation (HP) Officer. On November 27, 2023, SHPO issued a letter based on input from WDNR-HP that listed the following stipulations as part of the mitigation plan for the project (**Appendix B**):

- Production of a Determination of Eligibility.
- Produce a display posted near a public entrance or gathering area of the existing golf course highlighting the historic significance of the golf course/course design and architecture.
- A webpage hosted on the course home page, or a similar physical publication that can be provided to the public (i.e., pamphlet or booklet), that discusses the historic significance of the property.

Dane County produced and submitted the Determination of Eligibility on October 6, 2022, and the City of Madison agreed to complete the display and webpage stipulations.

4.4.3 State or Local Natural Areas and County Forest Land

The proposed landfill property does not contain state or local natural areas or county forest land.

4.4.4 Areas That Contain Threatened or Endangered Resources

An Endangered Resources Review Request application was submitted to the WDNR Endangered Resources Review Program on June 10, 2022, for the entire 230-acre property (consisting of Lots 1 and 2, represented by the Project Property Line on **Plan Sheet 2**). The WDNR determined the project is covered under the Broad Incidental Take Permit/Authorization for No/Low Impact Activities and does not require an Endangered Resources Review. The Endangered Resources (ER) Review Verification application form from the WDNR Endangered Resources Review Program, which was signed June 10, 2022, is provided in **Appendix B**.

4.5 TRANSPORTATION AND ACCESS

WisDOT recently completed construction of an overpass with a series of roundabouts for the USH 12 & 18 and CTH AB/Brandt Road interchange project. The road improvements were designed to accommodate typical landfill customer vehicles. The WisDOT changes will impact traffic routes and access to the Proposed Landfill, resulting in most traffic using the new interchange and roundabouts to travel from USH 12 & 18 to CTH AB/Brandt Road. The proposed access to the landfill will be split between large haulers and residential customers. Large haulers would access the Proposed Landfill directly off CTH AB/Brandt Road while residential customers would use an entrance off Millpond Road.

The proposed transportation routes within the Proposed Landfill include a main access road to the scale and service roads around the perimeter to provide access to the landfill disposal area (refer to **Section 8.13.2** for additional information). The proposed scale to service the landfill operations is shown north of the landfill (see **Plan Sheets 23** through **26**). As noted on **Plan Sheets 23** through **25**, the scale may alternatively be located south of the landfill. The scale location will be confirmed as part of the Plan of Operation.

There are no known weight restrictions for vehicles using USH 12 & 18 or CTH AB/Brandt Road.

4.6 AIRPORTS

There are no airports designed or planned to be designed within 5,000 feet or 10,000 feet of the proposed limits of waste. The nearest public airports are the Blackhawk Airfield, located in Cottage Grove, Wisconsin, and the Dane County Regional Airport, located in Madison, Wisconsin. Blackhawk Airfield and Dane County Regional Airport are located approximately 5.25 miles and 7 miles from the proposed limits of waste, respectively. The nearest private use airport is the Uff-Da Airport, located in Stoughton, approximately 6.5 miles from the proposed limits of waste. The location of airports in relation to the proposed Dane County Landfill Site No. 3 is shown on **Figure 4-4**.

The Quale Airport and the Little Wheel Field Airport, both located in Cottage Grove, Wisconsin, were once privately owned airports within 5 miles of the Proposed Landfill. However, these private airports have been closed and are no longer in use. Refer to **Appendix B** for email correspondences from the owners, or family members, confirming that the Little Wheel Field Airport was closed in 2018/2019 and the Quale Airport was closed in 2021.

Tetra Tech notified the Federal Aviation Administration (FAA) and the Quale Airport owner of the Proposed Landfill on June 22, 2022. The Quale Airport owner was notified before it was known that the private airport had been closed. The FAA acknowledged receipt of the notification letter via email on August 10, 2022. The notification letters to the Quale Airport owner and the FAA, delivery receipts from UPS, as well as the acknowledgement email from FAA, are provided in **Appendix B**.

In a letter dated September 1, 2023 (**Appendix B**), FAA concluded that there are no public use airports within 6 miles of the Proposed Landfill that have received grants under Chapter 471 and are primarily served by general aviation aircraft and regularly scheduled flights of aircraft designed for 60 passengers or less, therefore no further action is required.

Due to the anticipated height of the Proposed Landfill being at least 200 feet above existing ground surface, Dane County submitted a Notice of Construction to FAA as required under 14 CFR 77.9 (Aeronautical Study Numbers 2023-AGL-19100 through 2023-AGL-19106). In responses dated November 14, 2023, the FAA concluded that the Proposed Landfill would not be a hazard to navigation (**Appendix B**).

5.0 Geology and Hydrogeology

This section provides a description of the field investigation, a summary of geologic and hydrogeologic data for the site, an evaluation of the site data relative to the regional geology and hydrogeology as provided in the ISR, and a summary of baseline groundwater monitoring results. This section's format generally follows the outline provided by ss. NR 512.09 to NR 512.11 and includes the following sections:

- Geotechnical Investigation Program
- Geology
- Hydrogeology
- Groundwater Quality

The first section outlines the scope, methods, and data for all of the field investigation tasks completed as part of the feasibility investigation. The following three sections discuss the findings of the field investigation tasks as they relate to the site geology, hydrogeology, and groundwater quality.

5.1 GEOTECHNICAL INVESTIGATION PROGRAM

The standard s. NR 512.09 geotechnical program was implemented to investigate the Proposed Landfill site. The requirements of the standard s. NR 512.09 geotechnical program are given in **Table 5-1**. A list of the borings and wells used in the geotechnical program is given in **Table 5-2**. Due to changes in the location of the landfill footprint as the investigation program and design process have evolved, some of the borings, wells and piezometers are located greater than 300 feet from the proposed fill area as noted in **Table 5-2**. The required number of borings, wells, and piezometers have been installed. The required number of borings is 40, and 41 borings meeting the locational requirement have been installed. However, only 37 of the borings meet the depth criteria for extending to a minimum of 25 feet below subbase grade. As noted on **Table 5-2**, borings B-7, B-8, B-214, and B-215 extend 19.9, 20.1, 23.5, and 22.0 feet, respectively, below subbase grade and do not meet the depth requirement. An exemption has been requested in **Section 1.4.5**.

5.1.1 Field Investigation

The field investigation for the FR began with two phases of drilling, starting in February 2022 and January 2023, and was completed with the eighth round of baseline water level monitoring in December 2023. The 2022 field activities were conducted by Tetra Tech, Madison, Wisconsin, and results were reported in a Preliminary Geotechnical Investigation report dated May 20, 2022, and in the ISR for the Proposed Landfill dated September 2022 (Tetra Tech, 2022a, 2022b). The 2023 field activities were conducted by SCS Engineers (SCS), Madison, Wisconsin.

Soil and rock samples collected by Tetra Tech were re-examined by SCS geologists. SCS's additions and revisions to soil and rock descriptions and classification are noted on the Tetra Tech logs included in **Appendix F**.

Field activities conducted, documented, or observed by SCS geologists and field staff include installation of soil borings and monitoring wells, monitoring well development, hydraulic conductivity testing, borehole abandonment, description of all geologic samples, installation of staff gauges, measurement of surface and groundwater levels, and collection of groundwater samples. These activities were conducted by or under the supervision of a Wisconsin Professional Geologist.

Chemical laboratory analysis of groundwater samples was performed by Pace Analytical Services, Green Bay, Wisconsin. Analysis of soil samples for physical properties was performed by Tetra Tech, Green Bay, Wisconsin; CGC, Inc., Madison, Wisconsin; and Soils & Engineering Services, Inc. (SES), Madison, Wisconsin. Ayres Associates, Madison, Wisconsin, provided surveying services. On-Site Environmental Services, Inc., Sun Prairie, Wisconsin; SES, Madison, Wisconsin; and Subsurface Exploration Services, LLC, Little Suamico, Wisconsin, provided soil and rock sampling, drilling, and monitoring well installation services.

The locations of soil borings, monitoring wells, and staff gauges are shown on **Plan Sheet 2**.

5.1.2 Borings

A total of 41 soil borings meeting locational criteria in s. NR 512.09 were used for the feasibility investigation of the proposed footprint (**Table 5-2**). Borings completed at an additional 14 locations provide supplemental information on the surrounding area. Boring logs and abandonment forms are included in **Appendix F**.

Borings and wells numbered 1 through 11 were installed as part of the preliminary geotechnical investigation in 2022. Borings and wells numbered 100 and above were completed as part of the 2023 field investigation. Drilling and sampling methods are noted on the forms provided in **Appendix F** for each boring. Below is a description of the drilling and sampling methods that were used.

At some locations direct-push drilling and sampling methods were used to collect continuous soil samples. Borings were also drilled using hollow-stemmed augers and rotary wash drilling methods. Standard split-barrel sampling procedures were used with the auger and rotary drilling methods to obtain samples of unconsolidated sediment at 2.5- or 5-foot intervals.

For all soil sampling methods, percent recovery, soil structures, mottling, voids, lenses, Munsell color, geologic origin, and Unified Soil Classification System (USCS) classification were noted on the boring logs for each sample. Blow counts were also noted for samples collected using split-barrel sampling procedures. At locations where the bedrock was weathered, poorly cemented, or generally poorly indurated, split-barrel sampling procedures were used to collect representative samples of the rock. The borings not used for the installation of wells were abandoned according to ss. NR 507.08 and NR 141.25 requirements.

The bedrock was continuously cored using an NQ (minimum 1.7-inch-diameter) or HQ (minimum 2.1-inch-diameter) core bit. The core was described by SCS geologists using standard core-logging procedures noting general rock type and properties, fracture frequency, percent recovery, rock quality designation (RQD), etc. Also noted and described were features such as vugs, fractures,

bedding-plane partings and other voids, and observations of water production while drilling. Borings were abandoned per ss. NR 507.08 and NR 141.25 requirements.

In accordance with s. NR 512.09(6)(b), a minimum of one boring in the area of each proposed phase of the Proposed Landfill extended to a minimum of 50 feet below proposed subbase grades or to competent bedrock, whichever is shallower. For the Proposed Landfill, the borings encountered competent bedrock at depths of less than 50 feet below the proposed subbase, As noted above, standard penetration blow counts were noted for samples collected using split-barrel sampling procedures. Standard penetration data was also collected using a pocket penetrometer for fine-grained materials. The only fine-grained soil layer encountered was the loess layer near the land surface, which will be excavated within the Proposed Landfill footprint, and no soft or compressible coarse-grained layers were encountered. Therefore, no samples were collected for geotechnical testing to define parameters used in assessments of stability and settlement of the liner.

Soil samples and rock core will be retained at SCS's office in Madison, Wisconsin, until approval of this report. The Wisconsin Geological and Natural History Survey will be notified that the rock core is available for study and possible retention following approval of this report in accordance with s. NR 507.05(2).

5.1.3 Monitoring Wells and Piezometers

A total of 30 monitoring wells and piezometers were installed at 20 locations meeting locational criteria in s. NR 512.09. Monitoring wells were also installed at five additional locations more than 300 feet from the proposed limits of waste, and piezometers were also installed at two of those locations. Water table monitoring wells were generally installed in boreholes drilled using hollow-stem augers. Deeper water table wells and piezometers in bedrock were generally installed in boreholes drilled using air rotary drilling methods. All wells and piezometers are constructed with 2-inch-diameter polyvinyl chloride (PVC) well casings and screens. Boring logs, well construction and development forms, and well information forms (4400-89) are included in **Appendix F**.

Water used in drilling came from the Madison municipal water system. As required by s. NR 507.06(1), samples of the drilling water were analyzed for the parameters listed in NR 507, Appendix I, Table 1, which lists detection monitoring parameters for landfills accepting municipal solid waste (MSW). The samples were collected from the truck used to deliver the water to the site and from the supply well at the on-site maintenance building. The results of the analysis are shown in **Table 5-3**, and the analytical report is included in **Appendix I**.

The monitoring wells were developed by surging with a bailer and purging with a bailer and/or a pump. Following well development, a groundwater sample was obtained from each well and analyzed for total suspended solids (TSS) as required by s. NR 507.07. SCS confirmed with the WDNR (Carolyn Cooper) on February 20, 2023, that analysis for chemical oxygen demand (COD) was not required since the only drilling fluid used was water. Results are summarized in **Table 5-4**, and the analytical reports are included in **Appendix I**.

5.1.4 Staff Gauges

Seven staff gauges (SG-1 through SG-7) were installed in March 2023 to monitor surface water elevations. Two additional staff gauges, SG-8 and SG-9, were installed in November 2023, following the WisDOT Pond B construction (see **Plan Sheet 2**). Generally, the reference point for each of the staff gauges is the 0.0-foot mark on the gauge. The reference points for SG-4, SG-6, SG-8, and SG-9 are the tops of the culverts at these locations. The locations of the staff gauges are shown on the

existing conditions map (**Plan Sheet 2**). The water level measurements and surface water elevations at the staff gauges are summarized in **Table 5-5.**

5.1.5 Surveying

The elevations of borings, monitoring wells, and staff gauges were surveyed to the nearest 0.01 foot and referenced to mean sea level. The locations of each boring, well, and staff gauge are given as Wisconsin State Plane coordinates and are accurate to the nearest 0.1 foot. The borings and well locations were staked in the field at specified coordinates, and ground elevations were surveyed prior to drilling. Borings were drilled at the staked locations. The actual well locations and elevations at the top of the protective casings and the top of PVC casings were also surveyed.

5.1.6 Single-Well Hydraulic Conductivity Testing

In-field, single-well hydraulic conductivity tests, also called slug tests, were conducted on each well. Test data summaries and results are provided in **Appendix G**. The results are summarized in **Table 5-6**.

5.1.7 Groundwater Sampling and Water Level Monitoring

Five rounds of baseline groundwater quality samples were collected at wells outside the proposed limits of fill as required under s. NR 512.09(4)(g). The samples were collected a minimum of 30 days apart in May, June, July, August, and December 2023. One well, MW-123B, was installed later than the other wells, and was sampled for the fourth time in September 2023.

As noted in **Section 1.4.6**, monitoring well MW-1 was not included in the baseline water quality monitoring program because it was within the preliminary proposed limits of waste when monitoring was started, but it is outside the currently proposed limits. Monitoring well MW-121 is inside the current proposed limits, but was included in the baseline water quality program, because it was outside the preliminary proposed limits of waste when monitoring was started. Baseline groundwater monitoring was performed at the remaining wells outside the proposed limits of waste, including the required wells and piezometers within 300 feet of the limits (11 locations) and supplemental wells beyond 300 feet from the limits (5 locations).

Eight rounds of water level monitoring were completed, including the monitoring during the six sampling events listed above plus water-level-only monitoring events in March and November 2023. For each event, water levels at all wells and gauges were measured on the same day. Water levels are summarized in **Table 5-5**, and calculated vertical gradients for the well nests are shown in **Table 5-7**.

As specified in s. NR 507.18, the baseline samples were analyzed for public health parameters, public welfare parameters, and detection parameters including volatile organic compounds (VOCs). Four rounds of samples from all wells were analyzed for VOCs. The detection monitoring program included parameters required for landfills accepting municipal solid waste only as listed in Table 1 in Appendix I of NR 507. **Table 5-8** is a summary of the results for the detection monitoring parameters and includes a summary of the results of analysis for VOCs. **Table 5-9** is a summary of the results for the baseline and assessment monitoring parameters outlined in Table 3 in Appendix I of NR 507. Five wells were also sampled for Subtitle D well parameters outlined in Table 3 in Appendix I of NR 507. **Table 5-10** is a summary of the results for the Subtitle D well parameters. **Table 5-11** summarizes the results for parameters that were detected at concentrations greater than NR 140 standards.

The groundwater analytical laboratory reports are included in **Appendix I**.

5.1.8 Soil Analysis

Soil laboratory analyses were performed in accordance with s. NR 512.09(4). A minimum of five representative soil samples were obtained from each major geologic unit and tested in the laboratory for moisture content, grain-size distribution, and Atterberg limits. The samples were classified according to the USCS. A minimum of two representative undisturbed samples of each major fine-grained geologic unit were tested in the laboratory for hydraulic conductivity and dry density. In addition, a sample was collected from the screened interval of each well, analyzed for grain-size distribution and Atterberg limits, and classified according to the USCS. The results of the analyses are summarized in **Tables 5-12** through **5-18**. **Table 5-15** summarizes the results of analysis of one sample of lake sediment. Lake sediment is not a major geologic unit at the site, but the results of the soils analysis are provided for reference.

As noted in **Section 5.1.2**, the only fine-grained soil layer encountered was the loess layer near the land surface, which will be excavated within the Proposed Landfill footprint, and no soft or compressible coarse-grained layers were encountered. Therefore, consolidation testing in accordance with s. NR 512.09(6)(c) was not required.

The soil testing laboratory reports are included in **Appendix F** following the log of the boring from which the samples were obtained.

5.2 GEOLOGY

The Proposed Landfill area is located in an upland area of Ordovician-age bedrock, which is overlain by Quaternary-age glacial deposits. The glacial deposits are associated with the most recent advance of the Green Bay Lobe of the Laurentide Ice Sheet. Sediments associated with the most recent ice advance into the area belong to the Holy Hill Formation (Severson and others, 2011). The deposits of the Holy Hill Formation cover most of southcentral Wisconsin including most of Dane County. The Proposed Landfill site is located near the farthest southeastern extent of the ice advance that deposited the sediments of the Holy Hill Formation. The glacial geology of the Proposed Landfill area is discussed in **Section 5.2.2**.

Based on regional information and the Proposed Landfill Geotechnical Investigation Program, the unconsolidated sediments at the site overlie bedrock belonging to several major groups including the Sinnipee, Ancell, and Prairie du Chien Groups. Each of the groups has been divided into formations and members as listed in **Table 5-19**. Descriptions of the major unconsolidated sediment and bedrock units identified at the site are provided below. The distribution of the units is shown on Geologic Cross Sections A-A' through Q-Q' (**Plan Sheets 7** through **22**). The bedrock geology of the Proposed Landfill area is discussed in **Section 5.2.3**.

5.2.1 Surface Soils

Surface soils in the vicinity of the Proposed Landfill are primarily in the Dodge - St. Charles - McHenry Associations (Glocker & Panzer, 1978, Sheet Number 105). These soils formed in loess and calcareous, loamy glacial till. Specific soil units mapped on the northern and central areas of the Proposed Landfill site include:

- Dodge silt loam (DnB), 2 to 6 percent slopes, well drained, and formed from loess overlying calcareous loamy glacial till.

- McHenry silt loam (MdC2), 6 to 12 percent slopes, well drained, and formed from loess overlying loamy glacial till.

- Saint Charles silt loam (ScB), 2 to 6 percent slopes, well drained, and formed from loess overlying loamy glacial till.

Specific soil units mapped on the southern portion of the Proposed Landfill site include:

- Virgil silt loam (VwA), 6 to 12 percent slopes, well drained, and formed from loess overlying loamy glacial till.

- Orion silt loam, (Os), 0 to 2 percent slopes, hydric, poorly drained, and formed from silty alluvium.

Based on the borings completed for the feasibility study, the topsoil in the Proposed Landfill area is generally very dark grayish-brown (10YR 3/2) silt (ML), with varying amounts of sand, and is organic-rich. In some areas, the topsoil is organic silt (OL). The topsoil is generally about 1 foot thick and is not considered to be a major geologic unit. The organic-rich topsoil generally overlies loess which is a major geologic unit at the Proposed Landfill site. Thirteen loess samples were tested in the laboratory for grain-size distribution and Atterberg limits (**Table 5-12**). Most of the samples tested were classified as lean clay (CL). The loess is described further in the following section.

5.2.2 Holocene and Pleistocene Sediment

Sediment deposited by ice of the Green Bay Lobe is at the surface at the Proposed Landfill site. The sediment includes diamicton—a very poorly sorted mixture of particle sizes including gravel, sand, silt, and clay. Commonly, diamictons are interpreted as till, which is sediment that was deposited directly by or from glacier ice. The sediment also includes sand and gravel (commonly interpreted as outwash deposited by streams flowing away from the glacier), and sorted, generally laminated, fine sand, silt, and clay (generally interpreted as lake sediment). The glacial and related deposits in this part of Dane County belong to the Horicon Member of the Holy Hill Formation (Clayton & Attig, 1997).

The diamicton of the Horicon Member of the Holy Hill Formation is brown to reddish brown, and much of it is interpreted to be till. The till is generally crudely stratified or unstratified, gravelly, clayey, silty sand. The till is composed mainly of dolomite in all size fractions, indicating a predominantly local origin. At the Proposed Landfill site, the till generally underlies loess and directly overlies the bedrock. It is typically dense, and ranges in thickness from a few to several feet. Dolomite is the most common rock type of pebbles and cobbles, but igneous and metamorphic rocks are also present.

5.2.2.1 Loess

The loess is commonly grayish brown (2.5YR 4/2), dark gray (10YR 4/1), or yellowish brown (10YR 3/2) silt, with fine sand and clay that was probably deposited predominantly by wind. It is mostly uniform, massive, and well sorted. The loess is generally a clay as defined by its liquid and plastic limits and consists of predominantly silt-sized particles. In the area of the Proposed Landfill the loess is generally about 3 feet thick and ranges from absent to a maximum of about 8 feet thick at the south/southwest end of the site at the locations of B8 and B225, (**Plan Sheet 12**, Geologic Cross Section G-G').

Thirteen samples of loess were tested in the laboratory for grain-size distribution and Atterberg limits (Table 5-12). Ten of the samples that were tested classified as lean clay (CL), one sample tested as fat clay (CH), one tested as clayey sand (SC), and one sample had a borderline classification as lean clay/silty clay (CL/CL-ML). The hydraulic conductivity results for the two loess samples tested were 5.8×10^{-7} cm/sec and 2.0×10^{-8} cm/sec. The mean percentages of gravel-sand-silt-clay in the loess samples are 1 – 23 – 43 – 33, respectively.

5.2.2.2 Till – Horicon Member of the Holy Hill Formation

Beneath the loess is silty sandy till. The silty sandy till is brown (10YR 5/3), dark yellowish brown (10YR 4/6), or yellowish red (5YR 4/6). The matrix of the till is mostly fine sand with medium and coarse sand, is generally uniform and massive, and contains cobbles and boulders, many of which are sub-rounded dolomite. The till is generally cohesive.

Till is the predominant sediment type at the site and is present over most of the Proposed Landfill area. The till ranges from a minimum of about 1 foot in thickness, to a maximum of about 42 feet thick at MW-107, which is at the northeast corner of the site (Plan Sheets 7 and 20 - Geologic Cross Sections B – B', and 0 – 0'). The average thickness of the till is about 10 feet.

Fifteen samples of till were tested in the laboratory for grain-size distribution, two samples were tested for Atterberg limits, and two samples were tested for laboratory permeability (Table 5-13).

All of the till samples classified as silty sand (SM). The mean percentages of gravel-sand-silt-clay in the till samples are 12 – 60 – 16 – 12, respectively.

The laboratory hydraulic conductivity test results for two till samples tested were 1.2×10^{-6} cm/sec and 6.5×10^{-6} cm/sec.

5.2.2.3 Outwash – Horicon Member of the Holy Hill Formation

The outwash is poorly-graded sand with silt (SP-SM), and silty sand (SM), and is generally loose, fine-to-coarse sand with some fine gravel. The outwash is strong brown (7.5YR 5/6) or yellow brown (10YR 7/6). Typically, the outwash is horizontal or cross-bedded and includes finer and coarser-grained layers and lenses. The outwash was deposited by fluvial processes near glacial ice.

The outwash is predominantly at the north end of the Proposed Landfill site. At B-106 the outwash is beneath till and lake sediment at a depth of about 32 to 39 feet, and at B-107 the outwash is beneath till at about 29 to 48 feet and overlies bedrock (Plan Sheet 7, Geologic Cross Sections A - A', and B – B').

Five samples of outwash were tested in the laboratory for grain-size distribution (Table 5-14). Three of the outwash samples classified as silty sand (SM) and two classified as poorly graded sand with silt (SP-SM). The mean percentages of gravel-sand-silt-clay in the outwash samples are 17 – 70 – 8 – 12, respectively.

5.2.2.4 Lake Sediment – Horicon Member of the Holy Hill Formation

Lake sediment is not a major unit at the Proposed Landfill site. Only small areas of lake sediment were found in the area of the Proposed Landfill, including one notable area at B-106 (Plan Sheet 7,

Geologic Cross Sections A - A'). B-106 is not within the footprint of the Proposed Landfill (**Plan Sheet 2**).

The lake sediment was deposited in standing water near glacier ice. A sample of lake sediment from the B-106 location, tested in the laboratory for grain-size distribution and Atterberg limits, tested as silty clay (CL-ML) (**Table 5-15**). The percentages of gravel-sand-silt-clay in the lake sediment sample are 0 – 17 – 49 – 34, respectively.

5.2.2.5 Dolomite

Samples of dolomite from the screened interval of the monitoring wells were tested for grain-size distribution and Atterberg Limits if the dolomite at those locations was poorly indurated, and could easily be disaggregated, or was mechanically disaggregated by the drilling and sampling processes. Eight samples of dolomite were tested in the laboratory (**Table 5-16**). All of the samples tested as silty sand (SM), except one that tested as silty gravel (GM). The mean percentages in the five dolomite samples analyzed for the full grain-size distribution of gravel-sand-silt-clay are 26 – 52 – 13 – 8, respectively.

5.2.3 Bedrock

The Preliminary Bedrock Map of Dane County, by Brown and others (2013), included in **Appendix H**, indicates that the uppermost bedrock in the vicinity of the Proposed Landfill are Ordovician sedimentary rocks of the Sinnipee, Ancell and Prairie du Chien Groups and that the bedrock strata dip gently toward the east-southeast into the Michigan Basin with a slope of about 0.008.

A preliminary report by Olcott (1968) indicated the presence of a fault system in the bedrock in the vicinity of the Proposed Landfill. The Preliminary Bedrock Map of Dane County (**Appendix H**) shows a system of inferred faults in the same general area.

Olcott inferred the presence of the faults from the apparent off-set of stratigraphic units in the subsurface as presented on geologic logs for water supply well prepared by the Wisconsin Geological & Natural History Survey. The geologic logs are based on the study of drill cuttings from the well boreholes. Some of the wells (DN985, DN986, DN988) are located on the Proposed Landfill site, and some are for abandoned wells located on the adjacent golf course property (DN929 and DN945) (**Plan Sheet 2**, **Appendix C**).

Subtle folds in the Paleozoic units, which may be underlain or cut by faults, have been identified in Dodge County (Steward, 2021). However no recent work has been done in the area studied by Olcott to substantiate the presence of folds, or the presence or nature of associated faults in that area.

There is no evidence of faults in Wisconsin that are known to have had displacements during the Holocene Epoch.

The bedrock strata beneath the Proposed Landfill site are generally less than 20 feet thick and are variable in lithology as illustrated on the geologic cross-sections and described further in this section. Erosional contacts between the unconsolidated sediments and the bedrock, and between bedrock units have been inferred in several areas. No faults have been inferred from the investigations conducted at the site.

The bedrock surface generally slopes down from southeast to northwest, as shown on the bedrock surface contour map on **Plan Sheet 6**. The bedrock surface map is based on observations made at

drilling locations for the feasibility study. For locations with more than one boring, the bedrock surface elevation is based on geologic information from all borings at the drilling location.

The bedrock surface elevation is considered to be the elevation of the first encountered rock formation beneath the ground surface. In accordance with the note included with the definition of the "top of the bedrock surface" in s. NR 500.03(235), the presence of bedrock is indicated when a majority of the drill cuttings consist of either angular rock fragments, as in the case of crystalline bedrock, or rock fragments composed of individual grains or rock particles that are cemented together to form an aggregate, as opposed to single sediment particles, such as sand.

Per ss. NR 500.03(130) and (199), "rock" means all lithified earth material including all naturally occurring and naturally formed aggregates or masses of minerals or small particles of older rock that formed by crystallization of magma or by induration of loose sediments. "Rock" does not include unconsolidated earth materials, soil, or regolith lying at or near the earth surface. "Soil" means material that has been physically and chemically derived from the bedrock by nature (s. NR 500.03(214)). Buried soils (paleosols) are not considered to be rock in determining the bedrock surface elevation.

The top of bedrock elevations range from a high of about 920 feet above mean sea level near the southeast corner of the Proposed Landfill footprint to a low of approximately 835 feet above mean sea level on the northwest corner of the Proposed Landfill footprint. The slopes on the top of the bedrock are gentler in the central part of the site.

Fracture frequency (FF), percent recovery, and RQD are noted on the boring logs (**Appendix F**) for each run of bedrock. RQD is a qualitative designation based on the modified core recovery (MCR). MCR is calculated by dividing the sum of all the recovered pieces of core equal to or greater than 4 inches (100 mm) in length by the total length of the core run. RQD designations include **very poor** (0 to 25% MCR), **poor** (26 to 50% MCR), **fair** (51 to 75% MCR), **good** (76 to 90% MCR), and **excellent** (91 to 100% MCR). Fracture frequency (FF), percent recovery, and RQD were variable between lithologies and generally core recovery of the sandstone strata was better than core recovery of the dolomite strata.

The following sections describe the main lithologic characteristics of the bedrock formations in Dane and adjoining Dodge County as noted by Brown and others (2013), and Stewart (2021), with additional observations from the field investigation conducted for the feasibility study. The bedrock formations are all Ordovician in age and include sandstones and dolomites deposited in cycles bounded by erosional unconformities as nearshore through offshore deposits in an epeiric sea (Ostrom, 1964, 1970, 1978; Fraser, 1976; Mai and Dott, 1985; Watso and Klein, 1989, among others).

A summary of the stratigraphic units, listed from youngest to oldest, is provided in **Table 5-19**.

5.2.3.1 Sinnipee Group

The Sinnipee Group consists of dolomite and shaly dolomite that is yellow brown to light brownish yellow and gray and is massive or medium to thick bedded with shaly layers, contains minor white chert, and is fossiliferous in some zones. The Sinnipee Group includes the Galena, Decorah and Platteville Formations.

> **The Galena Formation** consists of dolomite to cherty dolomite, that is gray to beige, and yellow brown to light brownish yellow, and is massive to medium-bedded. The dolomite has a

distinctive mottled weathering pattern. The base of the unit is typically light gray, shaly, and fossiliferous. The rocks of the Galena Formation are typified as biogenic carbonates (Ostrom, 1978).

The Decorah Formation consists of shaly and silty dolomite that is dark gray, thin bedded, and has minor amounts of chert and pyrite. The rocks of the Decorah Formation are typified as reworked shallow water or lagoonal deposits (Simo and other, 2003).

The Platteville Formation consists of dolomite to shaly dolomite, that is yellow, beige, and gray to light brownish yellow. Gray weathering is typical of shaly intervals. The strata are massive, planar-laminated, or medium to thick bedded, interbedded with thin, wavy bedded shale/silt laminations, include minor chert, and are fossiliferous in some zones. The rocks of the Platteville Formation are typified as biogenic carbonates (Ostrom, 1978).

5.2.3.2 Ancell Group

The Ancell Group includes marine and aeolian sandstones, shales, and clays and silts, with chert and dolomite residuum, that rest on a high-relief unconformable contact with the underlying Prairie du Chien Group.

The Glenwood Formation consists of sandstone that is dolomitic (carbonate-cemented), silty, and/or shaly, poorly sorted, yellow-brown to green, with blue-green shale or sandy dolomite. The rocks of the Glenwood Formation are typified as reworked shallow water or lagoonal deposits (Mai and Dott, 1985).

The St. Peter Formation, Tonti Member consists of sandstone that is light brownish yellow, white, red, gray, orange, or brown (if cemented by iron oxides), and is medium to coarse grained, well rounded and well sorted. The sandstone is poorly cemented, has low to high angle cross-bedding or is massive. It may be poorly cemented by dolomite, have localized sulfide mineralization disseminated through the matrix and concentrated along bedding planes and fractures, and localized thin layers of pale green shale/silt. The Tonti Member is typified as marine and aeolian quartz sandstones (Mai and Dott, 1985).

The Tonti Member is predominantly at the east side and south end of the Proposed Landfill site (**Plan Sheets 13** and **21**, Geologic Cross Sections H - H', and P – P').

Seven samples of Tonti Member sandstone were tested in the laboratory for grain-size distribution (**Table 5-17**). Five of the samples classified as silty sand (SM), one classified as poorly graded sand with silt (SP-SM) and one classified as clayey sand (SC).

The mean percentages of gravel-sand-silt-clay in the in the three sandstone samples analyzed for the full grain-size distribution of gravel-sand-silt-clay are 18 – 59 – 13 – 9, respectively. The hydraulic conductivity of the Tonti Member sandstone based on single well tests conducted at five monitoring wells at the site is about 9.1×10^{-4} cm/sec (**Table 5-6**).

The St. Peter Formation, Readstown Member consists of sandstone, silty sandstone, and clayey sandstone, with gray, red, purple, green shaly layers, and is interbedded with clay and/or silt, that contains clasts of chert or dolomite. The strata are derived from partially reworked residuum on the Prairie du Chien erosional surface (Grether and Clark, 1985).

The Readstown Member is predominantly at the east side and south end of the Proposed Landfill site (**Plan Sheets 13** and **21**, Geologic Cross Sections H - H', and P – P').

Six samples of Readstown Member were tested in the laboratory for grain-size distribution (**Table 5-18**). Each sample had a different classification and ranged from fat clay (CH) to poorly graded sand with silt (SP-SM), illustrating the high degree of variability within the Readstown Member. The mean percentages of gravel-sand-silt-clay in the in the four samples analyzed for the full grain-size distribution of gravel-sand-silt-clay are 3 – 48 – 23 – 26, respectively. The large standard deviations for the mean percentages of gravel, sand, silt, and clay, also reflect the high degree of variability in the Readstown Member.

The hydraulic conductivity of the Readstown Member based on single well tests conducted at three monitoring wells at the site is about 2.2 X 10^{-4} cm/sec (**Table 5-6**).

5.2.3.3 Prairie du Chien Group

The Prairie du Chien Group includes dolomite and sandy dolomite, that is yellow, light brown, and gray, and is massive to medium bedded, and may be sandy, cherty, vuggy, and/or oolithic.

The Shakopee Formation consists of dolomite and sandy dolomite, that is gray, beige, and red (sandy dolomite is predominantly red), is interbedded with coarse grained well rounded sandstone, and/or green to gray siltstone or clay. The strata are massive, planar, or low-angle cross-bedded and may be oolithic, vuggy, cherty, and glauconitic.

The Willow River Member is sandy, glauconitic dolomite, which is gray, light gray, and is typified as biogenic carbonates (Ostrom, 1978).

The New Richmond Member is sandstone, and dolomitic sandstone, that is yellow and light gray, fine to coarse sand, massive or bedded, and contains chert and glauconite. The rocks of the New Richmond Member are typified as reworked shallow water or lagoonal deposits (Ostrom, 1978).

The Oneota Formation consists of dolomite and sandy dolomite that is gray to beige, massive, or has planar, and wavy-laminated bedding. It is oolithic, vuggy, cherty, and glauconitic in zones. The rocks of the Oneota Formation are typified as biogenic carbonates (Ostrom, 1978).

5.3 HYDROGEOLOGY

Groundwater occurs in all of the geologic units at the site and is monitored at two levels – the water table and the piezometer level, approximately 25 feet lower than the water table. The water table wells have designations MW-1 through MW-125 and the piezometers have designations MW-105A through MW-125A, as shown on **Plan Sheet 2**.

Due to the variability in the sediments overlying the bedrock, and variability in the bedrock, the water table wells and the piezometers are screened in different units at different locations, and at some locations are screened in more than one unit. The geologic unit in the screened interval of each well is noted in **Tables 5-5**, **5-6**, and **5-7**.

5.3.1 Flow at the Water Table

The depth to groundwater at the Proposed Landfill site, measured in water table wells in March through December 2023, was between about 0.3 and 51.2 feet below ground surface (bgs). The depth to groundwater was 0.3 feet bgs at MW-117 (screened in till) in March 2023, and 51.2 feet bgs at MW-123B (screened in the Readstown Member) in December 2023.

Groundwater elevations typically vary seasonally, generally with the highest water levels in spring and lowest water levels in winter. In the eight rounds of water level measurements at the Proposed Landfill site, the water levels observed in March 2023 were the overall highest water levels observed, and the overall lowest water levels were recorded in December 2023.

Plan Sheet 3 is a seasonal high water table contour map based on the March 2023 data. Groundwater flow was predominantly to the north with a component of flow to the east from the highest groundwater point in the southeast part of the site at MW-122.

A seasonal low water table contour map based on the December 2023 data is shown on **Plan Sheet 4**. Flow directions and horizontal gradients were generally consistent with the high water table map.

The average groundwater elevation measured at the water table monitoring wells was 5.2 feet lower in December 2023 than in March 2023.

5.3.1.1 Horizontal Gradients at the Water Table

The horizontal hydraulic gradient at the water table in March 2023 (High Water Table Map - **Plan Sheet 3**) ranged from about 0.010 to 0.037 (see **Appendix O** for gradient calculations). The lowest horizontal hydraulic gradient (0.010) was in the central part of the site where the water table is predominantly in the till. The steepest horizontal hydraulic gradient (0.037) was on the east side of the site. On the east side of the site the water table is in the till at MW-122 and is in Tonti Member sandstone at MW-123. The horizontal gradient of flow to the northwest was about 0.024. At MW-112, the water table is in the till and Galena dolomite, and at MW-1 the water table is in outwash.

In December 2023 (Low Water Table, **Plan Sheet 4**) the horizontal flow gradients to the northwest and to the east were about the same (0.023). The lowest horizontal hydraulic gradient (0.008) at the water table in December 2023 was in the central part of the site where the water table is predominantly in the till.

5.3.2 Flow at the Piezometer Level

Plan Sheet 5 is a potentiometric surface contour map based on the March 2023 data. Groundwater flow at the piezometer level was similar to flow at the water table with predominant flow to the north and a component of flow to the east from the highest groundwater elevation in the southeast part of the site at MW-120A.

The horizontal hydraulic gradient at the potentiometric surface ranged from about 0.018 to 0.033. The lowest horizontal hydraulic gradient (0.018) was in the central part of the site. The steepest horizontal hydraulic gradient (0.033) was on the east side of the site. The horizontal gradient of flow to the northwest was 0.020.

5.3.3 Groundwater Flow - Vertical Gradients

Vertical gradients of groundwater flow are summarized in **Table 5-7**. From March to December 2023, the vertical hydraulic gradient between the till and bedrock ranged from 0.002 to 0.070 downward. An exception to the downward gradients between the till and the bedrock was observed at the MW-117/117A nest, where the gradient was upward between the Oneota dolomite and till in March through July 2023 and then downward from August 2023 through December 2023.

From March to December 2023, the vertical hydraulic gradients within the bedrock were mostly downward and ranged from 0.001 (in the Tonti Member at MW116/MW116A) to 0.317 downward (between the Tonti Member and the Shakopee Formation dolomite at MW123/MW123A).

Exceptions to the downward gradients within the bedrock were observed for the MW-109/MW-109A and MW-125/MW-125A well nests. At the MW-109/109A nest, where MW-109 is screened in the till and Galena dolomite, and MW-109A is screened in the Galena Formation dolomite, the vertical gradient was upward. At the MW-125/125A nest, the gradient was generally upward between the Readstown Member and the Prairie du Chien dolomite.

5.3.4 Groundwater Flow Net

The groundwater flow net (**Plan Sheet 22**) is drawn along Geologic Cross Section Q – Q' using the March 2023 water levels. The flow net is drawn parallel to the predominant direction of groundwater flow to the northwest from southeast and shows the divide in groundwater flow direction at MW-118/118A. Please note the apparent vertical component of flow is exaggerated in the flow net due to the 10 times vertical exaggeration caused by the vertical and horizontal cross section scales. The equipotential cross section shows downward flow in the till overlying bedrock and in the bedrock in the southern and central parts of the site, and mostly horizontal flow in the till and outwash at the north end of the site. In the area of MW-109/109A there is a small component of flow upward from the Galena dolomite to the outwash.

5.3.5 Hydraulic Conductivity

Single-well hydraulic conductivity (slug and baildown) tests were conducted on the water table wells and the piezometers installed for the geotechnical investigation of the Proposed Landfill. The slug test results are summarized in **Table 5-6** and field data are provided in **Appendix G**.

The hydraulic conductivity test results from the water table wells, screened in various geologic units and a combination of geologic units including loess, till, outwash, and bedrock, ranged from 1.1×10^{-4} cm/sec (at MW-122 screened in till) to 4.4×10^{-2} cm/s (at MW-4 screened in Prairie du Chien Group dolomite). The geometric mean of the hydraulic conductivity test results from the water table wells is 9.9×10^{-4} cm/s.

The hydraulic conductivity test results from the piezometers, screened in various bedrock units, ranged from 8.0×10^{-6} cm/sec (at MW-123A screened in the Shakopee Formation dolomite) to 4.0×10^{-3} cm/s (at MW116A screened in the Tonti Member sandstone). The geometric mean of the hydraulic conductivity test results from the piezometers is 2.0×10^{-4} cm/s.

The horizontal hydraulic conductivity test results from wells screened only in the till ranged from 1.1×10^{-4} to 1.6×10^{-3} cm/s, with a geometric mean of 3.9×10^{-4} cm/s. Laboratory testing of till samples indicates that the vertical hydraulic conductivity of the till ranges from 1.2×10^{-6} cm/sec to 6.5×10^{-6} cm/sec (**Table 5-13**). The test results indicate that the till is anisotropic.

The results of the two vertical hydraulic conductivity tests performed on loess samples were 5.8×10^{-7} cm/sec and 2.0×10^{-8} cm/sec (Table 5-12). No horizontal hydraulic conductivity tests were performed on the loess because there are no wells screened solely in the loess.

5.3.6 Groundwater Velocity

The estimated horizontal velocity of groundwater flow at the water table ranges from about 30 to 130 feet per year, based on a geometric mean hydraulic conductivity of 9.9×10^{-4} cm/s (from slug tests), an assumed effective porosity of 30 percent, and a range of horizontal hydraulic gradients of 0.01 to 0.03.

The estimated horizontal velocity of groundwater flow at the piezometer level ranges from about 15 to 30 feet per year, based on a geometric mean hydraulic conductivity of 2.0×10^{-4} cm/s (from slug tests), an assumed effective porosity of 25 percent, and a range of horizontal hydraulic gradients 0.02 to 0.03. Higher horizontal velocities may occur locally due to heterogeneity in the bedrock.

Groundwater velocity calculations are included in Appendix O.

5.4 GROUNDWATER QUALITY

Baseline monitoring was conducted at monitoring wells located outside of the Proposed Landfill limits of waste in May, June, July, August, and December 2023. Due to changes in the location of the Proposed Landfill footprint, wells MW-4, MW-105, MW-105A, MW-106, MW-124, and MW-124A, were included in the baseline monitoring program but are located greater than 300 feet from the proposed fill area. Baseline monitoring was also conducted at MW-3 which is located on the adjacent property to the west. MW-3 was not considered to be a monitoring point for the Proposed Landfill but provides additional background water quality information. The baseline monitoring results to date are summarized in Table 5-8, Table 5-9, and Table 5-10. Parameters and wells with monitoring results at or above the NR 140 PALs are summarized in Table 5-11 and discussed in the following sections.

The baseline monitoring program followed the requirements of NR 507 for the waste types anticipated to be accepted at the Proposed Landfill. Wells MW-105, MW-107, MW-111, MW-119, and MW-120 were selected as potential new Subtitle D wells and sampled for the required additional Subtitle-D parameters. Due to changes in the location of the Proposed Landfill footprint, well MW-105 is located greater than 300 feet from the proposed fill area. An additional well will be designated as a Subtitle D well and sampled for the required parameters and sampling rounds prior to placement of waste.

5.4.1 Inorganic Parameters

The inorganic baseline monitoring results vary between monitoring wells due to 1) differences in the geologic environments in which the wells are screened, and 2) impacts associated with land use. Inorganic parameters detected at least once at concentrations greater than NR 140 PAL are listed in Table 5-11.

Fluoride was only detected at a concentration greater than an NR 140 standard in a sample collected at MW-3 which is located outside of the Proposed Landfill site. The fluoride concentration at MW-3 was flagged by the laboratory due to failure of one of the method quality control checks and was not confirmed by additional sampling; therefore, an NR 140 exemption is not being requested.

Exemptions from NR 140 to allow construction of the Proposed Landfill in an area with existing groundwater standard exceedances are requested in Section 1.4.4. Following is a discussion of the parameters with confirmed PAL exceedances for which exemptions are being requested. The likely cause and significance of the NR 140 exceedances are discussed for each parameter below.

Inorganic parameters for which NR 140 exemptions are being requested (Table 1-2) include:

- Public health parameters
  - Arsenic
  - Barium
  - Chromium
  - Lead
  - Manganese
  - Nitrate+nitrite

- Public welfare parameters
  - Manganese
  - Sulfate

Arsenic was detected at concentrations above the PAL at eight of the 23 wells included in the baseline monitoring program. The only concentration exceeding the ES for arsenic was the concentration reported for the sample collected in August from MW-122. Arsenic levels above the PAL are naturally occurring in the till soils and bedrock at the site, and the levels detected in the new monitoring wells are consistent with groundwater quality in other areas of Dane County.

Barium results exceeding the PAL were reported for two of the five samples from MW-122. The detected concentrations were well below the ES. Barium was detected at concentrations below the PAL at all of the monitoring wells in the baseline monitoring program (Table 5-9). Barium is naturally occurring in the glacial till soils.

Chromium results exceeding the PAL were also reported for two of the five samples from MW-122. Low levels of chromium, reported for several other wells in the baseline monitoring program, are likely naturally occurring in the till.

Lead was reported at a concentration exceeding the PAL for the sample collected from MW-105A in August 2023, and at concentration exceeding the ES in the samples collected from MW-122 in May and August 2023. Lead concentrations were below the PAL in the other three samples from MW-122. Low levels of lead can be attributed to natural background; however, the intermittent concentrations of lead above the ES at MW-122 along with the other metals detected at MW-122 may not be attributable to natural occurring water quality.

Manganese concentrations exceeded the PAL and/or ES in samples from 19 of the 23 baseline monitoring wells. At most wells, the manganese concentrations decreased as the water quality stabilized following well installation. At MW-122 and MW-125A the manganese concentrations increased from May through August, and in August were greater than the Public Health ES. However, in December 2023, the manganese concentrations at both wells were below the PAL. Manganese is naturally occurring in the unconsolidated sediments and the bedrock. Land use could potentially have contributed to elevated manganese through the use of manganese-containing pesticides; however, the fact that manganese concentrations are generally higher in the piezometer samples than in the water table well samples suggests that the observed manganese levels are more likely naturally occurring.

Nitrate plus nitrite concentrations above the PAL were reported for samples from 13 of the 23 monitoring wells in the baseline program. None of the results exceeded the ES. Nitrate+nitrite levels above the PAL are likely due to land use in the Proposed Landfill area and possibly land use upgradient from the site. Fertilizers are a common source of nitrate in groundwater.

Sulfate concentrations greater than the PAL were detected in two of the four samples from MW-105A and one of the four samples from MW-122. Sulfate concentrations reported for these wells are likely due to natural background in the unconsolidated sediments. Land use may also have contributed to elevated sulfate levels, especially at the water table well. Land use could potentially increase sulfate through use of sulfate-containing fertilizers.

5.4.2 VOCs

Exemptions from NR 140 to allow construction of the Proposed Landfill in an area with existing groundwater standard exceedances are requested in **Section 1.4.4**. Following is a discussion of the VOCs with confirmed PAL exceedances for which exemptions are being requested. The likely cause and significance of the NR 140 exceedances are discussed for each parameter below.

The results of the four rounds of baseline monitoring for VOCs (**Table 5-8**) indicated low levels of two VOCs in the groundwater in the Proposed Landfill area. Selected wells (MW-113, MW-120A, MW-123B, and MW-124A were sampled a fifth time for VOCs in December 2023.

Tetrachloroethene (PCE) was detected at concentrations greater than the PAL in samples collected from MW-113 in May and August 2023. However, the concentration detected in August was below the laboratory's limit of quantitation. In December 2023, PCE was not detected in the sample from MW-113; therefore, an exemption is not being requested for PCE at this time. If additional laboratory results indicate a PAL or ES exceedance for PCE at MW-113, an exemption will be requested as part of the Plan of Operation submittal.

1,2-Dichloroethane (1,2-DCA) was detected at 15 of the 23 monitoring wells in the baseline monitoring program at concentrations greater than the PAL. Many of the wells had only a one-time detection of 1,2-DCA and/or did not have a reported concentration above the laboratory's limit of quantitation; however, three wells (MW-113, MW-120A, and MW-124A) had confirmed exceedances of the NR 140 PAL and well MW-113 had one result exceeding the NR 140 ES. Estimated concentrations of 1,2-DCA greater than the PAL were also detected at MW-123B in July and September 2023 but were below the laboratory's limit of quantification.

The three wells with confirmed PAL exceedances for 1,2-DCA in the first four events were sampled a fifth time in December 2023, along with MW-123B, and none of the four results exceeded the PAL in December. 1,2-DCA was not detected in the groundwater samples collected from MW-113, MW-120A, and MW-123B in December 2023. An estimated concentration of 1,2-DCA below the PAL was reported for the groundwater sample collected from MW-124A in December 2023. Exemptions are being requested for 1,2-DCA at MW-113, MW-120A, and MW-124A (**Table 1-2**).

According to the Toxicity Profile for 1,2-Dichloroethane, published by the Agency for Toxic Substances and Disease Registry (ATSDR, 2022), 1,2-DCA, also called ethylene dichloride, is a widespread contaminant released to the environment during production and use, with most emissions going into the air. 1,2-DCA is primarily used in the production of vinyl chlorides, which are used to make a variety of plastic and vinyl products including PVC pipes and other construction materials. 1,2-DCA is also added to leaded gasoline and used as a dispersant in rubber and plastics, and as a solvent in organic synthesis.

1,2-DCA was previously used as an insect and soil fumigant, as an anti-knock compound in leaded gasoline, and in household cleaning compounds and solvents. Generally, it is no longer available for consumer purchase (ATSDR, 2022).

The existing Dane County Landfill No. 2, located north of the Proposed Landfill, is not a potential source of the 1,2-DCA detections because:

- Landfill No. 2 is downgradient from the Proposed Landfill, and
- 1,2-DCA is included in the groundwater monitoring program for Landfill No. 2 and has not been detected in any samples from the water table monitoring wells, piezometers, or water supply wells sampled for the existing site, based on review of the last 25 years of monitoring results.

5.4.3 Additional Investigation of Groundwater Quality

Likely source or sources of the 1,2-DCA and metals impacts to groundwater are unknown but are possibly related to historic land uses on site or in adjacent areas, and may have included the use of leaded gasoline and pesticides, or disposal of waste materials.

Additional groundwater monitoring and evaluation will be conducted to evaluate the cause and extent of the 1,2-DCA impacts noted in groundwater samples from several wells. The cause and extent of intermittent groundwater standard exceedances for metals at MW-122 will also be evaluated, including arsenic, lead, manganese greater than ESs, and barium and chromium over the PALs. The investigation will be conducted under the guidelines of Wis. Adm. Code NR 716 and will include additional groundwater monitoring and research into current and past land uses on the Proposed Landfill site and in the vicinity of the site.

6.0 WASTE AND LEACHATE CHARACTERIZATION

6.1 WASTE CHARACTERIZATION

The Proposed Landfill service area is anticipated to remain largely the same as the existing Dane County Landfill Site No. 2 service area, with most waste coming from Dane County and limited tonnage from municipalities and industries outside of Dane County. Therefore, the average waste types and volumes of solid waste that will be accepted are expected to be similar to what is accepted at the existing Dane County Landfill Site No. 2, detailed below:

- **Municipal solid waste (MSW):** MSW is the primary waste to be disposed of at the Proposed Landfill and consists mainly of household and commercial wastes. Based on a 6-year average from 2018 to 2023, MSW is projected to be approximately 74.9 percent of the total waste tonnage disposed of at the Proposed Landfill (see **Table 6-1**).
- **Industrial and special wastes:** The volume of industrial, C&D, and special wastes (non-MSW) is projected to be approximately 15.2 percent of the total waste tonnage disposed of at the landfill. Special wastes that are accepted at Dane County must follow the site's Special Waste Acceptance Plan, to be included as part of the Plan of Operation.

- **Alternate daily cover (ADC):** The volume of spray on ADC, shredder fluff, contaminated soil, C&D fines, and other waste exempt from fees and approved as ADC is projected to be approximately 9.9 percent of the total tonnage disposed at the landfill. ADC materials are also subject to the site's Special Waste Acceptance plan. Additional soil 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 6 years at Dane County Landfill Site No. 2, which is anticipated to be representative of what will be disposed at the Proposed Landfill, is indicated in **Table 6-1**. **Table 11-7** presents the annual waste intake by category for years 2018 to 2023.

Based on **Table 6-1**, two material types, Category 31 (MRF Residuals [30 percent cap]) and Category 19 (Fee Exempt Waste Used for ADC), constitute more than 5 percent of landfill capacity at Dane County Landfill Site No. 2. Because waste types to be accepted at the Proposed Landfill are anticipated to remain largely the same as Dane County Landfill Site No. 2, it is anticipated that these waste streams may constitute more than 5 percent of the Proposed Landfill capacity. Section NR 512.12(1) requires an analysis and description of the physical and chemical characteristics of waste streams that constitute more than 5 percent of the landfill capacity.

- Category 31 waste stream includes residual waste from the C&D MRF to the landfill (up to 30 percent of total C&D processed is exempt, and the excess is subject to fees).

  The C&D MRF residuals are highly variable and completely dependent on recycling efficiency of the C&D MRF. The materials qualified under Category 31 consist of fairly large and mostly intact materials, mainly composed of:

  - Plastic film,
  - Cardboard,
  - Insulation,
  - Plastics, and
  - Undesirable wood products.

  Since the material is highly variable, large, and mostly intact, a representative sample for chemical analysis would be difficult to collect. Dane County has provided photographs of a C&D MRF residuals trailer unloading into the landfill (refer to **Appendix J**).

- Category 19 waste stream consists of Fee Exempt Waste Used for ADC. Dane County has approval to use the following waste-containing ADC materials at Dane County Landfill Site No. 2 and may request similar approval for the Proposed Landfill as part of the Plan of Operation.

  - Fines from the C&D MRF located on the Dane County Landfill Site No. 2
  - Spray-on ADC (Posi-Shell®)
  - Spray-on ADC (Posi-Shell®) with waste latex paint included as an additive
  - Grit/screening, which includes materials from storm water systems such as catch basins or storm water basins (e.g., leaves, debris, refuse, etc.)
  - Street sweepings
  - Petroleum-contaminated soils

  Based on tracking records maintained by Dane County, only the fines from the C&D recycling facility used as ADC make up more than 5 percent of the waste stream from

2018 through 2023. Information on the physical (grain size distribution) and chemical characteristics (asbestos, arsenic, cadmium, chromium, lead, nickel, mercury, reactive sulfide) of the C&D fines from 2023 are included in **Appendix J**.

6.2 LEACHATE CHARACTERIZATION AND MANAGEMENT

Leachate from the Proposed Landfill is expected to be similar in chemical composition and concentration to leachate from the existing Dane County Landfill Site No. 2 and other MSW landfills throughout Wisconsin. Recent leachate quality monitoring results from the existing Dane County Landfill Site No. 2 are included in **Appendix K**. Leachate generated within the Proposed Landfill will be collected and treated off-site at a wastewater treatment facility. Alternatively, Dane County may request approval to recirculate leachate in active portions of the landfill as part of the Plan of Operation. The leachate quantities that are expected to be produced from the Proposed Landfill are discussed in **Section 6.3**.

Currently, Dane County disposes of leachate from the existing Dane County Landfill Site No. 2 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 Proposed Landfill. Dane County has been in discussions with MMSD regarding obtaining an Industrial Wastewater Discharge Permit for the Proposed Landfill, and a conditional leachate acceptance letter is included in **Appendix K**.

6.3 LEACHATE GENERATION

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

- Six inches per year for unclosed areas that have a composite liner
- One inch per year for closed areas that have composite cover
- Three inches per year for closed areas that do not have a composite cover (i.e., intermediate cover)

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

- Maximum during operation: 16,470 gallons per day
- Following closure: 5,878 gallons per day

Appendix K includes the detailed calculations.

7.0 CONSTRAINTS ON LANDFILL DEVELOPMENT

7.1 LOCATIONAL CRITERIA

Locational standards specified in s. NR 504.04(3) are addressed below.

7.1.1 Navigable Lake, Pond, or Flowage

Refer to **Section 1.3.5**.

7.1.2 Navigable River or Stream

The Proposed Landfill limits of waste are not located within 300 feet of any navigable stream or river. An unnamed river or stream (WBIC 803000) is located approximately 1,300 feet southeast of the proposed limits of waste. The unnamed stream flows to the northeast and discharges into Door Creek (WBIC 802800). Surface water features are shown on **Plan Sheet 2**.

7.1.3 Floodplain

The Proposed Landfill is not located within a 100-year floodplain, as shown on **Figure 7-1**, which is based on Flood Insurance Rate Maps (FIRM) developed by Federal Emergency Management Agency (FEMA).

7.1.4 Highways and Parks

The proposed limits of waste are located within 1,000 feet of USH 12 & 18 and CTH AB/Brandt Road (**Plan Sheet 2**). Interstate I-90/I-39 is approximately 1,880 feet southwest from the proposed limits of waste (see **Figure 1-1**). Additionally, a parcel to the south of the golf course, approximately 570 feet from the proposed limits of waste, is owned by the City of Madison Parks, which is also zoned as Parks and Recreation (Yahara Hills Park South; see **Figures 4-1** and **4-2**, and **Table 4-1**).

As noted in **Section 4.3**, the former golf course property purchased by Dane County has been rezoned as Industrial-General. The City of Madison plans to maintain 18 holes of the Yahara Hills Golf Course until at least 2042. This has been facilitated through a lease agreement between Dane County and the City of Madison, where approximately 76 acres will be leased back to the City of Madison. The anticipated 18-hole golf course configuration and the lease boundary are shown on **Plan Sheet 2**.

Dane County and City of Madison have a mutual understanding that berms and storm water management features may need to be constructed within the leased boundary.

In accordance with the approved neighborhood development plan, Dane County will maintain a 150-foot buffer around the landfill limits of waste and will construct a 10-foot-high berm within the buffer. Dane County will use additional screening measures including:

- Preserving as many existing mature trees around the perimeter of the proposed as practicable.
- Planting additional trees in select areas of the site (refer to the Landscape Plan in **Appendix L**).

- Creating a waste berm along the outside edge of the waste mass that includes intermediate soil cover placed on the exterior slope, then placing waste on the interior side of 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 Proposed Landfill to the waste placement operations and will 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 waste or soil berms for screening from USH 12 & 18, CTH AB/Brandt Road, and from the recreation areas are included in **Appendix L**. 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.

7.1.5 Airports

Refer to **Section 4.6**.

7.1.6 Water Supply Wells

Refer to **Section 1.4.1.2.**

7.1.7 Fault Areas, Unstable Zones, and Seismic Impact

The Proposed Landfill is not located within 200 feet of a known Holocene fault or within a seismic impact zone, nor within an unstable area. There are no faults in Wisconsin known to have had displacements in the Holocene Epoch. Inferred faults are shown in the area of the Proposed Landfill on the "Preliminary Bedrock Map of Dane County, by Brown and others (2013) (**Appendix H**). However, these faults are inferred from stratigraphic relationships in the subsurface which may be associated with folding and faulting but that are not well documented or understood at this time. Additional discussion on the bedrock geology in the area of the inferred faults is provided in **Section 5.2.3**.

7.2 PERFORMANCE STANDARDS

7.2.1 Wetlands

The entire property has been evaluated for wetlands. In November 2021, TRC Environmental Corporation (TRC) performed a wetland delineation study on the northern 157 acres (former Parcel No. 251/0710-254-0099-7) and identified five wetlands and one pond, outlined below:

- W-1 located in a depressional swale on the NE corner of the project area (3.66 acres),
- W-2 located in a swale on the NW corner of the project area (0.08 acres),
- W-3 located in a swale on the NW corner of the project area (0.01 acres),
- W-4 located as an isolated wetland contained within a shallow depression on the eastern portion of the project area (0.18 acres),
- W-5 located around the edge of a manmade pond in the central portion of the project area (0.11 acres), and
- P-1 is a manmade pond located in the central portion of the project area (2.02 acres).

In April 2022, Heartland Ecological Group (Heartland) performed a wetland delineation study on the southern 73 acres (former Parcel No. 251/10-361-0099-0). Heartland prepared a Wetland Determination Summary letter, dated May 23, 2022, and determined there were no wetlands present. The wetland delineation reports by TRC and Heartland are provided in **Appendix M.** Wetlands within the vicinity of the Proposed Landfill are shown on **Plan Sheet 2**.

In response to a request for Jurisdictional Determination, the USACE concluded that none of the wetlands were waters of the US and are therefore not required to obtain USACE authorization to discharge dredged or fill material (refer to the December 20, 2022, USACE letter included in **Appendix B**).

WDNR concluded that wetlands P-1, a portion of W-1 (0.61 acres), W-4, and W-5 are artificial wetlands exempt from state wetland permitting (refer to March 30, 2023, letter from WDNR included in **Appendix B**). WDNR further clarified that pond P-1 was artificial in nature and that no regulatory authority regarding Chapter 30 or 281 applies to this wetland/waterbody (refer to May 18, 2023, email from Mr. Allen Ramminger included in **Appendix B**).

While the Proposed Landfill will impact these wetlands, they are not subject to permitting requirements as they are non-jurisdictional and artificial in nature.

7.2.2 Endangered or Threatened Species

Refer to **Section 4.4.4**.

7.2.3 Surface Water

Detrimental effects on the surface water adjacent to the landfill are not expected. The design for control of surface water runoff from the Proposed Landfill will include berms, swales, and ditches located adjacent to and on the final cover of the landfill that will collect and divert water through downslope flumes to a perimeter sedimentation basin (see **Plan Sheet 26** for the conceptual sedimentation basin).

The sedimentation basin will limit the discharge of sediment to adjacent properties in accordance with applicable soil erosion regulations and local, state, and federal storm water runoff regulations. The potential for impacts due to surface water runoff is further discussed in **Section 8.10**. The Proposed Landfill 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 s. NR 504.045 are not expected as a result of the construction or operation of the Proposed Landfill. The Proposed Landfill includes a composite liner system, including a 4-foot-thick low-hydraulic conductivity clay layer overlain by a geomembrane liner and a leachate collection and removal system. The facility will also include a composite final cover system, which will limit infiltration through closed portions of the Proposed Landfill. In addition, the design includes a proposed underdrain system that restricts groundwater from reaching the liner (see **Section 8.4**).

7.2.5 Explosive Gases

The Proposed Landfill design will include a landfill gas collection and control system to collect gas from the Proposed Landfill. The landfill gas collection system prevents the migration of explosive gases. A detailed landfill gas collection system design to control the migration of explosive gases in accordance with s. NR 504.08 will be included as part of the Plan of Operation. Additionally, the proposed monitoring system includes gas probes to be installed around the perimeter of the landfill limits of waste to routinely monitor for landfill gas migration.

7.2.6 Hazardous Air Contaminants

The Proposed Landfill design includes a landfill gas collection and control system to collect gas from the Proposed Landfill. The landfill gas collection and control system will control emissions of hazardous air pollutants in accordance with state and federal air pollution control requirements. A detailed landfill gas collection system design will be included as part of the Plan of Operation.

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

7.3 GEOTECHNICAL INFORMATION

Per the requirement of s. NR 512.13 (2), following is an analysis of the geologic, hydrogeologic, topographic, and hydrologic features of the Proposed Landfill site that may be favorable or unfavorable for landfill development.

7.3.1 Geologic

Site geologic factors which may affect development of the Proposed Landfill site include the soil types present, the depth to bedrock, and the types, characteristics, and variability of the bedrock strata.

The soil types present are favorable for landfill development. The loess meets the requirements for liner quality clay, so clay for the landfill liner and cover may be obtained from on site. A clay borrow investigation will be conducted within the Proposed Landfill footprint and included as part of the Plan of Operation report (refer to Section 9.1). The predominant soil that will remain in place below the Proposed Landfill subbase and in the areas adjoining the landfill is till. The till is dense and massive, with few interbedded stratified layers. The till has low vertical hydraulic conductivity – on the order of 10^{-6} cm/sec, based on laboratory testing (Table 5-13). There is very little glacial outwash, or other sorted sediment at the site. The outwash at the site is located at the north end of the site and is primarily outside of the Proposed Landfill footprint.

The bedrock geology at the site is complex with several rock types including carbonate and clastic rocks belonging to several major stratigraphic units. However, all of the rocks to the depth investigated as part of the Geotechnical Investigation Program are sedimentary rocks and appear to have similar physical characteristics. Also, as indicated by geologic logs for supply well in the area of the Proposed Landfill, all the rocks to a depth of approximately 1,000 feet are sedimentary. Metamorphic and igneous rock, which are expected to have very different physical characteristics from the sedimentary units, are only present at greater depth and are not anticipated to have any effect on landfill development.

Only very minor solution features such as vugs have been observed in the carbonate rocks at the site. No indications of karst features, such as significant voids, were observed. The clastic rocks at the site are generally finer grained sandstone, siltstone, and clay. Generally there are no great horizontal hydraulic conductivity contrasts resulting in preferential flow pathways or localized perching of groundwater. Based on the results of single-well response tests conducted on the piezometers installed as part of the Geotechnical Investigation Program, the horizontal hydraulic conductivity of the bedrock is on the order of 10^{-4} cm/sec, which is similar to the hydraulic conductivity test results for the wells screened in the till (**Table 5-6**).

Based on the results of the Geotechnical Investigation Program, the bedrock surface in the area of the Proposed Landfill site does not have an extensively weathered zone. Extensive weathering in the upper bedrock could serve as a preferential flow path with much higher permeability than the rock body as a whole. Bedrock features such as bedding, layering, cementation and degree of induration observed in the upper bedrock are generally consistent with the rock features at greater depth.

The separation from bedrock was identified by the WDNR as a potential constraint on site feasibility in the ISR Opinion Letter (**Appendix B**). The depth to bedrock does not allow for the required 10-foot separation between the subbase grades and the bedrock surface in all areas of the Proposed Landfill (refer to **Section 8.4**). The elevation of the bedrock surface is variable, with a relatively high area near the center of the site, which affects the subbase grades and the overall position of the landfill base. To address the depth to bedrock constraint, the proposed subbase grades have been developed with varying slopes to stay above bedrock while maintaining a soil cut-fill balance.

In addition, Dane County plans to drill additional soil borings in the areas where bedrock is closest to the proposed subbase grades and will modify the proposed subbase grades as part of the Plan of Operation design, as necessary (refer to **Section 1.4.3**). Based on the features such as bedding, layering, cementation and degree of induration observed in the bedrock, the rock can likely be removed with typical excavating equipment if localized higher areas are encountered during construction.

The site geology is discussed in greater detail in **Section 5.2**.

7.3.2 Hydrogeologic

Hydrogeologic features which could potentially affect the development of the Proposed Landfill site include the depth to the water table and the groundwater flow directions and velocities in the soil and bedrock.

The depth to the water table varies seasonally from less than 1 foot bgs in the central part of the site to more than 50 feet bgs at the southeast corner of the site. The site generally does not meet the requirement for a 10-foot separation between the subbase grades and the water table (NR 504.06 (2)(b)) and an exemption from this requirement is requested in **Section 1.4.2**. Dane County proposes to include an underdrain system to maintain the water table below the bottom of the composite liner system (refer to **Section 8.4**).

Groundwater flow directions and velocities need to be considered in the development of the monitoring system for the Proposed Landfill. Groundwater flow directions at both the water table and the piezometer level have been consistent through the period of monitoring from March to December 2023. Groundwater flow directions at both levels have been predominantly to the north with a component of flow to the east from the highest groundwater elevations located in the southeast part of the site. The groundwater flow directions result in a wider area that will be in the down-gradient

flow direction from portions of the fill area, potentially necessitating additional groundwater monitoring points. Because of the complex bedrock stratigraphy additional groundwater monitoring wells may be needed to adequately monitor flow along any specific stratigraphically controlled pathway. Vertical gradients between the water table and piezometer level are generally very low, indicating the flow is predominantly horizontal reducing the need to monitor at multiple piezometer levels. The groundwater monitoring program, including additional or replacement monitoring well locations, monitoring parameters, and monitoring frequencies, will be outlined as part of the Plan of Operation (refer to **Section 8.14.1** for additional information).

As discussed in **Section 5.3**, groundwater flow velocity at the water table and at the piezometer level is similar, with somewhat higher estimated averages to the east than to the north. Overall groundwater flow velocity is fairly low or moderate, which is a favorable condition for the site.

The shallow depth to groundwater and the range of flow directions have been addressed by the feasibility investigation and creating a monitoring program based on the findings of the investigation. The groundwater monitoring program is outlined in **Section 8.13.1**.

In the area of the Proposed Landfill, the unlithified sand and gravel aquifer, and upper bedrock units are generally not used for water supply. The water supply wells on the Proposed Landfill property primarily draw water from the Cambrian sandstone, which is a favorable consideration for development of the Proposed Landfill.

7.3.3 Topographic

Site topographic features that could potentially affect the development of the Proposed Landfill site include the ground surface elevations and slopes. The site topography is favorable for landfill development because it is characterized by a generally flat surface that slopes gently from the southeast at an elevation of about 930 feet above mean sea level (M.S.L.), to the northwest at an elevation of about 870 feet above M.S.L. The Proposed Landfill subbase and underdrain system, constructed to slope from south to north, utilize the original ground surface slope to allow gravity drainage of the underdrain system, and groundwater discharge from the underdrain system to the current drainage areas northwest of the Proposed Landfill.

Given the site topography, maintaining surface water drainage within the current drainage basins as the site is constructed will be achievable.

7.3.4 Hydrologic

Hydrologic features that could potentially affect the Proposed Landfill development include surface water features and wetlands. Five wetlands and one pond have been identified on the Proposed Landfill site as discussed in **Section 7.2.1,** and as summarized below:

- Wetland W-1 located in a depressional swale on the NE corner of the project area (3.66 acres),
- Wetland W-2 located in a swale on the NW corner of the project area (0.08 acres),
- Wetland W-3 located in a swale on the NW corner of the project area (0.01 acres),
- Wetland W-4 located as an isolated wetland contained within a shallow depression on the eastern portion of the project area (0.18 acres),
- Wetland W-5 located around the edge of a manmade pond in the central portion of the project area (0.11 acres), and

- Pond P-1, a manmade pond, located in the central portion of the project area (2.02 acres).

Wetland W-1 (3.66 acres) located on the NE corner of the project area was previously filled as part of the WisDOT USH 12 & 18 and CTH AB interchange project.

Because the on-site wetlands that may be impacted are artificial and non-jurisdictional, no additional evaluation of impacts is required, and no unfavorable effect of the on-site wetlands due to the Proposed Landfill development is anticipated.

The man-made pond will be filled in to construct the Proposed Landfill. The pond is likely connected to shallow groundwater but there is no indication that there is preferential groundwater discharge to the pond, such as being spring fed, so that once drained and backfilled the pond is not anticipated to have an unfavorable effect on landfill development.

The surface water control features for the Proposed Landfill will maintain an approximate surface water balance compared to existing conditions, minimizing effects on surface water. The surface water management design is discussed in **Section 8.10**.

7.4 CONSTRUCTION AND OPERATION

There are no constraints with regard to design, materials, or support services necessary to construct and operate the Proposed Landfill.

- Soils needed to construct and operate the Proposed Landfill include clay, general fill, barrier soil (as an option for the final cover), topsoil, and daily and intermediate cover. These soils will be obtained from on-site excavations and off-site borrow sources. A discussion of off-site borrow sources for the clay and barrier soil materials is included in **Section 9.0**.
- Other materials such as granular fill and drainage aggregate for the leachate collection system are commercially available.
- The geomembrane, geosynthetic clay liner (GCL), geotextile, and other geosynthetics needed for construction are commercially available.
- Specialized engineering structures such as the scale, office, site entrance, leachate lift station, environmental monitoring features, and sedimentation basins are also typical features constructed at other landfills. Landfill gas extracted from the Proposed Landfill will be managed as described in **Section 8.9**. Further analysis and details will be provided as part of the Plan of Operation.
- Supporting design calculations for material quantities required for construction are included in **Appendix N**.

Leachate treatment is not a constraint on landfill development and is discussed in **Sections 6.2** and **8.6**. A proposed leachate forcemain is anticipated to convey leachate to the existing City of Madison sewer line that will convey the collected leachate to MMSD. Alternatively, the County may recirculate leachate within the active waste area if a leachate recirculation plan is proposed and approved as part of the Plan of Operation.

Dane County is in discussions with MMSD to accept leachate from the Proposed Landfill. MMSD has provided a conditional leachate acceptance letter indicating their understanding of the proposed plan to discharge leachate from the Proposed Landfill to the MMSD wastewater treatment plant

(Appendix K). A draft leachate treatment agreement will be included as part of the Plan of Operation. MMSD currently accepts leachate from Dane County Landfill Site No. 2.

Dane County will operate Dane County Landfill Site No. 3, similar to the current operation of Dane County Landfill Site No. 2. Site personnel and equipment are expected to be consistent with the current landfill 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, security, monitoring and maintenance of leachate and gas control systems, and grounds maintenance.

7.5 EXISTING FACILITY PERFORMANCE

NR 512.13(4) requires a discussion regarding existing facility performance for a proposed contiguous, horizontal or vertical expansion of an existing landfill. The Proposed Landfill is not a contiguous, horizontal or vertical expansion of an existing landfill.

8.0 ENGINEERING AND DESIGN

8.1 GENERAL

The Proposed Landfill is being pursued 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 the Proposed Landfill.

The Proposed Landfill is designed to meet or exceed local, state, and federal performance requirements, including NR 500 and RCRA Subtitle D regulations. Construction operations and long-term care will be conducted to minimize or eliminate impacts to the surrounding environment and to provide an economical solid waste disposal option 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 Proposed Landfill has a design capacity of approximately 12,386,300 cubic yards (see Appendix N). The design capacity includes waste, daily cover, and intermediate cover. Preliminary proposed final grades for the Proposed Landfill are shown on Plan Sheet 26.

The Proposed Landfill will accept nonhazardous municipal, commercial and industrial wastes, and special wastes from the surrounding area as detailed in Section 6.0. Refer to the Needs Analysis in Section 11.0 for information on available waste disposal capacity in the service area. The Proposed Landfill is estimated to provide 12-13 years of capacity based on historical waste acceptance.

8.3 PRELIMINARY MATERIAL BALANCE

The approximate volumes of material required to construct and cover the first phase of the Proposed Landfill are:

- Phase 1 (14.4 acres) Construction – Clay liner quantity = 92,930 cubic yards (see Plan Sheet 24)
- Closure Area 1 (11.3 acres) – Clay or barrier soil layer quantity = 36,460 cubic yards (see Plan Sheet 26)

Section 9.0 provides information on soil borrow sources. A more detailed volume calculation for the required liner and cover soil materials and available source materials will be provided in the phasing and closure plans of the Plan of Operation for the Proposed Landfill.

8.4 UNDERDRAIN SYSTEM AND SUBBASE GRADES

The proposed subbase grades were developed to provide ease of construction for the landfill liner system above bedrock while meeting or exceeding the minimum slopes for leachate collection as discussed in Section 8.6. The design bottom of the clay component of the liner is above the top of bedrock based on the soil borings completed for the subsurface investigation, including the leachate line undercuts and sumps. An isopach map of the separation distance between the top of the bedrock and the proposed subbase grades is provided in Appendix O.

The Proposed Landfill subbase grades will be below the current seasonal high water table, and an underdrain system will be used to maintain the water table below the bottom of the clay component of the composite liner. The underdrain system will be designed to meet the following:

- The bottom of the clay component of the liner (i.e., subbase grades), except at the leachate line undercuts and sumps, will be above the projected high groundwater elevations with the underdrain system operating under gravity-drained conditions.

- At the leachate line undercuts and sumps, with the underdrain system operating under gravity-drained conditions, the projected high groundwater elevations will be below the top of the clay component of the liner.

In general, the underdrain system will consist of groundwater collection pipes located below the liner. The design may include a partial sand or geocomposite drainage layer below the liner. The collected groundwater will flow via gravity to a manhole outside the limits of waste near the northwest corner of the Proposed Landfill. From the manhole, groundwater will be discharged via gravity to existing Golf Course Pond #1 or Pond #6 located west of the Proposed Landfill (see Plan Sheet 2), or to a new pond constructed on the Proposed Landfill property, or will be pumped to an alternative discharge location at or downstream from WisDOT Pond B (see Plan Sheet 2). Discharged groundwater will ultimately flow to the drainage ditch on the west side of the golf course. The underdrain discharge will be permitted under a Wisconsin Pollution Discharge Elimination System (WPDES) General Permit prior to construction.

The preliminary estimate of the long-term average discharge rate from the underdrain system is approximately 50 gallons per minute (gpm) based on current average water table conditions. Preliminary estimates of the discharge rate from the underdrain system for the peak flow shortly after construction of the final phase range from approximately 50 to 90 gpm. The underdrain will be installed primarily in the Horicon Till, which has an estimated hydraulic conductivity of approximately 6×10^{-4} centimeters per second based on slug test results (Table 5-6). Flow from the underdrain system is expected to decrease over time as the water table elevation below the landfill decreases in the future due to reduction in recharge by the landfill liner and cover and the termination of golf course irrigation in the landfill area.

The preliminary underdrain system design is shown on Plan Sheets 23 and 28, and preliminary flow calculations are included in Appendix O. Complete design calculations and details for the underdrain system will be provided in the Plan of Operation. The design concepts proposed for the underdrain have been implemented successfully at other landfills in Wisconsin.

The proposed subbase grades in approximately 30 percent of the Proposed Landfill (24 acres) are above the seasonal high water table (see cross sections on **Plan Sheets 7** through **22**). In these areas, the underdrain will not typically collect water. In the remaining areas of the Proposed Landfill, the underdrain may only collect groundwater seasonally. Water level monitoring in 2023 showed a decrease in the average water table elevation of more than 5 feet between March and December.

Clay material remaining below the proposed subbase grades may be removed and replaced with general fill, pending additional clay borrow source investigations and permitting. Clay material is present in the loess layer near the land surface; therefore, most of the on-site clay is above the proposed subbase grades and only limited quantities are anticipated to be below the subbase grades. Additional details will be provided in the Plan of Operation following a clay borrow site investigation of clay materials within the Proposed Landfill footprint as outlined in s. NR 504.075(2)(b).

8.5 LINER SYSTEM

Preliminary base grades are shown on **Plan Sheet 24**. The proposed base grades are 4 feet higher than subbase grades to accommodate a composite liner system consisting of a 60-mil HDPE geomembrane over 4 feet of clay. The proposed base grades provide the minimum slopes for the liner surface as required under s. NR 504.06(2)(d). The sidewall slopes are within the range for interior sidewall slopes allowed under s. NR 504.06(2)(g)

The composite liner system will be designed in accordance with s. NR 504.06. A geotextile cushion will be placed over the geomembrane and covered by a 1-foot leachate drainage layer.

8.6 LEACHATE COLLECTION SYSTEM

The leachate collection system will be designed in accordance with s. NR 504.06(5) and (6) and will consist of a granular drainage layer, leachate collection/transfer pipes, and leachate collection sumps along the landfill base. Leachate will be pumped from each sump to a perimeter leachate vault or manhole. From there, a dual walled forcemain or gravity line will direct the leachate to a sampling and metering manhole and lift station, with discharge to the MMSD sanitary sewer system. The preliminary leachate collection system layout is shown on **Plan Sheet 24.** The detailed leachate collection system layout will be provided in the Plan of Operation.

Leachate collection lines are sloped at 1 percent, exceeding the 0.5 percent minimum requirement required by s. NR 504.06(5)(b). In accordance with s. NR 504.06(6)(c), pipe settlement calculations will be performed as part of the Plan of Operation, and the leachate collection line slope will be increased if needed to account for consolidation settlement of the site soils. The longest leachate collection line will measure approximately 2,000 feet from the limits of waste to the toe of the slope from each direction.

The base of the Proposed Landfill includes a herringbone design with ridges and valleys having minimum slopes of 2 percent towards the perforated leachate collection pipes (see **Plan Sheet 24**). The proposed leachate collection system was designed to provide effective collection and removal of leachate from the landfill. Leachate headwells will be included in each phase to measure the leachate head on the liner system. Leachate headwell locations will be included in the Plan of Operation.

8.7 FINAL COVER SYSTEM

The final cover system will meet the requirements of s. NR 504.07 and is anticipated to consist of the following layers from the top down:

- Clay option
  - Native vegetation or a WisDOT standard highway seed mixture under Section 630
  - 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 per s. NR 504.07(4)

- Geosynthetic Clay Liner (GCL) option:
  - Native vegetation or a WisDOT standard highway seed mixture under Section 630
  - 0.5 foot of topsoil
  - 2.5 feet of rooting zone
  - Geocomposite drainage layer
  - 40-mil LLDPE geomembrane
  - GCL
  - 2 feet of barrier soil per s. NR 504.07(4)(a)

Native vegetation has been approved and used at the existing Dane County Landfill Site No. 2 and is proposed as an option for Dane County Landfill Site No. 3. The native vegetation provides the following benefits:

- Minimal mowing requirements (no burning will be done; spot herbicide treatments used as necessary);
- Maintain erosion control;
- Create habitat for bees and butterflies through nectar-producing species;
- Shallow rooting depth (majority of roots in upper 18 inches of soil column); and
- Seed habitat aligned with Dane County's vision of restoration encouraging pollinator habitat.

The final cover, or portions thereof, may also be stabilized with grass. Seed mixtures and sowing rates will be based on those specified for highways under Section 630 of the latest edition of the WisDOT Standard Specifications.

As shown on **Plan Sheet 26**, 4H:1V final cover slopes are proposed (excluding surface water diversion berms).

8.8 INTERMEDIATE WASTE GRADES

Dane County proposes maximum intermediate waste grades higher than the final waste grades to allow for settlement. The intermediate waste grades are proposed to be 5 percent higher than the final waste grades, measured from the top of the leachate collection layer. Proposed intermediate waste grades are shown on **Plan Sheet 25**. Prior to placement of final cover in a given area, waste grades will be surveyed to ensure design capacity is not exceeded and regraded as necessary to accommodate placement of the composite cover to permitted final grades.

To create a uniform surface and slope for final cover construction, either reclamation or excavation of exterior slopes may be necessary prior to final cover construction. This is critical to the long-term performance and maintenance of the final cover system, and in particular the surface water management system (diversion berms and downslope flumes).

Procedures for slope reclamation by waste placement typically consist of the following:

- Stripping intermediate cover soils to expose previously placed waste.
- Cutting steps into the existing waste to remove or interrupt the potential for any failure planes within the stripped area.
- Staging incoming waste along the top edge of the stripped area.
- Pushing the incoming waste down the slope to the stripped area.
- Compaction and grading of placed waste.
- Placement of grading layer soils to approved waste grades.

Removal or excavation of waste to final waste grades typically consists of the following procedures:

- Stripping intermediate cover soils to expose previously placed waste.
- Excavation of waste to final waste grades, compaction of the exposed surface and placement of grading layer soils.

The benefits to excavating waste from exterior slopes as opposed to placing waste include:

- Reduced time in achieving final waste grades as waste removal is under control of the operator or contractor as opposed to being dictated by the incoming waste streams and volumes.
- Reduction in litter associated with pushing waste down the slope to areas that are underfilled.
- Protection of leachate and gas infrastructure on the slope is more effective during waste excavation activities since it is more visible. Pushing waste to underfilled areas can block the equipment operator's line of sight.
- Leachate and gas collection infrastructure may be cut and lowered or require no adjustment rather than needing to be extended. Extension of leachate or gas collection lines weakens the infrastructure.
- The waste beneath intermediate cover soils is typically of a higher moisture content which reduces the "rebound" effect and provides a much more stable base for final cover construction.

8.9 LANDFILL GAS MANAGEMENT SYSTEM

Section 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. Gas monitoring probes will be installed around the perimeter of the landfill to allow monitoring for subsurface migration of landfill gas.

The Proposed Landfill gas collection system design will be provided as part of the Plan of Operation submittal. The design of the Proposed Landfill gas management system will include vertical gas extraction wells connected by lateral and header pipes. A blower system will draw landfill gas from the wellfield under vacuum and transfer it to a treatment system or control device.

Dane County may pipe landfill gas to the existing renewable natural gas (RNG) plant located at the existing Dane County Landfill Site No. 2 (Rodefeld) across USH 12 & 18 (**Plan Sheet 2**). It is anticipated that at some point during the life of the Proposed Landfill the existing RNG plant will be at capacity for both Dane County Landfill Site No. 2 and proposed Dane County Landfill Site No. 3. It is anticipated that a new landfill gas treatment system for RNG or other beneficial use of the landfill gas will be constructed on the Proposed Landfill property. Landfill gas may also be combusted in a flare at times when beneficial use options are not available. Further analysis and details will be provided as part of the Plan of Operation.

Driplegs and/or condensate sumps will be installed along the header piping as needed to prevent condensate buildup from limiting gas flow in the piping system. A new blower will be installed to extract the landfill gas.

Construction of vertical gas extraction wells will consist of 36-inch-diameter boreholes drilled through the waste and extended to achieve a 10 feet vertical separation from 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 Proposed Landfill and 150 feet for interior wells. Gases from the wells will be transferred to a header pipe, which will be sloped at a minimum of 2 percent, if located over the waste mass, so that condensate within the gas system can be collected and treated with leachate.

Dane County will submit an air pollution control construction and operation permit application to the WDNR Air Quality Division. Construction of the Proposed Landfill will not proceed until an air permit is obtained by Dane County. Additional details of the landfill gas monitoring plan are included in **Section 8.14.4**.

8.10 STORM WATER MANAGEMENT SYSTEM

8.10.1 Storm Water Management System Features

The surface water management system will be designed to meet the requirements of s. NR 504.09, NR 216, NR 151 and Chapter 14 of Dane County ordinances.

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 proposed diversion berm design is a 2 percent minimum 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 flumes consist of smooth walled piping and are designed for a 25-year, 24-hour storm event.
- Perimeter ditches to route surface water to the sedimentation basins. The perimeter ditches are designed for a 25-year, 24-hour storm event.
- Culverts to route surface water from the perimeter ditches to the sedimentation basin and at other infrastructure crossings. Culverts are designed for a 25-year, 24-hour storm event.
- A sedimentation basin(s) to provide treatment for the collected storm water before discharging to existing storm sewers, swales or downstream discharge locations. 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 is designed for a 100-year storm event, and the principal outlet is designed for a 25-year, 24-hour storm event.

Appropriate sizing of the features will be done as part of the Plan of Operation for the Proposed Landfill.

8.10.2 Pre- and Post-development Surface Water Patterns

Development of the Proposed Landfill will alter surface water drainage patterns in the immediate area of the landfill. During landfill operations, surface water runoff that comes into contact with waste or daily cover will be treated as leachate. Surface water runoff from intermediate or final cover areas will be routed via diversion berms, downslope flumes, perimeter ditches to sedimentation basins. The sedimentation basins will limit the release of sediment to adjacent properties and surface waters (including wetlands) in accordance with applicable soil erosion regulations and/or local, state and federal storm water runoff regulations. The storm water management system will be designed to meet WDNR and Dane County storm water performance standards, which includes providing a post-development discharge rate for multiple storm events less than or equal to the pre-development discharge rate. The full storm water management system design and demonstration of compliance with the performance standards will be provided as part of the Plan of Operation. Best management practices will be implemented to minimize and control erosion.

8.11 PRELIMINARY SLOPE STABILITY EVALUATION

Appendix O 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 at Dane County Landfill Site No. 3.

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 1.95, which exceeds the minimum recommended safety factor of 1.5. The results confirm that the proposed final waste slope of 4H:1V peaking at an approximate elevation of 1,135 feet above mean sea level (M.S.L.) will be stable. The slope stability analysis of the Proposed Landfill final cover system will be included as part of the Plan of Operation.

8.12 POTENTIAL C&D RESIDUALS AND FINES MONOFILL

Dane County is considering including a monofill area within the Proposed Landfill for the disposal of construction & demolition (C&D) residuals and/or fines from the C&D recycling facility located at the Rodefeld Landfill property. C&D residuals consist of materials that are not sent for post-market use. C&D residuals are currently disposed with MSW waste at the Rodefeld Landfill. C&D fines consist of small (generally less than 2-inch) material from the C&D processing operation. C&D fines are currently used as alternative daily cover at the Rodefeld Landfill.

The monofill area would be designed to segregate the landfill gas generated by the C&D residuals and/or fines. Under landfill anaerobic conditions, gypsum-containing materials, such as plasters, drywall, ceiling tiles, partitions, and building blocks break down, and sulfates contained in those items are converted to hydrogen sulfide (H_2S), dimethyl sulfide, and mercaptans. H_2S has a low odor threshold and is corrosive in nature. The presence of H_2S in landfill gas may require additional treatment and maintenance of the landfill gas system features if it were to be processed for

beneficial reuse (e.g., renewable natural gas, renewable electricity, etc.). If placed in a monofill, the organic fraction subject to decomposition and generation of H_2S is reduced. Additionally, a separate landfill gas system could be installed in the monofill area to manage the high H_2S gas separately from the remaining landfill gas.

Based on disposal records for the Rodefeld Landfill for the last 3 years, the average residuals and fines disposed from the C&D recycling facility are:

- 2020 – 2023 Average C&D Residuals = 32,000 tons per year
- 2020 – 2023 Average C&D Fines = 15,000 tons per year

Figure 8-1 shows concepts for how a monofill area could be incorporated into the Proposed Landfill design along with key design concepts.

Dane County will continue to evaluate the need and advantages or disadvantages of including a monofill area(s) in the Proposal Landfill. If Dane County decides to pursue this option, detailed design of the monofill area(s) will be provided as part of the Plan of Operation, including capacity needs, leachate collection system layout, landfill gas system layout, description of C&D material disposal and management in the monofill, closure sequencing, monitoring of the monofill area, and separation details as needed for overlay of MSW materials over the monofill area.

8.13 SITE DEVELOPMENT AND OPERATING PROCEDURES

8.13.1 General

The development and operation of the Proposed Landfill will meet or exceed local, state, and federal requirements, including NR 500 and RCRA Subtitle D. The Proposed Landfill will be developed, operated, and closed in phases. Operational practices will be carried out to minimize impacts to the surrounding environment and to a provide cost-effective solid waste disposal for the service area.

8.13.2 Site Access

Access to the site will be restricted by gates, fencing, and natural barriers. Traffic to the site will use USH 12 & 18, CTH AB/Brandt Road, and Millpond Road. New entrances will be constructed off of CTH AB/Brandt Road and Millpond Road. Large vehicle (commercial) traffic will be routed to the entrance on CTH AB/Brandt Road to the landfill. Small vehicle traffic will be routed to the entrance on Millpond Road to material drop-off facilities, where material will then be transferred to the landfill or diverted for recycling. Entrance gates will be constructed as necessary to limit access to the site outside hours of operation. A proposed maintenance facility, scales, scale office, and material drop-off facility will also be constructed for the Proposed Landfill. Details of these support features will be presented with the Plan of Operation. From the scales, access to the active working face will be on all-weather access roads. Perimeter access roads will be constructed around the Proposed Landfill as shown on Plan Sheets 23 through 27.

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 vehicles prior to accessing CTH AB/Brandt Road.

A 66-foot-wide easement exists along the southern end of the property for a future access road to Ho-Chunk Gaming to the west of the property.

8.13.3 Site Operations, Development, and Phasing

The Proposed Landfill will be operated according to the provisions of NR 506 and the conditions of approval from the Plan of Operation. Development of the Proposed Landfill will occur in seven phases as shown on **Plan Sheets 23** and **24** and conceptually closed as shown on **Plan Sheet 26**. Site phasing and development will be further defined as part of the Plan of Operation.

In general, daily landfill operations will be 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 7.1.4** 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 26**, excluding the 0.5-foot grading layer. Intermediate waste grades may at times be as much as 5 percent higher than the final waste grades when compared to the total depth of waste at a given location, as shown on **Plan Sheet 25**. Prior to the placement of final cover in a given area, waste grades will be surveyed to ensure design capacity is not exceeded 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 prior to final cover placement. **Section 8.8** provides additional information on intermediate waste grades.

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 ditches, mowing, and potential regrading of storm water management features if eroded during rain events. Erosion mat or riprap will be placed and maintained as needed.

Dust, noise, odor, and litter 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. A detailed dust control plan will be included as part of the Plan of Operation.
- Operational activities will occur during normal business hours, as detailed in **Section 3.0**. As such, the relative noise level is expected to be similar to that from the existing operations at Dane County Landfill Site No. 2 located across from USH 12 & 18.
- Odors will be controlled through:
  - Minimizing the area open for waste placement, including installing permanent cap over closed areas of the landfill, and installing temporary cover soils over as much of the uncapped landfill area as possible.
  - Placement of daily cover or an approved alternate daily cover material over the active area at the end of each day of operation.
  - Installing landfill gas wells sooner and possibly closer together than required to collect landfill gas as it is generated. This includes horizontal gas collection wells at intermediate elevations within the active area.
  - Operation of the active gas extraction system. This includes inspecting and monitoring the entire wellfield on a monthly basis, at a minimum.
  - Performing quarterly surface emission monitoring (SEM) and identifying areas in need of repair or additional soil cover.

  - Utilizing odor masking agents when appropriate.
  - An online Odor Reporting Form and creation of a formal procedure to ensure quick response to odor complaints.
  - Installing on-site weather stations, as necessary.

  A detailed Odor Control Plan will be included as part of the Plan of Operation.
- 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, as needed. Paper and other wind-blown debris will be collected on an as-needed basis. A Litter Control Plan will be included with the Plan of Operation.

8.14 ENVIRONMENTAL MONITORING PROGRAM

The following monitoring plan is a comprehensive program for monitoring groundwater, leachate, surface water, and landfill gas. This version of the environmental monitoring plan is preliminary, pending completion of the landfill Plan of Operation and approval by the WDNR. The complete proposed environmental monitoring program will be submitted as part of the Plan of Operation in accordance with s. NR 514.06(7)(a). The Environmental Sampling Plan is provided in **Appendix P** and will be updated to reflect the final monitoring program in the WDNR Plan of Operation approval after the approval is issued.

8.14.1 Groundwater Monitoring

Groundwater monitoring will be performed at the water table wells and piezometers in accordance with the preliminary monitoring program included in **Appendix P**, and subsequent modifications detailed in the Plan of Operation approval. The final groundwater monitoring plan will be designed to evaluate water quality information for key constituents regulated under NR 507 and NR 140 at locations upgradient and downgradient of the landfill. Static water levels measured before sampling will be used to evaluate groundwater flow patterns and gradients at the site. Monitoring of the underdrain discharge will follow the requirements of the WPDES General Permit that will be obtained prior to construction.

Some modifications to the preliminary groundwater monitoring plan in **Appendix P** are anticipated. Because the geotechnical investigation and monitoring well installation was based on a larger area than required for the current proposed limits of waste, some of the monitoring wells and piezometers installed for the feasibility investigation are located more than 300 feet from the limits of waste (e.g., MW-105/MW-105A) or are located in conflict with planned roads, berms, or storm water management features (e.g., MW-108, MW-111). The complete network of wells installed for the feasibility investigation provides the information needed to assess feasibility, but some well locations will likely need to be modified to provide the long-term groundwater monitoring network for the Proposed Landfill.

The final groundwater monitoring program will be proposed as part of the Plan of Operation and will include additional wells and/or replacement wells to monitor groundwater upgradient and downgradient from the limits of waste. At a minimum, one new water table and piezometer well nest and one new water table well will be proposed for the north side of the site. The MW-105/MW105A well nest and water table well MW-106 were initially installed to monitor the north side of the site, but are located too far from the currently proposed limits.

The complete background monitoring program required under s. NR 507.18 will be completed for wells added to the monitoring program.

Water supply wells will be monitored in accordance with the monitoring program included in Appendix P.

Discharge from the proposed underdrain system will be monitored in accordance with the WDPES permit obtained prior to construction.

8.14.2 Leachate Monitoring

Leachate monitoring will be performed at the leachate headwells and leachate lift station in accordance with the monitoring program included in Appendix P. Monitoring includes analysis of leachate quality, monitoring of leachate head on the liner, and monitoring of leachate volumes managed. If leachate recirculation is proposed as part of the Plan of Operation, additional leachate drainage basin monitoring related to leachate recirculation and additional liquids application will be performed as required under the leachate recirculation plan. A leachate recirculation plan is anticipated to be submitted as part of the Plan of Operation.

8.14.3 Surface Water Monitoring

Storm water discharge at Dane County Landfill Site No. 3 will be regulated by a WPDES General Permit, to be obtained prior to construction. Surface water monitoring will be performed in accordance with the WPDES General Permit requirements for the facility. The storm water monitoring program elements, including monitoring locations, will be outlined in the Storm Water Pollution Prevention Plan (SWPPP) developed for the landfill and included as part of the Plan of Operation. The SWPPP will incorporate construction events so that separate Construction Site Storm Water Permit coverage will not be required.

8.14.4 Landfill Gas Monitoring

An active gas extraction system will be constructed at the Proposed Landfill and will be expanded throughout the phased development. The specific number and location of gas extraction wells for the Proposed Landfill will be detailed in the Plan of Operation. The gas extraction wells, blower system, and treatment systems or control devices 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.

Gas system monitoring will be performed at the gas extraction wells, gas probes, and blower system in accordance with the monitoring program included in Appendix P.

8.15 VISUAL SCREENING

Visual screening from the landfill's waste disposal activities to the Yahara Hills public golf course, Yahara Hills Park South, USH 12 & 18, and CTH AB/Brandt Road will be provided by the measures described in Section 7.1.4.

8.16 FINAL USE

The current final use plan for the Proposed Landfill is open green space or recreation, 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.

9.0 SOIL BORROW SOURCES

9.1 CLAY BORROW SOURCE

The clay used for construction of the Proposed Landfill liner and final cover capping layer will consist of imported material. The CTH N borrow source has been identified and approved for use at Dane County Landfill Site No. 2 (**Appendix B**). This borrow site is anticipated to be used at the Proposed Landfill. The volume of clay available at the CTH N site and the approximate volumes of clay required for the first phase of liner and cover construction are as follows:

- Volume of clay available at CTH N borrow site: 139,750 cubic yards
- Volume of clay required for construction of Phase 1 liner (**Plan Sheet 24**): 92,930 cubic yards
- Volume of clay required for construction of first phase of closure (**Plan Sheet 26**): 36,460 cubic yards

The proposed clay borrow source has sufficient volume of clay to complete the first phase of liner and final cover construction for the Proposed Landfill. A more detailed volume calculation for the required liner and final cover soil materials and available source material will be provided as part of the Plan of Operation for the Proposed Landfill.

A clay borrow investigation is also being performed within the footprint of the Proposed Landfill. The results of the investigation will be provided as part of the Plan of Operation.

9.2 BARRIER LAYER BORROW SOURCE

If the GCL/barrier soil final cover option is used, the CTH N site material may be used as barrier layer soil. As demonstrated in **Section 9.1**, the CTH N site has the volume required for liner and final cover for the initial phase of construction.

10.0 ENVIRONMENTAL ASSESSMENT

The environmental review describes and summarizes the development of the Dane County Landfill Site No. 2 in accordance with s. NR 512.16. The focus of this section is to identify areas that may be affected by the Proposed Landfill and to describe what is being done through the design, construction, and operations to minimize or eliminate potential impacts.

10.1 PROJECT SUMMARY

A request for an ISI for the Proposed Landfill was submitted to the WDNR on March 17, 2022. WDNR performed a site inspection on April 14, 2022, and issued an ISI Response letter on May 11, 2022. The letter indicates that the site is potentially suitable for a landfill. A copy of the ISI Response letter is provided in **Appendix B**.

The ISR for the Proposed Landfill was submitted on September 1, 2022. Based on review of the ISR, WDNR indicated that the site had limited potential for development as a solid waste facility, outlining specific comments regarding the ISR and potential constraints to the site's feasibility. The specific comments and potential constraints identified are presented in **Section 1.3** of this FR. The WDNR ISR Opinion Letter dated November 29, 2022, is included in **Appendix B**.

10.1.1 General Description

Dane County Department of Waste & Renewables is proposing the Dane County Landfill Site No. 3 located in the SE ¼ of Section 25 and N ½ of NE ¼ of Section 36, T7N, R10E, City of Madison, Dane County, Wisconsin, within a portion of the existing Yahara Hills Golf Course. The location of the Proposed Landfill is shown on a USGS topographic map base on **Figure 1-1**. Existing conditions in the area of the Proposed Landfill are shown on **Plan Sheet 2**.

Refer to **Section 1.0** for additional background and **Section 8.0** for the proposed preliminary design.

The design capacity of the Proposed Landfill is approximately 12,386,300 cubic yards, including daily and intermediate cover. The Proposed Landfill would accept non-hazardous municipal, industrial, and commercial solid waste, as well as special wastes (refer to **Section 6.0** for additional information). The sources and types of waste disposed at the Proposed Landfill are not projected to change significantly from what is disposed at the current Dane County Landfill Site No. 2, located across USH 12 & 18 from the Proposed Landfill.

10.1.2 Purpose and Need

The purpose of the Proposed Landfill is to provide future disposal capacity for the service area. Dane County has provided safe, reliable, and reasonably priced waste disposal capacity for Dane County since 1985 at the Dane County Landfill Site No. 2. Dane County Landfill Site No. 2 is expected to reach final capacity in 2028. Based on current filling rates, the approved landfills for the service area are expected to reach capacity during 2030 (refer to the Needs Analysis in **Section 11.0**). The development of the Proposed Landfill will add approximately 12,386,300 cubic yards of landfill capacity for the disposal of waste from residential, commercial, and industrial sources, which will provide approximately 9 additional years of capacity to the service area (**Table 11-6**).

If the proposed Dane County Landfill Site No. 3 is not approved, when the existing Dane County Landfill Site No. 2 capacity is consumed, waste will have to be diverted from Dane County 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 Proposed Landfill is further discussed in **Section 11.0**.

10.1.3 Statutory Authority and Approvals

Following is a list of statutory authorities/approvals required for the proposed Dane County Landfill:

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 Code	WDNR	Air Construction Permit
NR 407, Wisconsin Administrative Code	WDNR	Air Operating Permit

Statute	Statute Authority	General Description
NR 445, Wisconsin Administrative Code	WDNR	Control of Hazardous Pollutants
NR 500 through NR 520, Wisconsin Administrative Code	WDNR	Feasibility Report and Plan of Operation approval
NR 140, Wisconsin Administrative Code	WDNR	Groundwater Quality
NR 141, Wisconsin Administrative Code	WDNR	Groundwater Monitoring Well Requirements
NR 205.08, Wisconsin Administrative Code	WDNR	General permits under Wisconsin Pollutant Discharge Elimination System
NR 216 and NR 151, Wisconsin Administrative Code	WDNR	Storm water discharge and quality
NR 812, Wisconsin Administrative Code	WDNR	Drinking water
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 FR under ch. NR 512, Wis. Adm. Code.

10.1.4 Exemptions, Zoning Changes, and Special Permits

Exemption requests are listed in **Section 1.4**.

In October 2022, the property was rezoned from "Parks and Recreation" to "Industrial – General" (refer to Legistar File ID #73476). Dane County subsequently received a CUP under "IG" zoning code to allow a landfill and accessory landfill infrastructure on the property (**Appendix D**). Additional information regarding zoning may be found in **Section 4.3**. The ISR Opinion Letter did not recommend any applications for special permits. Refer to **Section 2.1** for local approval requirements.

10.1.5 Locational Criteria and Performance Standards

10.1.5.1 Locational Criteria

Locational criteria for landfills includes prescribed setbacks from navigable surface waters, floodplains, state trunk highway right-of-ways, state parks or other natural areas, airports, public or

private water supply wells, fault lines, seismic impact zones, and unstable areas. The Proposed Landfill meets the locational criteria with the exception of:

- Setbacks from private wells as discussed in **Section 1.4.1.2**;
- Setbacks from navigable ponds as discussed in **Section 1.4.1.1**; and
- Setbacks from state trunk highways and public parks, as discussed in **Section 7.1.4**.

10.1.5.2 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. **Sections 1.4.4** and **7.2** discuss each of these in more detail.

The ISR opinion noted that wetlands may limit the potential for site development. The wetlands were determined to be non-jurisdictional and artificial (refer to **Section 7.2.1**). The ISR Opinion Letter stated that the Yahara Hills Golf Course and Clubhouse have been determined to be eligible for the National Historic Register of Historic Places. **Section 4.4.2** discusses historic resources and potential impacts in detail.

10.2 PROPOSED PHYSICAL CHANGES

10.2.1 Terrestrial Resources

The Proposed Landfill is currently used for recreation (i.e., Yahara Hills Golf Course). The 79.0-acre landfill is located on areas that have been previously disturbed for the golf course development and maintenance. The elevations in the surrounding area range from approximately 875 to 930 feet above M.S.L. The Proposed Landfill final cover system will have 4H:1V sideslopes. The anticipated peak elevation of the Proposed Landfill is 1,135 feet above M.S.L., which is approximately 205-260 feet higher than the surrounding existing grades in the area.

The design capacity of the Proposed Landfill is approximately 12,386,300 cubic yards, including waste, daily cover, and intermediate cover. Waste accepted will include nonhazardous municipal, commercial and industrial solid waste, and special waste. The footprint of the Proposed Landfill and support features (e.g., sedimentation basin, access roads, scale, etc.) is well-maintained and manicured grass/turf in the tee boxes, fairway and greens for the golf course, along with longer grass, trees and shrubs in the rough. An existing golf course pond used for irrigation water supply will be removed with the Proposed Landfill.

Soil used in development of the Proposed Landfill will be obtained from both on-site and off-site sources. The select clay fill for the landfill liner system and soil barrier layer material option for the final cover system will be obtained from off-site sources. Soil removed within the landfill footprint may qualify as clay or soil barrier layer, subject to additional investigation. If pursued, this additional investigation information will be provided in the Plan of Operation. Refer to **Section 9.0** for additional information on the clay or fine grained soil borrow sources. Select granular fill and aggregate materials will be obtained from off-site 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.

Approximately 1,271,400 cubic yards of soil will be excavated within the Proposed Landfill footprint to establish the subbase grades. Additional material will be excavated to install the underdrain

system. This soil will be stockpiled on site for general fill for berm construction, daily and intermediate cover soil, and final cover rooting zone. As shown in **Appendix N**, there is an overall excess of on-site general fill material for the full buildout of the Proposed Landfill.

All material and placement methods will be required to meet standards established in a quality assurance and quality control plan (QA/QC Plan, also referred to as the Construction Quality Assurance Plan, or CQA Plan). The CQA Plan will be included as part of the Plan of Operation.

Storm water runoff from the Proposed Landfill will be designed in accordance with the applicable requirements of ss. NR 504.09 and NR 151.122, Wis. Adm. Code and local regulations. The storm water management system will consist of diversion berms, downslope flumes, perimeter ditches, culverts, and sedimentation basins to efficiently route and treat runoff (refer to **Section 8.10**). The proposed storm water management system layout and supporting calculations will be included in the Plan of Operation.

10.2.2 Aquatic Resources

The Proposed Landfill has been designed to minimize effects to existing aquatic resources. Wetlands and ponds that will be impacted are non-jurisdictional and artificial, as discussed in **Sections 1.3.4** and **7.2.1**. The pond will be removed during construction of the Proposed Landfill. Various design features are included in the proposed design to minimize impacts to surface water (see **Section 8.10**).

10.2.3 Groundwater

The Proposed Landfill is designed and constructed with a composite liner system (i.e., HDPE geomembrane and clay liner system), with an overlying leachate collection system (refer to **Section 8.5**). These features protect groundwater.

Additionally, an underdrain system is included below the clay liner to prevent groundwater from contacting the liner during periods of high water table elevation (refer to **Section 8.4**).

10.2.4 Surface Water

The Proposed Landfill is not located within 300 feet of a navigable stream or river. However, a manmade surface water pond used to support irrigation activities at the golf course is located within the footprint of the Proposed Landfill (see Pond #3 on **Plan Sheet 2**). The pond will be removed during construction of the Proposed Landfill. As shown on **Plan Sheet 2**, additional wetlands are located northeast of the Proposed Landfill. Refer to **Section 10.3.1.4** for additional information on wetlands.

Development of the Proposed Landfill will alter surface water drainage patterns in the immediate area of the landfill. During landfill operations, surface water runoff that comes into contact with waste or daily cover will be treated as leachate. Surface water runoff from intermediate or final cover areas will be routed via diversion berms, downslope flumes, perimeter ditches to the sedimentation basin. The sedimentation basin will limit the release of sediment to adjacent properties and surface waters in accordance with applicable soil erosion regulations and/or local, state and federal storm water runoff regulations. The storm water management system will be designed to provide an approximate balance or reduction in peak discharge rates for several storm events under post-development conditions compared to pre-development conditions. Additional information on surface

water management is presented in Section 8.10. Best management practices will be implemented to minimize and control erosion.

10.2.5 Buildings, Roads, and Other Structures

New buildings, scales, roads and other support structures will be constructed to support landfill operations (see Plan Sheet 27). The buildings and scales are planned to be constructed along the north end of the site. The scale may alternatively be located south of the Proposed Landfill. The final location will be shown as part of the Plan of Operation. Access to the Proposed Landfill is discussed in Section 8.13.2. Gates will control access to the landfill property at the primary entrance points. New perimeter access roads will be constructed as phases of the landfill are developed to provide access to each phase. In accordance with the neighborhood development agreement, a 10-foot-high screening berm will be constructed within the 150-foot buffer, also required by the neighborhood development agreement. A perimeter or property fence is anticipated to be installed to limit access, as necessary. Natural barriers may also be used to limit access to the property. In addition, a litter fence will be installed along the landfill perimeter to help control windblown litter.

10.2.6 Emissions and Discharges

All landfills produce emissions and discharges. The landfill emissions and discharges expected from the Proposed Landfill include:

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. Traffic to the site is expected to be similar to what is experienced at the existing Dane County Landfill Site No. 2 located across USH 12 & 18. During post-closure, engine exhaust will be minimal and will occur during routine maintenance activities and monitoring events.

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 Dane County Landfill Site No. 2 facility located directly across USH 12 & 18. A similar plan will be prepared for the Proposed Landfill as part of the Plan of Operation. During post-closure, dust will be significantly reduced since all areas will be capped and vegetated; dust will likely come from access roads when vehicles are used for routine maintenance and monitoring activities.

Noise – During landfill 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 at the Dane County Landfill Site No. 2 located directly across USH 12 & 18. Hours of operation are determined in the local agreements with the host communities. Noise will be significantly reduced after waste is no longer accepted/during post-closure (due to elimination of MSW haulers accessing the site and a significant reduction in outdoor heavy equipment operations).

Upon construction and operation of an anticipated new landfill gas treatment or control system at the Proposed Landfill (see Section 8.9), Dane County expects only nominal increases in the volume

of noise from the gas treatment or control system as a result of the Proposed Landfill. If a treatment system is developed on-site, processing of gas would take place within enclosed equipment and/or buildings. There are no neighbors in the immediate vicinity of the anticipated location of the landfill gas treatment or control system (**Plan Sheet 27**) and is unlikely to change in the future. To date, the existing Dane County Landfill Site No. 2 landfill gas treatment or control system has not received any complaints related to noise, and noise issues from a new landfill gas treatment or control system are expected to be similar.

Leachate – The Proposed Landfill will generate leachate that will be managed by the proposed leachate collection system. Leachate is produced from the decomposition of waste and from precipitation infiltrating into the waste. Leachate will flow into a 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 potentially recirculated back into the waste mass within the landfill if Dane County decides to pursue approval of leachate recirculation as part of the Plan of Operation. Dane County is in discussions with MMSD to treat leachate from the landfill. MMSD currently treats leachate from the existing Dane County Landfill Site No. 2. The quality and characteristics of the leachate are expected to remain similar to those of the leachate that is currently collected at Dane County Landfill Site No. 2. Leachate characterization is further discussed in **Section 6.2**, and leachate generation is discussed in **Section 6.3**. During post-closure, no additional water will be added to the waste mass, reducing the volume of leachate generated.

Landfill Gas – Landfill gas from the decomposition of organic waste will be generated during operation of the Proposed Landfill. The chemical composition of the landfill gas is not expected to vary from what is generated at the existing Dane County Landfill Site No. 2 facility located directly across USH 12 & 18. The Proposed Landfill includes a proposed composite liner system and composite final cover system with an active gas extraction system. These controls will prevent any significant subsurface gas migration from the Proposed Landfill. Gas monitoring probes will be installed around the landfill perimeter and will be monitored for signs of gas migration. Landfill gas generated by the Proposed Landfill will be managed as described in **Section 8.9**. Further analysis and details will be provided in the Plan of Operation.

Dane County will also submit an air pollution control construction permit and operation permit application to the WDNR Air Quality Division. Construction of the Dane County Landfill Site No. 3 will not proceed until Dane County has obtained the air permit. Post-closure, landfill gas will continue to be collected efficiently, minimizing potential emissions and odors.

Odors – Odors will be controlled through minimizing the open area 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. An Odor Control Plan is currently in place for the existing Dane County Landfill Site No. 2 facility located directly across USH 12 & 18. A similar plan will be included as part of the Proposed Landfill Plan of Operation submittal. In response to odor issues at Dane County Landfill Site No. 2 in 2017, Dane County has expanded its odor response procedures. **Section 8.13.3** includes additional information on managing odors. During post-closure, odors will significantly decrease since areas will be capped.

Surface Water Runoff –The storm water management system will be designed to meet the applicable requirements of ss. NR 504.09 and NR 151.122, NR 151.123, and local storm water ordinances. The full design of the storm water management system will be included as part of the Plan of Operation. **Section 8.10** provides additional information on storm water management. During

post-closure, storm water runoff is expected to increase with the final cover system in place over the entire landfill. The storm water management features will be designed and adequately sized to manage runoff for the post-closure condition, as part of the Plan of Operation.

Collected Groundwater – Groundwater collected in the underdrain system will be discharged to the existing Pond #1 or Pond #6 located west of the Proposed Landfill (**Plan Sheet 2**), or to a new pond constructed on the Proposed Landfill property, or to an alternative discharge location at or downstream from the WisDOT Pond B. Discharged groundwater will ultimately flow to the drainage ditch on the west side of the golf course. Discharge from the underdrain system will be monitored in accordance with a WPDES General Permit that will be obtained prior to construction. During post-closure, less groundwater is expected to be collected since the landfill will reduce groundwater recharge in the vicinity of the landfill.

10.2.7 Other Anticipated Changes

No other anticipated changes are expected.

10.2.8 Maps and Other Descriptive Materials

Maps and other descriptive materials are presented in the plan set, figures, and appendices listed in the **Table of Contents** for this report.

10.3 EXISTING ENVIRONMENT

10.3.1 Physical Environment

10.3.1.1 Topography

As described in the ISR (Tetra Tech, 2022a), the proposed Dane County Landfill Site No. 3 is located in the Drumlin Zone of Dane County (Clayton and Attig, 1997). This region is characterized by generally flat to slightly hilly topography with abundant drumlins or drumlinoid hills. Topography within 1 mile of the Proposed Landfill is shown on **Figure 1-1**.

The Proposed Landfill property is generally flat and gently rises to the southeast and southwest. The current ground surface ranges in elevation from 875 feet above M.S.L. in the northwestern portion of the property to 930 feet above M.S.L. in the far southern portions of the property (see **Plan Sheet 2**). The existing topography is partially a result of ground surface modifications during the development of the Yahara Hills Golf Course.

10.3.1.2 Regional Geology

The Proposed Landfill area is located in an upland area of Ordovician-age bedrock, which is overlain by Quaternary-age glacial deposits. The glacial deposits are associated with the most recent advance of the Green Bay Lobe of the Laurentide Ice Sheet. Sediments associated with the most recent ice advance into the area belong to the Holy Hill Formation (Severson and others, 2011). The deposits of the Holy Hill Formation cover most of southcentral Wisconsin including most of Dane County. The proposed landfill site is located near the farthest southeastern extent of the ice advance that deposited the sediments of the Holy Hill Formation.

The Preliminary Bedrock Map of Dane County, by Brown and others (2013) indicates that the uppermost bedrock formations in the vicinity of the proposed landfill are Ordovician sedimentary

rocks of the Sinnipee, Ancell, and Prairie du Chien Groups and that the bedrock strata dip gently toward the east-southeast into the Michigan Basin with a slope of about 0.008.

A preliminary report by Olcott (1968) indicated the presence of a fault system in the bedrock in the vicinity of the Proposed Landfill. This report presented locations of suspected faults in the area which are shown in the same general area as those shown on the Preliminary Bedrock Map of Dane County (**Appendix H**). There is no evidence of faults in Wisconsin that are known to have had displacements during the Holocene.

Further information regarding regional geology is presented in **Section 5.2**.

10.3.1.3 Site-Specific Geology

Sediment deposited by ice of the Green Bay Lobe is at the surface in the area of the Proposed Landfill. The sediment includes diamicton—a very poorly sorted mixture of particle sizes including gravel, sand, silt, and clay. Commonly, diamictons are interpreted as till, which is sediment that was deposited directly by or from glacier ice. The sediment also includes sand and gravel (commonly interpreted as outwash deposited by streams flowing away from the glacier), and sorted, generally laminated, fine sand, silt, and clay (generally interpreted as lake sediment). The glacial and related deposits in this part of Dane County belong to the Horicon Member of the Holy Hill Formation (Clayton & Attig, 1997).

Geotechnical investigation at the Proposed Landfill site identified the major soil units as loess, till, and outwash. Lake sediment was present but was not a major soil unit.

The unconsolidated sediments at the site overlie bedrock belonging to several major groups including the Sinnipee, Ancell, and Prairie du Chien Groups. The bedrock strata beneath the proposed landfill site is generally less than 20 feet thick and is variable in lithology as illustrated on the geologic cross-sections. Erosional contacts between the unconsolidated sediments and the bedrock, and between bedrock units have been inferred in several areas. No faults have been inferred from the investigations conducted at the site.

The bedrock surface generally slopes down from southeast to northwest, as shown on **Plan Sheet 6**. The top of bedrock elevations range from a high of about 920 feet above mean sea level near the southeast corner of the Proposed Landfill footprint to a low of approximately 835 feet above mean sea level on the northwest corner of the Proposed Landfill footprint. The slopes on the top of the bedrock are gentler in the central part of the site.

Surface soils in the vicinity of the Proposed Landfill are primarily in the Dodge - St. Charles - McHenry Associations (Glocker & Panzer, 1978). These soils formed in loess and calcareous, loamy glacial till.

Further information on the site geology is provided in **Section 5.2**. Geologic cross-sections of the Proposed Landfill area are shown on **Plan Sheets 7** through **22**. Laboratory soil test results are summarized in **Tables 5-12** to **5-18**; soil boring logs and laboratory soil test reports are included in **Appendix F.**

10.3.1.4 Water Quality

Surface Water – As described in the ISR (Tetra Tech, 2022a), the Proposed Landfill is located within the Yahara River and Lake Monona Watershed. The Yahara River, Lake Monona, Lake Waubesa, and Lake Kegonsa are the major surface water features in the study area, according to the watershed

data provided by the WDNR. Most of the streams in the study area flow into the lakes and/or the Yahara River.

Two unnamed streams are the closest water features to the Proposed Landfill. One, located west of the Proposed Landfill property, flows to the north and northwest toward a floodplain which then drains towards Lake Waubesa via Upper Mud Lake. Upper Mud Lake is classified as impaired, with the pollutant of concern being polyfluorooctanesulfonic acid (PFOS). Upper Mud Lake is not classified as an Outstanding or Exceptional Resource Water by WDNR. The other unnamed stream, which may not be part of the site surface water drainage, is located to the southeast of the Proposed Landfill and flows northeast before draining into Door Creek, eventually reaching Lake Kegonsa. Door Creek is classified as impaired, with the pollutant of concern being total phosphorus. Door Creek is not classified as an Outstanding or Exceptional Resource Water by WDNR. Surface water features in the vicinity of the golf course area can be seen on **Plan Sheet 2**.

Hydrogeology – Groundwater occurs in all of the geologic units at the site and is monitored at two levels–the water table (denoted as "MW-1##" on **Plan Sheet 2**) and the piezometer level (denoted as "MW-1##A" or "MW-1##B" on **Plan Sheet 2**) or "A" wells. The depth to groundwater at the Proposed Landfill site, measured in water table wells in March through December 2023, was between about 0.3 and 51.2 feet bgs. Seasonal fluctuations in the groundwater are apparent at the site – generally higher in the spring and lower in the fall. Groundwater flow at the water table is predominantly to the north with a component of flow to the east from the highest groundwater point in the southeast part of the site. Groundwater flow at the level of the piezometers shows a similar pattern. Vertical gradients at the well nests indicate a downward component of flow at most locations. 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 units.

Groundwater Quality – Existing groundwater quality in the area of the Proposed Landfill has been documented through the background groundwater monitoring program. A detailed discussion of groundwater quality is included in **Section 5.4** and the monitoring results are summarized in **Tables 5-8** through **5-11**. Background monitoring results for several parameters exceeded the NR 140 PALs at one or more locations due to natural background conditions and/or land use. Inorganic parameters detected at least once at a concentration exceeding an NR 140 PAL included arsenic, barium, chromium, fluoride, lead, nitrate plus nitrite, manganese, and sulfate. Two VOCs were detected at concentrations exceeding an NR 140 PAL, including 1,2-DCA and PCE. Additional background monitoring and evaluation of results exceeding NR 140 standards will be performed to further characterize existing groundwater quality as part of the Plan of Operation.

10.3.1.5 Air Quality

Air pollutants from the Proposed Landfill and operations are expected to 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 Proposed Landfill will be controlled by an active gas extraction system. The gas extracted from the landfill will be managed as described in **Section 8.9**. Site operations at the Proposed Landfill will be consistent with current operations at the existing Dane County Landfill Site No. 2, located directly across USH 12 & 18.

Odors will be controlled through minimizing the open area 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. In the event of an odor complaint, the complaint will be logged, along with the corresponding corrective action taken. The Odor Control Plan in place at the existing Dane County Landfill Site No. 2 will be updated for the Proposed Landfill and included as part of the Plan of Operation.

10.3.1.6 Soil Borrow Sources

The soil materials needed to construct the Proposed Landfill will be obtained from both on-site and off-site sources.

General fill will be obtained from on-site stockpiles created from excavation performed to establish the subbase grades for the landfill. Granular materials will be obtained from off-site quarries. Topsoil will be obtained from either off-site sources or from the excavated areas during landfill and/or ancillary infrastructure construction.

Clay materials for construction of the landfill liner or final cover will be obtained from off-site clay borrow areas. Soil removed within the landfill footprint may qualify as clay or soil barrier layer, subject to additional investigation. If pursued, this additional investigation information will be provided as part of the Plan of Operation. Barrier soil for the GCL final cover alternative will be obtained from either on-site or off-site sources. **Section 9.0** discusses these borrow sources in more detail.

10.3.2 Biological Environment

The Proposed Landfill is located in an area currently used as a golf course. Wildlife use in the area is mostly for transient activities such as traveling, feeding, and resting. The dominant animal species known to exist in the surrounding area include songbirds (e.g., sparrows, goldfinch, chickadees, warblers, etc.), raptors (e.g., red-tailed hawk, turkey vulture, etc.), turkeys, small mammals (e.g., mice, vole, rabbits, etc.), and medium-sized mammals (e.g., coyotes, raccoons, etc.).

As described in **Section 4.4.4**, an Endangered Resources Review Request application was submitted to the WDNR Endangered Resources Review Program on June 10, 2022, for the entire 230-acre property consisting of Lots 1 and 2 identified by the Project Property Line on **Plan Sheet 2**. The WDNR determined the project is covered under the Broad Incidental Take Permit/Authorization for No/Low Impact Activities and does not require an Endangered Resources Review. The Endangered Resources (ER) Review Verification application form from the WDNR Endangered Resources Review Program, which was signed on June 10, 2022, is provided in **Appendix B**.

10.3.3 Land Use

The land in the Proposed Landfill footprint is part of a municipal 36-hole golf course. As part of the property purchase, Dane County and the City of Madison have mutually agreed to maintain recreation on the purchased property and at the City's remaining parcels to the west with 36 holes of golf until the end of the 2024 golf season, 27 holes until the end of the 2025 golf season, and 18 holes until at least 2042. Other areas on the property are used for additional golf course support activities and infrastructure, including a club house and maintenance shop. **Figure 4-3** shows current general land use type within one mile of the Proposed Landfill based on information obtained from the online data portals noted on the figure.

The majority of land surrounding the landfill property includes scattered rural residences, agriculture, woodlands, and open land located to the east and south; recreation, commercial, woodlands, agriculture, open land, water and vacant subdivided land to the west; a developing and expanding

small tract residential subdivision located to the southwest; and industrial, commercial, open land, agriculture, some residential, institutional/governmental and the existing Dane County Landfill Site No. 2 (which is shown as communication/utilities) to the north. Additional discussion on surrounding land use is provided in Section 4.4.

10.3.4 Socioeconomic Conditions

The Proposed Landfill is located within 1,000 feet of designated state, county, or town recreational areas (e.g., parks, public forests, state natural areas, public hunting or fishing areas, or trails), as described in Section 7.1.4. The Yahara Hills Golf Course also currently exists within 1,000 feet of the existing Dane County Landfill Site No. 2 located directly across USH 12 & 18. No impacts to ethnic or cultural groups are expected to occur from the Proposed Landfill. A 66-foot-wide easement has been provided at the southern end of the property for a future access road for businesses to the west, increasing accessibility (see Plan Sheet 2). Businesses to the west consist of a hotel, casino, gas station, restaurant and motorcycle dealership.

Dane County's objective is to provide environmentally sound, sustainable, and affordable solutions for managing non-hazardous solid waste in the service area. In addition, the Proposed Landfill will provide employment opportunities for local residents and contractors, and increased local business from the purchase of required goods and services.

10.3.5 Other Special Resources

Archaeologic resources in the area are discussed in Section 4.4.2.

10.4 ENVIRONMENTAL CONSEQUENCES

10.4.1 Physical Impacts

10.4.1.1 Topography and Visual Impacts

The topography and drainage in the immediate vicinity of the Proposed Landfill has been previously altered by golf course development activities. The Proposed Landfill will alter the topography further to construct the landfill, and ultimately increase the height as waste filling and final closure activities progress.

The Proposed Landfill will occupy approximately 79.0 acres on the parcel. The final cover will extend to a maximum elevation of approximately 1135 feet M.S.L., which is approximately 205-260 feet higher than existing grades in the Proposed Landfill footprint.

Dane County will incorporate screening measures including constructing a screening berm, maintaining existing vegetation where practicable, planting new trees, and where necessary, using soil or waste core berms in the waste mass. Refer to Section 7.1.4 for additional information on screening.

10.4.1.2 Surface Water

Construction and operation of the Proposed Landfill 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 and treated as leachate. Collected leachate will be

discharged into an MMSD sanitary sewer system or recirculated back into the waste mass, if Dane County pursues leachate recirculation as part of the Plan of Operation.

As part of closure, a final cover system consisting of the designs described in **Section 8.7** 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 8.10**.

10.4.1.3 Groundwater

Impacts on groundwater are not expected as a result of the Proposed Landfill. To protect groundwater, the design includes:

- A composite liner system to minimize the potential for leachate to leave the landfill (see **Detail 1**, **Plan Sheet 28**).

- A leachate collection system so that leachate does not accumulate on the base of the landfill. The leachate collection system will consist of 8-inch-diameter perforated HDPE pipes placed in trenches that are designed to collect leachate via gravity from the sloped base of the landfill (see **Plan Sheet 24**). The leachate collected in the leachate lines will flow to sumps, where it will be conveyed to a sanitary sewer connection to MMSD or recirculated back into the waste mass.

Routine groundwater monitoring around the landfill will continue to be performed during operation and after closure, during the long-term care period, for a minimum of 40 years.

10.4.1.4 Air Quality, Windblown Paper, and Dust

No significant impacts to air resources are expected to occur due to the construction and operation of the Proposed Landfill. The Proposed Landfill design includes a composite liner and cover system with an active gas extraction system. These controls help prevent surface and subsurface gas migration. Proposed gas monitoring probes will be installed around the landfill to monitor gas migration throughout operation and after closure, during the long-term care period, for a minimum of 40 years. The extracted gas will be managed as described in **Section 8.9**. Further analysis and details will be provided as part of the Plan of Operation. Air quality will be monitored to comply with Federal Title V (Clean Air Act) regulations. A detailed landfill gas management system design will be included as part of the Plan of Operation.

Odor will be controlled by use of several approaches as outlined in **Section 8.13.3**. Dane County has an Odor Control Plan for the existing Dane County Landfill Site No. 2 that will be updated for the Proposed Landfill and included as part of the Plan of Operation.

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 on an as-needed basis. Dane County has a Litter Control Plan for the existing Dane County Landfill Site No. 2 that will be updated for the Proposed Landfill and included as part of the Plan of Operation.

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 Dane County Landfill Site No. 2. A similar plan will be prepared for the Proposed Landfill and included as part of the Plan of Operation.

10.4.2 Biological Impacts

The Proposed Landfill is located on land that has been used as a golf course, and therefore, most of the native flora and fauna has already been displaced. The WDNR has determined that the project is covered under the Broad Incidental Take Permit/Authorization for No/Low Impact Activities and does not require an Endangered Resources Review (refer to Section 4.4.4). The Proposed Landfill property does not contain any state or local natural areas or county forest land.

The Proposed Landfill storm water management features will be designed to maintain a pre- versus post-development balance in surface water discharge rates from the landfill area as required by state and local storm water performance standards.

After site closure, the area is proposed to be vegetated as discussed in Section 8.7 with a final use as nature conservancy or recreation, potentially creating more habitat for native flora and fauna.

10.4.3 Land Use Impacts

As noted in Section 10.3.3, the Proposed Landfill footprint is part of a municipal 36-hole golf course. As part of the property purchase, Dane County and the City of Madison have mutually agreed to maintain recreation on the purchased property and at the City's remaining parcels to the west with 36 holes of golf until the end of the 2024 golf season, 27 holes until the end of the 2025 golf season, and 18 holes until at least 2042. Other areas on the property are used for additional golf course support activities and infrastructure, including a club house and maintenance shop.

The Proposed Landfill is located across USH 12 & 18 from the existing Dane County Landfill Site No. 2. The Proposed Landfill is consistent with existing land uses in the site vicinity. The Proposed Landfill will not require displacement of residents or condemnations. Traffic patterns will shift from hauling to the active landfill along the north side of USH 12 & 18 to now accessing the Proposed Landfill on the south side of USH 12 & 18. The amount of traffic is expected to be similar to that for the active Dane County Landfill Site No. 2. The levels of noise, odor, dust, and windblown debris are also not expected to increase above current levels from existing operations at the active landfill located directly across USH 12 & 18. A detailed discussion on land use is provided in Section 4.4.

10.4.4 Socioeconomic Impacts

Adverse socioeconomic impacts are not expected from the Proposed Landfill. The operation of the landfill will contribute to the local economy, as a source of economic waste disposal and employment. Dane County is going through the local negotiation process with affected communities as outlined in Section 2.1.

Operational activity will occur during normal business hours. As such, the relative noise level owing to the Proposed Landfill is expected to be similar to that from the existing operations at the active Dane County Landfill Site No. 2. There will be an increase in truck traffic to the new Proposed Landfill. The waste types accepted and the landfill operations will be similar to the current operations at the active Dane County Landfill Site No. 2, so there is not expected to be a significant increase in odors in the area, and Dane County plans to have a robust odor control plan in place as described in Section 8.13.3.

The Proposed Landfill 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.

10.4.5 Other Special Resources

Refer to Section 4.4.2 for archaeological and historic resources in the area. No other special resources, including state or local natural areas, or prime agricultural land will be impacted by the Proposed Landfill.

10.4.6 Probable Adverse Impacts That Cannot be Avoided

Certain environmental impacts from the Proposed Landfill cannot be completely avoided. These impacts will be minimized to the maximum extent practicable through the proposed engineering design and the use of best management practices in the operation of the facility. Potential impacts that cannot be avoided include the following:

- After the landfill is closed, there will be limitations on the use of the site. Deed restrictions will be used as institutional controls to prevent future agricultural use, building construction, and excavation of final cover or refuse.

- Truck traffic, noise, dust, and engine emissions will exist to some degree at and around the site. However, these conditions can be minimized using best operational practices. These impacts are expected to be similar to the impacts from the current landfilling activities at the Dane County Landfill Site No. 2 located across USH 12 & 18. As indicated in Table 11-8, waste acceptance quantities are expected to increase over time, so traffic is anticipated to increase proportionally. Although development of the Proposed Landfill will extend the period of time these impacts will occur in this area, 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 and applicable zoning 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.

10.5 ALTERNATIVES

There are several alternatives to landfilling; however, the alternatives do not eliminate the need for municipal solid waste landfills. Alternatives are discussed in Section 12.0. Other benefits of locating the Proposed Landfill close to the existing Dane County Landfill Site No.2 include its proximity to other existing waste drop-off locations at the existing landfill, proximity to existing utilities that can serve the Proposed Landfill, and location that is accessible and central to Dane County residents and business that will be served by the Proposed Landfill. The proposed location reduces costs, hauling distances, and associated environmental impacts and road impacts relative to an alternative location outside of the City of Madison.

Alternatives to the Proposed Landfill 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 is discussed below.

10.5.1 No Action

This alternative assumes that the Proposed Landfill would not be developed. The No Action alternative will result in little environmental benefit and negative impacts to socioeconomic factors as discussed in Section 10.4.4. The existing landfill (Dane County Landfill Site No. 2) is expected to reach capacity in 2028. If the Proposed Landfill is not constructed, over 447,700 – 951,300 tons per year between 2028-2040 of waste currently received and expected to be received will have to be disposed at other landfills. This would require waste to be hauled longer distances to be disposed 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 Landfill.

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

10.5.2 Enlargement/Reduction/Modification

The Proposed Landfill has been designed to optimize the disposal volume within the constraints of the site conditions, local agreements, and regulatory requirements. Enlarging the landfill is not feasible.

If the Proposed Landfill were reduced or modified, another landfill or landfill expansion elsewhere would have to be developed sooner.

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

10.5.3 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 11.0, the Mallard Ridge Landfill received a Feasibility Determination in 2023 for a proposed expansion. Even with this expansion potentially contributing to the waste disposal capacity in the service area, the Needs Analysis presented in Section 11.0 still demonstrates a need within the service area as defined by the Department's draft guidance document for preparing landfill needs assessments (WDNR, 2004).

Dane County selected the Proposed Landfill site for multiple reasons:

- Economic benefits
  - It maintains or minimizes Dane County residents' waste hauling costs due to proximity to the existing Dane County Landfill Site No. 2. The next closest landfill is 40 miles away, which Dane County estimates could increase hauling costs to local municipalities, for example, by approximately 80 – 100 percent.
  - It keeps tipping fees steady for customers.
  - It provides job opportunities and economic growth.
  - It provides localized waste and recycling systems.

  - The site has the potential to provide long-term waste management needs for the County.

- Infrastructure benefits
  - It maintains similar access to major haul routes.
  - It provides access to discharge leachate into the sanitary sewer system as opposed to hauling via truck.
  - It provides access to other critical infrastructure (i.e., water, electric, fiber optic, etc.).

- Sustainability benefits
  - It maintains the level of services currently provided.
  - An alternative site located further from the proposed location would result in longer hauling distances, which increases greenhouse gas emissions.

- Equity
  - It prevents shifting the burden of waste generated in Dane County to another community.

Developing the same amount of landfill capacity in an alternative undeveloped location would increase the costs and forgo the efficiencies of using some of the existing landfill management features available at the currently active Dane County Landfill Site No. 2 located across USH 12 & 18, including the potential to use the RNG processing facility, during the initial stages of landfill gas capture. In addition, a site located on an alternative property would increase transportation costs and increase emissions due to the further travel distance.

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 Landfill. Consequently, these alternatives are not considered feasible.

10.5.4 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 12.0 discusses these alternatives in detail. Furthermore, Dane County is pursuing development of a sustainable business park north of the Proposed Landfill. The purpose of the sustainable business park is to divert waste and create local circular economies. This will be accomplished by attracting reuse, repair, and recycling businesses; new waste management technologies; and research.

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.

11.0 DETERMINATION OF NEED

11.1 INTRODUCTION

This evaluation of need and site life for the Proposed Landfill has been prepared to satisfy the requirements of s. NR 512.17, which requires that an FR contain an evaluation to justify the need for the facility, in accordance with Wisconsin Statutes, s. 289.28. The analysis includes an evaluation using the most recent data available for the existing Dane County Landfill Site No. 2 and the anticipated service area. 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 the recovery of resources from solid waste that have been licensed by the WDNR.
  - Proposed facilities for the recycling of solid waste or 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.

Section 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 items:

- 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 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 Proposed Landfill.

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

The Proposed Landfill will be owned and operated as a municipally owned solid waste disposal facility open to the public. For the purposes of the needs analysis, the service area for the Proposed Landfill includes only Dane County. Limited quantities of waste from outside Dane County are accepted at the existing Dane County Landfill Site No. 2 and may be accepted at the Proposed Landfill, but are not considered in the needs analysis. The service area of the Proposed Landfill and the other landfills located within or near Dane County are shown on **Figure 11-1**.

Overlapping service areas of nearby landfills may divert some of the waste that is generated in Dane County to landfills other than the Proposed Landfill. 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 within 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 11-1** indicates the estimated percentage of waste, from the Proposed Landfill service area, that was disposed at competing landfills. The percentage of overlap for different landfills estimated in **Table 11-1** 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 Proposed Landfill, was confirmed by representatives from each landfill.

Waste disposal rates for the landfills included in **Table 11-2** 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 Proposed Landfill service area during the year 2028 (the anticipated approval and construction timeframe for the Proposed Landfill).

11.2.1 Waste Disposal Rate

The estimated rate of waste disposed of within the projected Proposed Landfill service area is shown in **Table 11-3**. Based on statewide waste disposal rates, approximately 747,138 tons (996,184 in-place cubic yards at 1,500 pounds per cubic yard [lb/cy]) of solid waste generated from the Proposed Landfill service area are expected to be disposed of at MSW landfills in the year 2024. The 1,500 lb/cy in-place waste density 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). 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 1,138,496 cubic yards per year. As the population increases in the service area after the year 2024, the volume of solid waste generated and disposal capacity required is expected to increase also.

The solid waste disposal rate identified in **Table 11-3** for the Proposed Landfill service area was determined using the WDNR's Solid Waste Landfill Tonnage and Capacity Reports for 2018 to 2022 (**Appendix Q**) and Wisconsin Population Records for 2019 through 2023. Recycled or items banned from landfill disposal were not included in the disposal rate. The average waste disposal rate at MSW

landfills in Wisconsin was determined to be 4.10 lb/capita/day for municipal waste and 2.69 lb/capita/day for industrial/commercial waste, for a combined disposal rate of 6.79 lb/capita/day. Table 11-4 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 Proposed Landfill service area assumed the following:

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

The data used to project the population of the Proposed Landfill service area was based on the Wisconsin Department of Administration-Demographic Services Center's projected population for each county. Based on these projections, the population in the service area is expected to increase by a prorated average of approximately 2.18 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 Proposed 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 11-2 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.

11.2.2 Design Capacity

The design capacities of facilities located within or near the service area of the Proposed Landfill, 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 Plan of Operation 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 proposed facilities for which FRs have been submitted and determined complete by WDNR when assessing the need for a proposed facility. Based on feedback from WDNR, as of January 22, 2024, only Mallard Ridge Landfill has received a Feasibility Determination for a proposed expansion within the Proposed Landfill service area. No other FRs for proposed facilities or

expansions of existing facilities have been submitted. Dane County Landfill Site No. 2 received a conditional Plan of Operation approval for a 990,300 cubic yard expansion in July 2023.

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 2022 (**Appendix Q**) and assumptions as outlined in **Table 11-2**. 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 (Dane County's existing landfill)

2023 disposal capacity:	2,466,490 cy (including 990,300 cy expansion approved in 2023)
2022 fill rate:	390,977 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

2023 disposal capacity:	2,696,517 cy
2022 fill rate:	422,667 cy/yr
Percent of waste from Dane County Landfill service area:	30.8%
Service area included:	Refer to **Table 11-1.**

GFL Glacier Ridge Landfill, Dodge County

2023 disposal capacity:	4,501,268 cy
2022 fill rate:	776,049 cy/yr
Percent of waste from Dane County Landfill service area:	32.3%
Service area included:	Refer to **Table 11-1.**

GFL Mallard Ridge Landfill, Walworth County

2023 disposal capacity:	1,649,995 cy (not including 5,292,000 cy expansion that received Feasibility Determination in March 2023)
2022 fill rate:	298,565 cy/yr
Percent of waste from Dane County Landfill service area:	31.4%
Service area included:	Refer to **Table 11-1.**

Janesville City Landfill, Rock County

2023 disposal capacity:	4,261,335 cy
2022 fill rate:	291,699 cy/yr
Percent of waste from Dane County Landfill service area:	59.6%
Service area included:	Refer to **Table 11-1.**

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 the Proposed Landfill.

Existing and Proposed Recycling and Resource Recovery Facilities

The Wisconsin Recycling Law, Act 335, was followed by NR 544, 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 Proposed Landfill service area (see **Sections 12.1** and **12.2**). 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, with the prices being paid for recycled materials and as less waste becomes suitable for recovery.

Dane County Department of Waste & Renewables is in the process of expanding food waste composting in Dane County, however the project will start with small quantities of food waste (less than 1,000 tons annually). The intent is to scale the program up to capture additional food waste, but quantities large enough to impact this assessment are not expected to be realized until at least 10 years into the future.

Licensed and Proposed Solid Waste Incinerators

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

11.2.3 Analysis

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

An analysis was performed to determine the need for the Proposed Landfill, based on the waste disposal rates at the existing, active Dane County Landfill Site No. 2 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 Proposed Landfill service area. **Table 11-2** was developed to estimate the annual disposal rate and the projected capacity of the respective sites that provide disposal services to the Proposed Landfill service area.

The need for the Proposed Landfill was evaluated based on the approved MSW landfill capacity within the service area, the capacity of the Proposed Landfill in the service area (prorated for the service area), and the capacity of the Proposed Landfill. Available capacity at competing landfills was prorated based on the percentage of overlap of service areas with the Proposed Landfill as shown in **Table 11-1**.

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, Mallard Ridge Landfill has submitted an FR that has been determined to be complete. The proposed expansion capacity is included in the analysis.

The available waste disposal capacity for the projected Proposed Landfill service area in the year 2028 (i.e., the first year that the Proposed Landfill might accept waste), which is currently approved, or which was determined to be in the process of being approved, is approximately 2,641,241 cy (see **Table 11-5**). At a waste disposal rate of 6.79 lbs/capita/day shown in **Table 11-4** (prorated for the expected population growth), the available disposal capacity for the Proposed Landfill service area without the Proposed Landfill will be depleted in 2030 (see **Table 11-5**).

With the addition of the Proposed Landfill capacity of approximately 12,386,300 cy, the site life for the service area would be extended later into the year 2038 (see **Table 11-6**).

11.2.4 Conclusion for Service Area Analysis

Dane County's existing, active Dane County Landfill Site No. 2 has been servicing the solid waste disposal needs of Dane County, Wisconsin, since 1985. The Proposed Landfill will 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 11-5** and **11-6**, the analysis conservatively indicates a continued need, not only for the Proposed Landfill, 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 Proposed Landfill or any other landfill in the service area, available disposal capacity for this area would likely be depleted in 2030 (from **Table 11-5**). The Proposed Landfill provides a timely solution for the future waste disposal needs of the service area.

Approval for the construction and operation of the Proposed Landfill will provide environmentally sound solid waste disposal at competitive prices, which will be beneficial to the communities in the

landfill service area. The approval of the landfill will allow for continued, uninterrupted waste disposal services in Dane County, Wisconsin. The need for the Proposed Landfill has been justified based on information provided by this needs analysis.

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

To determine a design capacity for the Proposed Landfill, the waste filling dynamics from 2018 to 2023 at the Dane County Landfill Site No. 2 were assessed. The 2023 waste intake was used as the starting intake rate. This equates to an average annual waste intake of 436,093 cy assuming 1,500 lb/cy density) (see **Table 11-7**).

An evaluation of the actual municipal solid waste intake at Dane County Landfill Site No. 2 between the years of 2018 and 2023 indicates an annual increase of 6.48 percent for that period (see **Table 11-7**). The average annual increase of 6.48 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 Landfill volume of 12,386,300 cubic yards is defined as the volume contained between the top of leachate drainage layer, and the bottom of the clay layer (or barrier layer if GCL is used) for the proposed final cover, 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 Landfill volume consumption due to daily cover soil placement, it is predicted that if the Proposed Landfill opens at the beginning of 2028, the landfill capacity will be fully consumed by mid-2040 (see **Table 11-8**), for a site life between 12 and 13 years.

11.4 CONCLUSION

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

12.0 ALTERNATIVES TO LAND DISPOSAL

12.1 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.

Dane County's mission is to provide environmentally sound and sustainable waste management and renewable energy solution for current Dane County residents and future generations. This includes

looking at waste as a resource to create renewable fuels and the conservation of landfill airspace through waste diversion, recycling, and efficient operations.

Dane County has a long history of completing successful, innovative projects, such as the renewable natural gas plant and offload station, C&D recycling facility, and Trash Lab mobile education exhibit.

Dane County has purchased the property for the Proposed Landfill with the vision of creating a Sustainability Campus that will include the landfill, Department of Waste & Renewables operations, and a sustainable business park. The vision for the sustainable business park is to create local circular economies by attracting reuse, repair and recycling businesses, new waste management technologies, and research. Dane County is working with consultants to provide development assistance for the campus, culminating with the development of a Comprehensive Plan that will provide the framework for the sustainable business park. This Comprehensive Plan is scheduled to be completed in mid-2026. Additional information can be found on the Department of Waste & Renewable's website (Sustainability Campus | Dane County Department of Waste & Renewables (countyofdane.com)).

12.1.1 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. Dane County provides waste education and training as a catalyst for education on waste reduction and will continue this with infrastructure to be included at the Proposed Landfill and associated Sustainability Campus (Section 12.1).

Disposal costs or disposal costs savings for waste reduction are difficult to estimate. Primary driving forces would be governmental and consumer pressure to encourage waste reduction at the manufacturing level. At a minimum, increased public awareness and education would be required to encourage and support manufacturing waste reduction. For waste reduction to have a long-term impact, consumers would ultimately need to support manufacturers that employ waste reduction with their purchasing decisions. The cost-benefit of the public education process and the corresponding reduction in waste quantity produced includes multiple variables and is therefore difficult to quantify.

12.1.2 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.

Opportunities for waste reuse may be provided by the proposed Sustainability Campus (see Section 12.1). Dane County supports reuse and provides education on reuse as part of current educational opportunities and educational opportunities that will be provided at the proposed Sustainability Campus.

Disposal costs or savings for waste reuse are difficult to estimate. Similar to waste reduction, increased waste reuse would require additional public awareness and education. Implementation of large-scale waste reuse requires societal values that supersede the convenience of disposable goods. To realize high diversion rates from landfills, these societal values to reuse would need to be broad. The cost-benefit of the public education process and the corresponding reduction in waste quantity includes multiple variables and is difficult to quantify.

12.1.3 Waste Recycling

Recycling is the manual or mechanical separation of solid waste materials into constituents that can be physically and/or chemically changed into new or different products. Typical examples of recyclable materials include newspaper, aluminum cans, glass, plastics, and scrap metals, all of which can be used to produce new materials of some kind.

The State of Wisconsin, through Statute 287.07, has banned certain material from landfills in an effort to reduce the volume of waste disposed 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.

The general public is familiar with recycling and understands that there is value to reusing materials and preserving landfill space. Based on the “Status of Recycling Report” prepared by the WDNR in July 2003, Wisconsin is diverting approximately 40.4 percent of solid waste materials, which demonstrates that Wisconsin has made great strides in recycling. Additional enforcement, collection, subsidies, and education to support the ban could increase additional diversion of the material.

The US EPA has developed a national strategy to reach the goal of a 50 percent recycling rate in the U.S. by 2030, but cites several challenges affecting improvements to recycling systems. Economically, the agency notes that weaker domestic and international markets for recycled materials impact recycling rates. Other factors include:

- Public confusion about what, where, and how to recycle various materials
- A lack of improvements in recycling infrastructure
- A need to incorporate recycled materials into packaging designs
- More consistent measurement

Recycling programs often have an advantage over other methods of solid waste reduction techniques in that they are comparatively low-technology methods requiring somewhat 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 (Legislative Audit Bureau, 2020), in recent years, foreign purchasers of recyclable materials introduced limits on the extent to which recyclable materials can be contaminated. 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.

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 (s. NR 544.05) 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 (The Recycling Partnership, 2020), 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 often along with other household wastes. The types of facilities available can range from unstaffed centers, which provide separate containers for recyclables, to full-scale facilities, which provide collection, 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. Section NR 540.02 requires all communities with population of 10,000 or more, and all disposal facilities with an annual solid waste intake of 50,000 tons or less, 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 participation 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 due 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. 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.

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 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 ban includes:

- 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

The law also established a statewide program, called E-Cycle Wisconsin. E-Cycle Wisconsin is based on a product stewardship approach, which assigns primary responsibility for collection and recycling to the manufacturer. 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).

Since these recyclable materials are already legally banned from landfill disposal, significant waste volume reductions may not be achieved by further recycling efforts. Additional enforcement, collection, subsidies, and education to support the ban may increase diversion of the material. 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. WDNR has prepared summaries of recyclable materials collected by local governments and material recovery facilities which are available at the following website: https://dnr.wi.gov/topic/Recycling/Studies.html.

12.1.4 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 unprocessed material under NR 502.

On a larger scale, materials are collected and prepared for composting by sorting salvageable materials from non-compostables, and then shredding and grinding, with the possible addition of sludges or water. Materials are then digested in open or closed digester systems and finished by regrinding and rescreening the 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.

Dane County has an agreement with the City of Madison to develop a compost facility that will accept yard waste and food waste from the City commencing no later than April 1, 2026. Dane County is in

negotiations with a local composting facility to accept yard waste generated in Dane County at an off-site facility and pilot a food waste composting program. Dane County also is working to expand food waste collection opportunities in local communities.

12.1.5 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, 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.

12.1.6 Food Waste Diversion and Anaerobic Digestion

Anaerobic digestion consists of decomposition of organic material in an oxygen-limited atmosphere. Anaerobic digestion is commonly used to treat the organic fraction of 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. Reactors 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 wastewater 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, may utilize recirculated leachate for moisture and requires the addition of significantly less water. The recirculation of liquid facilitates chemical processes that resemble 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 the waste by the organic fraction which can be minimized through 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. At the time of this report, due to high capital costs and limited feedstocks, an anaerobic digester is not financially viable.

12.1.7 Waste Incineration and Energy Recovery

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.

Combustion of solid waste requires control of air emissions in compliance with state and federal air pollution control requirements and requires significant capital investment, therefore is not a feasible alternative at this time.

12.2 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. Dane 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 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
- Electronic equipment recycling
- 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

- Grant program to support organics diversion
- Partnership with SustainDane for education support

Dane County estimates the following waste diversion rates achieved in 2023 at the existing Dane County Landfill Site No. 2:

- 823 tons of tires were recycled into playground tile or incinerated for energy
- 55,340 tons of construction & demolition material was processed for recycling
- 1,781 tons of brush and logs were ground into wood chip to be used as animal bedding and mulch
- Over 3.7 million gallons equivalent of gasoline were produced by the renewable natural gas facility
- 6,678 tons of shingles were recycled into asphalt
- 40 tons of products reused through Clean Sweep's exchange program
- Over 96 tons of electronics was processed for recycling

Thus, substantial amounts of materials are being diverted from landfill disposal through these efforts. Dane County, as part of the Proposed Landfill and Sustainability Campus, would continue to look for new and innovative ways to responsibly manage or divert waste and provide renewable energy solutions.

12.3 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.

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. As noted, Dane County is pursuing pilot scale organics diversion and development of a sustainable business park to be located along with the Proposed Landfill as part of an overall Sustainability Campus. While these efforts will continue to help create a local circular economy, waste disposal capacity is still required in the service area, and the Proposed Landfill will provide the capacity needed.

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