Feasibility Report

Vertical Expansion
Adams County Sanitary Landfill

Prepared for:

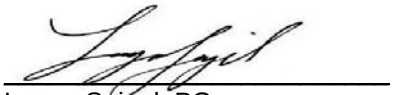
Adams County Solid Waste Department
Adams County, Wisconsin

February 2023

Feasibility Report

Vertical Expansion
Adams County Sanitary Landfill

This report prepared by:



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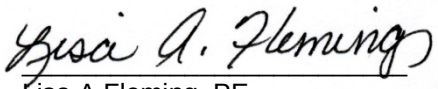

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September 2022

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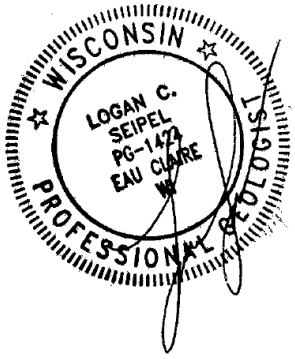
1.0 Certification

As required in the Wisconsin Administrative Code, Chapter NR 500.05, the following certification is provided:

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

February 7, 2023

“I, Logan Seipel, 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.”



February 7, 2023

1.1 1.1 Introduction

This Feasibility Report has been prepared by Ayres Associates, on behalf of Adams County Solid Waste Department, to continue to provide solid waste services at the existing Adams County Sanitary Landfill (License #3150, FID #701040560) by means of a contiguous vertical expansion. The purpose of this document is to determine the feasibility of the proposed expansion and that solid waste activities will be performed in accordance with current solid waste regulations. This Feasibility Report was prepared in accordance with Wisconsin Administrative Code (WAC) NR 512 for feasibility, applicable standards of NR 504 for landfill location, performance, design, and construction, and NR 500.05 for general submittal requirements. The Wisconsin Department of Natural Resources (WDNR) feasibility report completeness checklist, with the design and construction criteria completeness checklist identifying the locations of all required information in the report is provided in Appendix A.

This Feasibility Report, which includes plan sheets 1 through 28 has been prepared for the Adams County Solid Waste Department (referred to hereinafter as “Adams County” or “Adams County Solid Waste”).

1.1.1 History & Background

Adams County intends to permit a vertical landfill expansion of the existing Adams County Sanitary Landfill (referred to hereinafter as “Landfill”), located in the Town of Strongs Prairie, Wisconsin. The physical/mailing address of the Landfill is 1420 State Highway 21, Friendship, Wisconsin 53934. The existing Landfill is currently filling in Phase 5 and is anticipated to be full near December 2024 based on average filling rates. Observations from site personnel indicate Phase 5 may be full as soon as December 2023. Construction and utilization of Phase 6 is anticipated to add an additional 3.5 years of operation resulting in a calculated full date of 2027. This proposed Landfill expansion consists of a contiguous vertical expansion overlaying waste onto phases 2 through 5 while maintaining the existing permitted horizontal footprint of 21.9 total landfill acres. The proposed expansion would add an additional 2-3 years to the Landfill lifespan, the calculated full-by date would be approximately 2029. The vertical expansion proposes approximately 224,000 cubic yards (CY) of additional airspace to the permitted design capacity of 1,248,200 CY for a total capacity of approximately 1,472,000 CY. All proposed expansion activities will occur on property owned by Adams County.

Adams County has owned and operated the Landfill since 1989. In addition to the Landfill, Adams County owns and operates a Materials Recovery Facility (MRF) for processing recyclables and provides waste hauling services to its residents. The MRF is located on the same property in which the Landfill resides. A composting area, also located on the same property, collects brush and other yard wastes and is also operated by Adams County.

A small, closed construction and demolition (C&D) landfill, 50,000 CY is also present on the same property. The small C&D landfill was first permitted in 1989 and began operating in 1990. The C&D landfill was full in 2002 and approved for closure in 2004.

An initial site inspection (ISI) request for the proposed vertical expansion was submitted on June 1, 2022. The ISI was performed by the WDNR on June 29, 2022. The WDNR issued its preliminary opinion of the landfill expansion site location on July 27, 2022. The opinion indicated that the proposed expansion “can meet the requirements of NR 504.04, WAC,” and that it will be necessary to address the requirements of NR 509, WAC, to continue with the proposed expansion process. The ISI request and WDNR ISI response are included in Appendix B.

An initial site report (ISR) for the proposed vertical expansion was submitted on August 10, 2022. A resulting opinion letter from the WDNR was received November 29, 2022. The ISR response letter indicated the WDNR believes the site to have potential for landfill expansion development. The ISR, the request for additional information, and WDNR response are included in Appendix B.

In addition to the proposed Landfill expansion, an ISI for a new proposed soil borrow source (Borrow Area 2) was submitted on June 1, 2022. The WDNR preliminary opinion was issued on July 27, 2022, and stated the clay borrow source expansion "may be suitable for clay borrow activities." Results of the soil Borrow Area 2 source investigation activities are also included with this Feasibility Report. Adams County is seeking approval of the new proposed borrow source concurrently with the Feasibility Report. The soil borrow ISI request and corresponding WDNR response letter are provided in Appendix O. A full discussion of the investigation is provided in Section 9.1.

This report includes responses to the comments presented in the ISR response by the WDNR and is also intended to provide sufficient information to allow the WDNR to render an opinion on the feasibility for site development.

This Feasibility Report includes information from the 1986 Feasibility Report (Foth & Van Dyke), the 2016 Feasibility Report (Ayres Associates), and pertinent information from plan modifications as appropriate. Therefore, this Feasibility Report supersedes the former feasibility reports in their entirety.

1.1.2 Exemption Requests (NR 504.04)

Exemptions are requested from NR 504.04(4)(d) to allow development of the proposed expansion in an area where a preventive action limit (PAL) or an enforcement standard (ES) have been exceeded. Multiple exemptions (NR 140.28) were requested in the 2017 Feasibility Report for various parameters reported above the PAL and/or ES. The 2018 Determination of Site Feasibility letter issued by the WDNR granted one of the requested exemptions and determined the others to be unnecessary. A full discussion of the specific wells, parameters, and justifications are listed in the 2017 Feasibility Report and detailed response by the WDNR in the 2018 Determination of Site Feasibility letter.

The PAL for lead was exceeded in three of the eight sampling events conducted at MW-30 during the 2017 feasibility study. MW-30 is located upgradient from the Landfill. The WDNR issued an exemption for lead at MW-30 in the 2018 Determination of Site Feasibility Letter and stated the exceedances do not appear to be Landfill related. Given this, Adams County would like to retain the existing exemption for lead concentrations above the PAL in MW-30.

It is unlikely that construction of the vertical landfill expansion will cause further increases of any detected parameters as the performance of the existing landfill has shown landfilling activities can be conducted in an environmentally sound manner in this location.

This Feasibility Report intends to use the historical borings completed as part of the 1986 and 2017 feasibility reports at the site to satisfy NR 512.09 for the vertical expansion. The vertical expansion footprint is approximately 8.3 acres within the permitted limits of waste in Phases 2-5 (Sheet 2) Given the size discrepancy, some of the historical borings and soil samples analyzed for grain size included in this report to satisfy NR 512.09(4)a) are beyond the 300-ft distance from the proposed limits of waste (NR 512.09(1)(a)).

It is Ayres Associates opinion that the subsurface conditions have been sufficiently characterized in the previous feasibility reports. It is not anticipated that further exploration would result in a different outcome of the subsurface analysis due to consistent subsurface conditions as similarly approved by the WDNR in the 2018 Determination of Site Feasibility Letter for the horizontal expansion. There are results identified outside the 300-foot proposed landfill limit that do meet the criteria of the Nr 512.09(4) code. An exemption is requested under NR 512.09 for lack of Atterberg limit results and laboratory hydraulic conductivity per NR 512.09(4(a) and(b). This exemption was approved in the January 2023 Alternative Geotechnical Investigation Program (AGIP) acceptance letter.

The plan sheets and figures have been prepared as 22-inch by 34-inch plan sheets and present the information required under NR 512. 11. An exemption is requested under NR 512.11 which indicates that

results from the investigation are presented on 24-inch x 36-inch plan sets. This exemption request was approved in the January 2023 AGIP acceptance letter (Appendix T).

The 2017 Feasibility Report included a geotechnical investigation in compliance with NR 512.09 with the exception of two soil borings which were installed less than the required 25 feet below proposed subbase. An exemption was requested from NR 512.09(1)(b) for the two soil borings and the WDNR granted the exemption in the 2018 Determination of Site Feasibility letter (Appendix U).

An exemption is requested from NR 507.215(3) to reduce the sampling frequency of the listed parameters for the leachate storage tank from quarterly to semiannually. NR 507.215(3) requires quarterly monitoring of the leachate storage tank for the parameters listed if leachate recirculation is performed. The intent of this quarterly sampling is to determine the effects leachate recirculation has on leachate chemistry. However, there are many variables that can affect leachate chemistry such as amount of precipitation received, types and quantities of wastes disposed, quantity of leachate able to be recirculated in a given time period, etc. Because of these variables, the addition of quarterly monitoring would not provide any measurable benefit for determining the effects of leachate recirculation, alone, on leachate chemistry.

Additionally, and as discussed in Section 8.3.4, leachate recirculation is approved for existing Phases 3 and 4 and is proposed to occur within the vertical expansion. Leachate recirculation will not occur in Phases 1 and 2 due to the liner system consisting of only an earthen clay liner. Leachate from Phases 1 and 2 will continue to discharge to the leachate tank, therefore also affecting leachate chemistry. Because of the many variables affecting leachate chemistry and leachate recirculation not occurring in all phases of the Landfill, no variation in trends of leachate chemistry from leachate recirculation, alone, will be able to be determined with any great certainty. Ayres Associates respectfully requests leachate monitoring be conducted semiannually in accordance with the monitoring requirements identified in Section 8.7.2. This is the only exemption which has not been accepted or justified either in the January 2023 AGIP acceptance letter or the January 11, 2018 feasibility determination.

For further information regarding the previous and current exemption requests, see Table 1-1.

1.1.3 WDNR ISR Comments and Responses (NR 512.05)

In accordance with NR 512.05, all department review comments on the ISR opinion letter for the proposed vertical expansion of the Landfill dated November 29, 2022. For ease of review, all department comments from the ISR opinion letter are in **bold** font with responses in normal font. The ISR opinion letter is in Appendix B.

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

Section 2.1 of this report documents and provides details on the proper notifications and applications for local approvals.

2.0 Procedural Requirements (NR 512.06)

2.1 2.1 Local Approvals

Affected municipalities, as defined under §. 289.01(1), in the area of the proposed Adams County Landfill vertical expansion, include the Town of Strongs Prairie, Town of Preston, and Adams County. Notifications to the affected municipalities regarding the proposed Landfill expansion were sent out on May 18, 2022. A copy of the notification letters to the affected municipalities are included in Appendix C. Certified mail receipts of the sent notification letter to each affected municipality are also included in Appendix C.

Responses from affected municipalities did not specify any required applications for local approvals pertaining to the proposed expansion. The notifications were also sent to the Waste Facility Siting Board and a standard municipal notice was received on July 18, 2022, located in Appendix C.

2.2 2.2 Report Submittals

Adams County is submitting this Feasibility Report in accordance with NR 512 and the general submittal requirements of NR 500.05. In accordance with NR 512.06(2), the required number of copies of this report have been sent to the appropriate WDNR regional and central office. Copies of this report will be submitted to affected municipalities in accordance with §. 289.24(4) once the report is determined to be complete by the WDNR. Copies of the ISR and WDNR ISR opinion letter were also sent to the affected municipalities at that time. Copies of letters sent to the affected municipalities are be included in Appendix D.

2.3 2.3 Advisory and Public Opinion Process

In accordance with § 289.24(1)(d), the Feasibility Report is required to contain a description of the advisory process undertaken by the applicant prior to submittal of the Feasibility Report to provide information to the public and affected municipalities and to solicit public opinion on the proposed facility. The County has undertaken the following advisory process prior to submittal of this report and actions taken to solicit opinion from the public and affected municipalities:

- Conduct monthly meetings with the solid waste committee that are open to the public. Conduct semi-annual meetings with the advisory committee, which is made up of representatives from each affected municipality.

- Meet with and offer tours of the facility to neighboring property owners and representatives of municipalities to show the extent of the expansion and characteristics of landfill construction and operation if requested.

2.4 2.4 Ownership Information and Compliance with Plans or Orders

In accordance with NR 512.19, a Feasibility Report shall identify all persons owning a 10% or greater legal or equitable interest in the applicant or in the assets of the applicant, including shareholders of a corporation which is an applicant and partners of a partnership which is an applicant. The Feasibility Report shall identify all 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% or greater legal or equitable interest or a 10% 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.

The Landfill, including the proposed expansion, is 100% owned by a local government entity (i.e. Adams County). No other corporations or partnerships own 10% or greater legal or equitable interest in the Landfill. Adams County does not own or operate any additional solid or hazardous waste facilities.

2.5 2.5 County Solid Waste Management Plans (289.24(1)(c))

In accordance with § 289.24(1)(d), the Counties within the proposed Adams County Landfill service area were contacted to discuss how their applicable County Solid Waste Management Plan related to the proposed expansion. According to § 289.10, "Each county board individually or jointly with another county board may prepare and adopt a county solid waste management plan consistent with state criteria." All counties within the proposed service area either do not have a county plan or is outdated and no longer applicable.

The proposed vertical expansion of the Landfill will not conflict with any county solid waste management plans within the proposed service area.

3.0 General Facility Information (NR 512.07)

This section addresses general facility information required by NR 512.07. Most of this information has been presented in the ISI and ISR documents previously submitted. However, this information has been provided again as planning and design of the proposed expansion has progressed.

3.1 3.1 Project Title

Vertical Landfill Expansion
Adams County Sanitary Landfill
Adams County, Wisconsin

3.2 Primary Contacts Information

Landfill Property Owner, Operator, and Primary Contact

Adams County, Wisconsin
Mr. Charlie Kuhn – Director
Adams County Solid Waste Department
1420 State Highway 21
Friendship, WI 53934
608.339.9178
Charlie.Kuhn@co.adams.wi.us

Consultant and Primary Contact

Ayres Associates Inc
Greg Aldrian – Project Manager
3433 Oakwood Hills Parkway
Eau Claire, WI 54701
715.834.3161
AldrianG@AyresAssociates.com

3.3 Present and Proposed Property Owner and Operator

Adams County Solid Waste Department
1420 State Highway 21
Friendship, WI 53934

3.4 Proposed Landfill Location by ¼-¼ Section

SW ¼, NE ¼, Section 13, T18N, R5E.
Refer to Figure 1 for Regional Location.

3.5 Total Acreage of Property

581 acres.

3.6 Total Acreage of Proposed Fill Area

Existing limits of waste is 21.9 acres. Vertical expansion proposed fill area is 8.3 acres within existing limits of waste.

3.7 Proposed Design Capacity

1,472,200 CY (including the 6-inch grading layer).

3.8 Proposed Site Life in Years

6 years.

3.9 Anticipated Date of Closure

2029 (including remaining and proposed capacity).

3.10 Municipalities and Industries to be Served

Entire geographical boundary of Adams County and the municipalities located within it. These municipalities include:

Adams County Townships

Rome	Strongs Prairie	Adams	Springville
Leola	Preston	Lincoln	Jackson
Monroe	Richfield	Easton	Dell Prairie
Big Flats	Quincy	New Chester	New Haven
Colburn			

Adams County Municipalities

Village of Friendship
Village of Coloma
City of Adams
City of Wisconsin Dells (portion of)

Out of County

Village of Oxford (Marquette County)

Additional waste may originate from areas outside Adams County including, but not limited to, the surrounding counties of Columbia, Juneau, Marquette, Sauk, Waushara, and Wood.

3.11 Anticipated Waste Types, Characteristics, and Volumes

The proposed expansion is anticipated to primarily accept wastes that are categorized as municipal solid waste (MSW) (WDNR Category No. 1) from residential, institutional, and commercial sources. Other waste types anticipated to be accepted will include C&D debris, material recovery facility (MRF) residuals, and other non-MSW type wastes classified as special waste(s). These other waste types, with the exception of C&D waste, on an individual case basis, are anticipated to comprise less than 5% of the overall design capacity of the proposed Landfill expansion. Special waste acceptance will be documented in accordance with the facility's Special Waste Acceptance Plan and NR 506.09. Section 6.0 discusses in further detail waste characteristics and volumes.

The waste intake changes seasonally with the months of December through March seeing a 25% to 50% reduction in tonnages. January and February are the lowest tonnage months, whereas July has historically seen the greatest tonnage intake. The amount of waste received fluctuates as a result of seasonal construction, nearby vacation homes, and outdoor work activities.

Due to permanent closing of nearby solid waste disposal facilities in 2013-2014 (Juneau County Landfill), and the closing of Winnebago County Landfill, Adams County has seen an increase in other out-of-county waste disposed at the Landfill. A significant increase in waste acceptance quantities beginning in 2014 with total tonnage disposed at the Landfill between 2014 and 2016 was 24,880 tons, 27,156 tons, and 20,315 tons, respectively.

Total tonnage disposed at the Landfill in 2021 was approximately 44,000 tons, a significant increase from 2016. This increase is mostly due to a contract negotiated between the past landfill director and a third-party hauler (Lenorud). The amount of material received is anticipated to be sustained and grow over time to an estimated average of 46,000 tons annually over the lifespan of the Landfill. Refer to the needs and design capacity analysis in Section 11.0 for further detailed waste disposal rates.

3.12 Anticipated Cover Frequency

Daily.

3.13 Mode of Operation

Area fill method.

3.14 Hours of Operation

Monday – Friday 7:00 a.m. to 3:00 p.m.

Saturday (First Saturday in May-Labor Day) 8:00 a.m. to 12:00 p.m.

3.15 Anticipated Subbase, Base, and Final Grades

Anticipated range in subbase elevations: No change is anticipated from the existing subbase elevations.

Anticipated range in base elevations: No change is anticipated from existing base elevations.

Anticipated range in final surface elevations: 966 to 1,073.5 feet above msl.

3.16 Preliminary Design Concepts

Preliminary design of the proposed expansion's final cover systems will be in accordance with NR 504.07. The liner system has been permitted through Phase 6 and no modifications are anticipated. The final cover system is proposed to be a composite cover consisting of a grading layer, 2 feet compacted soil barrier, a geosynthetic clay liner (GCL), 40 mil LLDPE geomembrane layer, a 12-inch drainage layer, an 18-inch protective rooting layer, and 6 inches of topsoil. An active gas collection system will also be implemented in the design and incorporated with the existing active gas system. Further discussion of preliminary design concepts is included in Section 8.0.

4.0 Land Use Information (NR 512.08)

A discussion of land use at the proposed expansion and surrounding area is required per NR 512.08. Land use information was included in the ISR submitted to the WDNR, however a discussion of any changes in land use since the submittal of the ISR is required in the Feasibility Report. This section addresses land use at the proposed expansion, within a minimum 1-mile radius of the proposed expansion, and if any land uses may affect or be affected by the proposed expansion.

4.1 Present Land Use

Adams County currently owns approximately 581 acres of land at the Landfill location and within the surrounding area (i.e. within 1 mile of the Landfill). The existing Landfill resides on 433 acres of contiguous property owned by Adams County. The remaining acreage owned by Adams County are noncontiguous property located west and north of the Landfill. The area to the west consists of 69 acres that is currently being utilized as cultivated agricultural lands. The area to the north consists of 79 acres, 39 acres of which are currently utilized as the Landfill's approved clay borrow source. The remaining 40 acres on this property consists of the approved contiguous clay borrow source and a wooded area containing a portion of Big Roche A Cri Creek. Refer to Figure 2 for general project location and property owned by Adams County.

Other than the Landfill itself, the property use of which the Landfill resides is also used for the County's waste hauling services, MRF, organics composting, and various operational support features (i.e. access roads, storm water control features, etc.). The County Highway Department also utilizes a portion of the property for road de-icing material (salt) storage. Beyond these uses, the property consists primarily of woodlands.

The vertical Landfill expansion would be built within the waste limits the of landfill on lands currently owned by Adams County. Included on that land are existing perimeter support areas containing the Landfill's perimeter access road and environmental monitoring components, with undeveloped woodlands beyond the Landfill's support areas. Present land uses immediately adjacent to Adams County property consist of private woodlands and cultivated agricultural lands. Land uses within a 1-mile radius of the landfill consist of agricultural, woodlands, residential parcels with rural businesses.

Existing perimeter infrastructure that includes stormwater management, access roads, and environmental monitoring systems will have the same impacts as current operations, analysis of infrastructure will be conducted to see if any additional equipment needs to be provided but the perimeter area impacted will be minimal. The size and location of potential stormwater detention features will be determined in subsequent stages of the vertical expansion permitting process.

4.1.1 Present Land Use Changes Since ISR

There have been no known present land use changes to the Landfill property or any other properties within a 1-mile radius of the Landfill since the submittal of the ISR.

4.2 Adjacent Landowners

Land use adjacent to the County owned Landfill property generally include private woodlands and agricultural lands, which are either in production or fallow. Within 1 mile of the Landfill there are also single family and agricultural residences. There are no residences within 1,200 feet of the anticipated limits of waste of the existing Landfill or the proposed expansion. There are twelve (12) parcels with four (4) owners located within 1,200 feet of the limits of waste of the Landfill and proposed expansion. Eight of the 12 parcels are owned by Adams County and include the Landfill. Three landowners own the remaining four (4) parcels located within 1,200 feet of the limits of waste. Figure 3 depicts adjacent landowner information.

4.2.1 Adjacent Landowner Changes Since ISR

Review of the Adams County online land records on January 27, 2023, indicate there have been no other known landowner changes to parcels within 1,200 feet of the anticipated waste limits or those that immediately adjoin Adams County property since the submittal of the ISR.

4.3 Land Use Impacts and Zoning

In accordance with Wisconsin Law, Adams County established zoning rules to regulate land use associated with shoreland, wetland, and floodplain areas in the County. The Landfill parcels that include the existing Landfill and proposed vertical landfill expansion do not include these regulated features. The Adams County property is located within the Township of Strongs Prairie and, therefore, the Township regulates development through its zoning ordinance. The 433-acre contiguous County owned property on which the Landfill resides is zoned industrial by Strongs Prairie and the Landfill is an approved use. According to the Town of Strongs Prairie Comprehensive Use Plan (2006) the anticipated future use of the Landfill property and adjacent properties is identified as industrial. The area around the County parcels includes lands that are zoned as industrial, commercial, agricultural, with some scattered single-family homes present on smaller land parcels zoned single family residential. There are no residences located within 1,200 feet of the existing Landfill or proposed vertical expansion waste limits. Figure 4 depicts land use zoning information for the Landfill property and within 1 mile of the proposed expansion.

Land use of the Landfill property will not be changed by the vertical expansion as it will be located on property that is already zoned industrial and includes the existing Landfill. Both Adams County and the Town of Strongs Prairie recognize the Landfill as a continued land use in their respective comprehensive plans. Adjacent land uses previously described are not anticipated to be impacted by the expansion as continued present use will not be disturbed. Additionally, no future changes to adjacent land use are identified in either of the comprehensive plans for Adams County or Strongs Prairie. Conversely, current land use of adjacent properties will not impact the expansion as continued operation of the Landfill will be able to occur independently.

4.3.1 Zoning Changes Since ISR

There have been no known zoning changes to the Landfill property or any other properties within a 1-mile radius of the Landfill since the submittal of the ISR.

4.4 Surrounding Area

In general, the surrounding area within 1 mile of the existing Landfill and proposed vertical expansion consists primarily of woodlands, cultivated agricultural lands, and rural residences. Big Roche A Cri Creek is located approximately 0.7 miles to the north and west of the Landfill. As part of the ISI and ISR process, pertinent state agencies including the WDNR, WHS, and Adams County were contacted for respective information on threatened and endangered species, historic and archaeological sites, and agriculture. Further discussion on information from these sources related to the proposed expansion is included in Section 7.0.

Review of the Adams County Comprehensive plan identified a geologic feature labeled as a “butte” or “mesa” known as “Cottonville Rocks” located on the adjacent property to the east. This feature is located approximately 1,200 feet from the proposed limits of waste. It is not identified as a state or local natural area and is located on privately owned land. The proposed expansion will not impact this feature due to its distance from the expansion.

4.4.1 Surrounding Area Changes Since ISR

There have been no known surrounding area changes to the Landfill property or any other properties within a 1-mile radius of the Landfill since the submittal of the ISR.

4.5 Transportation and Site Access

The Landfill is located in a rural area in west-central Adams County, approximately 5 miles north-northwest from the primary County municipalities of Adams and Friendship. Access to the site is via State Highway 21, from which the facility access road extends north into the County property and Landfill area. State Highway 21 runs generally east-to-west near the solid waste facility. The facility entrance is approximately 1.5 miles west of State Highway 13 and 21 intersection. Access to Interstate Highway 39 is approximately 16 miles east of the site entrance.

State Highways 21 and 13 are not typically included in the springtime posted road restrictions imposed by the Wisconsin Department of Transportation (WIDOT). When WIDOT frozen road declarations are in effect, vehicle weight limits are restricted to 80,000 pounds. Adams County has no local weight restrictions applied to the County highways. Temporary road restrictions, if imposed by the State or County, have not and will not significantly restrict Landfill access by haulers.

4.5.1 Transportation and Site Access Changes Since ISR

There have not been any changes to the proposed transportation routes or access routes including weight restrictions since the submittal of the ISR.

4.6 Requested Information by DNR or FAA

The landfill is located more than 5 miles away from the nearest airport and meets criteria for no additional information to be requested by the Federal Aviation Administration (FAA), please refer to Section 7.0 for more information. The Department of Natural Resources (DNR) requested a copy of the 2015 FAA Response Letter as part of the ISR incompleteness determination. Ayres submitted a copy of the letter in the ISR addendum.

4.6.1 Requested Information Changes Since ISR

There have not been any changes to the status of requested information since the submittal of the ISR.

5.0 Site-Specific Geotechnical Information (NR 512.09, .10, .11)

A geotechnical investigation to determine the physical and subsurface characteristics of the proposed Landfill's location is required per NR 512.09. This data is then used to evaluate the suitability of the proposed location for landfill development. A Feasibility Report submitted by Foth & Van Dyke in 1986 described the site-specific geotechnical investigation conducted for Phases 1-4. The 1986 Feasibility Report was approved by the WDNR in 1987. The 2017 Feasibility Report included a full description of geotechnical activities performed for Phases 5 and 6. The 2017 Feasibility Report was approved by the WDNR in 2018. Given that the geotechnical investigations encompassing the entire area of the existing, permitted landfill have all been approved by the WDNR and no additional horizontal expansion is proposed, the following section is largely a summary of the most recent investigation, but also includes pertinent information from the previous (1986) investigation. The reported results of both geotechnical investigations indicate that subsurface conditions at the site are consistent across the previously permitted horizontal extent. Data collected over the course of the 1986 and 2017 investigations for are

presented in accordance with NR 512.11 and portrayed on Plan Sheets 3 through 21. Data collected from the 2017 FR included subsurface data analysis as required by NR 512.10.

Laboratory and field data collected are provided and summarized in the referenced appendices and tables, respectively, of this Section.

5.1 Alternative Geotechnical Investigation Information (NR 512.085)

An alternate geotechnical investigation program was requested for this proposed expansion and submitted under separate cover.

5.2 Field Investigation

The field investigation was performed in the Fall of 2015 as part of the Feasibility Report submitted in 2017 in preparation for Phases 5 and 6. The 2017 Feasibility Report was approved by the WDNR. Field activities performed or documented by Ayres Associates personnel included installation of soil borings and monitoring wells, monitoring well development and hydraulic conductivity testing, borehole abandonment, and description of all geologic samples. These activities were conducted under the supervision of a professional geologist. Ayres Associates also conducted groundwater monitoring and provided surveying services. CT Laboratories of Baraboo, Wisconsin, WI Laboratory Certification Number 157066030, performed chemical laboratory analysis of groundwater samples. Professional Service Industries (PSI) of Chippewa Falls, Wisconsin, performed analysis of soil samples for physical properties as well as provided drilling and well installation services. The soil borings and monitoring well locations are shown on Plan Sheet 3.

5.3 Soil Boring Installation

The landfill's existing fill area is approximately 21.9 acres, the proposed fill area is 8.3 acres and per NR 512.09(1) requires the installation of at least 12 soil borings extending 25 feet below the nearest subbase elevation and within 300 feet of the proposed limits of filling. The coarse-grained soil environment within the 300 feet of the proposed limits of filling was previously permitted during the 1986 feasibility and 2017 feasibility. The 1986 and 2017 feasibility reports indicate more than 12 borings have been installed per NR 512.09(1) requirements as summarized in Table 5-1. All soil borings for the 2017 geotechnical investigation were installed to the depth required in NR 512.09(1) with the exceptions for borings B-101 and B-104.The 1986 feasibility details 22 boreholes, with 14 monitoring well installations, all borings meeting the depth requirement of NR 512.09(1) except for MW-18. Soil boring logs are located in Appendix E.

The previously installed boring logs indicate consistent subsurface conditions. Borings adjacent to and surrounding B-101 and B-104 including MW-17, MW-17P, B-13, B-10, MW-16, MW-3, MW-3P, B103, MW-31, and B-106 were installed to the minimum 25-foot depth requirement. It was Ayres Associates opinion that the subsurface conditions were sufficiently characterized by the adjacent wells. Therefore, an exemption requested under NR 512.09 for these two borings was approved by the WDNR in the 2018 Determination of Site Feasibility Letter for the horizontal expansion.

Standard split barrel sampling procedures were used to collect soil samples of the unconsolidated soil at 5-foot intervals. Blow counts, percent recovery, soil structures, mottling, voids, lenses, Munsell color, geologic origin, and Unified Soil Classification System (USCS) classification were recorded on each soil boring log. Soil classification was based on field observations unless a grain size sample was collected, then classification was used from the laboratory. Soil borings were abandoned in accordance with NR 507.08 and NR 141.25. A copy of the boring abandonment forms for the soil borings installed as part of the 2015 investigation are in Appendix E. Abandonment forms for historical borings B-4, B-5, B-10, B-11, B-12, B-13, B-14, B-15, and MW-8 could not be located after extensive search of the Adams County

Landfill files, as noted in the 2017 Feasibility Report. Soil samples utilized for this report were collected from the property as part of the investigation for the 2017 Feasibility Report. This report included documentation of the soil sampling and was approved by the department in 2018. Given that documentation and approval, NR 507.07(1)(e) requirement has been met.

The following table summarizes the locational requirements of NR 512.09:

Inside proposed limits of filling	MW-8, 17 B-5[2], 13[2], 15[2]
Inside existing/permitted limits of filling	MW-3[1], 8, 17 B-5[2], 10[2], 12, 13[2], 14, 15[2], 100, 101, 102, 103
Outside proposed vertical limits of filling, within 300 feet	MW-3[1], 16, 18, 19[3,4] B-4, 10[2], 11, 12, 14, 100, 101,102, 103
Outside existing/permitted limits of filling, within 300 feet	MW-1, 2[1], 6, 7, 9, 16, 18, 19[3,4], 20, 21, 29, 30, 31 B-4, 11, 104, 105, 106
Borings that extend 25 feet below nearest subbase	MW-1, 2[1], 3[1], 6, 7, 8, 9, 16, 17, 19[3,4], 20, 21 29, 30, 31 B-4, 5[2], 10[2], 11, 12, 13[2], 14, 15[2], 100, 102, 103, 105, 106
Borings that do not extend 25 feet below nearest subbase	MW-18, B101, B-104
Borings installed that meet NR 512.09 code Require 12 borings for 8.3 acres.	MW-3[1], 8, 16, 17, 19[3,4] B-4, 5[2], 10[2], 11, 12, 13[2], 14, 15[2], 100, 102, 103
Soil physical properties collected near screen	MW-29, 30, 31

[1] Missing Well Development Form
[2] Missing Soil Boring Abandonment Form
[3] Missing Hydraulic Conductivity Value
[4] Missing Grain Size Analysis

5.4 Groundwater Monitoring Well Installation

Based on the area of the proposed vertical expansion (8.3 acres) and the coarse-grained soil environment, NR 512.09(2) requires the installation six water table observation wells and two piezometers. Table 5-2 summarizes the monitoring well information from the wells utilized for vertical expansion. Standard split barrel sampling procedures were used to collect soil samples of the unconsolidated soil at 5-foot intervals. Blow counts, percent recovery, soil structures, mottling, voids, lenses, Munsell color, geologic origin, and USCS classification were recorded on each soil boring log. All

monitoring wells were designed, installed, documented, sampled, and developed under the supervision of a professional geologist. The following is a summary of the numbers of wells and piezometers located inside and outside the proposed limits of fill (vertical expansion). MWs 3/3P, 16, 17/17P, 18, and 19/19P were installed for previous 1986 Feasibility permitting, but lie within 300 feet of the proposed waste fill limits.

Wells within 150 feet of proposed fill limits	MW- 3, 8, 17
Wells within 150 to 300 feet of proposed fill limits	MW-16, 18, 19
Required number of wells installed per NR 512.09	6
Piezometers within 300 feet of fill limits	MW-3P, 17P, 18P, 19P
Required number of piezometers installed per NR 512.09	3
Well nest inside proposed limits of filling	MW-17,17P
Required number of well nest installed per NR 512.09	1

Soil samples were collected for each boring and analyzed for grain size per NR 512.09(4)(a). However the 1976 Feasibility and 2017 Feasibility used other samples for Atterberg limits and laboratory hydraulic conductivity outside the 300 foot perimeter of the proposed vertical expansion fill limits. It is Ayres Associates opinion that the subsurface conditions have been sufficiently characterized in the previous feasibility reports. It is not anticipated that further exploration would result in a different outcome of the subsurface analysis due to consistent subsurface conditions as similarly approved by the WDNR in the 2018 Determination of Site Feasibility Letter for the horizontal expansion. There are results identified outside the 300-foot proposed landfill limit that do meet the criteria of the Nr 512.09(4) code. An exemption is requested under NR 512.09 for lack of Atterberg limit results and laboratory hydraulic conductivity per NR 512.09(4(a) and(b). Soil samples are known to have also been collected from MW-2, 3, 3P, 16, 17 and 17P according to the Feasibility Report submitted by Foth & Van Dyke in 1986. However, some soil samples were not taken at the depth of the well screen for the aforementioned wells as required by NR 507.05(1)(d). MW-19 was installed in 1987; no soil sample information was found for MW-19. Appendix F includes historic soil sampling results of the 1986 and 2017 feasibility reports.

Monitoring wells installed as part of the 2017 feasibility were developed according to NR 141.21 using various techniques including surging and purging with a bailer, surged and pumped, or pumped only. Following well development of the four wells installed in 2015, a groundwater sample was collected from each well and analyzed for total suspended solids (TSS) as required in NR 507.07. In addition, the supply water from the Adams County Landfill office supply well that was utilized in the construction of MW-30P was analyzed for the parameters required in NR 507.06(1). Results of the TSS analysis are shown on the well development forms in Appendix G, and the laboratory results are in Appendix H. TSS analytical results could not be found for the remaining wells onsite.

A laboratory hydraulic conductivity analysis was completed on two undisturbed soil samples collected in November 2015. In field hydraulic conductivity tests were conducted in January 2016 on the three water table observation wells and one piezometer installed as part of this feasibility. The locations of all wells are shown in Plan Sheet 3. Well construction reports for monitoring wells and piezometers are in Appendix G.

5.5 Laboratory Analysis

According to NR 512.09(4), a minimum of five representative samples shall be collected from each major soil unit and laboratory analyzed for grain size distribution and Atterberg Limits (if appropriate for the soil type). Laboratory hydraulic conductivity tests are required on two undisturbed soil samples from each major fine-grained unit. Data collected onsite indicated that there are four major soil units as classified under the USCS. These soil types consist of poorly graded sands (SP), silty sand mixtures (SM), inorganic silts with fine sand (ML), and inorganic clays with medium to low plasticity (CL). There are also lesser amounts of poorly graded sand with silt (SP-SM), poorly graded sand with clay (SP-CL, SC), silty sands with clay and silt (SM-CL), silty clays with very fine sand (CL-ML), clayey silts of low to medium plasticity (MH), and sandy organic silts and clays (OL). Grain size analysis was completed on a total of 19 soil samples in 2017 and all borings and monitoring wells installed during the 1986 Feasibility. The samples were collected from depths of 5 feet bgs to 75 feet bgs, all of which were mixtures of CL, ML, and SM soils from various depths.

In addition to the 2017 samples submitted for grain size analysis, two undisturbed, Shelby tube, samples were collected, outside the vertical expansion limits of filling, for laboratory analyzed for hydraulic conductivity. In 1986, two Shelby tubes and five remolded samples were collected, outside the proposed vertical expansion limits, and analyzed for hydraulic conductivity. The historic laboratory soil testing data is in Appendix F. (See geologic cross-sections in Plan Sheets 4-17 for soil distribution.)

5.6 Field Analysis

Field analysis required by NR 512.09(4)(d), (e), (f) and (g) includes in-situ hydraulic conductivity testing at each monitoring well, groundwater and surface water elevation measurements (monthly for 6 months and quarterly for one year in accordance with NR 512.09[4]), and at least four rounds of baseline groundwater monitoring. Table 5-4 summarizes the elevation data collected during the 6 months of baseline monitoring and Table 6-3 summarizes the elevation data for all wells since 2015. Historic groundwater water elevations are in Appendix I. Groundwater elevation measurements were collected from all monitoring wells onsite.

In field hydraulic conductivity testing was completed at the site for every monitoring well installed as part of the geotechnical investigation. Field hydraulic conductivity values were measured by conducting slug tests on each well; the slug test measures the rate at which groundwater recharges the well screen. The faster the rate of recharge, the higher the hydraulic conductivity value.

The individual well hydraulic conductivity values were used to calculate an average value for the overall aquifer. This average value is an approximation of the actual hydraulic conductivity. Typically, the more wells that are tested, the better the estimate of the aquifer value.

Using the information obtained during the slug test, the hydraulic conductivity was calculated using Waterloo Hydrologic Aquifer Test Pro v. 2013.1 graphical analysis and reporting software. Ayres Associates staff reviewed the monitoring well construction, aquifer conditions (confined or unconfined), and the slug test data and input the information in the software program and a hydraulic conductivity value was calculated.

Hydraulic conductivity values (recovery test only) calculated for the four water table observation wells installed for the geotechnical investigation ranged from 1.1×10^{-2} cm/sec to 4.6×10^{-4} cm/sec as silty sand with ranging composition of silt and clay deposits. Table 5-5 reports field tested hydraulic conductivity values and summarizes the slug test parameters for the wells installed as part of this geotechnical investigation. Historic slug test procedures and hydraulic conductivity values for the wells installed for Phases 1 through 4 are in Appendix J, if available. Hydraulic conductivity values that are not on the cross sections or in Appendix J could not be located.

5.7 Soil and Bedrock Descriptions

5.7.1 General

Tables shown in Sections 5.3 and 5.4 present information regarding compliance with NR 512.09 soil boring requirements. The locations of the borings and monitoring wells are shown in Plan Sheet 2. Geologic cross-sections showing unconsolidated material and groundwater in profile are presented in Plan Sheets 4–17. Copies of the boring logs installed for this expansion and previous phases are all included in Appendix E.

5.7.2 Soil Borings

No soil borings have been conducted during the vertical expansion feasibility report. However historic soil borings have been conducted to reflect the current conditions of the geology onsite.

The soil borings installed in November 2015 (B-100 through B-106 and monitoring wells MW-29 through MW-31) were performed with a truck mounted Diedrich D-120 rotary drilling rig utilizing continuous flight hollow stem augers. Test borings not completed as monitoring wells were abandoned in accordance with NR 141.25. (See Appendix E for these abandonment forms.) Soil samples were obtained by the Standard Penetration Test (SPT) method in accordance with ASTM D-1586 split barrel procedures. A field geologist under direction of a professional geologist visually classified these soil samples in the field. Grain size distributions, geologic origin, and USCS classifications are in Appendix F.

5.7.3 Bedrock Core

Bedrock was not encountered and therefore bedrock cores were not completed.

5.7.4 Soil and Unconsolidated Material

The Natural Resources Conservation Service (NRCS) mapping indicates the surficial soils onsite consists of Plainfield sands, which are formed on outwash plains, stream terraces and ground moraines and are present on 2-12% slopes. The Plainfield sands are described as excessively drained and are classified as low to very low for water runoff. Infiltration rates/soil permeability are high to very high at the site (mapping indicates 6 to 20 inches per hour). Generally, the soils have low natural fertility.

The subsoils of the proposed expansion consist mainly of glaciolacustrine deposits. Glaciolacustrine deposits consist of fine-grained sediments such as fine sands, silt, and clay which were deposited in glacial lakes. These sediments can be deposited in small layers with little variation of grain size.

This geotechnical investigation revealed that the unconsolidated material is at least up to 75 feet thick. Soil boring logs from the 1986 feasibility reveals that the unconsolidated material is at least 100 feet thick. Onsite soils were evaluated through auger cuttings and split barrel samples collected during 2017 subsurface investigations. Soil boring logs indicate that there are 0 to 8 inches of black topsoil (OL). The unconsolidated materials directly underlying the topsoil are described as light brown to dark brown and reddish yellow fine-medium grained silty sands (SM) interbedded with brown silt (ML) and brown clay (CL). Soils onsite were consistently classified as SM (silty sand mixtures), ML (inorganic silts with fine sand), CL (inorganic clay), and CL-ML (inorganic clay with silt) with a 10-foot-thick layer of sand interbedded with clay (SP-SC) encountered in one boring. The clay units varied in thickness (2-5 feet) and were discontinuous at the site. (See geologic cross-sections in Plan Sheets 4-17 for soil distribution.)

5.7.5 Bedrock

Bedrock does not outcrop at the site, and it was not encountered in any of the soil borings on the site from neither the newly installed borings nor the borings installed for the previous feasibility for Phases 1

through 4. Therefore, depth to bedrock is greater than 100 feet bgs. Well logs for private residences in the area indicate bedrock is greater than 109 feet bgs (Adams County 1986 Feasibility Report). The well record for the private water supply well located 1300 feet southwest of the expansion is 124 feet deep and bedrock is encountered at 115 feet bgs. Area mapping indicates that the bedrock in the immediate vicinity of the site consists of Cambrian-age sandstone (Trempealeau, Tunnel City, and Elk Mound Groups) that can range in thickness up to 440 feet and is underlain by Precambrian igneous and metamorphic rock (Devaul and Green, 1971; Mudrey et al., 1982).

A bedrock outcrop (Cottonville Rocks) occurs approximately 1,200 feet east of the proposed site. This outcrop and other outcrops in the County consist of resistant Upper Cambrian Wonewoc sandstone of the Elk Mound Group (Adams County 1986 Feasibility Report).

5.8 Hydrogeologic Properties and Functions

5.8.1 General

A total of four new groundwater monitoring wells (three groundwater observation wells and one piezometer) were installed as part of the 2017 feasibility within 300 feet of the proposed limits of waste. Previously existing monitoring well information was utilized as part of the 2017 geotechnical investigation to fulfill the requirements of NR 512.09. See Section 5.2.2 for the previously existing monitoring wells that were used to document conditions in the proposed expansion area. Monitoring well construction, well development forms, and the well information forms (WIF) are in Appendix G. Well construction forms and WIFs that are not attached in Appendix G could not be located for the previously existing wells utilized for the 2017 geotechnical investigation. Monitoring well locations are shown in Plan Sheet 2.

5.8.2 Regional Hydrogeology

Regional groundwater flow is southwest to Big Roche A Cri Creek, with approximate groundwater surface elevations ranging 910-960 feet msl (Lippelt, 1981). The groundwater table surface occurs at approximately 935-945 feet msl in the vicinity of the site. Infiltrating precipitation can be expected to travel vertically downward through the soils with slight lateral or diagonal movement along the upper surface of the silt and clay layers until it reaches the local groundwater aquifer. The regional water table is generally encountered in one of two aquifers: a glacial aquifer or a sandstone aquifer.

According to the U.S. Department of Agriculture (USDA), the glacial aquifer consists of outwash deposits with well yields as much as 1,000 gallons per minute (gpm) (USDA, 1980). The sand deposits are easily recharged due to their high permeability. Onsite, the deposits are classified as lacustrine. Due to the finer deposits associated with these types of deposits, well yields may be less locally.

The sandstone aquifer consists of fine to coarse grained Cambrian aged sandstone. Well yields from the sandstone aquifer range from 100 to 500 gpm (USDA, 1980). Groundwater in the basin is recharged by precipitation and by induced recharge from surface water bodies.

Regional groundwater elevation and flow information generally correlates to site-specific information measured and/or gathered from the monitoring well network at the site.

5.8.3 Site Specific Hydrogeology

The water table contour maps (Plan Sheets 18 and 19) indicate that the groundwater flows from the expansion area generally to the northwest towards Big Roche A Cri Creek. Depending on surface elevation, groundwater is encountered at approximately 25-45 feet bgs (elevation approximately 935-950 feet msl) within the unconsolidated aquifer. The aquifer is characterized as fine sand of lacustrine origin and laterally extensive throughout the expansion area. No confining layers have been identified and the aquifer is also vertically continuous. Small, alternating lenses of sand/silt layers were noted and typical in

a lacustrine environment. Plan Sheets 18 and 19 present the groundwater contours for high (September 2019) and low (December 2015) groundwater conditions, respectively. The local water table elevation has historically varied as much as approximately 16 feet over the period of monitoring for the existing Landfill site. A significant rise in groundwater elevation over the life of the site has been observed. During the groundwater high conditions (September 2019) and subsequent sampling events, all of the twenty monitoring well screens were submerged. Plan Sheet 19 shows that under the groundwater low conditions (December 2015), only one of the twenty monitoring well screens was submerged and not utilized for determining groundwater contours. Although there is some variation in the direction of groundwater flow between high and low conditions, the overall direction of a west/northwest flow is consistent. Groundwater recharge occurs up gradient and across the expansion area with discharge likely occurring at Big Roche A Cri Creek, the local groundwater discharge point.

Groundwater within the existing footprint travels generally northwesterly beneath the existing Landfill and discharges northwest of the site. Table 5-3 presents the groundwater elevation data collected during the 2016 feasibility monitoring. The high elevation for each well measured during the 2016 Feasibility Study is designated in bold text in Table 5-3. Utilizing groundwater elevations measured during the Feasibility Study on February 25, 2016, from MWs 1, 3, 7, 16, 17, 19, and 30, the groundwater horizontal gradient beneath the entire site ranges from 0.004 to 0.006 feet/feet with only an approximate 9-foot groundwater elevation change across the site. Within the 2016 expansion area, the groundwater horizontal gradient ranges from 0.002 feet/feet to 0.009 feet/feet with an approximate 4-foot groundwater elevation change. The average horizontal gradient is 0.005 feet/feet and the hydraulic conductivity values are $1.4x10^{-3}$ cm/sec to $2.1x10^{-2}$ cm/sec as determined by the slug testing completed on the monitoring wells. Utilizing Tables 4.4 and 4.11 of Fetter, 1994, the effective porosity range was determined as 0.02 to 0.15. The horizontal gradient coupled with the groundwater aquifer hydraulic conductivity values measured during the slug testing and effective porosity range equates to a groundwater flow seepage velocity range from 0.13 to 7.80 foot/day. Table 5-4 presents the results of the field hydraulic conductivity testing conducted as part of the geotechnical investigation, while historic hydraulic conductivity data for the existing wells onsite is located in Appendix J. Table 5-5 presents the seepage rate calculations.

Vertical gradients were calculated using elevation measurements collected from the February 25, 2016, sampling round from observation well/single piezometer well nests associated with the proposed expansion. These included well nests MW-2/2P, MW-3/3P, MW-17/17P, MW-19/19P, and MW-30/30P. A review of the values calculated indicate that all five of the well nests show a downward gradient, with the largest gradient in MW-17/17P (0.2124 foot/foot) and an average gradient of 0.1297 foot/foot. These results generally confirm that the site is a groundwater recharge area. Vertical gradients calculated from the EPA vertical gradient calculator for these wells are in Table 5-7.

Horizontal and vertical flow nets were prepared based on the groundwater gradient information and are presented in Plan Sheets 20 and 21. Groundwater elevation data for the horizontal flow net are summarized in Table 6-3. The flow nets show horizontal and vertical flow direction; however, they are not suitable for quantitative calculations. The flow nets suggest that the high ground to the east is a groundwater recharge area and that groundwater discharge occurs generally westerly of the site. In general, the flow nets are based on simplified assumptions that the groundwater flow environment is homogenous and isotropic. The flow net is used as a model to generally understand groundwater flow at the site.

5.8.4 Regional Groundwater and Surface Water Quality

Groundwater

Groundwater quality is generally good throughout the Central Wisconsin River Basin although there may be some isolated issues with excessive iron, hardness and total dissolved solids. In much of the sand plain, groundwater is soft and low in dissolved solids, especially near the Wisconsin River (Devaul and Green, 1971).

In general, total dissolved solids are found in moderate amounts and rarely exceed the recommended limits for drinking water (500 mg/L). The hardness of groundwater in the basin ranges from 18 mg/L to 568 mg/L and becomes softer toward the Wisconsin River. Chloride and sulfate concentrations are well below the recommended limits for drinking water (250 mg/L) (Devaul and Green, 1971).

High nitrate levels cause minor water use issues in the basin. High nitrate levels in groundwater are common in the basin in agricultural areas where manure spreading, agricultural fertilizers, and legume cropping systems are used, as well as in sandy areas where the soil is more permeable (WDNR, 2011).

Surface Water

Surface water quality in the basin is generally good. Most of the dissolved minerals in surface water are the same as those in groundwater, but are usually less concentrated (Devaul and Green, 1971).

The concentration of dissolved solids in the Wisconsin River itself ranges between 85 mg/L to 280 mg/L. Hardness concentrations range from 20 mg/L to 100 mg/L. The lowest concentrations occur slightly after periods of peak flow, whereas highest concentrations occur during times of low flow (Devaul and Green, 1971).

5.8.5 Site Specific Surface Water and Groundwater Quality

Surface Water

There is no surface water in the immediate vicinity of the site. The nearest surface water is Big Roche A Cri Creek, approximately 1 mile to the northwest.

Historic Groundwater Quality

Historic groundwater quality data exists for the existing Landfill site starting in 1987, with quarterly data available from approximately 1987 through 1994 and semiannual from 1995 to present. The WDNR reduced the required monitoring frequency to semiannual in 1994. The groundwater monitoring for the current Landfill occurs in March and September. Sampling conducted since the May 7, 1995, Plan of Operation approval included twenty-one monitoring wells (MW-1, 1P, 2 2P, 3, 3P, 6, 6P, 7, 7P, 9, 16, 17, 17P, 18, 18P, 19, 19P, 20, 21, and 22). Four additional monitoring wells onsite, associated with the recycling facility (MW-25, 26, 27, and 28), are monitored semi-annually only for groundwater elevation as approved in the 1994 Modification to the Plan of Operation.

The groundwater is encountered in the unconsolidated material of the glacial aquifer across the site. The new wells installed as part of the 2017 feasibility (MW-29, 30, 30P, and 31) have been included as part of the semi-annual monitoring program.

In 1995, the groundwater quality for the Landfill monitoring system was evaluated as part of the required Subtitle D groundwater plan modification. The full evaluation is in the August 1994 plan modification, which was approved in May 1995. In general, the plan modification included an evaluation of monitoring data for groundwater quality standard exceedances and calculation of PALs.

PAL values calculated were either approved or modified in a WDNR plan modification approval dated May 7, 1995. PALs were calculated for indicator parameters including filtered alkalinity, filtered chemical oxygen demand (COD), field conductivity at 25^{o} C, and filtered total hardness.

PALs have been calculated, and approved, for the four new monitoring wells in the monitoring program (MW-29, MW-30, MW-30P, and MW-31) for the indicator parameters of alkalinity, field conductivity, and hardness.

A summary of the Landfill monitoring data is available on the WDNR GEMS website, and a copy of the May 7, 1995, modification to the Plan of Operation approval including calculated PALs for Landfill monitoring is in Appendix K. PAL calculations for the four new monitoring wells and approval of the 2018 Plan of Operations are also in Appendix K.

Baseline Groundwater Quality for the Vertical Expansion

Per the requirements of NR 507.18, baseline groundwater quality must be established. During the Phase 5 and 6 feasibility study, all required rounds of baseline groundwater quality samples were collected at the four new wells (MW-29, 30, 30P, 31) installed as part of the proposed expansion. Baseline parameters that did not appear to be analyzed or reported on the WDNR GEMS database for the previously existing monitoring wells being utilized for the expansion area were also sampled until all required baseline sampling was completed. The samples were analyzed for applicable parameters listed in NR 507.18 Tables 1, 2, and 3. A summary of the inorganic and organic baseline sampling results is in Table 5-8. All onsite monitoring wells sampling results have been summarized, but it is noted which wells were being utilized as part of the 2016 feasibility monitoring. No baseline sampling was recorded on GEMS for MW-20, MW-21, and MW-22. These wells are associated with the C&D Landfill that was in operation from 1989-2004. These wells are being utilized in this feasibility report only for better site analysis of physical parameters, such as groundwater elevations and flow direction, and subsurface geology descriptions.

No volatile organic compounds (VOCs) were detected as part of the 2016 feasibility sampling. Sporadic detects of low-level VOCs, primarily benzene, have been detected throughout the routine monitoring. Trends have never been established and most likely the VOC detects were from ambient air exhaust from the heavy equipment in operation at the Landfill.

In general, the groundwater quality in the Phase 5 and 6 expansion area as reported during the 2016 feasibility study ranges from soft to very hard water. The 2016 hardness results from the four installed wells generally ranged from 80 mg/L to 289 mg/L, with the highest concentrations noted in MW-31. The hardness results from the last eight (8) rounds of semiannual sampling (2018-2021) at the same four wells range from 72.5 to 249 with the highest concentration again in MW-31. Historic sampling of the previously installed wells indicates that hardness over the entire expansion area ranges from as low as 37 mg/L (MW-17P sampled in December 1996) to as high as 835 mg/L (MW-3P sampled in June of 1994).

Testing for pH and conductivity indicate relatively neutral groundwater and low total dissolved solids content. Through the 2016 feasibility study, values of pH ranged from 6.6 to 9.5, with values reaching a low of 6.06 at MW-2 in March 1991. These values were not indicative of any water quality issues. Values of pH from the last 8 rounds of semi-annual sampling (2018-2021) report a low of 6.26 at MW-17P in September of 2018 and 7.9 in September of 2020 in MW-9.

Conductivity during the 2016 feasibility study, which is a relative measure of the dissolved ions present in the groundwater, was generally low, with values from the four newly installed wells ranging from approximately 110 to 417 µΩ/cm. Historic sampling of the previously installed wells indicates that the conductivity over the entire expansion area ranged from as low as 22 µΩ/cm (MW-17 in June 1988) to a high of 1791 µΩ/cm (MW-19 in March 2016). Values of conductivity over the last 8 rounds of semi-annual sampling (2018-2021) range from 107 µΩ/cm (MW-17 in March of 2019) to 1860 µΩ/cm (MW-22 in September 2019). These most recent data do not represent a significant change in the range of values compared to historical results.

The required rounds of baseline monitoring conducted in 2016 detected elevated levels of lead, vanadium, and manganese. A brief discussion of each parameter exceeding a PAL or ES is provided in the following paragraphs.

Manganese

Manganese was detected above the PAL in piezometer MW-30P during the December 17, 2015, sampling round. Historically, groundwater monitoring onsite showed elevated background concentrations of manganese at MW-3P, 6P, 7P, and 18P. Detectable background levels in the Phase 5 and 6 expansion area ranged from 0.0018 mg/L (MW-3) to 0.0292 mg/L (MW-30P) and are within the historic range of detection at the site prior to waste filling. This would indicate that the manganese detects are naturally occurring and represent background water quality.

According to the U.S. Department of Health and Human Services, manganese is a naturally occurring substance found in many types of rock and soil. Manganese concentrations can therefore vary greatly from well to well. Detectable background levels in the expansion area range from 0.0018 mg/L (MW-3) to 0.0292 mg/L (MW-30P). For the most recent baseline sampling, the PAL exceedance of manganese occurred only once during the feasibility baseline water quality testing and does not indicate groundwater quality issues.

Vanadium

Vanadium was detected above the PAL in monitoring well MW-30 during the December 17, 2015, sampling round. Common sources of vanadium in groundwater include dissolution of vanadium-rich rocks (such as mafic and andesitic rocks) and waste streams from industrial processes (Wright and Belitz, 2010). Neither of these sources is a likely source for the detects of vanadium in MW-30; it is located in an up-gradient position of current Landfill activities and the soils are lacustrine in nature. Only one exceedance has been detected at this location and it does not represent any pattern of detects indicative of contamination. Subsequent monitoring at this location has resulted in one low level detect of vanadium, but no further PAL exceedances. The exceedance appears to be an anomaly and is not Landfill related.

Lead

Lead was detected at levels above a regulatory standard during the 2016 feasibility study at monitoring wells MW-3, MW-3P, MW-17P, MW-30 and MW-31. Only one PAL exceedance was detected at MW-3, MW-3P, and MW-17P. Three PAL exceedances were noted at MW-30, and only one ES exceedance has been noted at MW-31. The following is a discussion on the repetitive exceedances:

MW-30

MW-30 is located near the eastern half of the phase 5 and 6 expansion area. There were three detects of lead at MW-30: the first during the December 2015 sampling round, the second during the February 2016 round, and the third during the June 2016 round. All three detects of lead (4.5, 2.6, and 1.8 µg/L respectively) exceeded the PAL of 1.5 µg/L.

MW-31

MW-31 is located in the southeast corner of the Phase 5 and 6 expansion area. Lead exceeded the ES during the first sampling round at MW-31. Only one lead detect has been noted at MW-31. This detect (97.9 µg/L) exceeds the ES (15 µg/L). Subsequent sampling at this location was no detect for lead. This exceedance at MW-31 appears to be an anomaly as confirmed by the following seven sampling rounds.

According to a study completed by the University of Wisconsin Stevens Point Center for Watershed Science and Education, Adams County Landfill is in a region of Wisconsin where lead in groundwater has been found to be 15 µg/L. In the southern region of Adams County, lead was found in the range of 26-50 µg/L. However, Kevin Masarik, Groundwater Education Specialist and lead of this study, indicated that these elevated detections of lead are likely a result of lead in the plumbing system of the residences in which the water samples were analyzed from, rather than directly from the groundwater.

As noted above, lead exceeded the PAL at other locations in addition to MW-30 and MW-31 both up and side gradient of the Phase 5 and 6 expansions. Historic sampling of lead from MWs 1, 1P, 2, 2P, 3, 3P, 6, 6P, 7, 7P, 9, 16, 17, 17P, 18, 18P, 19, and 19P from July 1986 to September 1987 indicates that

background levels of lead around the site is <5 µg/L (See Table 5-8 for background and baseline sampling summary).

The groundwater quality evaluation indicated similar quality over most of the Phase 5 and 6 expansion area, with little variation with depth of groundwater and few groundwater exceedances. Based on the eight rounds of the 2016 feasibility data, it appears slightly degraded water quality may be present in the vicinity MW-31. Hardness and conductivity were slightly elevated at MW-31 when compared to other three wells in the Phase 5 and 6 expansion area. The cause for the slight degradation in groundwater quality is not known but appears consistent through the additional rounds of sampling since 2016. The laboratory results from the eight rounds of monitoring associated with the horizontal expansion (Phases 5 and 6) are in Appendix H.

6.0 Waste and Leachate Characterization (NR 512.12)

A characterization of the waste and leachate anticipated to be disposed of and generated, during the proposed expansion is required per NR 512.12. The composition of waste accepted during operation of the vertical expansion is expected to remain consistent with waste currently accepted at the existing Landfill. Only non-hazardous solid waste will be accepted for disposal within the expansion. Special waste acceptance will vary and must meet the criteria listed in the approved Special Waste Acceptance Plan.

Leachate composition and generation is also anticipated to be consistent with leachate generated from the existing Landfill. Leachate that is generated at the existing Landfill is hauled offsite for treatment to a licensed WWTP. Leachate may also be recirculated back into the waste mass of Phases 3, 4, 5 and 6. Leachate generation will slowly decrease over time as phases reach capacity and final cover installed.

6.1 Waste Characterization

As discussed in Section 3.11, anticipated waste types to be accepted during operation of the proposed expansion are MSW, C&D, MRF residuals, and special wastes. These waste types represent recurring waste streams, or types, currently disposed at the existing Landfill. Discussions with Adams County Solid Waste staff indicate said waste types make up the majority of the waste received at the existing Landfill. No new waste types, such as a high-volume industrial waste, or other non-MSW, that would constitute more than 5% of the design capacity are anticipated to be disposed during the proposed expansion. MRF residuals consist of non-recyclable material that enter the recycling stream at the County owned and operated MRF located onsite. Below is a summary of the anticipated waste stream.

Waste Type	Percentage of Waste Composition (%)	Anticipated Waste Quantity (Tons)
Municipal Solid Waste	80% - 90%	20,000 – 27,000
Construction & Demolition	10% - 15%	2,000 – 3,000
MRF Residuals	1% - 2%	100 – 500
Special Wastes (see below)	≤1%	≤100

Special wastes are non-MSW type wastes that are not disposed of on a recurring basis at the Landfill, but occasionally receive requests for disposal. In order to accept these waste types, Adams County developed a Special Waste Acceptance Plan as a screening procedure to determine if the material is

suitable for disposal. Adams County intends to continue utilizing the Special Waste Acceptance Plan during the proposed expansion.

6.2 Leachate Generation

Leachate generation in regard to quantity and chemistry as a result of the proposed expansion is anticipated to be similar to the leachate generated by the existing Landfill. Leachate chemistry is anticipated to be similar because waste types are expected to remain consistent. Leachate generation calculations are summarized in Table 6-1 and a discussion of the calculations are as follows.

NR 512.12(3) requires the estimated daily volume of leachate that will be collected during operations and after closure of the Landfill be calculated. For unclosed, or open, areas of the Landfill with a composite liner, a minimum infiltration rate of 6 inches per year can be used for calculating daily leachate volume. For closed areas of the Landfill with a composite cap, a minimum infiltration rate of 1 inch per year can be used for calculating daily leachate volume. Utilizing these criteria along with the anticipated status of the existing Landfill at the start of expansion operation, leachate generation volumes can be calculated.

Currently, Phases 1 and 2 have their composite final cover installed and Phases 3, 4 and 5 remain open. Phase 6 has not yet been constructed but will be as part of the vertical expansion. During operations of the expansion approximately 7,674 gallons per day (gal/day) of leachate will be generated. This rate assumes Phases 3, 4, 5, and 6 are all open. This daily leachate generation rate represents the approximate maximum generation rate during operation of the expansion and existing Landfill. After closure, leachate generation will be reduced to approximately 1,622 gal/day. This rate is inclusive of all existing and proposed phases.

The existing leachate tank has a capacity of 30,000 gallons and can store the daily leachate generation rate for a 4-day period, per NR 504.06(5)(o).

7.0 Constraints on Landfill Development (NR 512.13)

As required by NR 512.13, the Feasibility Report shall contain a discussion of constraints that affect the development of the proposed expansion. Constraints considered consist of the following:

1. Locational criteria and performance standards outlined in NR 504.04.
2. Geotechnical features that may affect development.
3. Construction and operational features that may affect development.
4. Performance of the existing Landfill including compliance status.

The following subsections further discuss Landfill development constraints for the proposed expansion.

7.1 Locational Criteria (NR 504.04(3))

The following table summarizes the locational requirements of NR 504.04(3) for potential conflicts. Additional responses are provided below.

Table Landfill Expansion – Evaluation of Locational Criteria [NR 504.04(3)]

Locational Criteria	Potential Conflict?
Within 1,000 feet to the nearest navigable lake, pond, or flowage	No
Within 300 feet to the nearest navigable river or stream	No
Within a floodplain	No
Within 1,000 feet to the edge of right-of-way to a state or federal highway	No
Within 5,000 feet to the end of runway for piston airplanes	No

Within 10,000 feet to the end of runway for turbojet airplanes	No
Within 1,200 feet of a water supply well	No
Within 200 feet of a fault line	No
Within a seismic impact zone	No
Within an unstable area	No
Anticipated to have a detrimental effect on any surface water	No

7.1.1 Lakes, Rivers, Streams

No navigable rivers, ponds, flowages, or streams are within 1,000 feet of the proposed vertical expansion footprint. Big Roche-A Cri Creek is located approximately 1 mile from the northwest corner of the limits of waste of the existing Landfill. Refer to Figures 1 and 2 for locations of surface waters relative to the proposed expansion. The proposed vertical expansion meets the locational criteria of NR 504.04(3)(a)(b).

7.1.2 Floodplains

The proposed expansion is not within a floodplain. A FEMA floodplain insurance map is provided in Appendix L. The proposed expansion meets the locational criteria of NR 504.04(3)(c).

7.1.3 Highways, Public Parks, State Natural Areas

The proposed expansion is not within 1,000 feet of a right-of-way for a state trunk highway, interstate highway, or federal aid primary highway. The nearest state trunk highway is Highway 21, which is located approximately 3,000 feet from the existing and proposed limits of waste. There are no public parks or state natural areas within 1,000 feet of the proposed expansion. The proposed expansion meets the locational criteria of NR 504.04(3)(d)

7.1.4 Airports

A review of the Federal Aviation Administration (FAA) website of registered airports was conducted showing no results within a five-mile radius. The nearest airport is a small, public-owned (Adams County), public-use airport (Adams County Legion Field, #63C, Friendship, Wisconsin) located approximately 5.1 miles south-southeast of the eastern edge of the 2018 approved Landfill horizontal expansion (Phase 6). However, reviewing information conducted in the 2017 Feasibility Report it was revealed that there was a very small, private airstrip (Zanadu Airport, #WS04, Arkdale, Wisconsin) located approximately 0.93 miles west of the existing Landfill. A letter requesting FAA review during the 2017 feasibility of the horizontal expansion site was submitted to the FAA Regional Office on January 7, 2015, and a response was received on January 21, 2015, stating the FAA has no objection to the proposed expansion. Pertinent FAA correspondence was submitted to the Department as part of the 2017 ISR. The Zanadu Airport no longer exists; therefore, the Adams County Legion Field is the closest airport to the proposed vertical expansion.

Given that the Adams County Legion Field is greater than 5 miles from the proposed limits of vertical expansion and the existing MSW landfill was accepting waste prior to 4/5/2000, no notice or correspondence is required to be provided to the FAA or affected airport. The proposed expansion meets the locational criteria of NR 504.04(3)(e).

7.1.5 Public or Private Wells

A private water supply well is located on the south side of the Landfill office. The well (AJ514) is 124 feet deep. The construction report is in Appendix G. The distance from limits of waste to the well is 1,395 feet, outside of the required 1,200-foot setback distance. Figure 5 shows the location of this well relative

to the proposed expansion. No other private wells from neighboring properties or public water supply wells are located within 1,200 feet of the proposed expansion. There is one high capacity, non-potable well (K0311) associated with the property thereby classifying the site as a high-capacity property (high capacity well permit #1602). The well was installed for irrigation purposes and is located greater than the 1,200-foot setback distance from the proposed expansion as shown on Figure 5. The proposed expansion meets the locational criteria of NR 504.04(3)(f).

7.1.6 Fault Area Concerns

Based on a January 7, 1994, letter from the Wisconsin Geological and Natural History Survey (WGNHS), there are no identified faults of Holocene Age in the area. The proposed expansion is not located within 200 feet of a fault that has had displacement in Holocene time. A copy of the WGNHS correspondence is in Appendix M. The proposed expansion meets the locational criteria of NR 504.04(3)(g).

7.1.7 Seismic Impact Zones

According to the same letter referenced in Section 7.1.6, no known seismic impact zones, as defined in NR 500.03(208), exist in Wisconsin. The proposed expansion meets the locational criteria of NR 504(3)(h).

7.1.8 Unstable Areas

Subbase excavation activities during previous liner construction events of the existing Landfill have encountered areas of poorly graded or gap-graded sandy soils (often referred to as “sugar sand”). These soil types are typically undesirable subbase material and have been removed during previous construction events by excavating below planned subbase and replacing with a more suitable or stable subbase material. Subbase replacement material has occurred in the form of silty sand overburden from the clay borrow site and crushed glass. Both materials have worked effectively at providing stable subbase when these soil types have been encountered. Poor subbase soils are typically screened by visual inspection and proof rolling.

This potential for the need to remove and replace subbase material is not considered a significant constraint on landfill development as the proposed vertical expansion will not result in enlarging the existing Landfill footprint. No other unstable areas meeting the definition of NR 500.03(246) are anticipated to be encountered resulting in the inability of the proposed expansion from meeting the locational criteria of NR 504.04(3)(i).

7.2 Performance Standards (NR 504.04(4))

The following table summarizes the performance standard requirements of NR 504.04(4) for potential conflicts. Additional responses are provided below.

Table Landfill Expansion – Evaluation of Locational Criteria [NR 504.04(3)]

Performance Standard Criteria	Potential Conflict?
A significant adverse impact on wetlands?	No
A take of an endangered or threatened species in accordance with s. 29.604, Stats?	No
Within a floodplain	No
Anticipated to have a detrimental effect on any surface water	No
Anticipated to have a detrimental effect on any groundwater	No
Anticipated to have migration and concentration of explosive gases	No
Emission of hazardous air contaminant exceeding NR 445.04/05 limitations?	No

7.2.1 Wetlands

The proposed expansion is not anticipated to have any significant adverse impacts on wetlands. No wetlands are located within the expansion footprint. The nearest wetlands are located within the floodplain of Big Roche A Cri Creek approximately 0.7 miles northwest, refer to Appendix B ISI submittal for visual reference. Ongoing monitoring of the existing landfill has been conducted since inception showing no impacts reached the existing wetlands and the landfill will continue quality control testing of the monitoring wells for any possible impacts of the Big Roche a Cri Creek and associated wetlands. The proposed expansion meets the performance standard of NR 504.04(4)(a).

7.2.2 Endangered or Threatened Species

An Endangered Resources Review (ERR) was requested by Ayres during the ISI process, located in Appendix B, of the proposed expansion. The WDNR response indicated a formal ER Review letter is not necessary since the project is covered by Activity 1-A12 in Table 1 of the Broad Incidental Take Permit/Authorization. The Endangered Resources Review Verification Form (1700-079) was completed by the WDNR and is included in Appendix B. The proposed expansion meets the performance standard of NR 504.04(4)(b).

The ERR was conducted for the proposed borrow source west of the vertical expansion, as shown in the ISI submittal, Appendix B, as well as the northern site of their existing borrow site as operations in that area of the permitted borrow site has not been in use since 2015 Phase 4 liner construction, with some portions undisturbed since the initial 1989 Phase 1 construction. Ayres Associates performed the Level 1 vegetation survey that satisfied the required action of the ERR. No instances of the vegetation were identified in the project area.

7.2.3 Surface Water

The proposed expansion is not anticipated to have a detrimental effect on surface water. The expansion will be designed with appropriate storm water control features including, but not limited to, ditches, sedimentation and/or infiltration basins, etc. Storm water control features will be appropriately sized to control flow and sediment loading from runoff. The current and permitted infiltration basins are designed for 100-year 24-hour events. Refer to Section 8.8 for discussion on storm water control. The nearest surface water is Big Roche A Cri Creek which is approximately 1 mile from the Landfill. Infiltration and evaporation of runoff will occur prior to any runoff reaching the nearby creek The proposed expansion meets the performance standard of NR 504.04(4)(c).

7.2.4 Groundwater Quality

The expansion is not expected to have a detrimental effect on the groundwater quality of the area. The existing groundwater quality generally is good and is discussed in detail in Section 5.8.4. The proposed expansion is designed in conformance with NR 504.06. This design incorporates the existing composite liner and leachate and landfill gas collection systems along with a new cap system. The Landfill is located in a coarse-grained soil environment as previously permitted in the 1986 and 2017 Feasibility Studies. Ongoing monitoring of the existing landfill has been conducted since inception showing no ongoing impacts exceedances, or continuous increases of parameters since the recent 2016 Feasibility Report, except for the requested exemptions. The landfill will continue quality control testing of the monitoring wells for any possible impacts of the groundwater. Sporadic detections of various compounds have been reported and are summarized below.

MW-1P: Tetrachloroethylene was reported at 1.9 ug/kg which exceeds the PAL (0.5 ug/kg) in March of 2021. The subsequent sampling round did not detect tetrachlorethylene, but did have low-level detection of toluene below the PAL.

MW-19: Tetrahydrofuran was detected in the samples collected in March of 2017 and 2018 at concentrations below the PAL. Subsequent sampling has been non-detect for tetrahydrofuran.

MW-22: Reported elevations concentrations of alkalinity, conductivity and hardness since 2013. Concentrations have not exceeded the levels reported in 2013 but have fluctuated over the years. No trends have been established.

MW-30: Three petroleum-related compounds including 1,2,4 trimethylbenzene, m & p xylene and toluene were detected in the March 2021 round of sampling. Detections were below regulatory standards

MW-30P: 1,2,4 trimethylbenzene was detected at a concentration of 0.42 ug/kg in the sample collected from the March 2021 round of sampling.

7.2.5 Landfill Gas

The migration and concentration of explosive gases in excess of 25% of the lower explosive limit will be controlled by the active gas extraction system (i.e. flare and blower unit). Active gas system components including gas extraction wells, gas laterals, and gas header system will be incorporated in the proposed design to actively collect and mitigate explosive gases. Additionally, the proposed expansion will incorporate a composite cover system that will serve as an impermeable barrier to prevent gas migration beyond the limits of filling. Section 7.3.2 discusses the gas system performance of the existing Landfill. Section 8.0 further discusses preliminary design for the landfill gas system.

7.2.6 Air Emissions

Operations within the expansion are expected to be comparable to the existing Landfill. Air emissions will be similar in type to those that are emitted from current operations. Emissions will consist of gases generated by decomposition of waste in the Landfill, combustion byproducts from the active gas system, motor vehicle operation, and fugitive dust generated by wind and vehicle traffic. The active gas system will be utilized to control emissions of hazardous air contaminants NR 504.08 and NR 445.04 and the composite cover system will prevent further emissions.

7.3 Existing Landfill Performance

7.3.1 Groundwater Quality Monitoring Data

Twenty-nine monitoring wells monitor the groundwater quality of the existing Landfill complex. Of these twenty-nine wells, twenty-one are monitored as part of the existing monitoring program and four were installed to monitor the solid waste processing and recycling facility and are only monitored for groundwater elevation. The remaining four wells were installed as part of the June 2017 Feasibility Report. Table 5-8 shows the four most recent sampling rounds for the monitoring wells being utilized for the existing Landfill.

Groundwater quality data from the existing Landfill indicates the landfill liner and landfill gas control system are effectively protecting groundwater. PAL values have been calculated and were approved two separate WDNR plan modifications dated May 7, 1995, and February 14, 2019. PALs were calculated for indicator parameters including filtered alkalinity, filtered COD, field conductivity at 25 degrees Celsius, and filtered total hardness (PAL values are in Appendix K along with the WDNR approvals).

The calculated PAL values provide a point of comparison for current and future groundwater quality data. Currently the indicator parameter concentrations attain or exceed the calculated PALs for multiple monitoring wells at the Landfill. In addition to the indicator parameters, the Landfill monitoring wells have also been monitored for public welfare and public health parameters as required by WDNR. A review of

monitoring wells with exceedances of the site-specific NR 140.20 Table 3 Indicator Parameters is listed below:

Alkalinity (Dissolved)

Well ID	Date Sampled	Concentration (mg/L)	Calculated PAL (mg/L)
MW-1	March 7, 2012	320	290
	September 12, 2012	290	
	September 17, 2013	290	
	March 17, 2015	300	
	September 8, 2015	340	
	March 16, 2016	420	
	September 19, 2016	370	
	March 9, 2017	390	
	September 6, 2017	360	
	March 7, 20187	360	
	September 6, 2018	360	
	March 5, 2019	310	
	September 4, 2019	320	
	March 4, 2020	310	
	September 2, 2020	330	
	March 2, 2021	320	
	September 7, 2021	310	
MW-3	March 10, 2017	290	290
	September 8, 2017	290	
	March 8, 2018	290	
	September 6, 2018	290	
MW-6	March 7, 2012	240	230
	March 16, 2016	240	
	September 19, 2016	240	
	March 7, 2018	270	
MW-6P	March 7, 2012	290	290
	March 9, 2017	310	
	September 6, 2019	330	
	March 7, 2018	300	
MW-16	March 16, 2016	340	320
MW-18	March 16, 2016	360	340
	September 6, 2017	390	
	March 7, 2018	400	
	September 6, 2018	350	
MW-19	March 16, 2016	300	300
	September 19, 2016	420	
	March 9, 2017	590	
	September 6, 2017	480	
	March 7, 2018	550	
	September 6, 2018	460	
	March 5, 2018	380	
	September 4, 2019	320	
	March 4, 2020	320	
	September 2, 2020	300	
	March 2, 2021	310	
MW-19P	September 9, 2015	250	240
MW-20	March 7, 2012	700	290
	September 12, 2012	610	

	March 11, 2013	600	
	September 17, 2013	630	
	March 19, 2014	590	
	September 23, 2014	610	
	March 17, 2015	630	
	September 8, 2015	640	
	March 16, 2016	670	
	September 19, 2016	630	
	March 9, 2017	660	
	September 6, 2017	660	
	March 7, 2018	690	
	September 5, 2018	640	
	March 5, 2018	520	
	September 4, 2019	520	
	March 4, 2020	500	
	September 2, 2020	490	
	March 2, 2021	480	
	September 7, 2021	430	
MW-21	March 7, 2012	510	290
	September 12, 2012	480	
	March 11, 2013	490	
	September 17, 2013	490	
	March 19, 2014	490	
	September 23, 2014	450	
	March 17, 2015	470	
	September 8, 2015	500	
	March 16, 2016	540	
MW-21	September 19, 2016	500	
	March 9, 2017	540	
	September 6, 2017	540	
	March 7, 2018	530	
	September 5, 2018	510	
	March 5, 2018	440	
	September 4, 2019	420	
	March 4, 2020	410	
	September 2, 2020	420	
	March 2, 2021	390	
	September 7, 2021	330	
MW-22	March 7, 2012	750 (unfiltered)	
	September 12, 2012	730	
	March 11, 2013	820 (unfiltered)	
	September 17, 2013	550	
	March 19, 2014	650	
	September 23, 2014	570	
	March 17, 2015	650	
	September 8, 2015	670	
	March 16, 2016	730	290
	September 19, 2016	630	
	March 9, 2017	640	
	September 6, 2017	700	
	March 7, 2018	720	
	September 5, 2018	670	
	March 5, 2018	570	
	September 4, 2019	560	
	March 4, 2020	610	
	September 2, 2020	610	

	March 3, 2021 September 7, 2021	640 710	

PALs have been calculated for the monitoring wells of Phases 1-6 with the exception of MW-9. Alkalinity is an indicator parameter and any increase in this compound does not pose a threat to public health.

Chemical Oxygen Demand

Well ID	Date Sampled	Concentration (mg/L)	Calculated PAL (mg/L)
MW-1	September 16, 2016	70	32
MW-2	March 17, 2016	110	30
MW-2P	September 10, 2015 March 17, 2016	47 130	31
MW-3	March 20, 2014 March 17, 2016 September 20, 2016	95 110 35	32
MW-3P	March 20, 2014 March 17, 2016 September 20, 2016	95 66 49	30
MW-6P	September 23, 2014	36	28
MW-7P	September 17, 2013 March 17, 2015	32 72	29
MW-16	March 16, 2016 September 19, 2016	75 47	31
MW-17	March 17, 2016 September 20, 2016	62 31	29
MW-17P	September 24, 2014 March 17, 2016	91 55	29
MW-18	March 16, 2016	280	28
MW-18P	March 16, 2016	180	28
MW-19	March 16, 2016 September 19, 2016	240 31	28
MW-19P	March 19, 2014 March 16, 2016 September 19, 2016	30 170 100	29
MW-20	March 19, 2014 March 17, 2015 March 16, 2016	110 90 250	29
MW-21	March 16, 2016	240	42
MW-22	March 11, 2013 March 19, 2014 March 17, 2015 September 9, 2015 March 16, 2016	91 29 65 160 300	29

PALs have been calculated for the monitoring wells of Phases 1-4 with the exception of MW-9. Elimination of COD from the Groundwater Monitoring Plan was approved by the DNR in 2016.

Conductivity (Field)

Well ID	Date Sampled	Measurement at 25 °C (µΩ/cm)	Calculated PAL (µΩ/cm)
MW-1	March 11, 2013 March 19, 2014 September 23, 2014 March 17, 2015 September 8, 2015 March 16, 2016 September 19, 2016 March 9, 2017 September 6, 2017 March 7, 2018 September 6, 2018 March 5, 2019 September 4, 2019 March 4, 2020 September 2, 2020 March 2, 2021 September 7, 2021	956 634 633 703 921 1073 851 702 629 630 602 6789 645 674 699 653 650	590
MW-1P	September 2, 2020	680	610
MW-2	March 20, 2014	485	480
MW-3P	March 20, 2014	465	450
MW-6	March 11, 2013	712	470
MW-6P	September 6, 2017	586	580
MW-16	March 11, 2013 March 19, 2014 September 23, 2014	866 652 969	590
MW-18	March 11, 2013 September 23, 2014 March 17, 2015 September 8, 2015 March 16, 2016 September 19, 2016 March 9, 2017 September 6, 2017 March 7, 2018 September 6, 2018 March 5, 2019 March 4, 2020 March 3, 2021	959 1012 707 1470 1370 724 666 956 957 719 740 712 678	650
MW-19	March 11, 2013 September 23, 2014 March 16, 2016 September 19, 2016 March 9, 2017 September 6, 2017 March 7, 2018	796 597 603 933 1275 980 1115	590

	September 6, 2018 March 5, 2019 September 4, 2019 March 4, 2020 September 2, 2020 March 2, 2021 September 7, 2021	911 875 767 879 793 945 927	
MW-19P	March 11, 2013	460	460
MW-20	March 7, 2012 September 12, 2012 March 11, 2013 September 17, 2013 March 19, 2014 September 23, 2014 March 17, 2015 September 8, 2015 March 16, 2016 September 19, 2016 March 9, 2017 September 6, 2017 March 7, 2018 September 5, 2018 March 5, 2019 September 4, 2019	817 703 1696 834 974 1153 674 1084 1044 1012 1009 1014 1005 969 910 915	590
MW-20	March 4, 2020 September 2, 2020 March 2, 2021 September 7, 2021	876 862 833 799	

Conductivity (Field) (Continued)

MW-21	March 7, 2012 September 12, 2012 March 11, 2013 September 17, 2013 March 19, 2014 September 23, 2014 March 17, 2015 September 8, 2015 March 16, 2016 September 19, 2016 March 9, 2017 September 6, 2017 March 7, 2018 September 5, 2018 March 5, 2019 September 4, 2019 March 4, 2020 September 2, 2020 September 7, 2021	806 724 1684 845 1116 1084 656 1103 1076 1048 1069 1055 951 937 861 833 813 804 669	590
MW-22	March 7, 2012 September 12, 2012 March 11, 2013 September 17, 2013	1416 1183 1998 895	590

	March 19, 2014	1367	
	September 23, 2014	1144	
	March 17, 2015	823	
	September 8, 2015	1750	
	March 16, 2016	1791	
	September 19, 2016	1151	
	March 9, 2017	1098	
	September 6, 2017	1348	
	March 7, 2018	1468	
	September 5, 2018	1341	
	March 5, 2019	1450	
	September 4, 2019	1354	
	March 4, 2020	1640	
	September 2, 2020	1770	
	March 3, 2021	1660	
	September 7, 2021	1860	

PALs have been calculated for the monitoring wells of Phases 1-6 with the exception of MW-9. Conductivity is an indicator parameter and any increase in this compound does not pose a threat to public health.

Total Filtered Hardness

Well ID	Date Sampled	Concentration (mg/L)	Calculated PAL (mg/L)
MW-1	September 12, 2012	312	310
	March 17, 2015	381	
	September 8, 2015	367	
	March 16, 2016	419	
	September 19, 2016	375	
	September 2, 2020	334	
	March 2, 2021	314	
	September 7, 2021	317	
MW-16	September 23, 2014	363	360
MW-18	March 17, 2015	633	420
	September 8, 2015	591	
	March 16, 2016	467	
MW-19	March 17, 2015	351	340
	September 19, 2016	481	
	March 9, 2017	465	
	September 6, 2017	479	
	March 7, 2018	543	
	September 6, 2018	406	
	March 5, 2019	440	
	September 4, 2019	356	
	March 4, 2020	424	
	September 2, 2020	382	
	March 2, 2021	427	
	September 7, 2021	397	
MW-20	March 7, 2012	632	390
	September 12, 2012	651	
	March 11, 2013	615	
	September 17, 2013	589	
	March 19, 2014	558	

	September 23, 2014	631	
	March 17, 2015	741	
	September 8, 2015	588	
	March 16, 2016	517	
	September 19, 2016	571	
	March 9, 2017	456	
	September 6, 2017	570	
	March 7, 2018	602	
	September 5, 2018	515	
	March 5, 2019	533	
	September 4, 2019	472	
	March 4, 2020	480	
	September 2, 2020	485	
	March 2, 2021	459	
	September 7, 2021	432	
MW-21	March 7, 2012	640	390
	September 12, 2012	651	
	March 11, 2013	550	
	September 17, 2013	616	
	March 19, 2014	544	
	September 23, 2014	606	
	March 17, 2015	699	
	September 8, 2015	592	
	March 16, 2016	525	
	September 19, 2016	586	
	March 9, 2017	477	
	September 6, 2017	588	
	March 7, 2018	559	
	September 5, 2018	497	
	March 5, 2019	508	
	September 4, 2019	427	
	March 4, 2020	436	
	September 2, 2020	441	
	March 2, 2021	398	
MW-22	March 7, 2012	1120	390
	September 12, 2012	1210	
	March 11, 2013	2010	
	September 17, 2013	582	
	March 19, 2014	941	
	September 23, 2014	645	
	March 17, 2015	1020	
	September 8, 2015	965	
	March 16, 2016	915	
	September 19, 2016	650	
	March 9, 2017	488	
	September 6, 2017	762	
	March 7, 2018	923	
	September 5, 2018	740	
	March 5, 2019	893	
	September 4, 2019	724	
	March 4, 2020	939	
	September 2, 2020	1070	
	March 3, 2021	988	
	September 7, 2021	1130	

PALs have been calculated for the monitoring wells of Phases 1-6 with the exception of MW-9. Hardness is an indicator parameter and any increase in this compound does not pose a threat to public health.

7.3.2 Landfill Gas System Performance

The Landfill's active gas system consists of a blower and flare system that extracts landfill gas from the waste mass and combusts it to mostly carbon dioxide. The active gas system was installed in 2016. The system is currently operating seven of the scheduled nine landfill gas extraction wells. Additional gas extraction wells will be installed as waste filling progresses. Landfill gas readings at the flare unit indicate the system is performing adequately and will be able to tolerate significant increases in gas production as more gas extraction wells are installed. Any adjustments needed to the active gas system will be addressed in the Plan of Operations.

The performance of the landfill gas system is evaluated by the gas monitoring probes installed around the perimeter of the Landfill. Currently three of the scheduled four gas probes have been installed, GP-1 (Point ID 036), GP-2 (Point ID 037), and GP-3 (Point ID 038). GP-1 and GP-2 have been monitored quarterly since 2000 and GP-3 since 2022. Gas probes are monitored for percent oxygen and percent methane. Methane has not been detected in these gas probes with the exception of two monitoring events in 2011, where methane was detected at 0.9% and 0.4% in GP-1. However, these low-level detections are most likely due to either operator error or poor instrument calibration given to the consistent non-detect readings over the past 22 years and are an unlikely indication of gas migration. The addition of the landfill gas blower and flare system in 2016 has improved landfill gas treatment, management, and overall performance of the landfill gas system. No detections of methane have been encountered in the gas probes while the active gas system has been operational.

One additional gas probe (GP-4) will be installed around the perimeter of the existing Landfill and proposed expansion. Existing gas probe locations can be seen on Plan Sheet 29. Section 8.7 discusses the proposed monitoring requirements.

7.3.3 Leachate Collection System Performance

The existing leachate collection system collected and removed approximately 3,552,045 gallons of the leachate in 2021. This equates to a daily average of 9,732 gallons/day. Leachate quantities vary year to year based on precipitation.

Leachate collection system performance is evaluated by the installation of leachate headwells. The purpose of the headwells is to directly measure the head build-up atop of the liner system. Monitoring data from leachate headwells 5, 6, 7 and 8 is currently available on the WDNR GEMS database from September of 2018 through March of 2022 and can be found in Table 6-2. Measurements collected from LH-5 range from 0 ft to 45.3 ft (March of 2020). The most recent measurement in March of 2022 was 0 ft. No leachate has been measured during the aforementioned timeframe in LH-6 or LH-8. Measurements from LH-7 range from 0 ft to 22.85 ft. The measurements are consistent and show what appears to be seasonal variability. The recorded measurements of leachate in the headwells combined with the quantity of leachate removed from the landfill indicate the system is operating effectively.

7.3.4 Lysimeter Performance

Lysimeters have been installed beneath the liner of Phases 1 and 2. Phases 3 and 4 consist of composite liners and therefore do not contain lysimeters per NR 504.06(5)(u). Phases 1 and 2 consist of a clay soil liners. Lysimeters are intended to monitor the liner systems performance by being able to collect a liquid sample from leachate that may have permeated through the liner system. Lysimeter, CLR-1, which is located beneath Phase 1 has been monitored semi-annually since 1990. Lysimeter, CLR-2, which is located beneath Phase 2 has been monitored semi-annually since 1993.

Since the installation and monitoring of both lysimeters, liquid has been found present in the lysimeters. However, no detections of VOCs are indicated to have been detected on the WDNR Groundwater Environmental Monitoring System (GEMS) database. Additionally, Phases 1 and 2 have had final cover installed in the form of a 5-foot-thick composite cover. Final cover greatly reduces the amount of precipitation infiltrating the waste mass.

Lysimeters are not planned to be installed for the landfill Phases 3-6 or the vertical expansion as the liner system will consist of a composite liner, thus greatly reducing the potential of percolation versus a clay earthen liner.

7.4 Geotechnical Features Affecting Development

7.4.1 Geologic

Geologically, the upper soils consist of poorly graded silty sands; the majority of these soils are classified as SM, ML, and CL, with minor areas of soils classified as CL-ML and SP-SC. This unconsolidated material is at least up to 75 feet thick in the expansion area. These soil types should not affect landfill development. In addition, bedrock was not encountered during the geotechnical investigation, thereby meeting the required 10-foot separation distance between bedrock and the proposed subbase of NR 504.06(2)(4)(c).

7.4.2 Hydrogeologic

Groundwater was detected from approximately 21 to 38 feet below ground surface during the 2016 feasibility for the Phase 5 and 6 expansions. The groundwater seepage velocities of the unconsolidated aquifer at the site ranged from 0.70 to 3.31 feet/day. The 2016 geotechnical investigation did not reveal any hydrogeologic features that would affect landfill development. Subbase elevations were designed accordingly so that the required 10-foot separation distance between the subbase and groundwater could be attained, of NR 504.06(2)(4)(b).

7.4.3 Topographic

Current ground surface elevations for the vertical expansion area are presented on Sheet 2 and derived from the June 2022 site survey. Active waste placement is occurring from west to east as shown by the primarily eastward slope on Phases 3 and 4. Current elevations in the proposed vertical expansion footprint range from approximately 1028 ft msl to 970 ft msl.

The proposed subbase of the vertical expansion is the top of waste at various elevations across Phases 2 through 5. The subbase of those phases required the manipulation of existing topography by excavating and filling soils to achieve the current base grades.

The hills east of the Landfill will enable the site to blend into the surrounding topography after closure. Large trees surrounding the Landfill, as well as the Landfill lying approximately 0.6 miles north of State Highway 21, will continue to provide visual screening from most vantage points.

7.4.4 Hydrologic

Hydrologic conditions of the proposed expansion area are not anticipated to have an effect on landfill development nor be affected by landfill development. Currently, storm water drains north, south and west away from the capped Phases 1 and 2. The remaining phases are either active and receiving waste or not yet constructed. Due to the permeable nature of the site's soils, groundwater is the primary receiving water of storm water runoff at the site. The proposed expansion will incorporate storm water control features that follow existing hydrologic conditions. Storm water infiltration basins are proposed to be

incorporated into the development of the Landfill that will continue to allow infiltration. Storm water control features are further discussed in Section 8.8.

7.5 Construction and Operation

7.5.1 General

There are no construction or operational constraints that would restrict development of the proposed expansion nor prevent the expansion from maintaining compliance with current solid waste regulations. Soil materials that will be used for the final cover systems are available on County owned property.

There are no specialized engineering structures other than those typically involved with landfill construction required to expand the Landfill.

7.5.2 Leachate Treatment

Landfill leachate is currently being treated offsite at the City of Adams Wastewater Treatment Facility and/or Village of Plover Facility. Both treatment plants are capable of treating leachate from the Landfill and will be utilized for the proposed expansion. Additionally, Adams County received approval for leachate recirculation in March 2017. Adams County has not yet conducted leachate recirculation but may conduct leachate recirculation practices during operation of the proposed expansion if necessary. Further discussion of leachate treatment is in Section 8.3.3.

8.0 Proposed Preliminary Design (NR 512.14)

Pursuant to NR 512.14, the Feasibility Report is required to contain a discussion of the preliminary design and recognize any design constraints based on the constraints recognized in NR 504 and Section 7.0 of this report. As previously mentioned, the proposed expansion will be designed in accordance with the applicable provisions of NR 504. No design constraints that would conflict with NR 512.13 are anticipated to occur.

In general, the liner and cover components will consist of composite systems. The active gas system will continue to be implemented with the proposed expansion. The expansion will extend vertically over Phases 2, 3, 4, 5 and 6. Further discussion of the preliminary design is discussed in the following subsections. Further design details of the expansion will be provided in the Plan of Operations to follow this Feasibility Report.

8.1 Materials Balance

The quantity of soils required to construct the liner of Phase 6 and the final cap of the vertical expansion is approximately 206,400 cy. Available soils from the existing and proposed soil borrow sources plus the soils available from the Phase 6 subbase excavation total approximately 207,000 cy.

8.2 Liner System

The liner system consists of a composite liner designed in accordance with NR 504.06. The installed composite liner is comprised of a 4-foot-thick compacted clay layer overlain by a 60 mil HDPE geomembrane and leachate collection system. The composite liner functions as the primary containment system.

8.3 Leachate Control

Leachate will be controlled via the leachate collection system designed in accordance with NR 504.06(5). The leachate collection system is designed to collect leachate off the liner and route it to a collection tank or recirculate it back into the waste mass. Leachate that is routed to the collection tank will be transported offsite to a wastewater treatment facility or recirculated. The leachate collection system is shown on Plan Sheet 22.

8.3.1 Leachate Collection

The leachate collection system currently permitted and utilized at the Landfill will continue to be used as part of the vertical expansion. The subbase and base of the composite liner system have been installed in constructed phases to convey leachate to a centrally located collection trench within each Phase. Leachate collection trenches contain geotextile, gravel bedding, and a 6-inch diameter Schedule 80 PVC perforated pipe which convey leachate to a collection sump. A sump has been constructed in each constructed phase to allow leachate to be removed from the Landfill.

Leachate removal from the Landfill will continue to be completed by leachate extraction sumps, sideslope riser pipes, and submersible pumps. The sideslope riser provides access for a submersible pump that transfers leachate from the sump to the leachate header system. The sideslope riser extends to a leachate extraction manhole at the top of the berm, which provides a maintenance/access point for the submersible pump and a discharge connection to the leachate header system. A valve connection is located on the discharge line that allows leachate to either be recirculated back into the waste mass or to the leachate header system. The leachate header system transports leachate to a leachate collection tank where it is contained and eventually taken offsite for treatment. A new, 30,000-gallon leachate

collection tank was installed in 2019. All leachate collection features outside the composite lined area will have a form of secondary containment in the event the primary containment is compromised.

8.3.2 Leachate Containment

The installed composite liner system will continue to act as the primary containment within the Landfill. Outside of the liner system, secondary containment measures have been implemented to assure groundwater protection.

8.3.3 Leachate Treatment

Leachate that is discharged to the leachate collection tank is transported offsite to a wastewater treatment plant (WWTP). Currently, the City of Adams WWTP or the Village of Plover WWTP are utilized for treatment and disposal. Leachate treatment agreements from the City of Adams and Village of Plover are provided in Appendix N.

8.3.4 Leachate Recirculation

The County intends to recirculate leachate back into the waste mass of the proposed phases to improve waste degradation and stabilization. Approval for leachate recirculation implementation was received by Adams County in March 2017. The Adams County leachate recirculation plan discusses leachate recirculation activities in the form of a series of drain fields and by surface application. Leachate recirculation will occur within existing Phases 3, 4, 5 and the vertical expansion over these phases. Leachate recirculation will not occur in Phases 1 and 2 due to the liner system consisting of only an earthen clay liner. Leachate from Phases 1 and 2 will continue to discharge to the leachate tank,

Leachate recirculation methods for the proposed expansion will be consistent with the existing recirculation plan. Drainage layer material within the proposed expansion will consist of material that has a hydraulic conductivity of at least 1 cm/s. A more permeable drainage media will better aid in preventing trapped areas of leachate. Further design details of the leachate recirculation methods for the proposed expansion will be presented in the Plan of Operations.

8.4 Landfill Gas Control

Landfill gas produced by degradation of the waste mass will be extracted by a series of gas extraction wells. Currently, the Landfill has seven of the scheduled nine gas extraction wells installed. These gas extraction wells have been installed in accordance with NR 504.08. The previously approved gas extraction system services the entire landfill footprint. The vertical expansion does not expand on this footprint but does add height to the profile. The permitted gas extraction system will be utilized and gas extraction wells extended vertically while maintaining connection to the existing gas collection system to be actively collected by the Landfill's blower. Landfill gas of the expansion (and previously existing) area will then be destroyed (i.e. converted to carbon dioxide) by the flare.

Landfill gas control system layout, details, and evaluation of the existing blower, if needed, will be addressed in the Plan of Operations.

8.4.1 Landfill Gas Collection

Landfill gas that is extracted from the Landfill will be collected via a network of pipe laterals and headers that ultimately route the landfill gas to the existing flare unit. Gas collection pipes will be present within and outside the waste limits. Gas collection piping that resides outside the waste will incorporate an approved secondary containment method in accordance with Section 504.08(2)(L). Additionally, this pipe network will concurrently convey condensate that may develop from transport of the landfill gas. Ultimately, the condensate that develops is deposited into the existing leachate tank and treated as such.

8.4.2 Landfill Gas Containment

Landfill gas containment will be achieved by the composite liner and composite cover systems in combination with the active gas system. The liner and cover systems will act as impermeable barriers that will prevent the migration of landfill gas while the active gas system imposes a vacuum on the waste mass.

8.4.3 Landfill Gas Treatment

Landfill gas extracted from the waste mass will be treated via the existing active gas system. The active gas system consists of a blower and flare unit that draws landfill gas out of the Landfill and routes it to the flare where it can be combusted converting it to carbon dioxide. Methane has a much more potent greenhouse effect, roughly twenty times, compared to carbon dioxide.

8.5 Final Cover System

The final cover system will consist of a 5-foot-thick composite cap that will be designed in accordance with NR 504.07. Final cover grades are shown on Plan Sheet 24. The composite cover system, from top down, is proposed to consist of the following layers:

- 6 inches topsoil.
- 18-inch rooting layer.
- 12-inch granular drainage layer.
- 40 mil LLDPE geomembrane.
- Geosynthetic Clay Liner (GCL)
- 24-inch compacted general fill soil layer
- 6-inch grading layer

8.6 Site Development and Operation

Development of the proposed expansion will begin by removing intermediate cover that has been placed over Phase 3. Once the intermediate cover is removed, placement of waste will occur over existing waste in Phase 3.

Excavate and remove intermediate cover on Phase 3. Excavate and berm the extent of the vertical footprint where it intersects with the Phase 2 cap. Disturbance of the Phase 2 cap will be minimally invasive, the extent is presented on Sheet 24.

Storm water control features will also be constructed, as needed, during the preparation of Phases 2 and 3 for acceptance of waste as part of the vertical expansion.

Once the intermediate cover of Phase 3 is removed and the Phase 2 cap prepared, the general sequence of waste placement will vary dependent on access but in general, waste will be placed by pushing waste out over the existing waste from west to east. Intermediate cover will be utilized on areas that remain idle for longer than six months.

The working face will be kept as small an area as practical. Daily cover in the form of native onsite sand, or approved alternate daily cover (ADC) will be used to cover the active disposal area.

The surrounding landscape of the Landfill is primarily wooded, which will naturally screen daily operations from State Highway 21 and neighboring residences. No additional features to screen the operation from sight are anticipated at this time.

Nuisance issues, such as dust, odor, and noise will be minimized in accordance with generally accepted standard operating procedures. Dust will be controlled with a water truck as needed, odor will be controlled by use of daily cover and the active gas system, and noise will be handled by incorporating noise reduction systems where appropriate. Paper and other wind-blown debris will be collected in a timely manner. If needed, portable wind screens will be placed around the active filling area to aid in control of wind-blown debris.

8.7 Proposed Environmental Monitoring Plan

8.7.1 Groundwater Monitoring

The groundwater monitoring program is designed to comply with the requirements of the WDNR approved May 17, 1995, plan modification for the existing Landfill.

The existing Subtitle D wells for the site are MW-7, MW-16, and MW-18. We are proposing to utilize these same Subtitle D wells. During the most recent expansion (Phase 5), Subtitle D well MW-17 was abandoned due to location conflict with the expansion footprint. MW-17 formerly monitored the up-gradient water quality for the existing Landfill. MW-30, located up-gradient of the proposed expansion, was installed to replace MW-17. Monitoring wells MW-3/3P and MW-17/17P have been abandoned due to their locations within the Phase 5 expansion footprint.

The proposed monitoring plan includes water table observation wells and piezometers around the perimeter of the existing Landfill and the expansion area, as outlined in Plan Sheet 25.

8.7.2 Leachate Monitoring

Leachate monitoring will be performed at various monitoring points including the leachate collection tank, leachate headwells, and lysimeters. The number of monitoring points will be further detailed in the Plan of Operations. Below is a proposed leachate monitoring schedule for various points:

- Leachate Collection Tank: Monitored monthly for volume pumped and/or recirculated and semi-annually for laboratory analysis of parameters listed in Tables 4 and 5 of NR 507.

- Lysimeters: Existing lysimeters will continue to be monitored semi-annually in accordance with the existing monitoring schedule.

- Leachate Headwells: Monitored, at a minimum, quarterly for leachate head levels. Monitored monthly in drainage basins where leachate recirculation occurs.

8.7.3 Surface Water Monitoring

Surface water monitoring in the form of obtaining samples, for laboratory analysis, of a surface water body and/or a storm water discharge outfall is not currently performed. There are no surface water bodies located immediately adjacent to the existing nor proposed Landfill area. The existing sedimentation basin is the only location containing a typical “outfall” from which storm water could potentially be sampled. Since the start of Landfill operations, storm water has rarely accumulated in enough quantity to be discharged from the sedimentation basin outfall. Storm water readily infiltrates into the ground due to the permeable nature of the surficial soils.

Monitoring of storm water runoff is performed in accordance with the Facility’s SWPPP and WPDES Tier 2 Industrial Storm Water General Permit. This includes conducting quarterly visual inspections at storm water outfalls, non-storm water discharge monitoring, and an Annual Facility Site Compliance Inspection (AFSCI). In general, storm water inspections and monitoring involve observing storm water

outfalls for signs of storm water contamination and verifying compliance with the BMPs highlighted in the SWPPP. These routine inspections and monitoring events will continue to be conducted for the proposed expansion.

8.7.4 Landfill Gas Monitoring

Landfill gas monitoring will be performed at various monitoring points including gas probes, gas extraction wells, and flare. The number of monitoring points will be further detailed in the Plan of Operations to follow this report. Below is a list of the proposed landfill gas monitoring schedule.

- Gas Probes: Monitored quarterly for percent methane and percent oxygen. During each event, ambient air temperature, ground condition, barometric pressure, and barometric pressure trend will be recorded.

- Gas Extraction Wells: Monitored monthly for landfill gas temperature, percent methane, percent oxygen, percent carbon dioxide, vacuum, and flow rate.

- Flare: Monitored monthly at the inlet for the same parameters as gas extraction wells.

8.7.5 Air Monitoring

Ambient air monitoring for particulates or other constituents is not proposed as part of the monitoring program. Ambient air monitoring requirements, if any, will be established through the air permitting process.

8.7.6 Unsaturated Zone Monitoring

Unsaturated zone (i.e., portion of the subsurface above the groundwater table) will be monitored via gas probes to check for the presence of subsurface landfill gas migration. No lysimeters are proposed to be installed due to the proposed liner consisting of a composite system.

8.7.7 Other

No other environmental monitoring is proposed to occur.

8.8 Storm Water Control

Storm water control will be implemented in accordance with the requirements of the WPDES Tier 2 Industrial General Permit and the site specific SWPPP covering site activities. In general, storm water control features and best management practices exist (and will be constructed) in the form of ditching, infiltration basins, erosion control including, but not limited to, silt fencing, erosion mat, sediment logs, check dams, riprap, and re-establishment of vegetation. Preliminary design of the proposed and existing infiltration basins is shown on Plan Sheets 23.

Storm water control features will be finalized during preparation of the Plan of Operations. Any modifications to the design of the proposed expansion as a result of the Department approval, will result in changes to design of storm water control features. Routine storm water inspections of the facility's storm water control features will also be performed in accordance with the facility's SWPPP.

8.9 Final Use

The final use of the Landfill, at this time, is anticipated to be green space. Access to the Landfill to allow for long term care and maintenance, and monitoring will be maintained.

9.0 Identification and Characterization of Soil Borrow Sources (NR 512.15)

Soils required for construction of the vertical expansion final cover and landfill operation will include material needed for daily and intermediate cover, general fill soils, drainage layer soils, and protective cover soils for final cover. Section 9.1 identifies a new proposed borrow source from which these materials will be obtained and describes the results of the investigation performed in 2022.

9.1 Proposed Soil Borrow Area 2

Soil Investigation

A soil borrow investigation by means of backhoe test pits was performed for a proposed borrow area west of the existing Landfill. Sheet 1 of Appendix R shows the location of the areas investigated. On October 25 and 26, 2022 Ayres Associates staff was onsite to observe and log the backhoe test pit excavations and collect representative soil samples for laboratory analysis. Per NR 504.075(5)(a), a minimum of ten test pits are required for the first 5 acres and one test pit per additional 3 acres. The proposed borrow area is approximately 26 acres, a total of 17 test pits were completed.

Land cover in the investigation area consisted primarily of agricultural land. This proposed borrow area is also owned by Adams County.

Soils encountered in the proposed borrow area generally consisted of 12 inches of topsoil, 3 feet to 4 feet of orange to yellowish-brown silty sand, 1 foot to 3 feet of brown low plasticity clayey sand, 4 feet to 8 feet of sand, and 1 foot of of reddish-brown low plasticity clay which transitions to 0-1 foot of silt. Underlying the clay and silt deposits was a white sand. Test pit logs are provided in Appendix P. A minimum of two representative samples from each test pit were collected, one from the upper clayey sand unit and one from the lower clay deposit. Groundwater was not encountered in any of the test pits. Test pits were terminated between 14 to 16 feet below ground surface (limit of clay deposit or mechanical capacity of the excavator was reached). The thickness of the clay deposit in areas where the bottom of the clay was not reached is unlikely to exceed 2-3 feet based on the test pits where total clay thickness was observed.

The laboratory results indicate that the upper clayey-sand unit is not acceptable as clay liner or cap material for landfill construction. The laboratory results presented below are for the “lower” clay unit observed from 11 to 13’ bgs.

Soil Laboratory Testing

Representative soil samples were collected and sent to an independent soils testing laboratory, Tetra Tech, Inc. of Green Bay, Wisconsin, for Atterberg Limit determination, moisture content, and grain size distribution through the 0.002 mm particle size. In addition, five samples were sent to the soils laboratory for testing of moisture content and dry density using the Modified Proctor method. Hydraulic conductivity testing was performed on three samples. A total of 36 soil samples were submitted to the testing laboratory. Adams County is currently not seeking approval for the deep clay soils as clay liner material. Soils from Borrow Area 2 are intended to be used as general fill for various aspects of landfill construction and operation as detailed in Sections 9.0. Laboratory data and results summary are provided in Appendix Q.

Soil Borrow Excavation Methods

Soils will be obtained as needed for phase construction during the operational life of the existing Landfill, the final cover of the proposed vertical expansion and the Phase 6 cell construction. Topsoil will be removed, segregated and stored in berms around the perimeter of the site for later use in reclamation.

Excavation in the borrow area will commence once soil from the existing borrow source has been exhausted. Excavation methods will be conducted similarly to the existing borrow source, but excavating east to west. Excavation will commence at the northeast corner of the proposed clay borrow limits.

Soil materials will be extracted using bulldozers, excavators, scrapers, and offroad dump trucks. It is not anticipated all soils available and in the proposed borrow area will be required for landfill construction. Any remaining soil material not needed for construction will be left in place and undisturbed.

Storm Water Management

A SWPPP has been prepared for the Landfill facility and includes best management practices to be followed during the clay borrow source extraction activities. Storm water management activities in the expanded area will be consistent with the existing clay borrow source. In general, the clay borrow source will be excavated in a manner to allow storm water that encounters the open area to be internally drained. Overburden will be removed and stored along the perimeter of the active area to prevent storm water from flowing into the open excavation.

Erosion control features, or Best Management Practices, will include, but not be limited to silt fence, sediment logs, surface water diversions, erosion mat, and tracking pads. Erosion control measures are further discussed in the non-metallic mining reclamation plan for the existing clay borrow source.

Reclamation

Reclamation of the site will be in accordance with the non-metallic mining reclamation permit for the existing borrow source on file with Adams County Planning and Zoning. Section 9.1 of this report will be submitted to Adams County Planning and Zoning to amend the non-metallic mining reclamation plan to include the proposed area.

In general, reclamation activities will include replacing overburden and topsoil to achieve the final proposed slopes shown on Plan Sheets 2 and 3 of Appendix R. Final reclamation grades will not exceed 3:1 along the outer perimeter of the source area. It should be noted that the proposed reclamation grades shown reflect all available soils being extracted to the anticipated depth. Additional material beyond that estimated may removed from the existing borrow area resulting in less soil needed from Borrow Area 2. Considering these factors, the proposed reclamation reflects a maximum amount of soil removed from the expanded area.

Seeding, revegetation standards, and post-mining land use are not anticipated to change from the non-metallic mining reclamation plan.

9.2 Drainage Layer (Liner and Cap)

Drainage material for final cover will originate from onsite soils excavated during development of the existing borrow source to the north and proposed Borrow Area 2 to the west.

9.3 General Fill and Cover Soils

Soils for the final cover system may be obtained from the existing and proposed 26-acre clay borrow source overburden. These soils will be used for selective cover soil layers including general grading layer, rooting layer, and potentially for intermediate cover. If needed, additional rooting layer material may be obtained from the proposed clay borrow source.

Daily cover soils are anticipated to be obtained from clay borrow sources. Further detailed calculations of these type of soils utilized for landfill construction and operation will be included in the Plan of Operations to follow this feasibility determination.

10.0 Environmental Review (NR 512.16 and NR 150)

The environmental review describes and summarizes the development of the proposed vertical expansion in accordance with NR 512.16 and NR 150. The focus of this section is to identify areas that may be affected by the proposed expansion and to describe how the design, construction, and operations will minimize or eliminate potential impacts. Overall, the proposed expansion is expected to have no negative impacts to the site or surrounding areas.

10.1 Project Summary

Adams County intends to permit a vertical landfill expansion of the existing Adams County Sanitary Landfill (referred to hereinafter as "Landfill"), located in the Town of Strongs Prairie, Wisconsin. The physical/mailing address of the Landfill is 1420 State Highway 21, Friendship, Wisconsin 53934. The existing Landfill is currently filling in Phase 5 and is anticipated to be full near year end 2035. The proposed Landfill expansion consists of a contiguous vertical expansion while maintaining the existing horizontal footprint of 21.9 total landfill acres. The vertical expansion proposes approximately 224,000 CY of additional airspace to the permitted design capacity of 1,248,200 CY for a total capacity of approximately 1,472,000 CY. The proposed expansion will overlay its waste onto the phases 2 through 5. The vertical expansion enhances the minimized landfill footprint. The proposed expansion would add an additional 4 years to the Landfill lifespan from the anticipated closure date. All proposed expansion activities will occur on property owned by Adams County.

Adams County has owned and operated the Landfill since 1989. In addition to the Landfill, Adams County owns and operates a Materials Recovery Facility (MRF) for processing recyclables and provides waste hauling services to its residents. The MRF is located on the same property in which the Landfill resides. A composting area, also located on the same property, collects brush and other yard wastes and is also operated by Adams County.

A small, closed construction and demolition (C&D) landfill, 50,000 c.y., is also present on the same property. The small C&D landfill was first permitted in 1989 and began operating in 1990. The C&D landfill was full in 2002 and approved for closure in 2004.

Adams County is proposing to complete a vertical landfill expansion of the existing Landfill, located in the Town of Strongs Prairie, Wisconsin. The physical/mailing address of the facility is 1420 State Highway 21, Friendship, Wisconsin 53934. An initial site inspection (ISI) request for the proposed vertical expansion was submitted on June 1, 2022. The ISI was performed by the WDNR on June 29, 2022. The WDNR issued its preliminary opinion of the landfill expansion site location on July 27, 2022. The opinion indicated that the proposed expansion "can meet the requirements of NR 504.04, WAC," and that it will be necessary to address the requirements of NR 509, WAC, to continue with the proposed expansion process. The ISI request and WDNR ISI response are included in Appendix B.

In addition to the proposed Landfill expansion, an ISI for a new proposed soil borrow source (Borrow Area 2) was submitted on June 1, 2022. The WDNR preliminary opinion was issued on July 27, 2022, and stated the clay borrow source expansion "may be suitable for clay borrow activities." Results of the soil Borrow Area 2 source investigation activities are also included with this Feasibility Report. Adams County is seeking approval of the new proposed borrow source concurrently with the Feasibility Report. The soil borrow ISI request and corresponding WDNR response letter are provided in Appendix O. A full discussion of the investigation is provided in Section 9.1.

This report includes responses to the comments presented in the ISR response by the WDNR and is also intended to provide sufficient information to allow the WDNR to render an opinion on the feasibility for site development.

This Feasibility Report includes information from the original Feasibility Report (1986) produced by Foth & Van Dyke, the 2016 Feasibility Report prepared by Ayres Associates and pertinent information from subsequent plan modifications as appropriate. Therefore, this Feasibility Report supersedes the original feasibility in its entirety.

10.1.1 Statutory Authority

The proposed Landfill expansion activities will be performed under authority of the following state and federal statutes and codes:

- Ch. NR 500—Environmental Protection – Solid Waste Management.
- Ch. NR 504—Landfill Location, Performance, Design and Construction Criteria.
- Ch. NR 506—Landfill Operational Criteria.
- Ch. NR 507—Environmental Monitoring for Landfills.
- Ch. NR 512—Feasibility Reports for Landfills.
- Ch. NR 520—Solid Waste Management Fees and Financial Responsibility Requirements.
- Ch. NR 140—Groundwater Quality.
- Ch. NR 141—Groundwater Monitoring Well Requirements.
- Ch. NR 151 – Runoff Management.
- Ch. NR 216 – Storm Water Discharge Permits.
- Ch. NR 445 – Control of Hazardous Pollutants.
- Wisconsin State Statutes Chapter 289—Solid Waste Facilities.
- Environmental Protection Agency Title 40, Part 258 Code of Federal Regulation (Subtitle D).

10.1.2 Permits and Approvals

Wisconsin Administrative Code NR 512.06(1) requires a landfill applicant to apply for proper local approvals at least 120 days prior to submitting the Feasibility Report to the WDNR. Affected municipalities, as defined under § 289.01(1) Wisconsin Stats, in the area of the proposed Adams County Landfill vertical expansion include the Town of Strongs Prairie, Town of Preston, and Adams County. Notifications to the affected municipalities regarding the proposed Landfill expansion were sent out on May 18, 2022. A copy of the notification letter and responses from the affected municipalities are included in Appendix C. Certified mail receipts of the sent notification letter to each affected municipality are also included in Appendix C. Responses from affected municipalities did not specify any required applications for local approvals pertaining to the proposed expansion.

10.1.3 Exemptions, Zoning, Changes, or Special Permits

The following exemption(s) are being requested as part of this Feasibility Report:

- An exemption is requested from NR 507.215(3) to reduce the sampling frequency of the listed parameters for the leachate storage tank from quarterly to semiannually. Refer to Section 1.2 for further information on this exemption request.

10.2 Proposed Physical Changes

10.2.1 Terrestrial

Development of the vertical expansion will involve filling waste within an area currently zoned for landfill use. Development of the expansion will not result in alterations of land around the existing Landfill footprint.

Soils used for development of the proposed expansion will be obtained from both onsite and offsite sources. Soil used for cap construction will originate from the Landfill's existing WDNR approved borrow source and a new proposed Soil Borrow Area 2. Soils excavated from these areas will be also used as general fill in the construction of the Landfill access roads, berms, daily cover, grading layer, and protective cover layer. Granular fill used in the liner leachate collection system will be obtained from an offsite source.

General fill soils for the final cap and other landfill operations will come from the proposed sources listed above.

Existing storm water collection ditches around the perimeter of the Landfill footprint will continue to be used to convey storm water runoff from the landfill cover to the existing infiltration basins.

Existing access roads along the perimeter of the Landfill will be utilized. The current location and extent of access roads will be provided in the Plan of Operations.

10.2.2 Aquatic

No physical changes to any aquatic features are anticipated as part of the proposed expansion. No wetlands or surface water features are located on the property in which the Landfill resides. The closest surface water feature is Big Roche A Cri Creek, which is approximately 1 mile from the Landfill.

10.2.3 Groundwater Control Structures

Groundwater control structures are not included or necessary in the design and operation of the existing Landfill or in the proposed expansion. The existing and proposed Landfill are designed and constructed with composite liner and final cover systems, with the exception of Phases 1 and 2 which consist of an earthen clay liner and a leachate collection system. These features are designed to protect groundwater at the site.

10.2.4 Leachate Collection and Treatment

Leachate will be collected in leachate collection trenches and conveyed to collection sumps where it will be removed from the base of the Landfill by submersible pumps. The leachate will be pumped through a double wall force main to a leachate storage tank. Leachate treatment will be performed by recirculation back into the waste mass or offsite treatment at the City of Adams Wastewater Treatment Facility or Village of Plover Facility. Details of the leachate collection and removal system are discussed in detail in Section 8.3 and presented on Sheet 22.

10.2.5 Surface Water Discharge

No surface water discharges will be associated with the proposed expansion, as there are no navigable lakes, ponds, or flowages within 1,000 feet of the proposed expansion. No wetlands are located on the property upon which the Landfill resides. Surface water runoff will be directed to existing infiltration basins where it can infiltrate into the soil. The infiltration basins are designed to hold rainfall from a 100-year 24-hour storm. In the event of a major storm event, there is a high-water level structure with an orifice in the existing infiltration basin which discharges to the northwest to prevent overtopping and eroding of the existing infiltration basin walls.

Storm water will be managed at the proposed soil borrow source as discussed in Section 9.1 previously. Additionally, the soil borrow source is covered under the WPDES Tier 2 Industrial General Permit and applicable provisions of the facility SWPPP. A Chapter 30 Grading Permit is not anticipated to be required for the proposed soil borrow source as Big Roche A Cri Creek is located approximately 2,800 feet from the proposed soil borrow limits.

10.2.6 Structural

The proposed expansion will use much of the existing infrastructure established for the existing Landfill, including the existing office and scale. The expansion will continue to use the three existing infiltration basins which were sized to meet the requirements of NR 151. In addition, existing perimeter access and maintenance roads and ditches existing along the boundary of the Landfill will be utilized.

No new buildings or modifications to the main site access road are anticipated as part of the vertical expansion.

10.2.7 Emissions and Discharges

Emissions and discharges produced during the construction and operation of the proposed expansion will generally be consistent with the emissions and discharges from current operations at the facility. Landfill emissions and discharges are expected to include the following:

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 pieces of equipment in operation at a given time.

Dust could be generated from onsite gravel roads and earthwork activities. Dust quantities will vary depending on the number of vehicles or equipment in operation, weather conditions, and the amount of open area at the site. Dust control measures include application of water on the access and site roads during dry weather conditions.

Noise will be generated from the operation of motorized equipment and vehicles. The intensity will vary based on the number of vehicles in operation and the activity. Noise will be controlled via maintenance of exhaust systems on landfill vehicles and equipment.

Leachate will be generated when rainwater infiltrates the Landfill and percolates through the waste mass. Expected volumes of leachate are discussed in Section 6.2. Leachate from the proposed expansion area will be collected in the leachate collection system and recirculated back into the waste mass or hauled offsite for treatment.

Landfill gas from the decomposition of waste is expected to be generated during operation of the Landfill. Landfill gas will be collected in the active gas collection system. Horizontal migration of landfill gas is not expected to occur due to the presence of the composite liner system and active landfill gas extraction system. Gas monitoring probes will be installed around the Landfill to monitor for gas migration.

The control of odors will be achieved by cover soil placement and by active gas collection system.

A detailed surface water management plan will be incorporated in the Plan of Operation design for the proposed expansion and will be designed to maintain the maximum storm water discharge, which occurs under final cover conditions after the Landfill has ceased operation.

No groundwater will be collected other than during routine quality testing events.

10.2.8 Other

No other changes are anticipated.

10.2.9 Maps, Plans, and Descriptive Material

The following maps, plans, and descriptive material are included as a part of this Feasibility Report or were previously submitted as part of the approval process:

- Plan Sheets 1 through 25.
- Figures 1 through 6.
- WDNR ISI Letter; and the WDNR ISI Opinion Letter – Appendix B.
- WDNR ISR Letter; the WDNR Initial Site Report Opinion Letter – Appendix B.

10.3 Existing Environment

10.3.1 Topography

Land surface elevations in the regional area (Central Wisconsin River Basin) range from 840 feet msl near Wisconsin Dells, Wisconsin to 1940 feet msl at the peak of Rib Mountain in Wausau, Wisconsin. The region is characterized by gently rolling till plain slightly modified by stream erosion in the northern part of the basin, and gently sloping plain consisting of outwash and glacial lake deposits underlain by outwash, and wetland areas in the southern part of the basin (Devaul and Green, 1971). Topography within 1 mile of the site is shown on Figure 1.

The elevation over non landfill areas of the proposed expansion ranges from 960 to 980 feet msl and gently slopes to the northwest and southwest from a topographic high near the east-central portion of the expansion area. The regional low point, Big Roche A Cri Creek, approximately 1 mile west of the expansion at its closest point, is approximately 920 feet msl. The regional high point, the Cottonville Rocks, lies approximately 1,200 feet east of the expansion and is approximately 1,100 feet msl.

The hills east of the Landfill will enable the site to blend into the surrounding topography after closure. Large trees surrounding the Landfill, as well as the Landfill lying approximately 0.6 miles north of State Highway 21, will provide 10 from most vantage points.

10.3.2 Geology

Bedrock in the south-Central Wisconsin River Basin consists of Precambrian crystalline rocks overlain by Cambrian sandstone. Along the extreme southern border of the basin, the Cambrian sandstone is overlain by Ordovician sedimentary rocks.

Bedrock does not outcrop at the site and was not encountered in any test borings onsite from previous borings installed for the existing Landfill. Therefore, depth to bedrock is greater than 100 feet bgs. Well logs for private residences in the area indicate bedrock is greater than 109 feet bgs. Area mapping indicates that bedrock in the immediate vicinity of the proposed expansion site consists of Cambrian-age sandstone (Trempealeau, Tunnel City, and Elk Mound Groups), ranging in thickness up to 440 feet, underlain by Precambrian igneous and metamorphic rock (Devaul and Green, 1971; Mudrey et al., 1982).

A bedrock outcrop (Cottonville Rocks) occurs approximately 1,200 feet east of the proposed site. This outcrop and other outcrops in Adams County consist of resistant Upper Cambrian Wonewoc sandstone of the Elk Mound Group. Unconsolidated glacial deposits cover most of the Central Wisconsin River Basin. Deposits in the southern portion of the basin consist of glacial lake and outwash deposits that form the central sand plain. These deposits average about 100 feet in thickness but may be as thick as 200 feet in bedrock valleys. Glacial lake deposits are comprised of fine to coarse grained sand, silt, and clay and are partly underlain by and mixed with outwash deposits. Outwash deposits consist of thick deposits and stratified sand, gravel, and some silt and clay.

NRCS mapping indicates the surficial soils onsite consist of Plainfield sands, which are formed on outwash plains, stream terraces and ground moraines, and are present on 2-12% slopes. Plainfield soils are described as excessively drained and classified as low to very low for water runoff. Infiltration rates/soil permeability are high to very high at the site (mapping indicates 6 to 20 inches per hour). Generally, the soils have low natural fertility.

Subsoils within the proposed expansion area are primarily comprised of glaciolacustrine deposits, including fine sands, silt, and clay, deposited in glacial lakes.

Feasibility field work conducted as part of 2016 study revealed that the unconsolidated material onsite is at least up to 75 feet thick. Boring logs from the 1986 feasibility study reveal that the unconsolidated material is at least 100 feet thick. Onsite soils were evaluated through auger cuttings and split barrel samples collected during subsurface investigations. Soil boring logs indicate there are 0 to 8 inches of black topsoil (OL) on the site. Unconsolidated materials directly underlying the topsoil are described as light brown to dark brown and reddish yellow fine-medium grained silty sands (SM) interbedded with brown silt (ML) and brown clay (CL). These soil types were consistently classified as SM (silty sand mixtures), ML (inorganic silts with fine sand), CL (inorganic clay), and CL-ML (inorganic clay with silt), with a 10-foot-thick layer of sand interbedded with clay (SP-SC) encountered in one boring. Clay units varied in thickness (2-5 feet) and were discontinuous at the site.

10.3.3 Water Quality

Regional Groundwater and Surface Water Quality

Groundwater. Although there may be some isolated issues with excessive iron, hardness and total dissolved solids, groundwater quality is generally good throughout the Central Wisconsin River Basin. In much of the sand plain, groundwater is soft and low in dissolved solids, especially near the Wisconsin River (Devaul and Green, 1971).

In general, total dissolved solids are found in moderate amounts and rarely exceed the recommended limits for drinking water (500 mg/L). The hardness of groundwater in the basin ranges from 18 mg/L to 568 mg/L and becomes softer toward the Wisconsin River. Chloride and sulfate concentrations are well below the recommended limits for drinking water (250 mg/L) (Devaul and Green, 1971).

High nitrate levels cause minor water use issues in the basin. High nitrate levels in groundwater are common in the basin in agricultural areas where manure spreading, agricultural fertilizers, and legume cropping systems are used, as well as in sandy areas where the soil is more permeable (WDNR, 2011).

Surface Water. Surface water quality in the basin is generally good. Most of the dissolved minerals in surface water are the same as those in groundwater, at generally lower concentrations (Devaul and Green, 1971).

The concentration of dissolved solids in the Wisconsin River itself ranges between 85 mg/L to 280 mg/L. Hardness concentrations range from 20 mg/L to 100 mg/L. The lowest concentrations occur shortly after periods of peak flow, whereas highest concentrations occur during times of low flow (Devaul and Green, 1971).

Site Specific Groundwater and Surface Water Quality

Surface Water. There is no surface water in the immediate vicinity of the site. The nearest surface water is Big Roche A Cri Creek, approximately 1 mile to the west.

Historic Groundwater Quality. Groundwater monitoring for the existing Landfill began in 1987 with quarterly monitoring events from approximately 1987 through 1994 and semi-annually data available from 1995 to present. The WDNR reduced the required monitoring frequency to semi-annual in 1994. Groundwater monitoring for the current Landfill occurs in March and September. Sampling conducted since the May 7, 1995, Plan of Operation approval includes 21 monitoring wells (MW-1, 1P, 2, 2P, 3, 3P, 6, 6P, 7, 7P, 9, 16, 17, 17P, 18, 18P, 19, 19P, 20, 21, and 22). Four additional wells onsite (MW-25, 26, 27, and 28) are monitored semi-annually, only for groundwater elevation, as approved in the 1994 modification to the Plan of Operation.

Groundwater is encountered in the unconsolidated material of the glacial aquifer across the site. Wells installed as part of the Phase 5 and 6 expansion (MW-29, 30, 30P, and 31) are included in the semi-annual groundwater monitoring events as approved in the 2018 modification to the Plan of Operation.

In 1995, the groundwater quality was evaluated as part of the required Subtitle D Groundwater Plan Modification. The full evaluation is in the August 1994 Plan Modification, approved in May 1995. In general, the Plan Modification included the evaluation of monitoring data for groundwater quality standard exceedances and the calculation of PALs.

PAL values calculated were either approved or modified in the 1995 Plan Modification approval. PALs were calculated for indicator parameters including filtered alkalinity, filtered COD, field conductivity at 25 degrees Celsius, and filtered total hardness.

A summary of the Landfill monitoring data is available on the WDNR GEMS website, and a copy of the May 7, 1995, modification to the Plan of Operation approval, including calculated PALs for Landfill monitoring, is in Appendix K. This data provides a basis for comparison of the groundwater quality data for the vertical expansion.

10.3.4 Hydrogeologic Conditions

Regional groundwater movement is generally westerly to Big Roche A Cri Creek, with approximate groundwater surface elevations 910-960 feet msl (Lippelt, 1981). The groundwater surface occurs at approximately 940 feet msl in the vicinity of the proposed expansion (approximately 30 feet below ground surface). Infiltrating precipitation can be expected to travel vertically downward through the soils with lateral or diagonal movement along the upper surface of the silt and clay layers, or sandstone bedrock until it reaches the local groundwater aquifer. The regional water table is generally encountered in one of two aquifers: a glacial unconsolidated aquifer or a sandstone aquifer.

The regional groundwater elevation and flow information generally correlates to site-specific information from the monitoring well network at the site. Hydrogeologic conditions at the site are discussed in detail in Section 5.8 of this Report.

10.3.5 Air Quality

The proposed expansion will increase the operating life of the Landfill as well as the amount of waste volume within the Landfill. These changes will result in the generation of landfill gas for approximately 3-4 additional years if the proposed expansion is approved. The increased waste volume associated with the proposed Landfill expansion will add to the landfill gas generated from the site during and after operation of the Landfill. However, operations within the expansion are expected to be comparable to the existing Landfill and air quality is expected to remain comparable to current conditions. The active gas system onsite will be utilized to control emissions of hazardous air contaminants.

10.3.6 Wetlands

USGS topographic maps and the WDNR SWDV database do not indicate any wetlands present within the proposed expansion area. Should wetlands become evident during the initial development stages of the proposed expansion, proper delineations and protective measures will be implemented.

10.3.7 Soil Borrow Sources

Soil for cap construction will originate from the Landfill's existing WDNR-approved borrow source as well as the proposed Borrow Area 2. The existing borrow source has approximately 62,700 c.y. of soil remaining (approximately half of the required volume to complete capping of the proposed vertical expansion). To account for the additional soil needed for the Landfill expansion, a soil borrow investigation to the west of the existing landfill on Adams County property was performed as part of this Feasibility Report. Details of the clay borrow investigation are included in Section 9.1.

Overburden material from both the existing borrow source and proposed Borrow Area 2 will be utilized for cover soil during final cover construction of the proposed expansion.

10.3.8 Biological Resources

The existing Landfill and the proposed vertical expansion area are not known to be critical habitat areas for endangered or threatened species listed in Wisconsin Legislature Chapter NR 27. An ERR was completed by the WDNR during the ISI process of the proposed expansion. The ERR response from the Department was received on March 13, 2022, which indicated one (1) specie with required actions, one specie with recommended actions, and three species with no follow up actions. Ayres Associates performed a vegetation survey that satisfied the two required and one recommended action. No instances of the vegetation were identified in the project area. This information was submitted along with the ISI and is included in Appendix B. The ERR requested that, due to the sensitive information on endangered resources, the letter not be included in publicly disseminated documents.

10.3.9 Land Use

The Adams County property is located within the Town of Strongs Prairie, which regulates development through its zoning ordinance. The 433-acre contiguous County owned property on which the Landfill resides is zoned industrial and the Landfill is an approved use. The area around the County owned parcels includes lands zoned as industrial, commercial, agricultural, and some scattered single-family homes present on smaller land parcels zoned single family residential.

In general, the surrounding area within 1 mile of the existing Landfill and proposed expansion consists primarily of woodlands, cultivated agricultural lands, and rural residences. There are no residences located within 1,200 feet of the existing Landfill or proposed horizontal Landfill expansion waste limits. Big Roche A Cri Creek is located approximately 1 mile to the north and west of the Landfill. Figure 4 depicts land use zoning information for the Landfill property and within 1 mile of the proposed expansion.

There have been no zoning changes to the Landfill property or any other properties within a 1-mile radius of the Landfill since the submittal of the ISR.

10.3.10 Social/Economic Conditions

Adams County's objective is to provide cost effective, sustainable solid waste services. In addition to providing cost effective and environmentally sound waste disposal capacity for the region, the Landfill will also provide employment opportunities for local residents, contractors, and increased local business from the purchase of required goods and services.

The access route for waste entering the existing Landfill is via State Highway 21. The proposed expansion will utilize the same access route. Existing perimeter access and maintenance roads will be used along the perimeter of the proposed expansion. The proposed expansion is not expected to increase the traffic flow to the site.

No ethnic or cultural groups have been identified as having any concerns or possibilities to be impacted by the expansion other than the general public.

10.3.11 Other Special Resources

The WHS stated in their August 29, 2014, email correspondence that no archaeological or burial sites are located within the proposed expansion area.

The area west of the County owned Landfill property consists of 69 acres currently used as cultivated agricultural lands, which is not likely to be affected by the proposed expansion.

There are no public parks or state natural areas within 1,000 feet of the proposed expansion. A review of the Adams County Comprehensive plan identified a "butte" or "mesa" known as "Cottonville Rocks" located on the adjacent property to the east. This feature is located approximately 1,200 feet from the proposed limits of waste. It is not identified as a state or local natural area and is located on privately owned land. The proposed expansion will not impact this feature due to its distance from the expansion.

10.4 Environmental Consequences

10.4.1 Physical

Topography and Visual Impacts

The hills east of the Landfill will enable the site to blend into the surrounding topography after the proposed expansion's closure. Large trees surrounding the Landfill, as well as the Landfill lying approximately 0.6 miles north of State Highway 21, will provide visual screening from most vantage points. Visual impacts are expected to be minimal.

Surface Water

Construction and operation of the proposed expansion is not expected to impact surface water. Precipitation that encounters waste will be contained by the composite liner system and associated perimeter and phase delineation berms placed around active fill areas. Waste contact water will be treated as leachate. The leachate collection system will route leachate to a storage tank where it can be hauled offsite for treatment or back onto the Landfill for recirculation. When leachate is not recirculated, it will be taken offsite for treatment at the wastewater treatment facilities mentioned previously.

In addition, as a part of closure, a final cover system consisting of the layers described in Section 8.5 will be installed. The final cover system will reduce the infiltration of precipitation so that leachate generation will gradually diminish with time.

Storm water control features will be further developed during the Plan of Operations. Storm water control structures will be designed per NR 151 requirements.

Groundwater

Impacts on groundwater are not expected as a result of the proposed expansion. Groundwater will be protected by the existing composite liner and final cover system after closure. The leachate collection system will actively remove leachate from the constructed phases for treatment offsite. In addition, Adams County will conduct routine monitoring of the groundwater around the Landfill during operation and after closure of the Landfill, in accordance with Chapter NR 500 and the approved Plan of Operations.

Air Quality, Windblown Paper, and Dust

No significant impacts on air resources are expected to occur due to the construction and operation of the proposed expansion, with the exception of the duration of emissions. The proposed expansion design includes placing cover systems and expanding an active gas extraction system, which will prevent subsurface gas migration and minimize air emissions. Gas monitoring probes will be installed around the Landfill to monitor for subsurface gas migration.

The periodic collection of litter, including windblown paper, will likely occur on and adjacent to the proposed expansion. Litter will be controlled by proper landfill operational procedures including placement and compaction of daily cover. If needed, portable wind screens will be placed around the active filling area to aid in control of windblown debris.

Temporary increases in dust levels could occur periodically due to soil excavation and placement during construction activities and from site truck traffic traveling on road surfaces. These emissions will be controlled with a water truck as needed. The timely establishment of vegetative cover on completed work areas of the expansion, and the protection of any stockpiled soil, will also reduce dust emissions.

10.4.2 Biological

The proposed expansion will not have an adverse effect on the wildlife in and around the Landfill. The existing Landfill site and the proposed expansion area are not critical habitat areas for endangered or threatened species listed in Chapter NR 27. No critical habitat will be created nor destroyed as a result of the proposed expansion. A February 27, 2015, ERR response from the WDNR indicated two species with required actions, one specie with recommended actions, and six species with no follow-up actions. Ayres Associates performed a vegetation survey that satisfied the two required and one recommended action. No instances of the vegetation were identified in the project area. The WNDR ERR requested that, due to the sensitive information on endangered resources, the letter not be included in publicly disseminated documents. The post closure use of the property is proposed as open green space.

10.4.3 Land Use

Land use of the Landfill property will not be impacted by the vertical Landfill expansion, as it will be located on property that is already zoned industrial and includes the existing Landfill footprint. Both Adams County and the Town of Strongs Prairie recognize the Landfill as a continued land use in their respective comprehensive plans. Adjacent land uses previously described will not be impacted by the expansion as continued present use will not be disturbed. Additionally, no future changes to adjacent land use are identified in either of the comprehensive plans for Adams County or Strongs Prairie. Conversely, current land use of adjacent properties will not impact the expansion.

10.4.4 Social/Economic

The proposed expansion is not expected to result in any significant adverse social or economic impacts. The operation of the Landfill will contribute to the local economy as a source of tax base and employment. Impacts on adjacent neighbors is expected to be similar to those of the existing Landfill.

Waste disposal has occurred at this location beginning in 1989. There are no residences within 1,200 feet of the anticipated limits of waste of the existing Landfill or the vertical Landfill expansion. There are twelve parcels with four owners located within 1,200 feet of the limits of waste of the Landfill and expansion. Eight of the twelve parcels are owned by Adams County and include the Landfill. Three landowners own the remaining four parcels located within 1,200 feet of the limits of waste.

The proposed expansion will have a positive impact on the economic base of the surrounding community. In addition to providing for cost effective and environmentally sound waste disposal capacity for the service area, the proposed expansion will provide employment opportunities for local residents and contractors and increased local business traffic associated with the purchase of required goods and services. If the Landfill expansion did not occur, these economic benefits would likely go to a different city, county, or state.

The operation of the existing Landfill provides significant and direct economic benefits to the community in terms of tax payments and donations of money, goods, or services. Adams County pays real estate taxes on the property it owns. The proposed expansion will continue to provide these benefits throughout the life of the project.

The same route used for the existing Landfill will be used for vehicles that transport waste to the proposed expansion. Increases in traffic, noise levels, and congestion are not expected. Road conditions are not expected to change with the expansion and noise impacts from the expansion will be minimal and similar to those that occur from the existing Landfill.

There may be equipment and truck noise during construction and operation of the proposed expansion, however, the area is not densely populated. The relative noise level due to the expansion is expected to be similar to that of existing operations.

There will be a beneficial economic impact for Adams County by developing the proposed expansion. By having the facility approved in a timely manner, the necessary solid waste facility will be available for all communities and industries served by the existing Landfill. Without approval for the proposed expansion, Adams County and its customers, communities, and industries would have to consider drastic alternatives for waste reduction, storage, or alternate (more distant) disposal facilities.

10.4.5 Other

No endangered, threatened, or special concern species, natural communities or state natural areas, historical structures, archaeological sites, or prime agricultural lands would be affected by the proposed expansion.

10.4.6 Potential Unavoidable Adverse Impacts

The proposed expansion will be engineered to include the existing composite liner and leachate collection system. The expansion will include construction of a gas extraction system, final cover layers and a surface water control system. These measures will minimize any environmental effects resulting from the development of the facility.

The following adverse impacts from the proposed expansion cannot be avoided:

- After the Landfill is closed, there will be limitations to the use of the site. For example, construction of buildings on the Landfill may be prohibited. The current projected use of the Landfill after final closure is green space.

- Truck traffic, dust, engine emissions, and noise associated with the Landfill will be extended for approximately four (4) years. Dust will be controlled with a water truck as needed. Noise will be handled by incorporating noise reduction systems where appropriate. Individuals living around and near the Landfill will experience traffic, dust, noise, and emissions impacts similar to what they have experienced during operation of the existing Landfill.

- The appearance and the topography of the Landfill and the additional clay borrow area will be altered from what is currently permitted, although the surrounding landscape is primarily wooded, which will naturally screen daily operations from State Highway 21 and neighboring residences. Changes in the appearance and topography of the area are not necessarily considered adverse.

- Odors can periodically occur, but with the use of daily cover, minimizing the active waste disposal area, and operation of an active gas collection system, these issues should be limited in duration and intensity.

10.5 Alternatives

10.5.1 Take No Action

This alternative assumes the proposed expansion would not be developed. This would avoid the adverse impacts of expanding the Landfill, but likely result in several negative consequences. The no action alternative could potentially adversely impact residents within the service area. The existing Landfill is expected to reach capacity in 2035. At a minimum, a transfer station and/or various drop off locations would need to be employed to continue to provide waste disposal services to residents within the service area. These transfer stations and drop off locations would temporarily collect waste where it would later be hauled off in greater quantities to a nearby facility/facilities. This would result in additional costs for waste transportation, as well as increased wear on roadways. Additionally, there is no guarantee that the essential disposal volume replacement under the no action alternative could be approved of at a site where potential impacts can be minimized to the same extent they are by the proposed expansion.

10.5.2 Enlargement/Reduction/Modification

The proposed expansion has been designed to optimize available disposal volumes within the limitations of the existing landfill footprint, site boundaries, regulatory requirements, and environmental restrictions. The proposed design makes the best use of property currently owned by Adams County. Given past, current, and projected disposal rates, the projected site life, including the proposed expansion, will be extended until approximately 2039.

Moderation of potential significant adverse impacts was a primary consideration in the design of the Landfill expansion. Reducing the size of the proposed expansion is unlikely to lessen the potential for adverse impacts. However, if the life of the Landfill is reduced, an additional landfill or expansion would be necessary elsewhere, sooner. An unlimited number of modifications to the design are possible, but the dimensions of the proposed vertical expansion are planned to achieve the maximum volume of waste disposal capacity while not expanding the existing footprint of the Landfill.

10.5.3 Other Landfills or Locations

Locating a different landfill site within the general area of the current Landfill that meets WDNR locational and performance criteria and receives public approval would be difficult. The existing Landfill already has much of the necessary infrastructure, abundant land space, and would not require the initial capital costs typically involved with developing a new landfill facility. Additionally, the time required to site a new

landfill location would likely take a minimum of 5 years. Therefore, the vertical expansion of the Landfill would prolong the lifespan of the Landfill without the significant costs associated with developing a new landfill.

The Needs Analysis presented in Section 11 discusses other landfill facilities with service areas overlapping with the Landfill. There are five neighboring landfill facilities with service areas overlapping with Adams County Landfill. These facilities include the Advanced Disposal Services Cranberry Creek Landfill, the Waste Management Valley Trail Landfill, the Monroe County Landfill, the Dane County Landfill, and the Advanced Disposal Services Glacier Ridge Landfill. The three closest facilities to the Adams County Landfill are the Cranberry Creek Landfill in Wood County (30 miles north), the Monroe County Landfill (49 miles west), and the Valley Trail Landfill in Green Lake County (54 miles east).

Utilizing these facilities would likely increase waste disposal costs for residents within the Adams County Landfill service area due to increased hauling costs. Furthermore, the facility or facilities utilized for landfilling in place of the proposed Adams County expansion would see an increase in waste quantities. Therefore, these facilities would see a decrease in their expected site lives due to additional loading from the Adams County service area.

10.5.4 Other Waste Management 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 voluntarily utilized in Wisconsin and within the service area, as discussed in Section 12 of this report. The economics of some of these options make them impractical. Additionally, these waste reduction and recycling technologies generate residual waste, which requires the need for landfilling.

11.0 Need and Design Capacity (NR 512.17)

11.1 Introduction

NR 512.17 requires that a Feasibility Report contain an evaluation to justify the need for the facility in accordance with Wisconsin Statutes, § 289.28. Wisconsin waste disposal facility siting statutes include two provisions intended to assure that the size and number of solid and hazardous waste disposal facilities in the state are commensurate with the anticipated quantity of waste requiring disposal:

- The "needs" provision (§ 289.28) requires the WDNR to determine whether a proposed facility is needed, and if there is insufficient need, to deny permission to construct or operate the proposed facility.

- The "site life" provision (§ 289.28(1)(d)) prohibits the WDNR from approving a feasibility report for a proposed facility unless its proposed capacity is designed to be consumed within 15 years after it begins accepting waste.

This analysis includes the most recent solid waste management data available for Central Wisconsin with emphasis on the anticipated service area for the proposed expansion. Additionally, the 2004 Draft WDNR guidance, "Landfill Needs and Site Life – A Guide for Applicants, DNR Staff and the Public" was utilized as a guide for developing this section.

The following factors were considered in preparing this needs analysis and determining design capacity:

- The approximate service area for the facility, which considers 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 § 289.01, including the potential for the expansion of those facilities on contiguous properties already owned or controlled by the applicant.

    - Non-approved facilities, as defined under § 289.01, which are environmentally sound—the assumption being that a non-approved facility is not environmentally sound unless evidence to the contrary is produced.

    - Other facilities for which Feasibility Reports have been submitted and determined to be complete by the WDNR.

    - Facilities for the recycling of solid waste or for the recovery of resources from solid waste that have been licensed by the WDNR.

    - Proposed facilities for the recycling of solid waste or for the recovery of resources from solid waste for which plans of operation have been approved by the WDNR.

    - Solid waste incinerators licensed by the WDNR.

    - Proposed solid waste incinerators, for which plans of operation have been approved by the WDNR.

11.2 Service Area

The proposed vertical expansion to the existing Landfill will continue to be owned and operated as a municipal owned solid waste disposal facility open to the public. Service areas for municipal owned and operated landfills are typically established, through local ordinance, to capture solid waste from within their county, but also have the ability to accept waste from surrounding areas. For the purposes of this analysis, the anticipated service area is defined as the area from which Adams County Landfill currently receives its waste. Potential service areas that are not currently disposing of their waste at Adams County Landfill are not included in the defined service area. Service areas are defined by county boundaries, unless otherwise stated, in the following sections and referenced tables.

The current and anticipated Landfill service area identified by Adams County personnel and past tonnage reports is shown on Figure 6 and includes the following Wisconsin counties, all of which directly border Adams County:

- Adams
- Columbia
- Juneau
- Marquette
- Sauk
- Waushara
- Wood

To best service the residents of their County, Adams County Solid Waste Department has limited the amount of out of county waste to 25,000 tons per year, an increase from a 15,000 ton per year cap that was previously in place. This has subsequently resulted in higher waste disposal volumes compared to previous years.

It should be noted the service area identified above may change over time and can be affected by economic, political, social, and geographic conditions. Available waste for disposal at the Adams County Landfill is dependent on a complex set of variables, including available disposal capacity, tipping fees, transportation costs, the value associated with a waste disposal service, rate of waste disposal, economic development, and governmental regulations. A change in one or several of these variables will result in Adams County receiving waste from a continually varying service area.

11.2.1 Economics of Waste Collection, Transportation, and Disposal

A component of determining the feasibility of the needed vertical expansion is analyzing the economics of waste collection, transportation, and disposal. Adams County Solid Waste provides a full-service waste facility by providing the following internal services; waste collection and hauling, recycling at their MRF, and disposal via the existing Landfill. By providing these services, Adams County provides low-cost waste services to its County residents versus contracting through a private entity. Additionally, since the Adams County service area includes adjacent Counties, Adams County can compete with private haulers to extend their waste hauling services. This is evident as Adams County is currently the contracted hauler with the Village of Coloma in Waushara County.

Disposal costs, or tip fees, must be considered for feasibility of the proposed expansion. Tipping fees for Wisconsin landfill facilities (Cranberry Creek Landfill, Wood County) that compete in the same service area are $72 per ton (http://dnr.wi.gov/topic/landfills/documents/lftipfees.pdf, 2019 update). The tip fee for Adams County Landfill is similar (does not include hauling costs) for competing facilities, haul distances of 40 miles or more are economically feasible. This is supported with current operations where waste is routinely transported over 40 miles for disposal at this facility.

The origin of waste disposed at the existing Landfill, including the proposed vertical expansion, via transfer stations is difficult to track for the purposes of assessing the service area. At transfer stations, waste from different communities and counties is typically commingled prior to being placed in large transfer trucks. These trucks may then be sent to one of several different disposal locations based on distance, available landfill capacity, timing, service agreements, costs, and other issues.

Overlapping service areas of landfills create competition between both waste haulers and the landfills. This competition in the solid waste marketplace creates service areas that are continually changing. This is especially true when solid waste originates at the outskirts of a service area, where waste hauling costs make up a higher percentage of the overall cost of waste disposal.

11.2.2 Service Areas for Competing Landfills and Percent Overlap

To estimate the volume of waste likely to be disposed at Adams County Landfill, it is necessary to gauge the competitive effect of other landfills competing for available waste generated in the Adams County service area. This required an inquiry into the service areas of competing landfills and determining the amount, or percentage, of overlap a competing landfill has with Adams County. County boundaries were used for defining service area overlap. To utilize service area boundaries, other than the county boundaries, would require an analysis of individual communities, rural residences, industries, and commercial establishments served by each landfill competing for waste from that area. This information changes constantly and is not readily available, since it is found only in customer lists of haulers, usually controlled by competing landfills and unavailable for this analysis.

The percentage of service area overlap was determined by using populations of the counties in each landfill's service area, expressed as a percentage of the competing facility's capacity. This is considered the pro-rated method in the 2004 WDNR Draft Landfill Needs and Site Life guidance. Table 11-1 summarizes the percent overlap and available landfill capacity for the Adams County Landfill service area. Service areas for competing landfills was determined by reviewing the competing landfill's respective feasibility report, conversations with Adams County personnel, and discussions with WDNR staff. For most of the competing landfills, the actual service areas presented in the competing landfills feasibility report are overestimated. Table 11-1A lists the counties in the Adams County Landfill service area and counties in the competing facilities service areas. These populations were utilized to calculate the service area overlap.

Adams County has a county-wide ordinance that requires waste from private or public generators within the county to be disposed at the Adams County Landfill. Hence, 100% of Adams County waste is assumed to be disposed at the Adams County Landfill. Therefore, for this analysis, Adams County is not considered a potential service area for competing landfills. The service area outside of Adams County generates a smaller component of their overall waste volume on an annual basis but may expand tonnages in the future and are subsequently shown and described below. These tonnages from surrounding counties are currently capped at 25,000 tons per year to extend the life of the Adams County Landfill which was deemed in the best interest of county residents.

The following summarizes the landfills with overlapping service areas of Adams County, including the Adams County Landfill itself. Note: Underlined counties for other landfills below overlap with Adams County Landfill service area. Fill rate from 2021 DNR tonnage reports for tons consumed in 2021, with volume fill rate calculated using DNR Landfill Needs and Site Life Guidance Document of 1,500 lb/c.y. Service areas are noted below.

Adams County Landfill, Adams County (Lic. 3150)

January 1, 2022, disposal capacity:	498,538 c.y.
2021 Fill Rate:	44,115 ton/year, 58,821 c.y./year
Percent of waste from Adams County Landfill service area:	100%

Service area included:	Adams, Columbia, Juneau, Marquette, Sauk, Waushara, Wood

Advanced Disposal Services Cranberry Creek, Wood County (Lic. 2967)

January 2022 disposal capacity:	1,884,246 c.y.
2021 Fill Rate:	198,859 ton/year, 265,245 c.y./year
Percent of overlap from Adams County Landfill service area:	25%
Service area included:	Adams, Ashland, Clark, Columbia, Crawford, Grant, Iowa, Iron, Jackson, Juneau, LaCrosse, Langlade, Lincoln, Marathon, Marquette, Monroe, Oneida, Portage, Price, Richland, Sauk, Taylor, Vernon, Vilas, Waupaca Waushara, and Wood

Monroe County Landfill, Monroe County (Lic. 3660)

January 2022 disposal capacity:	51,000 c.y.
2021 Fill Rate:	54,317 ton/year, 72,432 c.y./year
Percent of overlap from Adams County Landfill service area:	22%
Service area included:	Jackson, Juneau, Monroe, Vernon

Waste Management – Valley Trail, Green Lake County (Lic. 3066)

January 2022 disposal capacity:	3,707,915 c.y.
2021 Fill Rate:	239,704 ton/year, 319,605 c.y./year
Percent of overlap from Adams County Landfill service area:	21%
Service area included:	Adams, Calumet, Columbia, Dodge, Fond du Lac, Green Lake, Marathon, Marquette, Outagamie, Portage, Sauk, Waupaca, Waushara, Winnebago, Wood

Dane County Rodefeld Landfill, Dane County (Lic. 3018)

January 2022 disposal capacity:	1,835,793 c.y.
2021 Fill Rate:	270,473 ton/year, 360,631 c.y./year
Percent of overlap from Adams County Landfill service area:	1%
Service area included:	Columbia, Dane, Dodge, Green, Iowa, Jefferson, Rock, Sauk

Note: Dane County waste comes primarily from Dane County. The landfill's Solid Waste Plan limits out of county waste to a maximum of 10% of annual total waste intake.

Advanced Disposal Services Glacier Ridge, Dodge County (Lic. 3068)

January 2022 disposal capacity:	5,335,956 c.y.
2021 Fill Rate:	537,177 ton/year, 716,236 c.y./year
Percent of overlap from Adams County Landfill service area:	2%
Service area included:	Columbia, Dane, Dodge, Fond du Lac, Green Lake, Jefferson, Milwaukee, Ozaukee, Sheboygan, Washington, Waukesha, and Winnebago

Note: Glacier Ridge expanded over 2 million cubic yards of airspace as noted between the 2021 and 2022 DNR Tonnage Reports.

11.3 Waste Quantities & Disposal Rates

The preliminary capacity mentioned in the ISR for the vertical expansion was 224,000 c.y. This preliminary volume is based off an anticipated average annual waste intake with a 2% growth in waste intake considered over the maximum 15-year allowable timeframe.

To determine if this proposed capacity is sufficient for the proposed expansion, anticipated future waste disposal quantities need to be determined. Two methods were utilized to determine future waste quantities expected at the proposed vertical expansion.

Method 1 – Historical Waste Disposal

Because this is an expansion to an existing facility, historic waste disposal data recorded at the facility can be used to calculate the anticipated future annual waste acceptance volumes. This is the preferred method to be used for calculating future waste quantities and future waste disposal rates as it is based on empirical data collected over years of operation.

The estimated site life of the proposed expansion can be calculated by dividing the total approved capacity (including current remaining and proposed capacity) by the anticipated future annual waste disposal rate to estimate whether the proposed expansion will be filled within, or at, the maximum 15 year lifespan per NR 504.05(3).

Method 2 – Per Capita Waste Disposal

The second method uses per capita solid waste disposal rates and population estimates to determine the quantity of waste that is generated and disposed of within the Adams County Landfill service area. These disposal rates are used to project when the available disposal capacity to the service area will be consumed based on the prorated capacity calculated for Adams County and competing landfills. This method is used to view the service area as a whole and how the Adams County Landfill fits into the larger service area.

11.3.1 Solid Waste Disposal Rates

The first, or preferred, method, Method 1, of calculating solid waste quantities and disposal rate for the proposed expansion simply uses current annual waste disposed from all sources. Over the past three years (2019-2021), Adams County accepted 39,024 tons, 40,666 tons, and 44,115 tons, respectively, of solid waste per the annual WDNR tonnage reports. Utilizing a waste density of 1,500 lbs/c.y. (0.75 tons/c.y.), this equates to an average waste disposal rate of 55,024 c.y./year over the past three years. A waste density value of 1,500 lbs/c.y. is typically utilized for calculating waste volumes, particularly when MSW is the primary waste stream, per the 2004 WDNR Draft guidance. Adams County routinely conducts annual waste volume surveys which compare the amount of airspace consumed, using topographic survey methods, to the total tonnage accepted in a year. Surveys have shown the running average for Adams County Landfill waste density to be approximately 1,421 lbs/ c.y. Annual waste disposal calculations utilizing historic data is presented in Table 11-2.

Although, Adams County annual disposal records date back circa 1991, disposal records for 2019 to 2021 are most applicable to the proposed expansion due to the total tonnage disposed in the past three years is significantly higher than years before. Reasons being; out of county waste, previously capped at 10,000 tons per year, beginning in year 2014 was increased to 15,000 tons per year. Additionally, a contract with a third-party hauler increased the disposal rate alone by 59% for years 2019 through 2021. Looking at historic tonnages, these changes have resulted in increased tonnages year over year at the Landfill and therefore this disposal rate is expected to increase throughout the proposed expansion.

To estimate the amount of anticipated growth during operation of the expansion, population growth and waste growth were evaluated. Population rates were obtained by reviewing the 2020 Census data from

the U.S. Census Bureau and comparing to the Wisconsin Department of Administration Demographic Services Center 2021 population estimate which yielded an anticipated growth rate of 0.10%. This indicates minimal growth. Population growth and MSW generation tend to directly correlate. However, annual waste (i.e., all waste types) growth does not generally correlate to population growth because MSW landfills accept other waste types such as C&D, industrial wastes, and other non-MSW type wastes. This is evident with Adams County's recent tonnage increase over the past 3 years. Refer to Table 11-2. Because of this increase, we must also include an anticipated waste growth rate throughout the proposed expansion 15-year timeframe.

Annual waste growth rates can fluctuate greatly from year to year based on a variety of factors that generally are indicative of economic conditions. Adams County's annual waste growth rate has fluctuated from year to year, with a compounded annual growth rate of approximately 4% over the past 3 years. Staying conservative, a 2% estimated growth rate in waste over the life of the expansion was utilized for the site life analysis portion discussed in Section 11.5.

Additionally, waste disposal is expected to be maintained at this rate due to an addition to the multi-use golf resort (Sand Valley) in the Town of Rome in Adams County. This expansion has the potential to generate additional jobs and expand the tonnage of solid waste already received from resort operations. Due to the county flow control ordinance, this additional waste would need to be directed to the Landfill. . The expansion is set to be completed in 2024. Due to uncertainties and difficulties estimating amount of waste the expansion will produce, any increased filling rate was conservatively not included in the needs analysis, but has the potential to increase waste disposal during future site life if implemented.

The second method, Method 2, for calculating waste quantities and disposal rate involves taking the Adams County Landfill service area population and applying the statewide per capita disposal rate to the service area. To apply this method, a per capita disposal rate was calculated. Table 11-3 calculates the statewide per capita disposal rate utilizing the WDNR annual tonnage reports and statewide population data. Disposal rate calculations were broken into three rates; MSW only (i.e., category 1), non-MSW (categories 2-6 and 19-32), and a total combined of MSW and non-MSW. Calculated disposal rates consisted of the following.

- MSW Only: 0.75 ton/cap/year (4.1 lbs/cap/day)
- Non-MSW: 0.67 ton/cap/year (3.7 lbs/cap/day)
- Combined (MSW and non-MSW): 1.41 ton/cap/year (7.8 lbs/cap/day)

These values represent an average over the past 5 years (2017-2021). For this analysis, only the per capita MSW disposal rate was utilized as MSW is generated by populace whereas non-MSW is primarily correlated with industrial activity. Additionally, the non-MSW disposal rate includes tonnage from industrial landfills, which does not reflect the amount of non-MSW currently being disposed at MSW landfills. WDNR annual tonnage reports are provided in Appendix S.

Using the statewide density for in place waste for Wisconsin Landfills, as referenced in the Department's draft guidance document for preparing landfill needs assessments (WDNR, 2004), waste quantity projections for the service area were calculated using the statewide per capita disposal rate and applied back to the specific service area using population data. Based on the calculated MSW disposal rate, approximately 213,571 tons (284,761 c.y.) of MSW will be generated from the Adams County Landfill service area in the year 2021. The population data for the counties within the Adams County service area shows a small increasing trend of 0.06% per year. Method 2 assumes waste disposal rates for MSW only are expected to conservatively increase at the rate of population growth. Calculations for the waste disposal rates, based on this method, for the service area and for projected population growth are presented in Table 11-4.

11.4 Design Capacity

The design capacities of facilities located within or near the service area of the proposed expansion, including other proposed disposal, recycling, and recovery facilities, and solid waste incinerators, are discussed in subsection 11.2.2 and as noted below.

11.4.1 Approved Facilities

An “approved facility” is defined under § 289.01 as “a solid or hazardous waste disposal facility with an approved Plan of Operation under §. 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 §. 289.30.” Subsection 11.2.2 discussed approved facilities within or near the Adams County Landfill service area and facilities providing disposal capacity in the areas of overlap.

11.4.2 Non-Approved Facilities

Non-approved facilities are defined in § 289.01(24) as a licensed solid or hazardous waste disposal facility that is not an approved facility. No non-approved facilities are currently known to be operating in the service area, nor are any expected to operate in the service area during the life of the proposed expansion.

11.4.3 Proposed Facilities

Proposed facilities for which feasibility reports have been submitted and determined to be complete by the WDNR must be addressed as part of the needs analysis for consideration of available disposal capacity to the service area. Based on correspondence with WDNR staff in July of 2022, no feasibility reports have been submitted for proposed facilities or for expansion of existing facilities within the Adams County service area. Feasibility reports have been received by the WDNR for Monroe County in 2019 and more recently for La Crosse County and Dane County. There are no known feasibility reports, as of the date of this report, submitted to the WDNR for siting a new landfill or for expanding an existing landfill in or near the Adams County Landfill service area. All available capacity from facilities within the Adams County service area that accept MSW are included in this evaluation.

11.4.4 Recycling and Resource Recovery Facilities

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

These efforts have banned items from landfill disposal that include electronics, lead acid batteries, major appliances, used oil and oil filters, yard waste, aluminum containers, corrugated paper and other container board, foam polystyrene packaging, glass containers, magazines, newspapers, office paper, plastic containers (#1 and #2), steel containers, tires, and bi-metal steel/aluminum containers. Some local ordinances require other items to be recycled. Due to the landfill ban, the Wisconsin per capita solid waste disposal rates in Table 11-3 do not include recyclable material and do not need to be adjusted to account for these materials.

Many ongoing waste recovery and recycling programs are currently operating in the Adams County Landfill service area including at the Adams County Landfill. These programs have been in place for the past several years as a result of recycling laws, county solid waste plans, economic incentives, and voluntary programs.

A local unit of government identified as the "responsible unit" generally oversees recycling efforts in the state of Wisconsin. In many cases, the responsible unit is the county; however, smaller units of local government often maintain responsible unit status for their own community within the county. For example, Adams County is the responsible unit for all of Adams County and all communities within the county participate in the program. On the other end of the spectrum, Clark County has forty-four individual responsible units within the county.

Due to the large number of responsible units within the service area, it is difficult to identify representative recycling rates and the effectiveness of recycling programs. Recycling plans vary and the responsible unit has little or no control over where private residents take their recyclable materials. The Adams County program collects curbside recyclables only from single family units up to four-unit dwellings. They do not collect recyclable material from larger rental units, dorm housing, or commercial and industrial businesses. Also, private individuals may take their recyclables to a private facility or drop them at a drop box outside the county. Thus, the amount of recycled material listed in a responsible unit's annual report is not all inclusive for the program area.

11.4.5 Solid Waste Incinerators

Several licensed solid waste incinerators are currently operating outside the Adams County Landfill service area. Two of these facilities, Barron County Waste-to-Energy Facility and Xcel La Crosse, are located in Wisconsin. Incineration accounts for approximately 2.5% of the total statewide MSW disposal in Wisconsin.

Intake rates listed below for the Wisconsin incinerator facilities were provided by facility and county personnel. Incinerated waste was not included in the calculation of the per capita waste disposal rate for Wisconsin residents. Thus, the per capita disposal rates presented in Table 11-3 do not need to be adjusted to account for incineration rates.

The following MSW incinerators are located outside the Adams County Landfill service area:

Barron County Waste-to-Energy Facility, Barron County, Wisconsin (License No. 3091)

Intake rate: 33,032 tons in 2021 Source: Barron County personnel, July 2022).

Service Area: Barron County, Chippewa County, Dunn County, Polk County, St. Croix County (Source: Barron County solid waste).

Xcel La Crosse French Island Generating Station, La Crosse County, Wisconsin (License No. 3776)

Intake rate: 80,000 tons in 2021 MSW (Source: La Crosse County Solid Waste personnel, June 2022).

Service Area: Buffalo, La Crosse and Trempealeau Counties, Wisconsin; Houston County and portions of Winona and Wabasha Counties, Minnesota (Source: La Crosse County personnel).

11.5 Analysis

Based on the waste disposal rates for Methods 1 and 2, we can calculate the anticipated site life. Method 1 used historical real data collected at the existing Landfill over the course of its operation. Method 2 involved calculating a per capita disposal rate using statewide waste disposal data and applying it back to the Adams County service area. Using these disposal rates, the total anticipated lifespan of the proposed expansion can be calculated.

The disposal rate calculated using Method 1 is approximately 58,820 c.y./year with a waste density of 1,500 lbs/c.y. Assuming a favorable feasibility determination and approval of the Plan of Operations in early 2023, and therefore, construction and approval for filling in the first phase of the expansion would begin late 2023 or early 2024. Factoring in an annual waste growth rate of 2% during operation of the proposed expansion, the existing Landfill including the expansion capacity will be consumed by early 2032, which meets the 15-year maximum permitted time requirement. Projected site closure of the Landfill including the proposed expansion, utilizing Method 1, is presented in Table 11-5.

Disposal rates calculated using Method 2 view the service area as a whole. The calculated prorated disposal capacity available to the service area and the estimated disposal rate are used in the same manner as Method 1 to calculate remaining years of disposal capacity to the entire service area versus just the Adams County Landfill. Table 11-6 shows that a 284,761 c.y./year disposal rate plus population growth of 0.00% for the service area, indicates there is approximately 7 years of disposal capacity available to the service area. This does not include the proposed increased volume of 224,000 c.y. to account for this Landfill expansion. With the additional proposed capacity, 224,000 c.y., factored in, the available disposal capacity in the service area is extended to mid-2028. Table 11-7 shows the projected increase in disposal capacity to the service area with the proposed expansion.

It should be noted that the remaining site capacity with and without the proposed expansion, Tables 11-6 and 11-7 respectively, do not consider non-MSW waste. Therefore, the remaining capacity to the service area may be considerably less than what is calculated when non-MSW waste is factored in.

When evaluating the remaining years of site capacity, going from a service area basis to an individual site basis, the service area capacity does not always translate due to ever changing service areas of competing facilities. As previously mentioned, Method 1 is the preferred method of calculating future waste quantities and disposal rates because it is based off actual data experienced at the existing facility. Method 2 is a good gauge for estimating the amount of waste generated in a service area. However, because the larger disposal facilities are primarily private, their service area is continually changing and can vary from year to year. Varying service areas can also be evident in municipally owned facilities, but is usually defined through local ordinance and/or county solid waste management plans.

Both methods show the proposed facility will meet the 15-year site life as required in § 289.29(1)(d). Method 1 is the most reliable calculation as it is based off historical empirical data. Future waste disposal rates are anticipated to be consistent with 2019–2021 data due to the large increase in the amount of waste over that timeframe compared to historical waste acceptance rates. Additionally, should the expansion on the resort in the Town of Rome in Adams County be built, this would further increase consumption further reducing the site life of the Landfill even with the expansion. These increased waste streams in addition to the in-county waste disposal mandated by county wide ordinance will maintain, or likely increase, the intake at the Landfill, hence the closure dates estimated in Table 11-5 appear accurate and subsequently meet the site life requirements of NR 504.05(3). When looking at the larger service area, without unduly increasing haul distances, the service area as a whole also appears to reach capacity well in advance of 15 years.

11.6 Conclusion

The current site life for the Adams County Landfill without the proposed expansion is expected to be less than 7 years. At the current waste disposal rates, Adams County Landfill will reach capacity near the end of 2029. Adams County is seeking approval for the proposed expansion to continue to provide efficient, cost effective, and environmentally sound waste management services primarily for Adams County residents, but also for the service area. The timing of this Feasibility Report is justified due to the long lead schedule of permit approvals and construction. It is anticipated that a 2023 Plan of Operation approval for the vertical expansion would lead to construction of the first phase in 2023. This would result in the first waste acceptance in late 2023 or early 2024. The vertical expansion will extend the life of the Adams County Landfill approximately 3 years from currently anticipated capacity date of 2028.

The determination of need of the facility was conducted by analyzing two different methods for determining the amount of available capacity to the Adams County service area compared to the projected amount of waste generated or waste disposal rates. Method 1 used real data collected at the facility calculating an anticipated future waste disposal rate and quantities, and ultimately determining a volume required to meet the 15-year timespan. Method 2 used a per capita disposal rate calculated from statewide disposal data and applied back to the service area. The available disposal capacity to the service area was calculated on a prorated basis based on county populations. The amount of waste generated in the service area was then used to calculate the rate at which the disposal capacity would be consumed with and without the proposed expansion. Both methods show the current and proposed remaining capacity will be consumed within the 15-year site life.

The need for the proposed vertical expansion is justified based on the projected site life of both the Adams County Landfill and competing landfills that accept waste from this defined service area in the currently considered overlap. Perhaps more importantly, the need is justified to continue to supplying cost competitive solid waste disposal services for Adams County residents. Additionally, Adams County Landfill provides competition to private MSW landfills in Wisconsin. Competition in a marketplace that has seen numerous private mergers is needed to provide efficient, cost-effective, waste disposal and is a benefit to residents of this region either directly or indirectly.

In addition to this needs analysis, Adams County retained Dr. Aga Razvi of Weaver Boos Consultants to conduct a solid waste disposal options evaluation in 2014. The purpose of the evaluation, or study, was to determine which waste disposal option(s) was most cost effective for the long-term need of Adams County. The study evaluated three options: expanding the existing Landfill, implementing a transfer station, or providing no solid waste disposal services. Results of the 2014 study indicate expanding the existing Landfill provided the most cost effective and best met the long-term solid waste disposal needs for residents of Adams County.

12.0 Alternatives to Land Disposal (NR 512.18)

This section evaluates possible alternatives to land disposal and the feasibility of implementing waste reduction initiatives in connection with the proposed expansion. Possible alternatives include no action, alternate location for a landfill, use of other existing facilities in the surrounding area, and landfilling alternatives. Some of the alternatives discussed below, are currently being employed by Adams County. Note that none of the alternatives discussed herein can eliminate the need for landfilling; however, some of the alternatives have potential to reduce the amount of landfill space consumed.

The existing Landfill is expected to reach capacity near the end of 2028. Landfill expansion is necessary if the County is to continue to provide waste disposal services past 2028. If the County were to reach capacity and close, current users would be required to dispose of waste at other disposal facilities. In most cases, this would require a longer haul distance to a disposal facility and ultimately higher disposal costs, due to the significant reduction in competition within the service area.

12.1 No Action

A no action alternative would involve closing the existing Landfill once it reaches capacity and not expand. No action could potentially adversely impact residents of the service area by creating a disposal crisis. At a minimum, a transfer station or various drop off locations would need to be employed to continue to provide waste disposal services to residents within the service area. Transfer stations and drop off locations would temporarily collect waste where it can be hauled off in greater quantity to a neighboring facility. A transfer station and/or combination of drop off locations would likely result in a costlier option to the public as the increased hauling distance would result in increased transportation costs.

12.2 Other Locations

Locating a different landfill site within the general area of the current Landfill that meets WDNR locational and performance criteria and receives public approval would be difficult. The existing Landfill already has the necessary infrastructure, abundant land space, the capability of expanding vertically and would not require the initial capital costs typically involved with developing a new landfill facility. Additionally, the time required to site a new landfill location would likely take a minimum of 5 years. The existing facility would be out of capacity before the new landfill could be permitted and constructed, leaving the service area without an active facility in the interim.

12.3 Other Disposal Facilities

The Needs Analysis presented in Section 11 discussed other landfill facilities with service areas overlapping with Adams County Landfill. There are five neighboring landfill facilities with service areas overlapping with Adams County Landfill. These facilities, as presented in Section 11, include Advanced Disposal Services Cranberry Creek Landfill, Waste Management Valley Trail Landfill, Monroe County Landfill, Dane County Landfill, and Advanced Disposal Services Glacier Ridge Landfill. The three closest facilities relative to the Adams County Landfill are the Cranberry Creek Landfill in Wood County (30 miles north), Monroe County Landfill (49 miles west), and Valley Trail Landfill in Green Lake County (54 miles east).

Utilizing these facilities would likely increase waste disposal costs for residents within the Adams County Landfill service area as a result of the increased hauling costs. Additionally, the facility or facilities utilized for landfilling would see a decrease in site life with the increase in waste quantity from the Landfill service area.

12.4 Waste Reduction

Waste reduction, or waste prevention, is the reduction of the quantity of materials used to produce consumer goods. This practice reduces the quantity of waste generated by eliminating unnecessary materials used in products and/or by making product materials more readably recyclable. Waste reduction is the most preferable method of managing waste.

Waste reduction also involves the development and use of products with longer useful lifespans. Increasing product lifespan reduces the need to frequently replace items and results in a reduction of the amount of waste requiring landfilling.

Waste reduction is generally more environmentally, socially, and economically acceptable practice than many other management techniques. If the quantity of waste requiring disposal can be greatly reduced, it can theoretically eliminate the need for landfilling. However, realistically, it can reduce the amount of space consumed by landfills.

Implementing waste reduction initiatives would require efforts from all portions of society, with a heavy emphasis on manufacturers to create such products. However, as supply and demand greatly influence industry practices, consumers would have to influence industry by demanding products constructed of readily recyclable material and/or longer lifespans. Educating consumers on the importance of waste reduction and being a conscientious consumer can help employ waste reduction initiatives.

Assigning a disposal cost or general cost savings amount for waste reduction would be very difficult and outside the scope of this Feasibility Report. However, the Landfill currently, and has been for several years now, educating students of all ages the importance of reduce, reuse, and recycle by conducting field trips for local schools. These short educational activities help local younger generations understand where their waste ends up and encourages future generations to be more responsible consumers. The County intends to continue this activity during operation of the expansion and increase its outreach.

12.5 Waste Reuse

Waste reuse consists of a variety of actions that prevent products and materials from being landfilled. These can include an alternative use of a product, sharing, donating, repairing, and rebuilding older items. Waste reuse reduces landfill space consumption and conserves environmental resources. Reuse, when possible, is sometimes preferable to recycling as the item does not need to be reprocessed before it can be used again. For waste reuse to have a significant impact, a socio-economic impact of the benefits of waste reuse must be perceived by the public.

Adams County has implemented a waste reuse initiative termed “Practical Cents Re-Use Project.” Adams County facilitates this initiative by providing a collection area at the Landfill’s public drop-off area where local customers can donate goods suitable for reuse. Typical goods that are donated for reuse are toys, tools, furniture and housewares, mattresses and box springs, bedding, clothing, and other accessories. These items are then made available to local residents in need.

Adams County promotes this initiative by providing information on its local County website and by sending out informational brochures to residents. Discussions with Adams County personnel indicate that the program has been well received and diverts anywhere from 2,000 lbs to 5,000 lbs of items from landfilling per year. The Practical Cents reuse project will continue to be implemented during the proposed expansion.

12.6 Recycling

Recycling is the diversion of waste material that can be physically and/or chemically altered into a new product. Common recyclable materials include glass, paper, plastics, aluminum, tin, and steel, all of

which can be reprocessed to create new products of the same kind. Local municipalities, community organizations, or private businesses can manage recycling programs and recycling centers. Programs can be implemented by statutory laws and regulations, local ordinances, or voluntarily.

Recycling programs remove recyclable materials from the waste stream, thereby reducing the amount of waste disposed by landfilling. Recycling programs are relatively easy to implement and can take one of several forms of collection, including curbside collection, drop-off centers, and buy-back centers. Curbside collection is the routine collection of recyclables at the point of generation. Drop-off centers are facilities where people can bring recyclables but are not compensated for their return. Buy-back centers are facilities where people can bring recyclables and be compensated for them based on current market value.

Adams County owns and operates a MRF at the Landfill location. Materials recovered are primarily household recyclables and include aluminum, tin, glass, plastic, and paper products. To increase awareness to its residents of what can be recycled, Adams County has developed brochures and posted information on the County website instructing people on how and what to recycle. In 2021, Adams County received approximately 3,982 tons of recyclables, of which 95% was processed onsite and shipped for reprocessing. Additionally, the County accepts other universal waste type items including batteries, used motor oil and filters, cooking grease, appliances, fluorescent bulbs, tires, scrap metal, sharps, and electronics. These materials are sent offsite for proper recycling or disposal by third parties.

Every other year, the County provides a “Clean Sweep” program that allows local residents to bring universal waste type items for proper recycling or disposal. The program offers low-cost recycling/disposal for these non-readably recyclable materials. The program is beneficial to the Landfill as it reduces the amount of potentially hazardous materials from being mixed in with MSW. Discussions with the County indicate more participation from local residents as the quantity of items increase with each event. Indicating the County’s outreach of reduce, reuse, recycle, and informing residents of being conscientious consumers has been successful.

12.7 Composting

Composting is the segregating of organic material from the waste stream to promote biodegradation resulting in a usable resource. Organic matter (food waste, wood, yard waste, etc.) through microbial activity is decomposed into a stable, humus like, substance referred to as compost. Compost is typically used as a soil amendment. Many different composting processes exist, ranging from simple backyard composting to automated composting in enclosed digesters.

Small scale composting can be accomplished effectively by individual households, 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 c.y. of material.

On a larger scale, materials are collected and prepared for composting by sorting salvageable materials from non-combustibles 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, and proper moisture content. Few bulk commercial and specialty markets exist, however, for the sale of composted material.

Currently, Adams County operates a composting area in which yard waste including leaves, yard clippings, and brush are disposed of separately to the Landfill. Material is stockpiled in location away from landfilling activities and is allowed to decompose. The resulting compost product is available for sale to Adams County residents. Over the past 12 months, Adams County diverted approximately 1,150 tons of yard waste and brush for compost.

12.8 Energy Recovery/Incineration

Incineration is the controlled burning of solid waste to reduce the volume of waste requiring landfill disposal. Incineration can reduce the volume of burnable solid waste by up to 90%, significantly extending the life of a landfill. Energy recovery involves the use of heat created during waste incineration to produce electricity.

Incineration and energy recovery systems are either mass-burn or refuse-derived fuel (RDF) systems. In a mass-burn system, solid waste is placed directly into an incineration chamber with little or no preparation or processing for the removal of unburnable material. Mass-burn systems typically incorporate energy recovery features that produce steam or electricity for sale to local industries or utilities. In an RDF system, solid waste is transformed into intermediate fuels and are incinerated in boilers. A common mixing rate for the incineration of RDF in a boiler is ten 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 three days of storage are common to allow for continuous use of the facility. Heavy machinery, such as cranes and end loaders, are 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, which eventually convey the ash to a storage area. Electrostatic precipitators or scrubbers are used to collect particulates in the exhaust. To be operational, incineration systems must be licensed.

Exhaust emissions are a function of waste composition, incinerator design characteristics, and operating time. Air emissions are categorized into one of three types: inorganic particulate matter, specific chemical pollutants, and nitrogen oxides. Documentation is required to incorporate stringent measures to control emissions. It should be noted that exhaust emission restrictions are often a limiting factor for incineration of solid waste materials.

There are currently two energy recovery/incinerator facilities operating in Wisconsin. The Barron County Waste-to-Energy Facility located in Almena, Wisconsin and the Xcel La Crosse Incinerator.

Incineration does not eliminate the need for land disposal. The by-product of combustion (i.e. ash) contains contaminants such as heavy metals that need to be properly disposed. Typically, ash is disposed in an industrial landfill or monofil. In order to stay cost effective, the County would likely need to construct its own monofil to dispose of the by-product waste.

Energy recovery would require having customers available to purchase the produced steam and/or electricity. The rural setting of the Landfill creates a difficult scenario to provide these products to potential customers. Additionally, the large capital cost associated with starting an energy recovery facility greatly reduces the potential for implementation.

12.9 Evaluation of Implementing Alternatives to Land Disposal

In summary, the County currently implements waste reuse, recycling, and composting alternatives concurrently with providing land disposal or landfilling. These alternatives, in part, help achieve the goal of waste reduction. Waste reduction, alone, cannot be implemented by a single entity (i.e., Adams County) in order to completely eliminate the need for landfilling. Adams County will continue to provide the currently implemented alternatives to land disposal throughout operation of the expansion.

A no action or use of an existing nearby facility would not provide an alternative to land disposal, but rather dispose of waste at one facility versus the other. Residents within the Adams County Landfill service area would likely see increased cost for waste disposal services with a no action alternative.

Incineration for energy recovery would require siting, permitting, construction, etc. in order to provide this service. Large upfront capital costs and rural setting of the Landfill do not allow incineration as a feasible alternative at this time.

13.0 Conclusions and Recommendations

Based on the findings of this report, it is recommended that a favorable feasibility determination be granted for the proposed vertical expansion to the existing Adams County Landfill. Approval for the expansion will allow continued, uninterrupted, waste disposal services for the Adams County service area. Current regulatory requirements combined with sound engineering and design concepts will allow the proposed expansion to be operated in an environmentally sound and nuisance free manner. Performance of the existing facility has shown that development of a landfill at this location can be done in a manner to protect human health and the environment. The Need and Design Capacity Section, Section 11, presented in this report also justifies sufficient need for the proposed expansion to the service area.

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