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WASTE MANAGEMENT

PHASE 14 SOLID WASTE PERMIT APPLICATION

VOLUME I OF VI

Crossroads Landfill

Norridgewock, Maine

Prepared for

Waste Management Disposal Services of Maine, Inc.

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1. APPLICATION FORM AND PROJECT DESCRIPTION

Introduction

This document was prepared to satisfy the requirements established in applicable sections of Chapters 400 and 401 of the Maine Solid Waste Management Rules (Maine SWMR), effective 2 November 1998 (revisions effective 12 April 2015) for submittal of a solid waste permit application. This document represents Volume I of the Phase 14 Solid Waste Permit Application package, which, in its entirety, is organized as follows:

- Volume I Application Form and General Information Requirements
- Volume II Natural Resources Protection Act Application Report
- Volume III Geologic and Hydrogeologic Assessment
- Volume IV Landfill Engineering Report
- Volume V Site Operations Manual
- Volume VI Draft Construction Bid Documents

Application Form

Pursuant to Chapter 400.3.C(3) of the Maine SWMR, the Maine Department of Environmental Protection (MEDEP) Application for a New Landfill or Landfill Expansion (Application) is provided in APPENDIX 1A. The licensing fee of $14,623.20 and the processing fee of $8,602.00 were submitted to MEDEP on 12 September 2019 as confirmed by an email response from Kathy Tarbuck of MEDEP on 26 September 2019. The purpose of the proposed Phase 14 project is to ensure that the Crossroads Landfill is able to continue providing cost-effective solid waste disposal options for Maine residents, businesses and institutional customers beyond 2023, when current capacity at the site is expected to be fully utilized.

Tables 1 and 2 present references for the requirements set forth in SWMR for Chapter 400 and Chapter 401 as well as the location (i.e., Volume # and Section #) where each specific requirement is addressed in this solid waste permit application package. Similarly, the Application provided in APPENDIX 1A has been annotated to indicate where each requirement set forth on the Application form (Volume # and Section #) is addressed in this solid waste permit application package.

Project Description

For the Crossroads Landfill (Crossroads) facility (approximately 721 acres) to be able to continue serving the residents and businesses of Maine, it requires additional disposal capacity which will be provided by Phase 14. Phase 14 will be located east of the existing main access road into the Crossroads facility. In accordance with Sections 3, 11, and 13 of the MEDEP Application Form

and Chapter 401.2.A(1) and (2) of the Maine SWMR, the site plan and the aerial image map are presented in APPENDIX 1B.

Development of Phase 14 is anticipated to include the following: (1) excavation of topsoil and designated amounts of underlying soils; (2) construction of a liner and leachate collection system; (3) construction of perimeter berms and an access road; (4) construction of landfill gas and leachate transfer pipes to the existing on-site landfill gas and leachate management facilities; and (5) construction of stormwater management features including stormwater detention basins. Based on the current preliminary design, the calculated waste capacity of Phase 14 is approximately 7.75 million cubic yards within a lined footprint of about 48.6 acres. Based on WMDSM's projected rate of 450,000 tons of waste per year to be accepted at the Crossroads facility, Phase 14 will provide municipalities and businesses in Maine with disposal capacity for approximately 17 years beyond the currently projected closure of Phase 8. The Phase 14 Project is expected to extend facility life until approximately the year 2040. Consistent with the operations of the existing landfill units of the Crossroads Landfill, the waste accepted at Phase 14 will consist mostly of municipal solid waste, construction and demolition debris, special waste, and materials or waste used as daily cover. The list of the municipalities to be served by Phase 14 is provided in Section 15 of this volume.

2. TITLE, RIGHT, AND INTEREST

In accordance with Chapter 400.4.A of the Maine SWMR, copies of the relevant site deeds, a current site tax map, and the list of abutters to the property are provided in APPENDICES 2A, 2B, and 2C.

3. FINANCIAL ABILITY

Chapter 400.4.B. of the Maine SWMR requires the applicant to provide accurate information on design, construction, operation, maintenance, closure and post-closure costs, and submit evidence that the applicant has the funds necessary to complete the project in accordance with applicable requirements. The total cost of the Phase 14 project, including through closure and post-closure care, is approximately $80,500,000. The itemized cost is provided below.

Phase 14 Project Costs

Item	Cost
Design and Permitting	**$3,500,000**
Construction	**$41,900,000**
Operations	**$16,200,000**
Final Closure	**$8,300,000**
Post-Closure Care for the Entire Crossroads Landfill	**$10,600,000**
Total	**$80,500,000**

Waste Management Disposal Services of Maine, Inc. (WMDSM) is an indirect subsidiary of Waste Management, Inc. Waste Management, Inc. is North America's leading provider of comprehensive waste management environmental services and through its subsidiaries owns or operates more than 250 landfills, including the Crossroads Landfill in Norridgewock, Maine. As reflected in the consolidated balance sheets included in the most recent annual report filed with the U.S. Securities and Exchange Commission and attached as APPENDIX 3A, as of December 31, 2018, Waste Management, Inc. had total assets of $22,650,000,000, and operating revenues of $14,914,000,000. As reflected in the letter attached as APPENDIX 3B, Waste Management, Inc. will make the funds available as necessary to fund the Phase 14 project.

Consistent with the requirements for financial assurance for closure and post-closure care costs, prior to construction of each Phase 14 landfill cell, WMDSM will update the existing performance bond that is in place to reflect the closure and post-closure costs associated with the new cell. See Section 22 of this Volume I to the Phase 14 Solid Waste Permit Application.

4. TECHNICAL ABILITY

WMDSM purchased the site in October 1990 and has operated the solid waste disposal facility since then in accordance with federal, state, and local solid waste management permits issued by the MEDEP and various regulatory authorities. Since 1990, WMDSM has obtained permits for and constructed several landfill phases, most recently the Phase 8C" PM landfill.

WMDSM is fully capable of operating and maintaining the proposed Phase 14 landfill. Pursuant to Instruction #11 of the solid waste permit application form, a certificate of good-standing signed by Maine Secretary of State for WMDSM is provided in APPENDIX 4A. The engineering, operations, and financial staff at WMDSM and its consultants, listed below, have been instrumental in preparing this application. Brief summaries of the technical ability, capabilities, and expertise of WMDSM and WMDSM's design team are presented in APPENDICES 4A through 4E, along with resumes of the key technical personnel.

- Geosyntec Consultants, Acton, Massachusetts
    - Landfill Design, Geotechnical Engineering
- Golder Associates, Manchester, New Hampshire
    - Geological and Hydrogeologic Analysis
- Normandeau Associates, Bedford, New Hampshire
    - Natural Resources Assessment
- SCS Engineers
    - Air Emissions, Gas Collection and Control System

In addition, Waste Management, Inc., WMDSM's parent company, operates the largest network of solid waste landfills in North America. After recycling and diversion, Waste Management manages disposal of nearly 100 million tons of waste annually. Waste Management employs and works closely with many of the leading experts in the field of landfill design, operation, closure and reuse. The experience and expertise gained from leading this complex industry is afforded to Maine residents and businesses through WMDSM's operation of the Crossroads facility that will continue with Phase 14.

In accordance with Chapter 400.4.C of the Maine SWMR, this information demonstrates that WMDSM and its consultants have the technical ability and relevant engineering and/or solid waste experience to design, construct, operate, maintain, and close the Phase 14 landfill.

5. PROVISIONS FOR TRAFFIC MOVEMENT

The Phase 14 project will shift operations within the Crossroads facility from those currently occurring at the Phase 8 location to the Phase 14 site. Traffic volumes, the type and size of waste hauling vehicles entering the facility, and the routes traveled by waste hauling vehicles are projected to remain consistent with current operations. As such, WMDSM expects to see little to no change in the Phase 14 traffic patterns from those previously approved by MEDEP for the Phase 8 landfill.

The Phase 8 Traffic Study

As part of WMDSM's Phase 8 solid waste application, Casey & Godfrey Engineers analyzed operational traffic associated with the proposed Phase 8 landfill. Trip generation counts were taken at both the Route 2 entrance and on Airport Road and then combined to reflect the highest traffic volumes recorded. The study then measured vehicular traffic counts during peak operation hours from 6:30 a.m. to 9:30 a.m. and 2:30 p.m. to 5 p.m. Finally, to further ensure maximum traffic volumes for the Crossroads facility were assessed, rates were then adjusted to reflect August volumes; peak traffic flow for Crossroads and the state of Maine. Traffic rates associated with the construction of Phase 8 were also analyzed. The study, which is included in APPENDIX 5A, provides the following findings.

- No significant impacts on Route 2 are expected based on the projected truck volumes and no alternative routing is necessary.
- There are no capacity constraints within the vicinity of the landfill. Route 2 has more than adequate capacity to accept the existing operational landfill traffic, and Airport Road also has excess capacity given its low volumes.
- There are no sight distance concerns at the Route 2 site entrance.
- There is no need for auxiliary left-turn or right-turn lanes on Route 2 near the site entrance.
- The existing and projected traffic volumes do not even begin to approach the required volumes for a traffic signal nor were any capacity concerns identified that require a traffic-signal evaluation.
- There were no High Accident Locations within the vicinity of the landfill on Route 2 or Airport Road that indicate any safety deficiencies.
- Construction traffic can be accommodated and will fall within the established traffic standard and guidelines.

In summary, the Casey & Godfrey study concluded that even at peak volumes, the Phase 8 project would not have a significant impact on the traffic near the Crossroads facility.

It is also important to note that the Casey & Godfrey study recorded trip generation counts for both waste hauling trucks and vehicles in October 2000. During that year, the Crossroads facility accepted 473,648 tons of waste. Projections for the Phase 14 project indicate that Crossroads will receive 450,000 tons annually, slightly less than the volume accepted for the Phase 8 landfill in 2000. As a result, these tonnage figures, ultimately determining the quantity of waste hauling vehicles, further support the conclusion that the Phase 14 traffic patterns will be similar to those previously approved by MEDEP for the Phase 8 landfill.

Maine Department of Transportation Information

In addition to the above, the most recent information from the Maine Department of Transportation further demonstrates the limited impact the Phase 8 project has had on traffic attributable to the Crossroads facility. Given the similarities between Phase 8 and Phase 14, this information also demonstrates the limited impact Phase 14 will have on surrounding traffic.

- High Crash Location: Based on the on-line Maine Public Crash Query Tool of the Maine Department of Transportation[1], none of the High Crash Locations in the Town of Norridgewock between 2016 and 2019 are located within a quarter (1/4) mile of the Crossroads facility (see APPENDIX 5B of this section). The nearest High Crash Location is along the section of Betterment Road – Upper Main Street – Winding Hill Road which is approximately 1.5 miles away from the Crossroads facility main entrance.

On-site Traffic Pattern Shift

As discussed above, the Phase 14 landfill will simply shift existing traffic patterns on internal roads within the Crossroads facility. Specifically, after passing over the facility scales, trucks will be directed into Phase 14 via the access road shown on the Permit Drawings. Truck staging and small vehicle parking areas for WMDSM employees will be provided near Phase 14 as shown on the Permit Drawings. No changes to the scale location, office building parking areas, site-wide pedestrian traffic, or maintenance procedures for the facility roads are anticipated in transitioning site operations from Phase 8 to Phase 14.

Phase 14 Traffic Impacts

The Casey & Godfrey study demonstrated that roads and intersections in the vicinity of the Crossroads facility could safely and conveniently handle any additional traffic associated with the Phase 8 project. As described above, the Phase 14 project will be consistent with the Phase 8 project in many important respects including waste tonnage, traffic volume, type of hauling vehicles, and routes taken by waste hauling vehicles to and from Crossroads. As such, the background above provides the necessary information to conclude that roads and intersections in

[1] Maine Dep't of Transp., Maine Public Crash Query Tool, https://mdotapps.maine.gov/MaineCrashPublic/ (last visited Oct. 23, 2019).

the vicinity of the Crossroads facility will safely and conveniently handle the traffic attributable to the Phase 14 project.

Additional Measures Taken by WMDSM

To further reduce any adverse traffic impacts that could result from the Crossroads facility, WMDSM has a transporter management program in place. The program requires transporters to comply with all local, state and federal laws and an additional set of stringent requirements put in place specifically for the Crossroads facility. The program minimizes and eliminates truck lineup prior to the daily facility opening time, designates travel routes to and from the facility, and imposes measures such as a prohibition on engine breaking and a requirement to secure loads to minimize and prevent any impacts to the local community. The Crossroads transporter management program is enforced on a daily basis with consequences such as a two-week ban from the facility for non-compliance. Rigid enforcement of transporter requirements further ensures that the roads and intersections in the vicinity of the Crossroads facility will safely and conveniently handle the traffic attributable to the Phase 14 project.

6. ENVIRONMENTAL SETTING

In accordance with Chapter 400.4.E of the Maine SWMR, WMDSM contracted with Normandeau Associates of Bedford, New Hampshire to review the current environmental setting at the Crossroads Landfill and natural resources that could be affected by the Phase 14 project. Normandeau conducted comprehensive on-site surveys on WMDSM property within 500-feet of the proposed Phase 14 project inclusive of wetlands, vernal pools and streams in 2017, 2018 and 2019. Normandeau also conducted a review of the mapped deer wintering area in the vicinity of Phase 14 in 2018. As part of these studies, Normandeau reviewed the current and proposed buffer strips at the site, as well as protected natural resources.

A summary of the natural resources that were evaluated and the potential effect of those resources associated with the Phase 14 project is provided below. Additional details are included in Volume II (Natural Resources Protection Act (NRPA) Permit Application).

Overview of Project Setting and Natural Resources

The Phase 14 project area is adjacent to the existing solid waste landfill units, which encompass approximately 721 acres. Infrastructure associated with the existing facility includes a system of facility access roads; several stormwater erosion control structures; active secure landfill (Phase 8); multiple inactive secure landfills (Phases 1-6, Phase 7, and Phase 9); multiple closed secure landfills (Phase 10, Phase 11, Phase 12 and Asbestos Landfill); an inactive commercial transfer station; an active residential transfer station; an active material recovery facility; an active Tire Processing Facility; an active wood waste recycling operation; active container storage areas; an active Leachate Storage Tank Facility; an active Scale House and an operational Landfill Gas to Energy (LFGTE) facility. Other uses in the surrounding area include an airport located to the west of the landfill and residential development along airport road to the east of the Phase 14 project area. Forested land, much of which is and has been actively managed for timber and forest products and agricultural lands are also common south and west of the existing facility. Areas east of the facility are more heavily developed and are associated with the central areas of the Town of Norridgewock. The Phase 14 project area consists primarily of previously disturbed land that has been used in the past for soil borrow and subsequently graded and restored as meadow, along with existing infrastructure such as roads and stormwater sediment control basins, and storage areas. Less disturbed forested and old field/early successional forested areas, including forested wetlands, are also common within the Phase 14 project area.

Several vegetation cover types typical for Maine are present within and immediately surrounding the Phase 14 project area. The upland areas are primarily cleared and maintained as meadows or are disturbed lands or early successional forest areas that have been previously cleared and are gradually reverting back to forested cover. Other upland areas include forested uplands that are generally a mix of Oak-Northern Hardwood and Hemlock Forests and intergrades between the two forest types. Portions of the forest including the northwest portion of the Phase 14 project area have been logged. Utilization of the site by wildlife species is typical for a forested area with mixed commercial and residential lands in Central Maine.

Wetlands are present within the Phase 14 project area. The majority of the wetlands are forested, however some emergent and wetlands with a scrub-shrub component are also present. The forested wetlands are generally Hardwood Seepage Forests, Spruce-Fir Flats and combinations of the two. The emergent wetlands are located within the previously disturbed areas that are seasonally mowed to deter the intrusion of woody species. Wetland boundaries were delineated according to the 1987 U.S. Army Corps of Engineers (USACE) Wetland Delineation Manual and Regional Supplement to the USACE Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0), which utilize the three- parameter approach (i.e., evaluating the site for the presence of hydric soils, hydrophytic vegetation and wetland hydrology) for identifying wetlands and determining their jurisdictional limits. The wetland mapping was used in conjunction with other solid waste landfill siting criteria and wetland impacts were avoided and minimized to the maximum extent practicable. There will be approximately ten acres of wetland impact that will be mitigated through the in-lieu fee program and/or preservation.

The on-site surveys conducted during the appropriate seasonal window also identified nine vernal pools, although none were significant. Three pools will be impacted by the project and six will be avoided entirely.

Streams and drainages were mapped during the wetland delineations. All streams mapped in the Phase 14 project area are classified by MEDEP as Class B streams in accordance with 38 M.R.S.A. § 467.4(I). A total of seven field delineated intermittent Class B streams are located within the vicinity of Phase 14. No Class AA or SA streams, great ponds, or other waterbodies greater than 10 acres in size occur within 1000 feet of the proposed waste boundary limit. The Phase 14 waste boundary was developed to maintain at least a 100-foot setback from the identified Class B streams to meet the Restrictive Siting Criteria under the Maine SWMR Chapter 401.1.C(3)(v).

One intermittent stream will be crossed to accommodate the proposed Phase 14 access road and a new culvert that will meet the applicable MEDEP and USACE design criteria and standards will be installed to convey the stream under the road; a nearby existing crossing of the same stream will be decommissioned and the area restored. This stream crossing is more than 100 feet from the proposed limit of waste.

Significant Wildlife Habitat

There is no significant wildlife habitat within or proximate to the Phase 14 project area. Although there is a mapped Deer Wintering Area (DWA), it is classified as a candidate area and has not been ground surveyed by Maine Department of Inland Fisheries and Wildlife (MDIFW) to determine its rating. The mapped extent of the DWA is 483.5 acres, and it overlaps with portions of the Crossroads Landfill and also extends beyond the property boundaries to the north and the south. Normandeau conducted a qualitative assessment of the deer wintering habitat in the vicinity of the proposed Phase 14 project in March 2018, using the criteria and methods described in the 1993 MDIFW DWA survey guidelines. No qualifying current deer sign of any sort was observed during the survey. According to the 1993 MDIFW guidelines, these results indicate the portion of the

DWA surveyed would receive a quality rating of "low." The complete methods and results of the assessment are available in Volume II, Attachment 9, Appendix E.

Potential or Known Endangered, Threatened or Special Concern Species

The Maine Natural Areas Program (MNAP) determined that according to the information currently in the MNAP Biological and Conservation Data System files, there are no rare state or federally listed botanical features documented specifically within the project area. No unique or unusual natural communities were observed during comprehensive wetland, stream and vernal pool delineations. Review of the U.S. Fish and Wildlife Service's (USFWS) Information for Planning and Consultation (IPAC) system did not identify any plant species.

Based on known distribution and habitat preferences of Maine's special status invertebrate species, none of these species are expected to be present within the project site. Likewise, based on known distribution and habitat preferences of Maine's special status reptile and amphibian species, none of these species are expected to be present within the project site.

All of Maine's eight bat species are listed, and based on known distribution and the habitat available, all have some potential to be present on-site during the summer. The forest cover provides ample summer roosting habitat for the foliage-roosting species (eastern red, hoary, and silver-haired bat, all listed as Special Concern (SC) as well as a small amount of summer roosting habitat for the northern long-eared bat (State-Endangered, Federally-Threatened), which roosts under loose bark and tree trunk crevices and hollows. Forest edges and nearby semi-open wetlands also provide foraging habitat for these four species as well as little brown (State-Endangered) eastern small-footed (State-Threatened), tri-colored (SC), and big brown bats (SC). However, there are no known maternity roosts or hibernacula on or in the vicinity of the Crossroads property. No other listed mammals are expected to be present.

A larger area (572.1 acres) of mapped upland sandpiper (UPSA) habitat lies to south of the proposed project area and overlaps minimally with a southeastern portion of the project footprint. However, UPSA require large areas of unbroken, open field habitat and generally do not occur in fields less than 50 hectares (ha) in size. The habitat portion of the project area that overlaps with the mapped UPSA habitat is a mix of forested and open patches that are too small to provide suitable habitat.

Wildlife Impacts

Impacts to wildlife due to construction of the proposed Phase 14 will primarily be limited to the immediate loss of habitat within the footprint of the landfill. Given the phased approach to the proposed construction of Phase 14; the extent and intensity of disturbance to the project area will be spread out over several years. Restricting the clearing of trees between October 15 and April 15 will limit direct impact to any species of birds and/or bats that have the potential to be present in the area of the Phase 14 project. The ability of animals to move from one area to another is a vital feature of the landscape. Initially, the landfill will create both a physical barrier during construction and operation, and a biological barrier by the removal of natural soils and vegetation.

Given the long history of landfill-related activities at the facility and the on-going landfill operations, the common wildlife that utilize the area are already somewhat acclimated to this type of disturbance. As landfill operations at Phase 8 are completed and the final landfill cell is closed and capped with permanent herbaceous and low shrub vegetation; wildlife will likely utilize this area where access is permitted. Deer, for example, are frequently observed on the existing closed landfill caps feeding on the herbaceous growth, especially in the early spring when forest resources are less accessible. Many bird, small mammal and reptile species that prefer open field habitats (garter snakes, meadow voles, killdeer, savannah sparrows, meadowlarks and American kestrels) also have been observed on the capped landfills, and could be expected to move in quickly to the proposed landfills at their time of closure. No unreasonable, adverse impacts to wildlife are anticipated from the Phase 14 project.

Buffer Strips

The Phase 14 project allows for the retention of naturally vegetated buffer strips around the proposed facility of varying types, widths, and topography, all dependent on the existing cover type and habitat currently present around the perimeter of the proposed facility. In some areas the retained buffer strip is mature mixed softwood and hardwood forest, in others it is early successional forest or meadow/old field.

The Phase 14 project is not proposing to establish any new buffer strips outside of the limit of disturbance; rather the existing natural areas will be retained adjacent to the facility limits. The existing natural areas will not require any maintenance. The Phase 14 landfill facility has been designed to collect and treat all stormwater associated with the facility in engineered and properly sized and configured stormwater control structures. Clearing and grading have been minimized around the facility perimeter to reduce the overall footprint of the project, especially when adjacent to wetland areas.

MDIFW recommends that vegetated buffer strips of at least 100-feet in width be maintained around intermittent and perennial streams. The Phase 14 project remains more than 100 feet from all streams and drainages on the site, with the exception of one unavoidable intermittent stream crossing. This crossing will comply with MEDEP and USACE requirements for aquatic organism passage and hydraulic passage as recommended by the MDIFW (see Volume II, NRPA Attachment 5, Sheet 36 of 37). An existing stream crossing that is not suitable for the proposed project will be removed and the banks restored and stabilized.

There are no Inland Waterfowl and Wading Bird Habitat areas, Seabird Nesting Islands, Shorebird areas, Significant Vernal Pools, or Tidal Waterfowl and Wading Bird Habitat areas on or adjacent to the Phase 14 project and therefore additional buffer strips are not required to protect these areas as they are not present. The establishment of a new buffer strip adjacent to the proposed facility in the mapped candidate Deer Wintering Area would result in additional clearing of trees and shrubs, further reducing the quality of the area which has already been partially logged and developed. Near wetland areas, the addition of buffer strips would result in an increase in the area of wetland impacts (direct if filled and secondary if cleared of forested vegetation and maintained in that

altered state) and therefore these have not been proposed. Adherence to the other Restrictive Siting Criteria and setbacks will also result in sufficient and effective buffers from sensitive resources.

7. EXISTING USES AND SCENIC CHARACTER

As indicated in Chapter 400.4.F of the Maine SWMR, it must be demonstrated that Phase 14 will not have an "unreasonable adverse effect on existing uses and scenic character". The specific criteria for this requirement are identified below, with a discussion of how each is addressed.

Chapter 400.4.F(1)(a). The facility may not present a bird hazard to aircraft.

Phase 14 is not anticipated to present a bird hazard to aircraft for the reasons described below.

- WMDSM has followed a stringent bird control program at the Crossroads Landfill since acquiring the site in 1990. The bird control program is implemented in accordance with the Federal Migratory Bird Depredation Permit (Permit #: MB724868-0), issued by the U.S. Fish and Wildlife Services and the State of Maine Department of Inland Fisheries and Wildlife (MEDIFW) Permit (Permit #: REGION D -- 2019-1) issued by the MEDIFW. A copy of the current State and Federal bird permits are provided in APPENDIX 7A. In addition, the renewal application cover letter of the federal license is provided in APPENDIX 7A. Please refer to Response 5 in the federal license renewal application cover letter for a description of non-lethal bird control measures (deterrents) that have been employed successfully by Crossroads Landfill. WMDSM's priority is to manage bird species by non-lethal bird control measures and as a last measure to rely on the depredation permits mentioned above in order to minimize birds to ensure airport safety, as necessary.

- The closest point of Phase 14 from the nearest runway of the Central Maine Regional Airport is approximately 1.09 miles (5,800 feet), which is almost a mile (4,700 ft) further away from the nearest runway of the airport than the permitted Phase 8 waste disposal unit at Crossroads. The existing bird-deterrent programs have been effective and no bird hazards to aircraft have been reported to WMDSM during the current and previous Phase 8 landfill operations.

In addition, the Chapter 401.1.D(4) of the Maine SWMR states, *"Applicants must notify the affected airport and the Federal Aviation Administration (FAA) whenever a new landfill or expansion of an existing landfill is proposed within a five-mile radius of any airport runway."* Pursuant to the state requirement, WMDSM submitted the Notice of Proposed Construction or Alteration to the FAA on 4 October 2019 (APPENDIX 7A) and notified the Central Maine Regional Airport of the intent to file a solid waste permit application for Phase 14 on 7 September 2019 and re-notified on 16 October 2019.

Chapter 400.4.F(1)(b). The facility may not have an unreasonable adverse effect on the preservation of historical sites.

As documented in the letter presented in APPENDIX 7B, the Maine Historic Preservation Commission concluded *"…there will be no historic properties (archaeological or architectural) affected by the proposed undertaking, as defined by Section 106 of the National Historic Preservation Act."* In addition, Normandeau's correspondence with the Tribal Historic

Preservation Officers indicate no native American tribes' lands are in close proximity to the Phase 14 area based on available information. A memorandum of their correspondence is also included in APPENDIX 7B.

Chapter 400.4.F(1)(c). The facility may not unreasonably interfere with views from established public viewing areas.

Geosyntec performed a visual impact assessment for the Phase 14 landfill project. The report, included in APPENDIX 7C, presents visual assessments from both regional and local vantage points around the perimeter of the Crossroads facility. The assessment utilized AutoDesk® InfraWorks®, a 3-deminstional modeling program, to perform the simulations studied in the assessment. The study also analyzed the findings made by Mitchell & Associates in its visual impact assessments previously conducted and utilized by WMDSM for approval of its Phases 9, 11, and 12 solid waste applications (Mitchell Assessment), included in APPENDIX 7D. The Mitchell Assessment is informative and applicable to the Phase 14 project as it thoroughly assesses the regional landscape surrounding the Crossroads facility, including landform, vegetation and land use, which has not appreciably changed since publication. In summary, the Phase 14 visual impact assessment concludes that based on design and operational policies, the regional landscape, large setback distances with prevalent vegetative screening, the project will not have an adverse effect on the current scenic character of the Norridgewock area.

Local Landscape and Vegetation:

The landscape surrounding Crossroads, as described in the Mitchell Assessment, varies in elevation, generally 200 to 300 ft msl, creating a rolling topography of hills and valleys with both open and forested land. The forested land or vegetation surrounding Crossroads is a mix of trees, including deciduous and evergreens of varying maturity and color. The Mitchell Assessment concluded that the rolling topography and vegetative mix promotes the landscape's natural ability to screen, buffer, and integrate diverse aspects into the scenery.

Given that the landscape surrounding the Crossroads facility has not appreciably changed since publication of the Mitchell Assessment, it is anticipated that the landscape and vegetation will play a similar buffering role during construction and operation, and after closure of Phase 14. It should also be noted that vegetation surrounding Phase 14 is expected to continue growing and therefore providing additional visual screening over the years during which Phase 14 is operational. Finally, as with prior Crossroads phases, WMDSM plans to evaluate the effectiveness of existing vegetative screens on an ongoing bases, supplementing as appropriate.

Design and Operation:

In addition to the area's natural ability to buffer and integrate, the design and operation of Phase 14 will further mitigate visual impacts associated with the project. First, the siting and large setback distances planned for the project will generally obstruct views of the facility from most regional and local vantage points from construction through closure. Only during the final years of operation, and only from limited vantage points, will Phase 14 be visible to the surrounding

area. WMDSM's use of daily cover materials and incremental construction of the final vegetated cover system will further minimize any visual impacts within the final stages of filling. Upon closure and thereafter, the landfill will be completely vegetated in accordance with MEDEP's regulations and resemble a grassy hill or open field.

The Mitchell Assessment demonstrated that Phases 9, 11, and 12 would have little to no impact on the scenic character surrounding the Crossroads facility. The recent Geosyntec report reaches the same conclusion for Phase 14. Like past phases, the surrounding landscape and vegetation, in combination with the landfill's design and operation, will ensure that Phase 14 will not unreasonably interfere with views from established public viewing areas.

Chapter 400.4.F(1)(d). The facility may not generate excessive noise at the property boundary or at any protected location.

The Phase 14 project is a continuation of ongoing Phase 8 operations at the facility. The sources, scope and extent of sound generating activities (e.g., use of dozers, compactors, trucks, excavators, etc.) are expected to be similar to what has occurred for Phase 8, and therefore the modeling and monitoring done for Phase 8 is applicable to the Phase 14 project.

WMDSM's operation at Phase 8 has complied with the applicable sound limits. The distances between the Phase 14 activities and the nearest regulated receptor is significantly further than the closest receptor to the Phase 8 activities where sound monitoring was conducted in 2016 during Phase 8 operations. In addition, Phase 14 activities will benefit from the existence of mature vegetation that will further reduce sound impacts. As a result, sound associated with the Phase 14 project is expected to be below applicable limits, as discussed below.

The solid waste regulations require that sound from routine operation of Phase 14 not exceed 75 dBA at the facility property boundary and 70 dBA for daytime hours and 60 dBA for nighttime hours at protected locations in areas where the zoning or existing use is predominantly commercial and industrial, and 60 dBA for daytime hours and 50 dBA for nighttime hours at protected locations where the zoning or existing use is not predominantly commercial or industrial. The daytime limit applies during the hours of 7:00 a.m. to 7:00 p.m., and the nighttime limit applies during the period of 7:00 p.m. to 7:00 a.m. Phase 14 operations will occur predominantly during periods when the daytime sound limits apply. Limited activities will occur prior to 7:00 a.m. as employees and contractors arrive on site, with the majority of sound-generating activities occurring after 7:00 a.m. and ending by 7:00 p.m.; therefore, the daytime thresholds are used in this Phase 14 evaluation.

As shown on the Phase 14 site plan, provided as Figure S7-1 in APPENDIX 7E, the nearest property boundary is approximately 310 feet from the Phase 14 solid waste boundary. Also situated on this particular property is a residential dwelling adjacent to Airport Road. Although the dwelling is over 1100 ft away from Phase 14, the shortest distance from Phase 14 to the boundary of a property on which there is a residential dwelling (in this case approximately 310 feet) is considered to be the nearest protected location. The land use along Airport Road is not

predominantly commercial or industrial and, as a result, the more conservative sound limits of 60 dBA during the day have been evaluated at the distance of 310 ft.

The Previous Sound Level Study

During the solid waste permitting for Phase 8, Resource Systems Engineering (RSE) of Brunswick Maine analyzed the anticipated sound levels at the property boundary and the closest protected locations for Phase 8. A copy of the sound level report is provided in APPENDIX 7F. RSE developed a sound model and concluded that the proposed Phase 8 activities would not generate excessive sound levels and would comply with applicable solid waste sound limits at the facility boundary and all protected locations (see the sound level estimates in Table 2 of the RSE report). Specifically, the estimated hourly sound levels were 68 dBA at the nearest property boundary (identified as receiver position 17), which was approximately 105 feet from the sound generating activities (see Figure S7-2 in Appendix 7E).

Monitoring Results During Phase 8 Operation

WMDSM conducted sound monitoring during operation of Phase 8 to confirm that actual sound levels met applicable limits at the closest property boundary. Those results indicate that actual sound levels were less than the predicted noise level of 68 dBA in the RSE report, and complied with applicable limits. Specifically, sound monitoring conducted in 2016 at Receiver Point 17 (see Figures S7-2 and S7-3 in Appendix 7E) over a period of 120 hours indicated that all but two of the hourly sound levels were below 60 dBA. It is noted that the two hourly sound levels above 60 dBA (the highest of which was only 68 dBA) were mainly due to the 1-minute sound level spike for each case. By excluding those 1-minute spikes, the adjusted hourly sound levels are estimated to be 51 dBA and 56 dBA on 3 June 2016 and 21 June 2016, respectively.

Expected Phase 14 Sound Levels at Regulated Receptors

The distance to the property boundary / protected location closest to the Phase 14 solid waste boundary (310 ft as shown on Figure S7-1 of APPENDIX 7E) is almost three times further than the distance between Phase 8 and the nearest property boundary (105 feet) where the 2001 sound level study and 2016 sound monitoring was performed. Sound attenuation by distance is commonly estimated using the Inverse Square Law[2]; in general, doubling the distance between a sound source and receptor reduces sound levels by 6 dBA. Based on the Inverse Square Law, the expected Phase 14 sound levels at the nearest property boundary / protected location is estimated to be at or below 59 dBA (i.e., 9 dBA reduction from 68 dBA of the predicted sound level at the nearest regulated location, and even less when reduced from the measured sound levels).

Furthermore, in contrast to the area where sound levels were measured as part of the Phase 8 activities, substantial vegetation is prevalent around the Phase 14 perimeter. According to the

[2] Lp(R2) = Lp(R1) – 20Log(R2/R1) where Lp(R1) = Sound Pressure Level at Initial (monitoring) location; Lp(R2) = Sound Pressure Level at the new location; R1 = Distance from the noise source to initial location; and R2 = Distance from noise source to the new location.

Audible Landscape: A Manual for Highway Noise and Land Use, issued by the Federal Highway Administration of US Department of Transportation (1974), a sound level reduction of 3 to 5 dBA per 100 feet can be expected when vegetation is high, dense, and thick enough to be visually opaque; therefore, approximately 9 to 15 dBA of noise reduction can be expected from the approximately 300 feet thick vegetation strip between the Phase 14 solid waste boundary and the closest property boundary / protected location.

In summary, because the sound-generating equipment for Phase 14 will be similar to those for Phase 8, the sound levels from routine operation of Phase 14 at the closest property boundary will be significantly less than the 75 dBA limit that applies at the property boundary, and below the 60 dBA daytime limit that applies at the closest protected location. Thus, the significant distance between sound-generating activities and the presence of vegetation in the setback zones that further reduces sound impacts, ensure that sound levels associated with the Phase 14 project will comply with applicable limits.

8. AIR QUALITY

As indicated in Chapter 400.4.G. of the Maine SWMR, it must be demonstrated that the proposed Phase 14 will not "unreasonably adversely affect air quality". The specific criteria for this requirement are identified below, with a discussion of how each is addressed in this section.

Chapter 400.4.G(1)(a). The applicant must obtain an air emission license if required by 38 M.R.S.A. §§ 581 et seq. The air emissions produced from either point or non-point sources must be in conformance with the current State Implementation Plan, as approved by the Environmental Protection Agency.

Currently, WMDSM has a landfill gas (LFG) management system in place for Phases 8, 9, 10, 11 and 12 of the facility. The primary purpose of the LFG management systems is to collect and combust LFG generated within these areas of the landfill to control odors and reduce the potential for LFG migration. In addition, these systems direct LFG to an on-site landfill gas-to-energy facility (LFGTE facility) for renewable energy purposes. WMDSM will install and operate a LFG management system for the Phase 14 project consistent with the existing system. A conceptual landfill gas well layout and details are provided in APPENDIX IV(g) of Volume IV of this permit application. WMDSM will submit a detailed design report for a landfill gas collection system prior to construction and filling the first cell of Phase 14.

The Crossroads Landfill currently operates in accordance with Part 70 Air Emission License Renewal with Amendment (A-816-70-C-R/A), issued on July 18, 2014, and most recently amended on April 1, 2019. WMDSM will apply for a New Source Review license amendment and modification to the Part 70 Air Emission license for the Phase 14 landfill, prior to commencement of construction and filling of the first cell. In addition, in June 2019, the landfill became subject to Subpart XXX of the New Source Performance Standards NSPS. Further details about the air permitting for the site are provided in Section 6 of SCS' Phase 14 LFG Collection and Control System Design Report located in APPENDIX IV(g) of Volume IV of this permit application. Other emissions at the site will not be affected by the proposed Phase 14 landfill.

Chapter 400.4.G(1)(b). The applicant must control fugitive dust and nuisance odor.

Fugitive Dust

Fugitive dust that is currently generated at the Crossroads Landfill is managed in accordance with WMDSM's Fugitive Particulate Matter Control Plan (FPMCP), presented in APPENDIX 8A. As described in the plan, WMDSM implements several methods in controlling fugitive dust, both from the site roads and from the trucks that haul soil and waste at the site. The site FPMC Plan has been successfully implemented to minimize dust associated with construction and operation of Phase 8 and closure of Phases 10, 11, and 12. Particularly, WMDSM uses a water truck to wet unpaved access roads and an industrial sweeper to clean paved roads, as necessary. In addition, WMDSM requires that, as much as practical, their customers use a pressure washer (i.e., truck wash) before exiting the active landfill. The truck wash cleans soil and potential waste debris from

the wheels and undercarriage of the truck preventing tracking onto the landfill roads and/or public roads.

Nuisance Odor

The Gas Migration and Monitoring Plan discussed in Section 7 of APPENDIX IV(g) of Volume IV and Section VI – Landfill Gas of Volume V of this permit application presents the monitoring and control of nuisance odor. In addition, WMDSM's transporter management program requires waste haulers ensure that all loads are secured to prevent litter and odor.

Chapter 400.4.G(1)(c). Open burning of solid waste other than clean or painted wood waste, is prohibited. Wood that has been treated and other wastes, such as tires or waste oil, shall not be open burned.

No open burning of any waste will be performed associated with the site operations.

9. SURFACE WATER QUALITY

As indicated in Chapter 400.4.H. of the Maine SWMR, the facility must include evidence that affirmatively demonstrates that there will be no unreasonable adverse effect on surface water quality at the site. The specific criteria for this requirement are identified below, with a discussion of how each is addressed. As described below, the proposed Phase 14 project will not have an unreasonable adverse effect on surface water quality.

Chapter 400.4.H(2)(a). The applicant will comply with all applicable stormwater management standards of 06-096 CMR 500, if the proposed facility is in the direct watershed of "waterbodies most at risk from new development".

The Phase 14 landfill is not located in the direct watershed of waterbodies most at risk from new development. Nonetheless, as demonstrated in the Stormwater Management Design analyses provided in Volume IV of this Application (i.e., Landfill Engineering Report), surface water runoff from the site will be managed in accordance with Chapter 500 of the Maine Stormwater Management Rules. In addition, Section 7.2 of Volume III of this Application (i.e., Geologic and Hydrogeologic Assessment Report) presents the proposed Phase 14 surface water quality monitoring program.

Chapter 400.4.H(2)(b). A waste water discharge license has been obtained or will be obtained, if required by 38 M.R.S.A. § 413.

As discussed in Volume IV of this application, there will be no discharge of waste water from the Phase 14 development. Volume IV also describes how leachate will be collected and managed in accordance with the Leachate Management Plan (See Volume V, Site Operations Manual) for the site, and how surface water will be managed in accordance with Chapter 500 of the Maine SWMR. The facility currently operates and maintains three permitted septic systems for restroom facilities that are located at the Main Office, Scale House, and Maintenance Facility. Additional septic systems and/or restroom facilities are not proposed for Phase 14. Therefore, additional discharge licenses are not required for the Phase 14 project.

10. NATURAL RESOURCES

As required by Chapter 400.4.I of the Maine SWMR, the facility must include evidence that it will not have an unreasonably adverse effect on other natural resources in the municipality or in neighboring municipalities. Specifically, the facility must conform to the standards of the Natural Resources Protection Act (38 M.R.S.A., §§480-A to 480-Z). In addition, if required, the proposed facility must be permitted by the federal government if the site activities require a federal wetlands permit.

In order to address these requirements, WMDSM has contracted with Normandeau Associates of Bedford, New Hampshire to prepare and submit a NRPA Application. The NRPA Application for the Phase 14 landfill is provided as Volume II of this Application and a stand-alone copy of the NRPA Application will be filed directly with the MEDEP concurrently with the submittal of the Phase 14 Solid Waste Permit Application. As reflected in the NRPA Application and summarized in Section 6 of this volume (i.e., Volume I) to the Application, the project will not have an unreasonable adverse effect on natural resources.

WMDSM will also be filing an USACE Individual Permit application for proposed impacts to jurisdictional Waters of the United States (WOTUS) and other applicable resource habitat areas pursuant to Section 404 of the Clean Water Act, 33 U.S.C. § 1344. The USACE Individual Permit application is currently scheduled to be submitted in November or December of 2019.

11. EROSION AND SEDIMENT CONTROL PLAN

Pursuant to Chapter 400.4.J and Chapter 401.2.F(11) of the Maine SWMR, an erosion and sediment control plan is required to be submitted in the Application. In accordance with these requirements, the site-wide erosion and sediment control measures that are implemented by WMDSM are described in Section IX of WMDSM's Site Operations Manual, which is provided in Volume V of this permit application. Additionally, a temporary erosion control specification is provided in Volume VI of this permit application describing the required erosion and sediment controls for landfill construction at Crossroads. Because Phase 14 will be implemented over a several year period, involving construction of five discrete cells, the attached erosion control specification will be revised and/or refined as necessary to accommodate construction activities associated with each landfill phase.

12. LOCATION AND RISK TO SIGNIFICANT GROUNDWATER AQUIFER

Subsurface conditions of the Phase 14 area were intensely investigated over a three-year period and supplement extensive data developed since the early to mid-1980s on geologic and hydrogeologic conditions at the Crossroads Facility. The Phase 14 investigations included:

- advancing over 50 soil borings
- installation of 64 overburden wells and piezometers
- installation of 4 bedrock wells
- installation of 7 stream gauges/piezometers
- laboratory testing of 25 soil samples
- slug testing (i.e., hydraulic testing) of 40 monitoring wells/piezometers
- 25 rounds of water level measurements

Detailed information collected during these investigations was used to evaluate the geologic and hydrogeologic conditions in the Phase 14 area. Results of this work demonstrate that the natural geologic and hydrogeologic conditions beneath and adjacent to Phase 14 are well-suited for landfill development.

Presumpscot clay is present across the entire Phase 14 footprint and all investigation locations. This clay is very fine-grained and has a very low permeability, providing a natural barrier to underlying water bearing units. The prevailing groundwater flow direction is generally to the south and towards previously permitted landfill units. The groundwater beneath Phase 14 flows away from public water supply protection areas and the significant sand and gravel aquifers mapped by Maine Geological Survey.

The extensive groundwater and surface water monitoring program currently in place at the Crossroads Landfill facility will be supplemented with a network of new groundwater monitoring wells and new surface water monitoring locations for Phase 14. Routine monitoring of water quality in accordance with MEDEP requirements will ensure that any changes in water quality are identified and addressed in a timely manner.

As described in further detail below, and pursuant to Chapter 400.4.K of the Maine SWMR, the location of Phase 14 and the combination of engineered systems, the natural geologic and hydrogeologic conditions, and routine water quality monitoring will ensure that Phase 14 will not pose an unreasonable risk of a discharge to a significant groundwater aquifer.

The following identifies the specific requirements of Chapter 400.4.K of the Maine SWMR and how Phase 14 meets each of these requirements.

Chapter 400.4.K(1)(a). The solid waste disposal facility may not overlie any significant sand and gravel aquifers.

As indicated in Figure S1-1 of APPENDIX 1B, the site does not overlie a mapped significant sand and gravel aquifer. In addition, the site meets the minimum setback of 300 feet from a mapped sand and gravel aquifer, required by Chapter 401.1.C(2)(b) of the Maine SWMR.

Chapter 400.4.K(1)(b). The solid waste disposal facility may not pose an unreasonable threat to the quality of a significant sand and gravel aquifer.

A "Significant sand and gravel aquifer" is defined by Maine SWMR Chapter 400.1.Ddd as "a porous formation of ice-contact and glacial outwash sand and gravel that contains significant recoverable quantities of water likely to provide drinking water supplies." Significant sand and gravel aquifers identified by the Maine Geological Survey in the Norridgewock quadrangle (Open-File No. 00-26-200) are presented on Figures 1 and 14c of Volume III. The identified significant sand and gravel aquifers are located north and east of the Crossroads Landfill and Phase 14. There is no hydraulic connection between groundwater in the Phase 14 area and the significant sand and gravel aquifers because groundwater flow in all hydrostratigraphic units in the Phase 14 area is primarily to the south-southwest, away from the aquifers.

The Crossroads Landfill facility and Phase 14 are located in an area where the Maine Geological Survey identified surficial deposits with "less favorable aquifer characteristics", which are described by the Maine Geological Survey as "areas with moderate to low or no potential ground-water yield (includes areas underlain by till, marine deposits, eolian deposits, alluvium, swamps, thin glacial sand and gravel deposits, or bedrock)" (Maine Geological Survey, Open-File No. 00-26-2000). As described in Volume III Sections 4 and 5 of this solid waste permit application, surficial soils within the proposed Phase 14 area include eolian silty fine sand and glaciomarine clay underlain by glacial till. These findings are consistent with the Maine Geological Survey's mapping of deposits "with less favorable aquifer characteristics" in the Phase 14 area. These deposits do not meet the definition of a significant sand and gravel aquifer.

In summary, Phase 14 does not pose an unreasonable threat to the quality of a significant sand and gravel aquifer because:

- there is no hydraulic connection between groundwater in the Phase 14 area and the Maine Geological Survey mapped significant sand and gravel aquifers
- the surficial deposits in the Phase 14 area have "less favorable aquifer characteristics" and do not represent a significant sand and gravel aquifer.

Chapter 400.4.K(1)(c). The solid waste disposal facility may not pose an unreasonable threat to the quality of an underlying fractured bedrock aquifer.

A "fractured bedrock aquifer" is defined by Maine SWMR Chapter 400.1.EEE as "a fractured consolidated rock formation that is saturated and recharged by precipitation percolating through overlying sediments to a degree that will permit wells drilled into the rock to produce a sufficient water supply for domestic use." The risk posed to bedrock underlying Phase 14 is minimal due to:

- the thoroughly engineered multi-layered liner system that will be installed
- the natural geologic conditions beneath Phase 14
- and the proposed groundwater monitoring program

As described in Volume IV of the permit application, Phase 14 will be constructed with a multi-layered liner system consisting of the following units, from top to bottom:

- a sand and geocomposite drainage layer
- a high density polyethylene (HDPE) geomembrane
- a geosynthetic clay liner (GCL)
- compacted clay

The sand and geocomposite drainage layer is engineered to efficiently collect any leachate generated in the landfill. The leachate will be collected and removed from the landfill for treatment at the Sappi North America and/or Anson-Madison Sanitary District wastewater treatment facilities.

The HDPE, GCL and compacted clay layer are designed to ensure that leachate within the landfill is not released to the subsurface. These engineered features ensure that a release from the landfill is highly unlikely.

The Phase 14 liner system will be constructed on top of a thick layer of natural in-situ clay. As described in Volume III, Sections 4 and 5 of this solid waste permit application, the Phase 14 area is underlain by a glaciomarine clay referred to as the Presumpscot clay. The Presumpscot clay is very fine-grained and has a very low permeability. Given these characteristics, the clay is an aquitard, meaning it is almost impermeable and greatly impedes flow to the underlying till and bedrock. In the highly unlikely event that a release was to occur from the landfill, the bedrock would be protected by this naturally occurring Presumpscot clay aquitard beneath the engineered liner system.

Lastly, like all the landfills at the Crossroads facility, groundwater quality at Phase 14 will be routinely monitored in accordance with MEDEP requirements at a network of new groundwater monitoring wells located downgradient of Phase 14. Through this monitoring any changes to groundwater quality will be identified and corrective measures implemented as necessary.

The engineered liner systems, the natural geologic conditions, and the planned groundwater monitoring network proposed for Phase 14 are very similar to those at the other Crossroads facility landfills, which have proven highly effective at mitigating any potential threats to the fractured bedrock aquifer. As such, these measures ensure that the Phase 14 solid waste disposal facility will not pose an unreasonable threat to an underlying fractured bedrock aquifer.

13. EFFECT ON EXISTING AND PROPOSED UTILITIES

As required by Chapter 400.4.L of the Maine SWMR, the proposed facility must demonstrate that it will not pose an unreasonable adverse effect on existing and proposed utilities in the municipality or area served by those utilities. The specific criteria for this requirement are identified below, with a discussion of how each is addressed in this Section.

Chapter 400.4.L(1)(a). There must be adequate water supplies for the solid waste facility.

The facility is currently served by two water wells that are located on the property boundary. One well is located near the existing scale house and provides water to the scale house and the main office. The second well is located near the maintenance facility. The wells provide potable water, which is sampled in accordance with the Maine regulations. The water use requirements for the facility are not expected to vary from current levels. Because the site does not currently, nor does WMDSM intend to connect to a municipal water supply, Phase 14 will not pose an unreasonable adverse effect on existing and proposed water supply in the municipality or area served by the municipal water supply.

Chapter 400.4.L(1)(b). Appropriate sanitary waste water disposal must exist for the solid waste facility.

Waste (septic and gray) water from main office, maintenance facility and scale house are discharged to permitted septic systems which are located within the property boundary. Because the site does not currently or intend to connect to a municipal sewer system, Phase 14 will not pose an unreasonable adverse effect on existing and proposed sewer system in the municipality or area served by the municipal sewer system.

Leachate that is collected from the various landfill units at the site is currently collected and stored in the leachate storage tanks that are located near the scale house. The leachate is then trucked off site to permitted wastewater treatment facilities. WMDSM has leachate disposal contracts with SAPPI in Hinkley, Maine for up to 376,000 gallons per day, and with the Anson-Madison Sanitary District in Madison, Maine for up to 32,000 gallons per day. A copy of these contracts is provided in APPENDIX 13A. As presented in Volume IV of this Application, the maximum sustained quantity of leachate from the facility once Phase 14 is operational is considerably less than the existing agreements for the disposal of up to 408,000 gallons per day, thereby confirming that the facility has appropriate waste water disposal capabilities.

14. STORMWATER MANAGEMENT PLAN

As required by Chapter 400.4.M of the Maine SWMR, the facility may not unreasonably cause or increase flooding on-site or on adjacent properties nor create an unreasonable flood hazard to a structure. The specific criteria for this requirement are identified below, with a discussion of how each is addressed in this Section.

Chapter 400.4.M(1)(a). The solid waste facility may not be located in a 100 year flood plain or restrict the flow of a 100 year flood.

A copy of the most recent Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for the area surrounding WMDSM's property is provided in Figure S1-1 of APPENDIX 1B. As indicated in the attached map, the Phase 14 area is not located within the 100-year flood plain (i.e., 1% annual chance flood hazard) nor will it restrict the flow of a 100-year flood.

Chapter 400.4.M(1)(b). The solid waste facility must include a stormwater management system that controls run-on and run-off, and infiltrates, detains, or retains water falling on the facility site during a storm of an intensity up to and including a 25-year, 24-hour storm, such that the rate of flow of stormwater from the facility after construction does not exceed the rate of outflow of stormwater from the facility site prior to the construction of the facility.

Detailed calculations and discussions of the site stormwater management system, including the Erosion Control Structure (ECS) Stormwater Basins is presented in Volume IV of this Application. As shown, the Phase 14 stormwater management system has been designed to manage the stormwater run-on and run-off from a storm with the intensity up to and including a 25-year, 24-hour storm. The ditches, swales, culverts, and stormwater management ECS basins are designed to limit the flow of stormwater from the facility after construction such that it does not exceed the rate of current off-site stormwater flow from the Crossroads facility.

15. CONSISTENCY WITH SOLID WASTE MANAGEMENT HIERARCHY

As demonstrated in its Phase 14 Public Benefit Determination Application,[3] WMDSM will develop and operate the expanded facility in a manner that is consistent with and supportive of the State's Solid Waste Management Hierarchy (the Hierarchy). A copy of the narrative text of the Public Benefit Determination Application is provided in APPENDIX 15A. The Crossroads facility currently operates numerous programs that promote the State's Hierarchy. The Phase 14 project will provide an important opportunity for existing programs to grow and for additional programs to launch, all furthering the State's Hierarchy into the future. Central to WMDSM's promotion of the State's Hierarchy is its Single-Sort Recycling Program. The Crossroads facility provides recycling services to nearly 30 communities, business and institutions, as indicated in Table S15-1 below.[4]

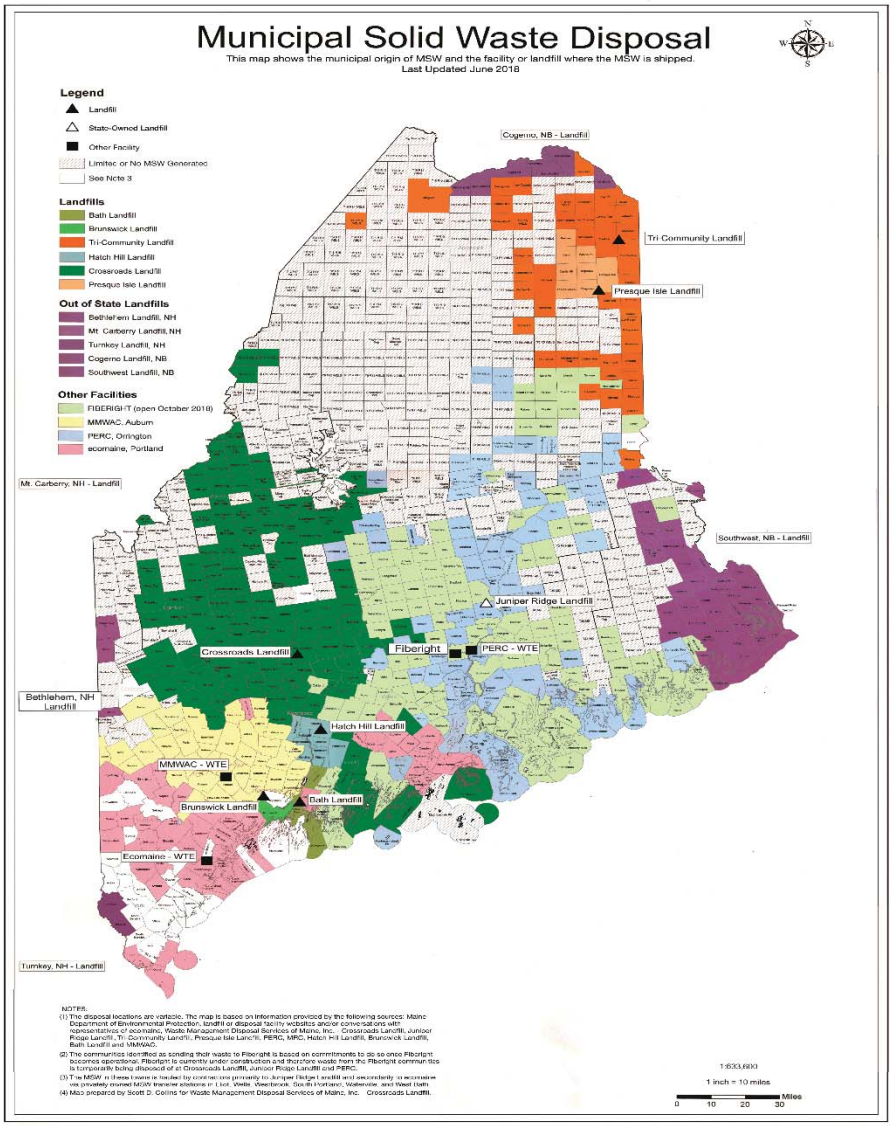
TABLE S15-1: COMMUNITIES, INSTITUTIONS AND COMMERCIAL ENTITIES SERVED BY WMDSM RECYCLING SERVICES

Communities	Businesses and Institutions
Anson	Colby College
Carrabassett Valley	Sappi
Embden	Sugarloaf Mountain Corp.
Eustis	Unity College
Fairfield	
Jackman	
Kingfield	
Madison	
Mercer	
Mohegan	
Mount Vernon	
New Sharon	
New Vineyard	
Norridgewock	
Phillips	
Rangeley	
Rangeley Plantation	
Rome	
Smithfield	
Somerset County Commissioners	
Vienna	
Waterville	
Winslow	

[3] On December 21, 2018, the Maine Department of Environmental Protection issued a determination concluding that WMDSM's Phase 14 project and its associated programs promote the State's Solid Waste Management Hierarchy.
[4] Bolding indicates the communities in close proximity to the Crossroads facility that utilize the transfer station on Airport Road in Norridgewock.

To date, WMDSM's Single-Sort Recycling Program has been highly successful. Following introduction of the program in 2010, WMDSM saw an increase in the volume of recyclable materials collected. From 2015 to 2017, WMDSM's Single-Sort Program, including cardboard, diverted 17,516.07 tons of recycled material from disposal. This figure is even more impressive when considering that the materials are collected from a region that is distant from processing and recycling facilities. Without WMDSM's recycling services, these materials would be geographically stranded; transportation to other facilities would be cost-prohibitive. The green shading below in Figure S15-1 depicts the region served by the Crossroads facility.

FIGURE S15-1: MAINE MUNICIPAL SOLID WASTE DISPOSAL MAP MAY 2018



In addition to its Single-Sort Recycling Program, WMDSM undertakes specific measures at the Crossroads facility to divert materials from entering the landfill that can be recycled. WMDSM staff carefully monitor wastes entering the landfill for high-volumes of recyclable materials.[5] WMDSM also plans to significantly enhance its Airport Road Transfer Station to better divert a range of materials including, recyclables, organics, textiles, household hazardous materials, electronic wastes, and clean wood wastes.

WMDSM also currently administers a number of additional programs at Crossroads to reduce or recycle waste. Such programs include a waste evaluation and consulting program to reduce waste generation at its source, a battery and e-waste diversion program, a partnership with BDS Waste Disposal to beneficially reuse tires and blasting mats, a corrugated cardboard recycling program, and a landfill gas renewable energy plant.

As part of Phase 14, WMDSM proposes to expand education and outreach to customers to improve recycling and waste reduction efforts. Phase 14 will also include the implementation of a textile diversion and reuse program and a hazardous waste collection and reuse program. WMDSM will also work with its customers to address the ongoing recycling crisis and explore options for continuing and expanding existing recycling

To promote the State's Food Recovery Hierarchy and to further its solid waste reduction goals, WMDSM launched an Organics Diversion Program with the development of Phase 14. The goal of the Organics Diversion Program is to assist large-volume businesses and institutions in diverting organic materials from traditional MSW streams. To further this program, in the fall of 2018, WMDSM partnered with the Town of Farmington to develop and operate a composting facility saving the Town thousands of dollars annually through avoided disposal costs while also generating revenue for the Town through compost sales.[6] WMDSM's Organics Diversion Program will also include the development of a composting operation at the Crossroads site for nearby communities and commercial entities. As with all existing and proposed WMDSM programs, the volume of materials contributed to the programs will be collected and quantified. This data will assist WMDSM in evaluating the effectiveness of its programs and overall diversion rates.

Finally, the vast majority of wastes accepted at the Crossroads Landfill cannot be incinerated and have been processed, recycled or reduced to the maximum extent practicable. Such wastes include

[5] In 2017, Crossroads staff became aware of large volumes of glass sent to the landfill by one of the State's largest glass distributors. WMDSM staff worked with the customer to develop a process at its facility for diverting the glass from its waste and located a recycler that could accept the composition of glass which had previously been difficult to recycle. WMDSM estimates that over 18 months, nearly 6,000 tons of glass were diverted from the landfill and recycled.

[6] Maine Department of Environmental Protection, Food Scrap Composting Pilot Program Report, 10 (January 2019), https://www.maine.gov/dep/publications/reports/index.html

special waste, construction and demolition debris and materials or waste used as alternative daily cover. The Crossroads facility provides a critical outlet for these wastes, which would otherwise have to be transported at significant economic and environmental cost to more distant locations.

As the Department concluded in its December 21, 2018 determination, WMDSM's Phase 14 project promotes the State's Solid Waste Management Hierarchy and ensures that wastes proposed to be handled at Crossroads Landfill will be reduced, reused, recycled, composted and/or processed to the maximum extent practical.

16. PUBLIC BENEFIT DETERMINATION

The Department's determination that the Phase 14 project provides a substantial public benefit was issued on December 21, 2018. A copy of the Department's determination is provided in APPENDIX 16A.

17. RECYCLING

As demonstrated below, the proposed Phase 14 project is consistent with state recycling and source reduction programs and complies with the recycling provisions of the State Materials Management Plan.

a. Consistency with State Recycling Programs and Source Reduction Programs

As demonstrated more completely in its Phase 14 Public Benefit Determination Application, Phase 14 is fully consistent with and supportive of the State's recycling and source reduction programs. WMDSM is committed to the implementation and expansion of these programs and has the resources, expertise and commitment to ensure that they continue and expand into the future.

WMDSM's parent company, Waste Management, is North America's largest residential recycler. On an annual basis, it manages nearly 15,000,000 tons of recyclable material and operates 120 recycling facilities throughout the nation.

At the Crossroads facility, WMDSM is actively committed to assisting the State of Maine further its recycling programs. WMDSM continues to be committed to the implementation and expansion of recycling programs for communities, institutions and commercial entities within the Crossroads disposal network that maximize the amount of material recycled and reused, while minimizing contamination and disposal. Table S15-1 above provides a list of the locations where WMDSM currently provides recycling services.

In 2010, WMDSM instituted a Single-Sort Recycling Program that has increased overall recycling with its disposal territory. WMDSM collects recyclables and manages and consolidates the materials into bulk containers at the Crossroads facility for shipment south to recycling brokers or purchasers. WMDSM's ability to manage recyclables at a regional level and transport these materials to facilities such as ecomaine, is critical to the ability of these communities to recycle waste that would otherwise have to be landfilled.

WMDSM also implements a number of additional programs to recycle or reduce materials. These programs include a waste evaluation and consulting program to reduce waste generation at its source, a battery and e-waste diversion program, a partnership with BDS Waste Disposal to beneficially reuse tires, removing 33,611 tons of whole tires in 2017 alone, a corrugated cardboard recycling program, and a landfill gas renewable energy plant at Crossroads that generates approximately 21,685,000 kilowatt hours of electricity per year. As part of the Phase 14 project, WMDSM proposes to significantly upgrade its existing transfer station, expand education and outreach to customers to improve recycling and waste reduction efforts, as well as implement a new textile diversion and reuse program, an organics diversion and reuse program, and a hazardous waste collection and reuse program. WMDSM will also work with its customers and all stakeholders to address the ongoing recycling crisis and explore options for continuing and expanding existing recycling efforts.

Phase 14 presents an important opportunity for the Crossroads facility to further the State's recycling and source reductions programs for years to come.

b. Phase 14 Complies with the Recycling Provisions of the Maine Materials Management Plan

In January of 2019, the MEDEP published its most current version of the Maine Materials Management Plan (the Plan).[7] The Plan provides information, guidance and direction for implementing integrated approaches to solid waste management within the State. The centerpiece of the current Plan are the State's Solid Waste and Food Recovery Hierarchies. The Hierarchies rank management strategies in order of priority. An additional component of the Plan are strategies identified by the State to reduce, reuse and recycle.

As demonstrated in Sections 1.0, 2.0 and 3.0 of WMDSM's Phase 14 Pubic Benefit Determination Application, the proposed facility is consistent with the recycling provisions of the State's Plan. The Crossroads facility subjects the vast majority of wastes to reduction, processing or recycling or disposes of wastes that have no higher management options. CDD is processed for reuse and recycling, multiple initiatives are exercised minimizing MSW volume through materials diversion, and Phase 14 ensures that a critical component of the State's infrastructure for wastes with no alternative disposal option remains viable into the future. Thus, the Phase 14 project directly assists the State with affirmatively promoting the recycling-related elements found within both the State's Waste and Food Recovery Hierarchies.

Crossroads Landfill also specifically furthers the initiatives identified within the Plan for reducing, reusing and recycling of wastes. For example, the Phase 14 Diversion Programs for organics, textiles, batteries, hazardous and electronic wastes outlined in Section 3.2.1 of the Phase 14 Public Benefit Determination Application support the priorities identified in Section IV.A. of the Plan. The Phase 14 Beneficial Reuse and recycling programs outlined in Section 3.2.2 along with the composting program outlined in Section 3.2.3 specifically advance priorities identified in Sections IV.B and C. of the Plan. Finally, Phase 14 also supports some areas of need identified in Section IV.D.

The initiatives presented in this section demonstrate that the Crossroads facility is currently consistent with the State's recycling and source reduction programs and that it also complies with the recycling provisions of the State Plan and the Plan as a whole.

[7] The Plan's full title is, "Maine Materials Management Plan: State Solid Waste Management and Recycling Plan 2019 Update." Maine Department of Environmental Protection, "Maine Materials Management Plan: State Solid Waste Management and Recycling Plan 2019 Update, (January 2019). https://www.maine.gov/dep/publications/reports/index.html

18. HOST COMMUNITY AGREEMENT

As required by Chapter 400.7.A(1) of the Maine SWMR, an applicant for an expanded commercial solid waste disposal facility license shall demonstrate one of the following:

"(a) The applicant is complying with municipal ordinances requiring host community benefits;

(b) The applicant has negotiated in good faith, including mediation and binding arbitration if appropriate, with the municipality(ies) in which the facility is proposed to be located to formulate a host community agreement;

(c) The applicant has developed and will implement a host community agreement; or

(d) The applicant has renegotiated, if appropriate, the terms of an existing host community agreement."

WMDSM developed a host community agreement with the Town of Norridgewock in March 1993, which was revised in June 1997. In 2002, WMDSM entered into a new host community agreement in connection with the Phase 8 project and has been operating pursuant to that agreement since that time. As part of the Phase 14 project, WMDSM and the Town have revised the host benefit agreement with a resulting increase in the host fees to be paid to the Town. The first increase takes effect January 1, 2020, and additional increases take effect as certain milestone associated with Phase 14 project are reached. The revised host benefit agreement is attached as APPENDIX 18A.

19. MUNICIPAL INTERVENOR GRANTS

As required by Chapter 400.7.B of the Maine SWMR, prior to filing an application for an expanded waste disposal facility, an applicant much provide the following:

> *"(a) Preliminary notice. At least sixty days prior to submitting an application with the Department for a solid waste disposal facility license, the applicant shall notify by certified mail the Department and the municipal officers of the municipality in which the facility site is to be located or, in the unorganized territories, the county commissioners with jurisdiction over the proposed facility site; and*
>
> *(b) This preliminary notice must include a description of the right of the municipal officers to apply for municipal intervenor status, their right to receive grants not exceeding $50,000 to support certain activities to intervene before the Department, and the requirement that they must request intervenor status within 60 days of this notification or be deemed to have waived the right to receive municipal intervenor grants."*

Pursuant to these requirements, WMDSM notified the Town of Norridgewock, Maine of its status as a potential municipal intervenor for the Phase 14 development. A copy of the 2 July 2019 letter from WMDSM to the Town of Norridgewock, Maine is provided as APPENDIX 19A. The Town has since notified the MEDEP of its intent to be an intervenor in this proceeding and WMDSM has submitted the required $50,000 additional fee to the MEDEP for disbursement to the Town for documented expenses associated with participation in this licensing proceeding.

20. HAZARDOUS AND SPECIAL WASTE HANDLING PLAN

WMDSM prohibits the disposal of hazardous or toxic materials within the landfill units at Crossroads. Pursuant to Chapter 400.9.A of the Maine SWMR, only non-hazardous materials permitted by MEDEP are accepted for disposal. To ensure that prohibited materials are kept out of the secure landfill units, WMDSM enforces a Hazardous and Special Waste Handling and Exclusion Plan (Exclusion Plan).

The Exclusion Plan is fully compliant with all applicable state and federal laws and includes provisions for detection, identification, handling, storage, transportation and disposal of unpermitted wastes received at the facility. The Exclusion Plan operates in tandem with WMDSM's facility-wide Characterization and Acceptance Program which is a part of the Crossroads Site Operations Manual found in Volume V of this Phase 14 Solid Waste Permit Application. Together, these two programs ensure only non-hazardous materials enter the secure landfill units. The Crossroads Exclusion Plan is included in APPENDIX 20A.

Prior to accessing any secure landfill unit at Crossroads, all waste hauling and collection vehicles must receive approval for disposal. While disposal approval varies by waste type, each process continually ensures that only permitted materials are accepted for disposal. In addition, for all waste types, scale operators have the ability to communicate directly with landfill operators to provide real-time waste confirmation during the unloading process.

Nearly all MSW and CDD haulers and generators are bound by preexisting service agreements that prohibit disposal of hazardous materials. Haulers and generators without preexisting service agreements must characterize the contents of loads for scale operators prior to disposal. All special waste customers must also characterize their waste materials. Special wastes are characterized though a web-based program supported by Waste Management's Technical Services Center. Special waste customers are required to answer targeted questions about their waste stream in order to generate a characterization report. The results of the characterization report determine the proper disposal location for the waste material as typically dictated by the Technical Services Center. Only waste materials permitted for disposal at Crossroads will be directed to the facility. Approved special wastes are assigned a unique profile number that must be included on shipping documents and presented to the Crossroads scale operator at the time of arrival. Waste haulers lacking proper profile numbers are turned away from the facility.

All waste streams entering the secure landfill are carefully scrutinized during unloading. Operators are specially trained to identify unacceptable materials and practice a high-level of awareness and observation during landfilling activities. Loads are spread into thin layers providing operators with the best possible opportunity to identify non-permitted materials. Operators have the authority to stop operations at any point to ensure acceptable materials are received at all secure landfill units at Crossroads. In addition, random inspections are conducted on the landfill working face on a routine basis to provide more focused observations.

The Crossroads Exclusion Plan also includes general administration requirements such as selecting facility leadership, developing and implementing regular training courses, prescribing routine

recordkeeping objectives, and developing emergency and hazardous materials response protocols. The precautions taken during waste prescreening and during active landfill monitoring by trained Crossroads personnel ensure that only non-hazardous materials are accepted at the facility. WMDSM's Phase 14 project will continue to abide by the Exclusion Plan and all steps possible will be taken to ensure that prohibited materials are kept out of the secure landfill units at Crossroads.

21. LIABILITY INSURANCE

As required by Chapter 400.10 of the Maine SWMR, all applicants for an expanded solid waste disposal facility license shall submit with the application, and annually thereafter, proof of liability insurance for sudden and accidental occurrences for the solid waste disposal facility. Coverage must also be provided for bodily injury and property damage and must be provided for the active life and closure of the solid waste disposal facility. In accordance with this requirement, a copy of WMDSM's most recent liability policy is provided as APPENDIX 21A. WMDSM has and will continue to submit to MEDEP an updated copy of the insurance policy annually throughout the life and closure of the Crossroads facility.

22. FINANCIAL ASSURANCE

As required by Chapter 400.11 of the Maine SWMR, the owner or operator of a solid waste disposal facility shall provide financial assurance that is sufficient to ensure that funds are available to pay for the anticipated costs of compliance with all facility closure, post-closure, post-closure maintenance, and post-closure monitoring requirements. As reflected in the documentation in APPENDIX 3B of Volume I of this Application, WMDSM has the financial ability to cover the total cost of the Phase 14 project, including closure and post-closure costs. Consistent with the requirements for financial assurance for closure and post-closure care costs, prior to construction of each Phase 14 landfill cell WMDSM will update the existing performance bond that is in place to reflect the closure and post-closure costs associated with each new cell.

23. CRIMINAL OR CIVIL RECORD

As required by Chapter 400.12.A of the Maine SWMR, all applicants shall submit with the permit application a full disclosure statement to MEDEP. The disclosure statement shall include information on the applicant as well as the applicants' officers, directors, and partners, and related entities and persons with operational responsibility. The required civil and criminal disclosure statement is included in APPENDIX 23A of this volume.

The owner and operator of the Crossroads Landfill, WMDSM, does not operate a landfill in any other state. Neither WMDSM nor any of the persons or entities subject to the disclosure requirements has a criminal conviction or within the last five years has adjudicated any civil violations or entered into any administrative agreements for violations of environmental laws.

24. VARIANCES

WMDSM is seeking no variances for the Phase 14 solid waste permit application.

25. PUBLIC NOTICES

On September 7, 2019, WMDSM published a Notice of Intent to File a solid waste permit application and a Natural Resources Protection Act (NRPA) permit application in the Morning Sentinel. In connection with the applications, the notice also included information regarding WMDSM's upcoming Public Informational Meeting. A copy of the notice was sent to Crossroads abutters and Town officials by certified mail. A copy of the published notification can be found in APPENDIX 25A (September 7, 2019 Notice). APPENDIX 2C also contains a list of abutters and a tax map showing the Crossroads Facility and abutting properties (September 7, 2019 Notice Documents).

On September 19, 2019, WMDSM held a Public Informational Meeting from 6 P.M. to 8 P.M. at the Mill Stream Elementary School in Norridgewock, Maine. At the meeting, WMDSM and its technical consultants provided information to the public about the Phase 14 project. Information was separated into four content-related areas focusing on landfill design, hydrogeology, natural resources and facility operations, including Phase 14 initiatives. Copies of the 17 informational posters presented at the meeting are available in APPENDIX 25A (Informational Posters). In addition to the informational posters, the public was provided a summary of the project, a list of necessary state, local and federal licenses, and a fact sheet obtained from MEDEP explaining public participation in the licensing processes. A copy of each document is also available in APPENDIX 25A (Additional Documents).

In total, 14 members of the public attended the informational meeting, excluding individuals associated with the project. A copy of the sign-in sheet is available in APPENDIX 25A (Sign-in Sheet). Throughout the meeting, the public was provided an opportunity to ask questions directly of WMDSM personnel and members of its technical team. Questions raised were general in nature concerning groundwater, liner design, water quality, leachate control and treatment, composting, wetland mitigation and odor control. Members of WMDSM's technical team provided responses to each question and referenced the informational materials prepared for the meeting for background. Additional photographs from the meeting are available in APPENDIX 25A (Meeting Photos).

On October 16, 2019, WMDSM published an updated Notice of Intent to File for the solid waste and NRPA applications in the Morning Sentinel (October 16, 2019 Notice). A copy of the notice was sent to Crossroads abutters and Town officials by certified mail and can be found in APPENDIX 25A (October 16, 2019 Notice Documents).

26. PROHIBITIVE AND RESTRICTIVE SITING CRITERIA

Pursuant to the Maine SWMR Chapter 401.1.C(2) and 1.C(3), compliance with the prohibitive and restrictive siting criteria are addressed in this section.

Prohibitive Siting Criteria

The regulatory requirements for the prohibitive siting criteria for the project are set forth in Chapter 401.1.C.(2)(a through d), of the Maine SWMR. The specific criteria and how the Phase 14 satisfies each is summarized below.

- *SWMR 401.1.C(2)(a). The waste handling area must not be located within 1000 feet of Class AA or Class SA waters*.

  Class AA waterways are fresh surface waters and Class SA waters are estuarine and marine waters. Based on the definition of Class AA and Class SA waterways, per M.R.S.A. Sections 465 and 465-B and on the surface water feature survey performed in November 2017, there are no Class AA or Class SA waterways within 1000 ft of the Phase 14 footprint. The closest Class AA surface waters are in excess of 23 miles away in Kingfield, Maine. Surface waters delineated within the Phase 14 Project Area have been classified as Class B (see Volume II of this permit application).

- *SWMR 401.1.C(2)(b). The area within the solid waste boundary must not lie over or be within 300 feet of a significant sand and gravel aquifer.*

  Significant sand and gravel aquifers identified by the Maine Geological Survey in the Norridgewock quadrangle (Open-File No. 00-26-2000) are presented in Figure 1 and 14c of Volume III of this permit application. As shown, the Phase 14 footprint is further than 300 ft from the closest mapped sand and gravel aquifer.

  In addition, the Crossroads Landfill facility and Phase 14 are located in an area where the Maine Geological Survey identified surficial deposits with "less favorable aquifer characteristics", which are described by the Maine Geological Survey as "areas with moderate to low or no potential ground-water yield (includes areas underlain by till, marine deposits, eolian deposits, alluvium, swamps, thin glacial sand and gravel deposits, or bedrock)" (Maine Geological Survey, Open-File No. 00-26-2000). As described in Volume III Sections 4 and 5 of this solid waste permit application, surficial soils within the proposed Phase 14 area include eolian silty fine sand and glaciomarine clay underlain by glacial till. These findings are consistent with the Maine Geological Survey's mapping of deposits "with less favorable aquifer characteristics" in the Phase 14 area. These deposits do not meet the definition of a significant sand and gravel aquifer.

- *SWMR 401.1.C(2)(c). The area within the solid waste boundary must not be located within 200 feet of a fault that has had displacement in Holocene.*

Mapped fault lines and earthquake epicenters in Maine are shown on Figure S26-1 in APPENDIX 26A. As shown, the site is not within 200 ft of a mapped fault.

- *SWMR 401.1.C(2)(d). The facility site must not be located in, on, or over a coastal sand dune system, coastal wetland, or fragile mountain area, as these terms are defined in 38 M.R.S.A. § 480-B.*

  Based on the location of the site relative to the coast, and any fragile mountain areas in Maine, no coastal sand dune systems, coastal wetlands, and fragile mountain areas are located within 500 ft of the facility.

Restrictive Siting Criteria

The regulatory requirements for the restrictive siting criteria are presented in Maine SWMR Chapter 401.1.C.(3)(a through g). The specific restrictive criteria, and how Phase 14 complies with each is summarized below.

- *SWMR 401.1.C(3)(a)(i-vii).* The following setbacks must be maintained:
  - (i) *A minimum 300 foot set-back between the solid waste boundary and all public roads.*

    As shown on Figure S26-2 in APPENDIX 26A, the solid waste boundary is greater than 300 ft from public roads. The closest road to the Phase 14 boundary is Airport Road, which is no less than 880 ft from the Phase 14 solid waste boundary.
  - (ii) *A minimum 300 foot set-back between the solid waste boundary and the property boundary.*

    As shown on Figure S26-2 in APPENDIX 26A, the solid waste boundary is at least 300 ft from WMDSM's property boundary.
  - (iii) *A minimum 1000 foot set-back between the solid waste boundary and the nearest residence not owned by the applicant at the time the application is filed with the Department.*

    As indicated in Figure S26-2 in APPENDIX 26A, there are no residences that are not owned by the applicant within 1000 ft of the solid waste boundary. The nearest residence not owned by WMDSM is on the parcel identified as Tax Map 14, Lot 45, which is slightly more than 1,100 ft from the Phase 14 solid waste boundary.
  - (iv) *A minimum 100 foot setback between the solid waste boundary and stratified sand and gravel deposits that are capable of providing sufficient water for domestic use or are a contaminant migration pathway to a significant ground water aquifer, a significant sand and gravel aquifer, a fractured bedrock aquifer, or a surface water body.*

    "Sand and gravel deposits" are defined in Maine SWMR Chapter 400.1.Vv as "a surficial stratigraphic unit, consisting primarily of well-sorted particles of sand size

or larger". As described in Sections 4 and 5 of Volume III of this permit application, surficial soils within the proposed Phase 14 area include silty fine sand underlain by glaciomarine clay. In some areas the silty fine sand is overlain by a thin layer of organic material and silty clay and/or by fill material stockpiled during development of previous landfill units or infrastructure construction at the Crossroads facility.

The silty fine sand is absent in some areas of Phase 14. Where present in the Phase 14 area, the silty fine sand typically ranges in thickness from approximately 1 to 6 ft. Thicker deposits of silty fine sand were encountered in some areas. The saturated thickness of the silty fine sand is limited and was observed to be "dry" in many of the piezometers screened in the silty fine sand during one or more water level monitoring events. Given the fine-grained nature of the silty fine sand, the limited saturated thickness, and its discontinuity, the silty fine sand does not meet the definition of a "stratified sand and gravel deposit capable of providing sufficient water for domestic use".

The silty fine sand is directly underlain by the Presumpscot clay of very low vertical hydraulic conductivity, which serves as an aquitard, impedes meteoric recharge and creates artesian heads in the underlying glacial till. The Phase 14 design includes removal of most material overlying the Presumpscot clay, including the downgradient areas and beneath the leachate collection sumps. Therefore, the surficial silty fine sand does not represent "a contaminant migration pathway to a significant ground water aquifer, a significant sand and gravel aquifer, a fractured bedrock aquifer, or a surface water body".

(v) *A minimum 100 foot setback between the waste handling area and classified surface water.*

Pursuant to M.R.S.A. Sections 464 to 470 and as shown on Figure S26-2 in APPENDIX 26A, the Phase 14 waste handling area does not lie within 100 ft of a classified surface water body. The nearest classified surface water body is an intermittent stream, which is located approximately 150 ft northeast of the limit of the waste handling area.

- (vi) *A minimum 1000 foot setback between the solid waste boundary and any water supply spring at the time the Preliminary Information Report is filed with the Department.*

  There are no water supply springs within 1,000 ft of the solid waste boundary.

- (vi) *A minimum 1000 foot setback between the solid waste boundary and any water supply well not owned by the applicant at the time the Preliminary Information Report is filed with the Department.*

  As indicated in Figure S26-2 of APPENDIX 26A, there are no water supply wells within 1,000 ft of the solid waste boundary. The water supply well locations are

shown in Figure S26-2 of APPENDIX 26A, as provided by the Maine Geological Survey Water Well Database[8].

- *SWMR 401.1.C(3)(b). The area within the solid waste boundary must be located on soils that contain sufficient fines and clay-size particles to minimize infiltration of leachate. The in-situ soils must have an undisturbed hydraulic conductivity less than or equal $1x10^{-5}$ cm/s.*

  The Phase 14 subgrade design incorporates removal of undifferentiated soil/fill material and silty fine sand, such that the baseliner will be constructed directly atop the Presumpscot clay or compacted clay backfill. Laboratory testing of Presumpscot clay samples indicates the clays are composed of greater than 97% silt and clay particles. The geometric mean of the horizontal hydraulic conductivity for the Presumpscot clay in the Phase 14 area is 7.74E-07 cm/sec, based on slug testing results. The geometric mean of the vertical hydraulic conductivity for the Presumpscot clay in the Phase 14 area is 1.31E-07 cm/sec for the upper stiff clay facies and 1.79E-07 cm/sec for the soft lower facies based on laboratory testing. Both the horizontal and vertical hydraulic conductivity of the Presumpscot clays meet the requirement for soils within the solid waste boundary to be of less than or equal to 1.0E-05 cm/sec. Likewise, the specifications for any clay backfill (in areas where undifferentiated soil/fill material and silty fine sand is over-excavated will require a hydraulic conductivity ≤ 1.0E-05 cm/sec. Refer to Volume III for a detailed description of the hydraulic parameters of the Presumpscot clay and for Silt Clay Borrow in Section 02200 of the specifications in Volume VI.

- *SWMR 401.1.C(3)(c). The landfill and leachate storage ponds must be located so that site characterization monitoring, detection monitoring, and assessment monitoring can be conducted. (See 06-096 CMR ch. 405 for detailed monitoring requirements).*

  The Phase 14 development will include the groundwater and surface water monitoring network described in Volume III, *Geologic and Hydrogeologic Assessment*, of this permit application. As shown, the Phase 14 and the surrounding features will not impact the ability to monitor groundwater.

- *SWMR 401.1.C(3)(d). The waste handling area may not be located on a 100-year flood plain.*

  As indicated by the flood plain map provided in APPENDIX 14A, the solid waste boundary does not lie within the limits of the 100-year flood plain (i.e., 1% annual chance flood hazard).

- *SWMR 401.1.C(3)(e). A waste handling area may not overlie an unstable area.*

[8] The Maine Geological Survey "Maine Well Database – Well Depth" as downloaded on 22 July 2019.

TABLES

Table S1-1. Summary of SWMR Chapter 400 Requirements with References to Where Addressed (Volume # and Section #) in Permit Application Package

Phase 14 Permit Application
Crossroads Landfill, Norridgewock, Maine

SWMR Ch.400 Section	Regulatory Requirement	Location Where Addressed in Permit Package
3.	**Solid Waste Licensing Process**	
3.B.(1)(c)	Permit by Rule Notifications	Vol. I, Sect. 25
4.	**General Licensing Criteria**	
4.A.	Title, Right or Interest	Vol. I, Sect. 2
4.B.	Financial Ability	Vol. I, Sect. 3
4.C.	Technical Ability	Vol. I, Sect. 4
4.D.	Provisions for Traffic Movement	Vol. I, Sect. 5
4.E.	Fitting the Solid Waste Facility Harmoniously into the Natural Environment	Vol. I, Sect. 6
4.F.	No Unreasonable Adverse Effect on Existing Uses and Scenic Character	Vol. I, Sect. 7
4.G.	No Unreasonable Adverse Effect On Air Quality	Vol. I, Sect. 8
4.H.	No Unreasonable Adverse Effect on Surface Water Quality	Vol. I, Sect. 9
4.I.	No Unreasonable Adverse Effect On Other Natural Resources	Vol. I, Sect. 10 and Vol. II
4.J.	Soil Types That Are Suitable and Will Not Cause Unreasonable Erosion	Vol. I, Sect. 11 and Vol. VI
4.K.	No Unreasonable Risk That a Discharge to a Significant Ground Water Aquifer Will Occur	Vol. I, Sect. 12
4.L.	Adequate Provision for Utilities and No Unreasonable Adverse Effect on Existing or Proposed Utilities	Vol. I, Sect. 13
4.M.	Not Unreasonably Cause or Increase Flooding	Vol. I, Sect. 14 and Vol. VI
4.N.	Solid Waste Management Hierarchy	Vol. I, Sect. 15
5.	**Public Benefit Determination.**	Vol. I, Sect. 16
6.	**Recycling**	Vol. I, Sect. 17
7.	**Host Community Agreements and Municipal Intervenor Grants**	Vol. I, Sect. 18 and 19
8.	**Right of Entry**	
9.	**Hazardous And Special Waste Handling And Exclusion Plan**	Vol. I, Sect. 20
10.	**Liability Insurance**	Vol. I, Sect. 21
11.	**Financial Assurance for Solid Waste Disposal Facility Closure and Post-Closure Care and Corrective Action**	Vol. I, Sect. 22
12.	**Criminal or Civil Record**	Vol. I, Sect. 23
13.	**Variances**	Vol. I, Sect. 24

Table S1-2. Summary of SWMR Chapter 401 Requirements with References to Where Addressed (Volume # and Section #) in Permit Application Package

Phase 14 Permit Application
Crossroads Landfill, Norridgewock, Maine

SWMR Ch.401 Section	Regulatory Requirement	Location Where Addressed in Permit Package
1.	**General Licensing Requirements**	
1.C(2)	Prohibitive Siting Criteria	Vol. I Sect. 26
1.C(3)	Restrictive Siting Criteria	Vol. I Sect. 26
1.D(4)	Notify airport and the Federal Aviation Administration (FAA)	Vol. I Sect. 7
2.	**Application Requirements**	
2.A.	General Information	
2.A(1)	Site and Surroundings Map	Vol. I Sect. 1
2.A(2)	Aerial Photographs	Vol. I Sect. 1
2.B.	Site-Specific Investigation	
2.B(1)	Geological Investigations	Vol. III Sect. 2
2.B(2)	Ground and Surface Water Investigation	Vol. III Sect. 2
2.B(3)	Geotechnical Investigation	Vol. IV Sect. 2
2.C.	Site Assessment Report	
2.C(1)	Maps, Drawings, and Sections: (a) topographic base map; (b) surficial geologic map; (c) geologic cross-sections; (d) isopach map of surficial deposits; (e) bedrock contour map; (f) two phreatic surface contour maps (seasonal high and low water conditions); (g) vertical flow nets; (h) detailed drawings	Vol. III Figures
2.C(2)	Time of Travel Calculations	Vol. III Sect. 6
2.C(3)	Geotechnical Results	Vol. IV Sect. 3.2. App IV(b)
2.D.	Design Standards for Landfills	
2.D(1)	Liner System Requirements	Vol. IV Sect. 2.2
2.D(2)	Improvement Allowance System	Not Applicable
2.D(3)	Base Preparation below Liner Systems	Vol. IV Sect 2.1, 2.2
2.D(4)	Leachate Conveyance System and Storage Structure Standards	
2.D(4)(a)	Leachate Conveyance System	Vol. IV Sect. 2.3, 2.4, & 3.5
2.D(4)(b)	Leachate Storage Systems Standards	Vol. IV Sect. 3.5.5
2.D(5)	Seismic Impact	Vol. IV Sect. 3.2
2.D(6)	Phased Operations	Vol. IV Sect. 3.8 and 3.9, App IV(a)
2.E.	Alternative Design Process	Not Applicable
2.F.	Engineering Landfill	
2.F(1)	Stability Assessment	Vol. IV Sect.3.2
2.F(2)	Settlement Assessment	Vol. IV Sect.3.3
2.F(3)	Stability and Settlement Monitoring Plan	Vol. IV Sect. 3.4
2.F(4)	Water Balance Submission	Vol. IV Sect. 3.5
2.F(5)	Leachate Management Submission	Vol. IV Sect. 3.6
2.F(6)	Gas Management Submission	Vol. IV Sect. 3.7
2.F(7)	Cell Development Plan	Vol. IV Sect. 3.8
2.F(8)	Phased Final Cover System Proposal	Vol. IV Sect. 3.9
2.F(9)	Waste Storage, Staging, and Burn Areas Design Submission	Vol. IV Sect. 3.10
2.F(10)	Waste Characterization and Design Compatibility Submission	Vol. IV Sect. 3.11
2.F(11)	Surface Water Control Plans	Vol. IV Sect. 3.12 & Sect. 4
2.F(12)	Test Pads Submission	Vol. IV Sect. 3.13
2.F(13)	Special Construction Requirements	Vol. IV Sect. 3.14
2.G.	Contaminant Transport Analysis	Vol. III Sect. 6 and Vol. IV Sect. 5
2.H.	Plan View and Profile View Drawings	Vol. IV App. IV(a)
2.I.	Quality Assurance Plan	Vol. VI
2.J.	Construction Contract Bid Documents	Vol. VI
2.K.	Water Quality Report and Proposed Monitoring Program	Vol. III Sect. 7
2.L.	Operations Manual	Vol. V

APPENDIX 1A
MEDEP Application Form

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Solid Waste Program Attn: Geraldine Travers
17 State House Station
Augusta, Maine 04333-0017
Telephone: (207) 287-7688

FOR DEP USE ONLY			
ATS ID:	Seq:	DEP ID:	Received by DEP:
Bureau: S	Type of Application: WD	Activity: N	Fees Paid:
Project Analyst:			Check No.:

APPLICATION FOR A NEW LANDFILL OR LANDFILL EXPANSION

This form shall be used to request approval for the establishment of a new landfill or landfill expansion, pursuant to 38 MRSA, Section 1301 et seq., and Chapter 401, sections 1-6 of Maine's Solid Waste Management Regulations.

Company and Address Information

Company Name: Waste Management Disposal Services of Maine, Inc. **Telephone:** 207.634.2714

Applicant's Last Name: McGown First Name: Jeffrey

Contact Person: Sherwood Mckenney Telephone: 207.634.2714

Applicant Name: Waste Management Disposal Services of Maine, Inc. **Agent/Consultant Name:** Geosyntec Consultants

Telephone: 207.634.2714 Telephone: 978.263.9588

Mailing Address: P.O. Box 629 Mailing Address: 289 Great Road Suite 202

Street Address: 357 Mercer Road Street Address: 289 Great Road Suite 202

Town: Norridgewock State: ME Zip: 04957 Town: Acton State: MA Zip: 01720

Billing Information

Name: Waste Management Disposal Services of Maine, Inc.

Mailing Address: P.O. Box 629

Street Address: 357 Mercer Road

Town: Norridgewock State: ME Zip: 04957

Site/Activity Information

Project Description: Landfill - New

911 address: 48 Upper Main St. Norridgewock, ME GPS Location: 48 Upper Main St. Norridgewock, ME

Directions: From Norridgewock town center, Route 2 West for approximately 1.5 miles; site entrance on right.

PLEASE SEE PAGE 2 - SIGNATURE REQUIRED

SIGNATURE OF APPLICANT

By signing this application, the applicant certifies that he or she has: (1) published the public notice form once in a newspaper circulated in the area where the project is located, (2) sent a copy of the public notice form to the owners of property abutting the land upon which the project is located, (3) sent a copy of the public notice form to the chief municipal officer and chair of the municipal planning board of the municipality in which the project is located (4) filed a complete copy of this application in the municipal office of the municipality in which the project is located, (5) reviewed the instructions contained in this application form, and (6) reviewed the appropriate state laws that relate to the proposed project.

I certify under penalty of law that I have personally examined the information submitted in this document and all attachments thereto and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the information is true, accurate, and complete. I, the property owner or lessee, authorize the Department to enter the property that is the subject of this application, at reasonable hours, including buildings, structures or conveyances on the property, to determine the accuracy of any information provided herein. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

DATE: 10-24-2019

NAME: _____
(Applicant)

TITLE: District Manager
(If other than applicant, attach letter of agent authorization.)

PLEASE CALL GERALDINE TRAVERS AT 207-287-7865 TO DETERMINE FEE FOR A NEW SECURE LANDFILL OR LANDFILL EXPANSION APPLICATION.

REQUIRED INFORMATION FOR APPLICATION FOR A NEW LANDFILL OR LANDFILL EXPANSION

Landfill applications must include all information necessary to address the requirements of Chapter 400 and Chapter 401. The application must include all pertinent data and calculations.

1. **Description**. Provide a brief description of the proposed landfill, including the types of waste to be handled and the municipalities to be served. (provided in Sections 1 and 15 of Volume I)

2. **Schedule**.

   a. Proposed date of start of construction: May 2021

   b. Proposed date of start of operation: October 2022

   c. Anticipated lifetime of facility use: Approximately 17 years

3. **Topographic Map**. Submit the most recent full size U.S.G.S. topographic map (7.5 minute series if available) showing the location of the proposed facility site, the waste handling area, the solid waste boundary and the property boundary. The map must include all surrounding areas within one mile of the proposed waste handling area. (provided in Section 1 (Appendix 1B) of Volume I)

4. **Title, Right, or Interest.** State the number of acres included in the facility site (see Chapter 400 for the definition of "facility site") . Attach copies of deeds, leases, contracts or agreements that establish the applicant's title, right or interest for the proposed site. (provided in Sections 1 and 2 of Volume I)

5. **Abutters**. Attach a copy of the municipal tax map with the proposed site and names of abutting property owners clearly marked. Also, include a list of the names and addresses of all the owners of property abutting the proposed facility site. (provided in Section 2 of Volume I)

6. **Notice of intent to file.** Provide a copy of the completed "Notice of Intent to File" and evidence of compliance with the public notice requirements delineated in items 8, 9 and 10 of the instructions. (provided in Section 25 of Volume I)

7. **Financial ability**. Submit evidence that affirmatively demonstrates the financial ability of the applicant to develop the project in a manner consistent with the State environmental standards and laws. Refer to Chapter 400, section 4.B for standards and submission requirements. (provided in Section 3 of Volume I)

8. **Technical ability**. Include evidence that affirmatively demonstrates that the applicant has the technical ability to design, construct, operate, maintain and close the facility. If the proposed project will be managed by other than the applicant, state the persons or businesses that will be responsible for management and operation of the facility. This information should include the applicant's or operator's prior experience and/or appropriate training related to the nature of the proposed facility, and a description of the personnel who will be employed to design, construct, operate, maintain and close the facility. (provided in Section 4 of Volume I)

9. **Disclosure statement**. Include the criminal or civil record of the owner, operator, or anyone having a legal interest in the applicant or the facility, as described in Chapter 400, Section 12(A) of the Maine Solid Waste Management Regulations. (provided in Section 23 of Volume I)

10. **Other authorizations**. Identify all environmental or land use licenses, permits, or authorizations which are or may be required by any governmental agency. Indicate those now held with an asterisk(*); indicate when the remaining licenses and permits will be obtained.

Building permit: NA	Waste discharge license: NA	NRPA license: Approx. Oct. 2020
Plumbing permit: NA	Highway entrance license: NA	
Air emissions license: Approx. April 2022	Other (describe): USACOE Approx. October 2020	

11. **Site and Surroundings Map.** Submit a site and surroundings map, or series of maps, that meets the requirements of Chapter 401, section 2.A(1). (provided in Section 1 (Appendix 1B) of Volume I)

12. **Prohibitive and Restrictive Siting Criteria.** Submit information sufficient to demonstrate that the siting of the landfill facility meets the prohibitive and restrictive siting criteria in Chapter 401, section 1.C(2) and 1.C(3). (provided in Section 26 of Volume I)

13. **Aerial Photographs.** Submit aerial photographs in conformance with the requirements in Chapter 401, section 2.A(2). (provided in Section 1 (Appendix 1B) of Volume I)

14. **Site Assessment Report.** Submit a site assessment report in conformance with the requirements of Chapter 401, section 2.C. (provided in Volume III)

15. **Engineering Design and Report.** Submit an engineering design and report sufficient to meet the standards and requirements of Chapter 401, sections 2.D and 2.F, and section 2.E if applicable. (provided in Volume IV)

16. **Contaminant Transport Analysis.** Submit a contaminant transport analysis conducted and reported in conformance with the requirements of Chapter 401, section 2.G. (provided in Section 6 of Volume III)

17. **Plan View and Profile Drawings.** Include plan view and profile drawings prepared to meet the requirements of Chapter 401, section 2.H. (provided in Volume IV Appendix IV(a))

18. **Quality Assurance Plan.** Submit a quality assurance plan that meets the requirements of Chapter 401, section 2.I. (provided in Volume VI)

19. **Construction Contract Bid Documents.** Submit construction contract bid documents n accordance with the requirements of Chapter 401, section 2.J. (provided in Volume VI)

20. **Water Quality Report and Proposed Monitoring Plan.** Submit a site characterization water quality report and a proposed water quality monitoring program prepared in accordance with the requirements of Chapter 401, section 2.K and Chapter 405. (provided in Section 7 of Volume III)

21. **Traffic Movement**. Submit information in compliance with the submission requirements of Chapter 400, section 4.D(2) to demonstrate that the facility will meet the standards of Chapter 400, Section 4.D(1). (provided in Section 5 of Volume I)

22. **Fitting Harmoniously into the Natural Environment.** Submit evidence to affirmatively demonstrate that the proposed facility will meet the standards in Chapter 400, section 4.E(1) and that the facility will fit harmoniously into the natural environment. This must include the information required in Chapter 400, section 4.E(2). (provided in Section 6 of Volume I)

23. **Existing Uses and Scenic Character.** Describe the existing use of the site. Also, provide information sufficient to meet the submission requirements of Chapter 400, section 4.F(2) and to demonstrate that the standards of Chapter 400, section 4.F(1) will be met by the proposed facility. (provided in Section 7 of Volume I)

24. **Air Quality.** Provide information sufficient to meet the submission requirements of Chapter 400, section 4.G(2), and to demonstrate that the standards of Chapter 400, section 4.G(1) will be met by the proposed facility. (provided in Section 8 of Volume I)

25. **Surface Water Quality.** Provide information sufficient to meet the submission requirements of Chapter 400, section 4.H(2), and to demonstrate that the standards of Chapter 400, section 4.H(1) will be met by the proposed facility. (provided in Section 9 of Volume I)

26. Other Natural Resources. Provide information sufficient to meet the submission requirements of Chapter 400, section 4.I and to demonstrate that the standards of Chapter 400, section 4.I(1) will be met by the proposed facility. (provided in Section 10 of Volume I)

27. Adequate Provisions for Utilities. Provide information sufficient to meet the submission requirements of Chapter 400, section 4.L(2), and to demonstrate that the standards of Chapter 400, section 4.L(1) will be met by the proposed facility. (provided in Section 13 of Volume I)

28. Recycling & Source Reduction. Submit information to demonstrate that the volume of waste and the risks related to its handling and disposal have been reduced to the maximum practical extent by recycling and source reduction prior to being landfilled. This includes submitting information sufficient to meet the requirements of Chapter 400, section 6.B. (provided in Section 17 of Volume I)

29. Operations manual. Submit an operations manual, suitable for use by the facility, which includes at a minimum all information that would enable supervisory and operating personnel and persons evaluating the operation of the facility to determine what sequence of operation, plans, diagrams, policies, procedures, and legal requirements are to be followed for orderly and successful operation on a daily and yearly basis. The operations manual must address all the requirements specified in Chapter 401, section 4 and must include a Hazardous and Special Waste Exclusion Plan in conformance with the requirements of Chapter 400, section 9. Variances from operational requirements may be requested pursuant to Chapter 400, Section 13 of the Solid Waste Management Regulations. (provided in Volume V)

30. If a variance or variances are being requested as part of this application, specify the nature of the variance and the justification for why it should be granted. Refer to Chapter 400, Section 13 of the Solid Waste Management Rules for the standards and submissions required in this variance application. Variances are not allowed to the performance standards and prohibitive siting criteria contained in Chapter 401, section 1.C. (discussed in Section 24 of Volume I)

31. Host Community Agreement. If the proposed landfill is a commercial disposal facility, please submit information demonstrating that you have met the host community agreement requirements of Chapter 400, section 7.A. (provided in Section 18 of Volume I)

32. Liability Insurance. Submit proof of liability insurance for sudden and accidental occurrences as required in Chapter 400, section 10. (Applicants who are public entities are exempt from this requirement.) (provided in Section 21 of Volume I)

33. Financial Assurance. Submit all information and documentation necessary to demonstrate that the owner or operator of the proposed landfill is providing sufficient financial assurance in conformance with the requirements of Chapter 400, section 11. (provided in Section 22 of Volume I)

END

APPENDIX 1B
Site Plan and Aerial Image Map

CHILDS RD

AIRPORT RD

LAGASSE RD

WINDING HILL RD

BETTERMENT RD

PINE ST

FREDERICKS CORNER RD

Central Maine Airport of Norridgewock

Kennebec River

MAN Stream

Sunset View Cem

ASBESTOS LANDFILL

PHASE 8C'

PHASE 8C

PHASE 9

PHASE 8B

PHASE 7

PHASE 8A

PHASE 1-6

PHASE 10

PHASE 11

PHASE 12

PHASE 14

LANDFILL GAS-TO-ENERGY PLANT

MAINTENANCE FACILITY

MAIN OFFICE

SCALE HOUSE

LEACHATE STORAGE TANK FACILITY

EXISTING FACILITY ENTRANCE

N

LEGEND

- PUBLIC WATER SUPPLY FROM WELL MAINE GEOLOGICAL SURVEY DATABASE
- DOMESTIC WELL FROM MAINE GEOLOGICAL SURVEY ON LINE WELL DATABASE
- DOMESTIC WELL FROM SURVEY DATA PREPARED BY BOYNTON & PICKETT RECEIVED 7 FEBRUARY 2018.
- DOMESTIC WELL FROM SHAPE FILE DATA PREPARED BY MAINE GEOLOGICAL SURVEY AND COORDINATED WITH NORRIDGEWOCK QUADRANGLE SURFICIAL MATERIALS MAP OPEN-FILE NO. 00-65 DATED 2000.
- INDUSTRIAL WELL FROM MAINE GEOLOGIC SURVEY DATABASE
- APPROXIMATE LOCATION OF WMDSM NEW OFFICE WELL
- BUILDING / STRUCTURES
- WMDSM FACILITY SITE BOUNDARY
- ABUTTING PROPERTY OF WMDSM
- PHASE 14 SOLID WASTE BOUNDARY
- ACCESS ROAD TO PHASE 14
- EXISTING FACILITY ACCESS ROAD
- DIGITIZED APPROXIMATE NORRIDGEWOCK AIRPORT ZONING HORIZONTAL LIMIT
- REGULATORY FLOODWAY
- 1% ANNUAL CHANCE OF FLOOD HAZARD
- 0.2% ANNUAL CHANCE OF FLOOD HAZARD
- PUBLIC DRINKING WATER BEDROCK SOURCE WATER PROTECTION AREA
- SIGNIFICANT SAND AND GRAVEL AQUIFER GREATER THAN 500 GALLONS PER MINUTE
- SIGNIFICANT SAND AND GRAVEL AQUIFER 10 -50 GALLONS PER MINUTE

NOTES:

1. BASE MAP IMAGE FROM USGS NORRIDGEWOCK QUADRANGLE MAINE - SOMERSET COUNTY 7.5 MINUTE SERIES
2. SITE FACILITY BOUNDARY AND WASTE MANAGEMENT PROPERTY AND FACITITY BOUNDARIES FROM SHAPE FILES RECEIVED FROM BOYNTON PICKETT 2019.07.09.
3. EXISTING WASTE MANAGEMENT FACITITY FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017 AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT.
4. THE FOLLOWING FEATURE WERE OBTAINED FROM SHAPE FILES DOWN LOADED FROM WWW.MAINE.GOV DATABASES:
   - REGULATORY FLOODWAY
   - 1% ANNUAL CHANCE OF FLOOD HAZARD
   - 0.2% ANNUAL CHANCE OF FLOOD HAZARD
   - PUBLIC DRINKING WATER BEDROCK SOURCE WATER PROTECTION AREA FROM ME DEP WEBPAGE ACCESSED 09/13/2019
   - SIGNIFICANT SAND AND GRAVEL AQUIFER BOUNDARY
5. FLOOD HAZARD ZONES ARE FROM FEMA FIRM PANELS 230178004C, 2301780008C, 230178015C, 2301780016C, ALL EFFECTIVE MAY 6, 1996. ALL AREAS ARE APPROXIMATE.

0 500
SCALE IN FEET

SITE PLAN
PHASE 14 PERMIT APPLICATION

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC. CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

Geosyntec consultants

Acton, MA | SEPTEMBER 2019

Figure: S1-1

T:\PROJECTS_CAD\CLV\CROSSROADS_LANDFILL\PHASE 14 EXPANSION\PERMIT\FIGURES\2019 09 PERMIT REPORT SITE FIGURE

N

Legend

- Phase 14 Solid Waste Boundary
- WMDSM Facility Site Boundary
- Abutting Property of WMDSM

Note:
Aerial Image Taken by Aerial Survey and Photo, Inc., on 27 September 2019.

0 250 500 1,000
Feet

Aerial Imagery Map

Phase 14
Waste Management Disposal Services of Maine, Inc.
Crossroads Landfill
Norridgewock, Maine

Geosyntec consultants

Acton, Massachusetts | October 2019

Figure
S1-2

Q:\GISProjects\BE0214_Norridgewock\mxd\2019\AerialMap_landscape.mxd 10/18/2019 11:42:50 AM

APPENDIX 2A
Site Deeds

WARRANTY DEED

KNOW ALL MEN BY THESE PRESSNTS, THAT WE, ELIZABETH P. LAPPIE and HERBERT D. LAPPIE, also known as Daniel Lappie, husband and wife, of Norridgewock, County of Somerset and State of Maine, whose mailing address is RFD#2, Box 292, Norridgewock, Maine 04957,

11783

in consideration of one dollar and other valuable considerations paid by CONSOLIDATED WASTE SERVICES, INC. A Corporation organized and existing under the laws of the State of Maine, and having a place of business at Bangor, Penobscot County, State of Maine,

the receipt whereof we do hereby acknowledge, do hereby GIVE, GRANT, BARGAIN, SELL and CONVEY unto the said CONSOLIDATED WASTE SERVICES, INC.

A certain lot or parcel of land, together with any buildings thereon, situated in Norridgewock, County of Somerset, and State of Maine, bounded and described as follows, to-wit:

Beginning at a point, said point being marked by a 1/2-inch iron rebar on the southerly limits of the Airport Road, said point also being the northeasterly corner of land now or formerly of Charles H. Blood;

Thence S.72°10'23"E. along the southerly limits of the Airport Road 130.36 feet to a 1/2-inch iron rebar at the westerly corner of land now or formerly of David and Janice Decato;

Thence S.30°40'13"E. along the line of land of said Decato 1023.85 feet to a wooden post at the southerly corner of land of said Decato;

Thence S.23°37'11"W. along the line of land now or formerly of Emery Warren 406.34 feet to a 2-inch iron pipe at the southwest corner of said Warren and at the northwest corner of land now or formerly of Glenn R. and Joyce M. Totman, and thence continuing S.23°37'11"W. along the line of land of said Totman 807.47 feet to a 1/2-inch iron rebar at the southwest corner of land of said Totman;

Thence S.53°40'54"E. along the line of land of said Totman, 839.81 feet to a 1/2-inch iron rebar and continuing S.53°40'54"E. 29.53 feet along the line of land of said Totman to a point;

Thence S.30°38'37"E. along the line of land now or formerly of Edward and Gloria Frederick 113.61 feet to a 1/2-inch iron rebar, said rebar being at the northwesterly corner of land now or formerly of Herbert D. and Elizabeth P. Lappie;

Thence S.30°21'23"W. along the line of land of said Lappie 1474.65 feet to a granite stone and continuing S.30°21'23"W. along the line of land now or formerly of Arthur Chester Frederick 1113.76 feet to a 1/2-inch iron rebar at the northeasterly corner of land now or formerly of Joseph E. and Irene M. Pion;

Thence N.59°21'48"W. along the line of land of said Pion, being along the remains of a wire fence 237.15 feet to a point;

Thence N.53°24'17"W. along the line of land of said Pion, being along the remains of a wire fence 254.13 feet to a point;

Thence N.64°04'26"W. along the line of land of said Pion, being along the remains of a wire fence 119.29 feet to a point;

Thence N.55°59'13"W. along the line of land of said Pion, being along the remains of a wire fence 149.71 feet to a 1/2-inch iron rebar at the southeasterly corner of land now or formerly of David W. and Elizabeth Y. Andrews;

Thence N.27°48'11"E. along the line of land of said Andrews 560.37 feet to a 1-inch iron pipe at the northeasterly corner of land of said Andrews;

Thence N.54°51'49"W. along the line of land of said Andrews 882.70 feet to a 1/2-inch iron rebar at the northwesterly corner of land of said Andrews;

Thence S.30°45'11"W. along the line of land of said Andrews 663.24 feet to a 1/2-inch iron rebar at the southwesterly corner of land of said Andrews, and on northerly line of land now or formerly of Leslie M. and Caroline G. Hilton;

Thence N.60°53'06"W. along the line of land of said Hilton, being along the remains of a wire fence 338.98 feet to a 1/2-inch iron rebar at the northwesterly corner of land of said Hilton and on the easterly line of land now or formerly of Avis E. and Alice E. Emery;

Thence N.28°46'21"E. along the line of land of said Emery and along the line of land of said Blood 4417.92 feet to the point of beginning.

Said parcel to contain 150.11 acres.

All bearings are referenced to Magnetic North 1983.

Together with a 33-foot wide right-of-way, which is unrestricted as to use and is hereinafter described as follows:

Beginning at a 1/2-inch iron rebar on the northerly line now or formerly of David W. and Elizabeth Y. Andrews, said rebar being N.54°51'49"W. 106.39 feet from a 1-inch iron pipe, said iron pipe being at the northeasterly corner of land of said Andrews;

Thence S.28°53'11"W. 568.45 feet to a 1/2-inch iron rebar, said rebar being N.59°26'24"W. 116.40 feet from another 1/2-inch iron rebar at the southeasterly corner of land of said Andrews;

Thence N.61°49'49"W. 33 feet to a 1/2-inch iron rebar. said rebar being S.61°49'49"E., 760.36 feet from another 1/2-inch iron rebar at the southwesterly corner of land of said Andrews;

Thence N.28°53'11"E. 572.48 feet to a 1/2-inch iron rebar on the northerly line of land of said Andrews, said rebar being N.54°51'49"W. 139.59 feet from a 1-inch iron pipe at the northeasterly corner of land of said Andrews;

Thence S.54°51'49"E. 33.20 feet to the point of beginning.

Reference may be had to a Map Plan dated October 28, 1983, entitled "Boundary Survey - Herbert D. & Elizabeth P. Lappie - Norridgewock - Somerset Co. - Maine", prepared by Robert Garbacik, Land Surveyor No. 1182, recorded in Somerset County Registry of Deeds, Plan File C-83-156.

Subject to the conditions and restrictions contained in the Site Location Order recorded in Somerset County Registry of Deeds, Volume 864, Page 198.

Reference may be had to a deed of Elizabeth P. Lappie to Herbert D. Lappie and Elizabeth P. Lappie dated May 4, 1978, recorded in Somerset County Registry of Deeds, Volume 891, Page 694.

TO HAVE AND TO HOLD the aforegranted and bargained premises, with all the privileges and appurtenances thereof to the said CONSOLIDATED WASTE SERVICES, INC., its successors and assigns, to its and their use and behoof forever.

AND we do COVENANT with the said Grantee, its successors and assigns, that we are lawfully seized in fee of the premises; that they are free of all encumbrances, except as aforesaid mentioned; that we have good right to sell and convey the same to the said Grantee to hold as aforesaid; and that we and our heirs shall and will WARRANT AND DEFEND the same to the said Grantee, its successors and assigns forever, against the lawful claims and demands of all persons.

IN WITNESS WHEREOF, we the said ELIZABETH P. LAPPIE and HERBERT D. LAPPIE, husband and wife, of the said Norridgewock, Somerset County, Maine, joining this deed as Grantors, and relinquishing and conveying our rights by descent and all other rights in the above described premises, have hereunto set our hands and seals this twenty-second day of December, in the year of our Lord one thousand nine hundred and eighty-three.

SIGNED, SEALED AND DELIVERED
IN PRESENCE OF:

Witness — Elizabeth P. Lappie
Elizabeth P. Lappie

Witness — Herbert D. Lappie
Herbert D. Lappie

STATE OF MAINE
PENOBSCOT, ss.

December 22, 1983

Personally appeared the above-named Elizabeth P. Lappie and Herbert D. Lappie and acknowledged the above instrument to be their free act and deed.

Before me,

Wallace A. Bilodeau
Notary Public

SEAL

Somerset County
REC'D DEC 23 1983 AT 8 H. 30 M. A. M.
and recorded from the original

BOOK 1116 PAGE 79

HERBERT D. LAPPIE, also known as Daniel Lappie, and ELIZABETH P. LAPPIE, husband and wife,

of Norridgewock, Somerset County, Maine

(being ~~married~~), for consideration paid,

grant to CONSOLIDATED WASTE SERVICES, INC., a corporation organized and existing under the laws of Maine, and having a place of business at Bangor, County of Penobscot and State of Maine,

~~County~~ 14385

with Warranty Covenants

the land in Norridgewock, Somerset County, State of Maine.

A certain lot or parcel of land situated in Norridgewock, County of Somerset and State of Maine, bounded and described as follows, to-wit: On the north by the C.P. Bigelow farm; on the east by land of W.S. Tobey and N. Miller; on the south by the highway leading from Norridgewock to Mercer; on the west by land of Dan Nason and the Stephen Holway farm, containing one hundred ten (110) acres, more or less.

Excepting and reserving those premises conveyed to David A. Sincyr and Marie N. Sincyr by deed from Leo J. Redmond and Hazel H. Redmond dated May 10, 1968, recorded in Somerset County Registry of Deeds, Book 779, Page 101, now owned by said Marie N. Sincyr and more particularly described as follows; viz: "Beginning on the northerly line of the highway leading from Norridgewock to Mercer at the south-west corner of land conveyed to Leo J. Redmond and Hazel H. Redmond by William E. Clayton, et al, by deed dated November 18, 1965 and recorded in said Registry, Book 730, Page 159; thence running easterly along the northerly line of said highway two hundred eight and seven-tenths (208.7) feet to an iron stake set in the ground; thence running northerly parallel with the westerly line of land conveyed to the Redmonds by Clayton et al, above mentioned, two hundred eight and seven-tenths (208.7) feet to another iron stake set in the ground; thence running westerly parallel with said highway two hundred eight and seven-tenths (208.7) feet to another iron stake set in the ground; thence running southerly along the westerly line of land conveyed to said Redmonds by said Claytons two hundred eight and seven-tenths (208.7) feet to the point of beginning."

Being a portion of the premises conveyed to Leo J. Redmond, et al by deed from William E. Clayton, et al., dated November 18, 1965, recorded in said Registry of Deeds, Book 730, Page 159. Being the same premises conveyed by David A. Sincyr to said Herbert D. Lappie and Elizabeth P. Lappie by deed dated May 4, 1978, recorded in said Registry of Deeds, Book 891, Page 692.

Herbert D. Lappie and Elizabeth P. Lappie join as grantors and release all rights by descent and all other rights.

Witness our hands and seals this 22nd day of December, 1983

Wallace A. Bilodeau

Herbert D. Lappie

Elizabeth P. Lappie

The State of Maine Penobscot, ss. December 22, 1983

Then personally appeared the above named HERBERT D. LAPPIE

SEAL

and acknowledged the foregoing instrument to be his free act and deed,

Before me, Wallace A. Bilodeau

Wallace A. Bilodeau - Notary Public

Somerset County
REC'D DEC 23 1983 AT 8 H 30 M. A.M.
and recorded from the original

1201 S WARRANTY DEED

BOOK 1206 PAGE 266

Maine Real Estate Transfer Tax Paid

Know All Men By These Presents.

That David W. Andrews and Elizabeth Y. Andrews, husband and wife, both of Norridgewock, Somerset County, Maine
(Mailing Address: R.F.D. #2, Box 360, Norridgewock, Maine 04957)

07402

in consideration of One dollar and other valuable consideration

paid by Consolidated Waste Services, Inc., a corporation organized and existing under the laws of the State of Maine, and having a place of business at Norridgewock, Somerset County, Maine
(Mailing Address: Airport Road, P.O. Box 629, Norridgewock, Maine 04957)

the receipt whereof we *do hereby acknowledge, do hereby* give, grant, bargain, sell and convey *unto the said* Consolidated Waste Services, Inc., its successors and assigns *forever,*

A certain lot or parcel of land situated in Norridgewock, County of Somerset, State of Maine, being on the easterly side of the road leading from Frederick's Corner to Starks and at the northerly termination of the Town Road, so-called, and bounded and described as follows, to-wit:

Beginning at a pipe, said pipe being at the intersection of the southerly line of land now or formerly of Willis Tryon, and the easterly side line of a private right-of-way, being the one described and excepted below; thence following an old wire fence N 61° 58' W a distance of 793.36 feet to a pipe; thence along land of Willis Tryon N 30° 37' E a distance of 665.12 feet to a pipe; thence along land of Willis Tryon S 55° E a distance of 882.7 feet to a pipe; thence along land of Willis Tryon S 27° 40' W a distance of 558.25 feet to a pipe; thence along an old rail fence N 61° 33' W a distance of 116.4 feet to the point of beginning.

EXCEPTING AND RESERVING to Willis Tryon, his heirs and assigns forever a right-of-way across the granted premises being 33 feet in width and described as follows: Beginning at the northerly terminal of the said Town Road; thence N 28° 45' E 572.1 feet across the granted premises to other land of Willis Tryon. Said right-of-way to be unrestricted to use.

Being the same premises conveyed to David W. Andrews and Elizabeth Y. Andrews by deed of Earl B. Babcock and Mary K. Babcock dated October 17, 1977 and recorded in the Somerset County Registry of Deeds in Book 884, Page 236.

This instrument is given in satisfaction of the obligations of David W. Andrews and Elizabeth Y. Andrews under an option agreement dated November 19, 1984, a memorandum of which is recorded in Somerset County Registry of Deeds, Book 1166, Page 284. Paragraphs 5, 6, 7 and 9(b) of the option agreement provided as follows, and are made a part of this instrument:

> "(5) The Sellers may, at their option and upon notice to the Buyer, be entitled to exclusive use and occupancy of the premises for a period of one year after closing without the payment of rent to the Buyer, provided that the Sellers shall be responsible for and pay all utilities and maintain the premises as they now are, reasonable wear and tear and act of God excepted, and provided, further that they shall not commit waste.

(6) In addition to the right of the use and occupancy given to Sellers in paragraph (5) of this agreement, Sellers may, at their option, extend such right to use and occupancy for an additional six (6) month period, upon the same terms and conditions as set forth in paragraph (5), except that Sellers, in order to exercise such right, must give notice to Buyer and pay, in advance, the sum of One Thousand Dollars ($1,000.00) at least fourteen (14) days prior to expiration of the one year period.

(7) During any period of use and occupancy of the premises by Sellers, they hereby covenant and agree to indemnify, save and hold harmless the Buyer from all claims, including costs of investigation and defense, losses, damages, judgments or settlements which may be made against Buyer as a result, or claimed to be as a result, of any use or activity thereof by Sellers.

(9)(b) The Sellers shall have the right to remove all fences upon the premises at any time up and until the time when they finally vacate the premises."

To Have and to Hold *the aforegranted and bargained premises with all the privileges and appurtenances thereof to the said*

Consolidated Waste Services, Inc., its successors

~~heirs~~ *and assigns, to* it *and their use and behoof forever.*

And we *do COVENANT with the said Grantee* , its successors ~~heirs~~ *and assigns, that* we are *lawfully seized in fee of the premises that they are free of all encumbrances:*

that we *have good right to sell and convey the same to the said Grantee to hold as aforesaid; and that* we *and* our *heirs shall and will WARRANT* successors *and DEFEND the same to the said Grantee* , its / ~~heirs~~ *and assigns forever, against the lawful claims and demands of all persons.*

In Witness Whereof, David W. Andrews and Elizabeth Y. Andrews, husband and wife,

~~joining in this deed as Grantor, and relinquishing and conveying~~ ~~right~~ ~~by descent and all other rights in the above described premises~~, *have hereunto set* our *hand* s *and seal* s *this* 30th *day of* July *in the year of our Lord one thousand nine hundred and* eighty-five.

Signed, Sealed and Delivered in presence of

Clinton B. Townsend

Clinton B. Townsend

David W. Andrews

David W. Andrews

Elizabeth Y. Andrews

Elizabeth Y. Andrews

State of Maine, Somerset } ss.

July 30, 19 85

Personally appeared the above named David W. Andrews and Elizabeth Y. Andrews *and acknowledged the above instrument to be* their *free act and deed.*

Before me,

Clinton B. Townsend SEAL

CLINTON B. TOWNSEND
Notary Public - Typed Name

~~Justice of the Peace.~~
Notary Public

RECEIVED SOMERSET SS
1985 JUL 31 AM 9:15
RECORDED FROM ORIGINAL

DISCHARGE OF MORTGAGE 037015

KNOW ALL MEN BY THESE PRESENTS, that I, DOUGLAS R. FARRIN, owner of a certain mortgage given by LARRY J. SMITH dated June 10, 1975, and recorded in the Somerset County Registry of Deeds, in Book 1234, Page 148, do hereby acknowledge that I have received full payment and satisfaction of the same, and I do hereby cancel and discharge said mortgage and release unto the said LARRY J. SMITH his heirs and assigns forever the premises therein described.

IN WITNESS WHEREOF, I, DOUGLAS R. FARRIN have hereunto set my hand and seal, this 12thday of April , 1989.

Signed, Sealed and Delivered
in Presence of

Judith A. Wembley

Douglas R. Farrin
DOUGLAS R. FARRIN

STATE OF MAINE
SOMERSET, ss.

Personally appeared the above named DOUGLAS R. FARRIN and acknowledged the foregoing instrument to be his free act and deed.

Before me,

Judith A. Wembley
Notary Public

JUDITH A. WEMBLEY
NOTARY PUBLIC, MAINE
MY COMMISSION EXPIRES OCTOBER 6, 1994

SEAL

RECEIVED SOMERSET SS
1989 APR 14 PM 12:00
RECORDED FROM ORIGINAL

WARRANTY DEED

Maine Real Estate Transfer Tax Paid

JAMES R. DELORIE and DENISE J. DELORIE, husband and wife, both of Norridgewock, Somerset County, Maine (Mailing Address: P.O. Box 307, Norridgewock, Maine 04957), for consideration paid, grant to CONSOLIDATED WASTE SERVICES, INC., a corporation organized and existing under the laws of the State of Maine and having its principal office at 33 Rigby Street, South Portland, Maine 04106, its successors and assigns, with WARRANTY COVENANTS, the land in Norridgewock, Somerset County, Maine, bounded and described as follows:

00599

A certain lot or parcel of land with the buildings thereon situated in Norridgewock, Somerset County, Maine, and being more particularly bounded and described as follows, to-wit:

Being located at the junction of the road leading from said Frederick's Corner Road to Sandy River with the road leading from said Frederick's Corner Road to the Charles Road, so-called, said latter road formerly having been known as the Lagasse Road, and now being known as the Pion Road; bounded on the south by the highway leading from Frederick's Corner to Starks, on the west by the highway leading northerly from the first named highway to the Charles Road, so-called, now known as the Pion Road; on the north by Charles P. Bigelow Farm, later owned by Cassius G. Everett; bounded on the east by land formerly owned by the Heirs of Stephen Halway; later owned by Chester L. Frederick; containing 50 acres, more or less.

Excepting and reserving to the grantors, their heirs and assigns, a certain parcel land more particularly described to wit:

Commencing at a point which is marked by a three quarter inch iron rebar driven in a stone wall on the easterly sideline of the Grantors herein. Said point being North Twenty-nine degrees, Thirty-five minutes, sixteen seconds east, five hundred and eighty-nine point eighty-three feet (N 29°-35'-16"E; 389.83') from

a two inch iron pipe located on the northerly sideline of the Frederick's Corner Road, said iron pipe being at the southeasterly corner of land of the Grantor's herein; Thence, north seventy-two degrees thirty three minutes fifty-nine seconds west (N 72°-33'-59"W) along a blazed and painted line a distance of three hundred and twenty-two point sixty-two feet (322.62') to a point marked by a three quarter inch iron rebar set in the ground; Thence north twenty-five degrees zero minutes forty-six seconds west (N 25°-00'-46"W) a distance of four hundred and twenty-nine point eighty nine feet (429.89') to a point marked by a three quarter inch iron rebar set in the ground; Thence north twenty-nine degrees forty-three minutes fifty seconds east (N 29°-43'-50"E) a distance of three hundred and nine point fifty-seven feet (309.57') to a point marked by a three quarter inch iron rebar set in the ground; Thence south sixty degrees east (S 60°E) twelve feet (12') plus or minus (±) to the thread of Mill Stream; Thence easterly along the thread of said stream a distance of six hundred and ninety feet more or less (690'±) to the easterly sideline of land of Grantor's herein; Thence south twenty-nine degrees twenty minutes thirty seconds west (S 29°-29'-30"W) a distance of twenty eight feet plus or minus (29'±) along the easterly sideline of land of the Grantor's herein to a point marked by a three quarter inch iron rebar set in the ground; Thence south twenty-nine degrees twenty minutes thirty seconds west (S 29°-20'-30"W) along a barb wire fence and stone wall a distance of three hundred and forty-eight point sixty-seven feet (348.67') to the point of beginning, said barb wire fence and stone wall being the easterly sideline of the Grantor's herein, containing five point seven (5.7) acres more or less.

Also excepting and reserving to the grantors, their heirs and assigns, a right-of-way 25 feet in width to the excepted and reserved parcel for all purposes; the centerline being described as follows, to wit:

Beginning at a point on the easterly sideline of the Pion Road said point being eight hundred and eighty-one point sixty-six feet (881.66') northerly from the intersection of the easterly sideline of the Pion Road and the northerly sideline of the Frederick's Corner Road; Thence south eighty degrees zero minutes twenty-one seconds east (S 80°-00'-21"E) along the centerline of an existing paved driveway a distance of twenty-nine feet plus or minus (29'±) to a

point; Thence south thirty-nine degrees forty-one minutes fifty-one seconds east (S 39°-41'-51"E) no longer following the existing driveway a distance of eighty point eighty-six feet (80.86') to a point; Thence south sixty degrees east (S 60°E) one hundred and ten point sixty-five feet (110.65') to a point on the westerly sideline of parcel herein reserved said point being north twenty-nine degrees forty-three minutes fifty seconds east (N 29°-43'-50"E) twenty-six point eighty four feet (26.84') from a point being the south westerly corner of the parcel herein reserved, said point being marked by a three quarter inch iron rebar.

Being a portion of the premises conveyed by Ronald C. Currier and Laurelee H. Currier to James R. Delorie and Denise J. Delorie by deed dated June 16, 1987 and recorded in Somerset County Registry of Deeds, Book 1351, Page 316.

The above described premises are subject to a mortgage given by James R. Delorie and Denise J. Delorie to Merrill Trust Company (now known as Fleet Bank) dated June 16, 1987 and recorded in Somerset County Registry of Deeds, Book 1351, Page 317.

WITNESS our hands this 18th day of January, 1990.

Witness

James R. Delorie

Witness

Denise J. Delorie

STATE OF MAINE
SOMERSET, ss.

January 18, 1990

Then personally appeared the above named JAMES R. DELORIE and DENISE J. DELORIE and acknowledged the foregoing instrument to be their free act and deed.

Before me,

Notary Public

Typed Name - Notary Public

RECEIVED SOMERSET SS

1990 JAN 19 AM 8:30

RECORDED FROM ORIGINAL

Doc 8157 Bk 5174 Pg 341
Recorded: Somerset County Jul 05,2017 10:57A
Deputy Register of Deeds Laura L Price

TRANSFER TAX PAID

Warranty Deed

I, **Allison J. Keating, also known as Allsion J. Keating** ("Grantor"), of 2220 Swedish Drive, Unit 60, Clearwater, FL for consideration paid in the amount of [redacted] does hereby give, grant, bargain, sell and convey, to Waste Management Disposal Services of Maine, Inc. ("Grantee"), with address of 720 East Butterfield Road, 4th Floor, Lombard, IL.

With ***WARRANTY COVENANTS***

Certain lots or parcels of land located in Norridgewock, Somerset County, State of Maine, situated generally westerly or southwesterly of the Airport Road, so-called, referred to in previous deeds as the Childs Road, or the Starks Road, and collectively abutting thereto, being bounded and described as follows:

Parcel One: Beginning on the south side of said Road at the dividing line of land formerly owned by S.H. Crosby and land formerly owned by Levi Powers; thence S-62°-W, by said line, about one hundred and twenty-seven (127) rods to the corner of said Powers lot; thence northwesterly (sic: northeasterly) on the southerly line of said Powers lot fifteen (15) rods to a cedar stake marked; thence southeasterly, parallel to the first named line to the road aforesaid; thence by said road fifteen rods to the first mentioned bound. Containing twelve and one-half acres, more or less.

Parcel Two: Beginning on said Road at a cedar stake, thence running S-62°-W one hundred and twenty-seven (127) rods, more or less, on line of land formerly owned by Levi Powers and Loring B. Jones, to a point marked by a cedar stake; thence northwesterly fifteen (15) rods to a point marked by a second cedar stake; thence on a line parallel with the first above described line on a bearing of N-62°-E to said Road; thence on said Road to the place of beginning. Containing twelve (12) acres, more or less.

Parcel Three:

Lot 1: Bounded on the east by said Road; on the south by land now or formerly of the Estate of

4

the late James Trench; on the west by the line of lot seventy-two (72) of which said lot is a part, and land formerly owned by William S. Tobey; on the north by the old rangeway and by land formerly owned by W. W. Gould.

Lot 2: Commencing at said Road at a point marked by a cedar stake at the northeast comer of land conveyed by Levi Powers to Stephen D. and John H. Burgess on the 27th day of November, 1863; thence running S-62°-W about one hundred twenty-seven rods to a point marked by a cedar stake on a line with the land conveyed to said Burgess as above described thence on a line running northwesterly seven and one-half (7 and 1/2) rods to a point marked by a cedar stake; thence on a line parallel with the first described line, N-62°-E, to said Road; thence on said Road to first described bound.

The premises herein conveyed have been subject of a survey by Robert Garbacik, P.L.S. #1182 dated November 7, 1997 and the Grantor does hereby additionally give, grant, bargain, sell and convey to said Grantee, its heirs and assigns forever, the above described premises by a description based on said survey as follows:

Beginning at a point in the southwesterly sideline of said Airport Road, assuming a width thereof of four rods, marked by a ½" iron rebar with cap inscribed #1182 at the northeasterly comer of land now or formerly of Waste Management of Maine, Inc., with reference to an instrument recorded in the Somerset County Registry of Deeds in Book 1871, Page 62; thence on a compass bearing of S-64°-14'-20"-W, along the northwesterly line of said now or former land of Waste Management of Maine, Inc., a distance of 2,439.33 feet to a point in the line of land now or formerly of Edward & Gloria Frederick, with references to an instrument recorded in said Registry in Book 777, Page 1192 and marked by a wood post marked "Harlow 1931-Tibbetts" located 0.42 feet on a compass bearing ofN-85°-08'-30"-W from a point marked by a 3" iron fence post; thence from said point marked by said wood post on a compass bearing of N-27°- 59'-45"-W, along the line of said now or former Frederick land, a distance of 1,014.75 feet to another point marked by a ½" iron rebar with cap inscribed #1182 in the line of land now or formerly of P.J. Realty Trust with reference to instruments recorded in said Registry in Book 1711, Page 301 and Page 303; thence on a compass bearing of N-64°-14'-20"-E, along the southeasterly line of said now or former land of P. J. Realty Trust, and along the southeasterly line of land now or formerly of Lester J. & Marlene K. Clark, with reference to an instrument recorded in said Registry in Book 862, Page 278, a distance of 2,327.10 feet, to another point marked by a ½" iron rebar with cap inscribed #1182 in the southwesterly line of said Airport Road at the southeasterly comer of said now or former Clark land; thence on a compass bearing of S-34°-16'-30"-E, along the southwesterly line of said Road, a distance of 1,025.28 feet to the point of beginning. Being the 55.48 acre parcel shown on survey of land of former owner, Thomas R. Dhillon, recorded in Plan File 2001, Page 42.

Being the same premises acquired by the Grantor in warranty deed from Thomas R. Dillon dated September 9, 1999, and recorded in the Somerset County Registry of Deeds in Book 2601, Page 223.

Title not examined by preparer of deed.

To have and to hold the aforegranted and bargained premises, with all the privileges and appurtenances thereof, to the said Grantee, its successors and assigns, to its and their use and behoof forever.

And I do covenant with the said Grantee, its successors and assigns, that I am lawfully seized in fee of the premises, that they are free of all encumbrances that I have good right to sell and convey the same to the said Grantee to hold as aforesaid; and that I and my heirs shall and will warrant and defend the same to the said Grantee, its successors and assigns forever, against the lawful claims and demands of all persons.

In witness whereof, I, Allison J. Keating, also known as Allsion J. Keating, relinquishing and conveying all rights in above premises, have hereunto set my hand and seal this 26th day of June, 2017.

Executed as a sealed instrument this 20th day of June, 2017.

Allison J. Keating

STATE OF FLORIDA

Pinellas County, ss.

On 20 day of June, 2017, before me, the undersigned notary public, personally appeared Allison J. Keating, and who proved to me through satisfactory evidence of identification, which was a driver's license, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that she signed it voluntarily for its stated purpose as a free act and deed.

Notary Public: Tyler Duncan
My Commission Expires: July 1, 2020

TYLER DUNCAN
Notary Public - State of Florida
Commission # FF 989139
My Comm. Expires Jul 1, 2020

Doc 3994 Bk 5398 Pg 244
Recorded: Somerset County Apr 16,2019 10:29A
Register of Deeds Laura L Price

WHEN RECORDED RETURN TO:

VERRILL DANA, LLP
One Portland Square
Portland, ME 04112-0586
Attention: Juliet Browne

NO TRANSFER TAX

QUITCLAIM DEED WITHOUT COVENANT

WASTE MANAGEMENT OF MAINE, INC., a Maine Corporation with a place of business in Portland, Maine, for consideration paid, hereby releases to **WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.**, a Maine Corporation with a mailing address of 357 Mercer Rd., Norridgewock, ME 04957, all right, title and interest in and to certain real estate located in the Town of Norridgewock, County of Somerset and State of Maine, more particularly described in Exhibit A attached hereto and made a part hereof.

IN WITNESS WHEREOF, the undersigned has caused this instrument to be executed as of the 2nd day of April, 2019.

WITNESS:

Vidya VIDYA DARSHANE

WASTE MANAGEMENT OF MAINE, INC.

By: James A. Wilson
Print: James A. Wilson
Its: Vice President

STATE OF MAINE
COUNTY OF SOMERSET

~~March~~ April 2, 2019

Personally appeared before me the above-named James A. Wilson, the Vice President of Waste Management of Maine, Inc., and acknowledged the foregoing instrument to be his/her free act and deed in said capacity, and the free act and deed of Waste Management of Maine, Inc.

OFFICIAL SEAL
Cynthia Schultz
NOTARY PUBLIC, STATE OF ILLINOIS
My Commission Expires Sept 23, 2022

Cynthia Schultz
Notary Public
Print Name: CYNTHIA SCHULTZ
My Commission Expires: 9-23-22

2

EXHIBIT A

Norridgewock Tax Map 14, Lots 14, 16, 16-1, 18 and 19

Those certain lots or parcels of land located in the Town of Norridgewock, County of Somerset and State of Maine described in the following deeds:

1. Warranty Deed from Kendall K. Baker and Barbara H. Baker dated November 20, 1992 and recorded in Book 1840, Page 244, and re-recorded in Book 1846, Page 136, of the Somerset County Registry of Deeds.

2. Warranty Deed from Raymond L. Lancaster and Emerald A. Lancaster dated January 28, 1993 and recorded in Book 1861, Page 98 of said Registry.

3. Warranty Deed from Laura C. Doyle dated March 11, 1993 and recorded in Book 1871, Page 62 of said Registry.

4. Warranty Deed from Stephen P. Pomelow and Donna L. Pomelow dated June 14, 1993 and recorded in Book 1895, Page 118 of said Registry.

$35.00

19840911 D 01 13 1993

This Space For Use By Secretary of State

STATE OF MAINE

1930151200011 LNME

ARTICLES OF AMENDMENT
(Amendment by Shareholders Voting as Separate Class)

OF

CONSOLIDATED WASTE SERVICES, INC.

MAINE SECRETARY OF STATE FILED

January 13, 19 93

Gary Cooper
Secretary of State
AGENT

Fee Paid $35.00
C. B. -----
Date -----
3

Pursuant to 13- A MRSA §§805 and 807, the undersigned corporation adopts these Articles of Amendment.

FIRST: As set out in detail in "THIRD", one or more classes of shares of the corporation were entitled to vote on the following amendment as a separate class.

SECOND: The amendment to the Articles of Incorporation of the corporation set out in Exhibit A attached hereto was adopted by the shareholders by unanimous written consent without a meeting on December 1, 19 92.

THIRD: On said date, the number of shares of each class outstanding and entitled to vote on such amendment (whether or not entitled to vote as a separate class), the manner in which each such class was entitled to vote (whether or not as a separate class), and the number of shares voted for and against said amendment, respectively, were as follows:

Designation of Each Class However Entitled To Vote	Manner In Which Entitled To Vote	No. of Shares Outstanding And Entitled To Vote	Voted For	Voted Against
Common		500	500	0
Totals of All Classes		500	500	0

FOURTH: If such amendment provides for exchange, reclassification or cancellation of issued shares the manner in which the same shall be effected is contained in Exhibit B attached hereto, if it is not set forth in the amendment itself.

*FIFTH: If such amendment effects a change in the number or par values of authorized shares the number of shares which the corporation has authority to issue after giving effect to such amendment, is as follows: N/A N/A

Class	Series (If Any)	Number of Shares	Par Value (If Any)

The aggregate par value of all such shares (of all classes and series) *having par value* is $_____.

The total number of all such shares (of all classes and series) *without par value* is _____ shares.

(MAINE - 2356 - 7/15/82)

SIXTH: The address of the registered office of the corporation in the State of Maine is One Portland Square, Portland, ME 04101
(street, city and zip code)

Dated: December 1, 1992

CONSOLIDATED WASTE SERVICES, INC. **
(name of corporation)

By _____
(signature)

Gregory T. Sangalis, Vice President
(type or print name and capacity)

By _____
(signature)

Howard L. Kruse, Assistant Secretary
(type or print name and capacity)

Legibly print or type name and capacity of all signers 13- A MRSA §104.

I certify that I have custody of the minutes showing the above action by the shareholders.

_____
(signature of clerk, secretary or asst. secretary)

Howard L. Kruse, Assistant Secretary

NOTE: Shares may be entitled to vote as a separate class for any of the reasons stated in §806, or if so provided in the Articles. For vote necessary for adoption, see §805.

*To be completed only if Exhibit A or B do not give this required information.

** The name of the corporation should be typed, and the document must be signed by (1) the Clerk or (2) by the President or a vice-president and by the Secretary or an assistant secretary or such other officer as the bylaws may designate as a second certifying officer or (3) if there are no such officers, then by a majority of the directors or by such directors as may be designated by a majority of directors then in office or (4) if there are no such directors, then by the holders, or such of them as may be designated by the holders, of record of a majority of all outstanding shares entitled to vote thereon or (5) by the holders of all of the outstanding shares of the corporation.

FORM NO. MBCA-9A
(MAINE - 2356)

EXHIBIT A

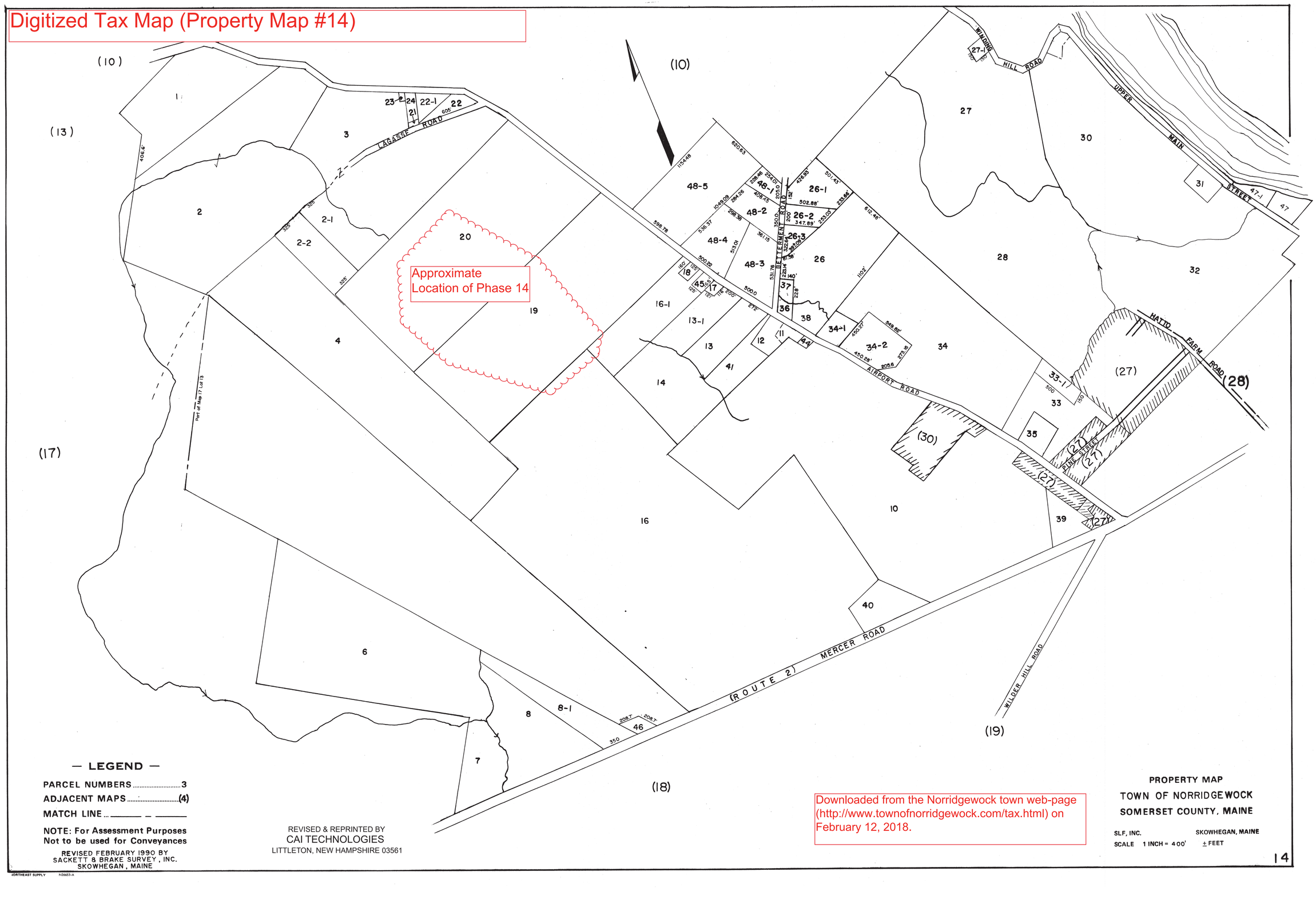
The Certificate of Incorporation of this corporation is amended by changing the Article thereof numbered " First " so that, as amended said Article shall be and read as follows:

" The name of the corporation is: Waste Management Disposal Services of Maine, Inc. "

(MAINE - 2356)

APPENDIX 2B
Site Tax Map

Digitized Tax Map (Property Map #14)



— LEGEND —

PARCEL NUMBERS 3

ADJACENT MAPS ..... (4)

MATCH LINE ..... _____ – _____

NOTE: For Assessment Purposes Not to be used for Conveyances

REVISED FEBRUARY 1990 BY
SACKETT & BRAKE SURVEY, INC.
SKOWHEGAN, MAINE

REVISED & REPRINTED BY
CAI TECHNOLOGIES
LITTLETON, NEW HAMPSHIRE 03561

PROPERTY MAP
TOWN OF NORRIDGEWOCK
SOMERSET COUNTY, MAINE

SLF, INC. SKOWHEGAN, MAINE
SCALE 1 INCH = 400' ± FEET

NORTHEAST SUPPLY N26653-A

Digitized Tax Map (Property Map #10)

(9)

(11)

(13)

(14)

(15)

(17)

Match Map 9 Lot 26

Match Map 6 Lot 34

KENNEBEC RIVER

WINDING HILL ROAD

CHILDS ROAD

AIRPORT ROAD

DISCONTINUED ROAD

LAGASSE ROAD

BETTERMENT ROAD

UPPER MAIN STREET

Approximate Location of Phase 14

— LEGEND —

PARCEL NUMBERS 3

ADJACENT MAPS ..... (4)

MATCH LINE ... ——— – ———

NOTE: For Assessment Purposes Not to be used for Conveyances

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REVISED & REPRINTED BY
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LITTLETON, NEW HAMPSHIRE 03561

PROPERTY MAP
TOWN OF NORRIDGEWOCK
SOMERSET COUNTY, MAINE

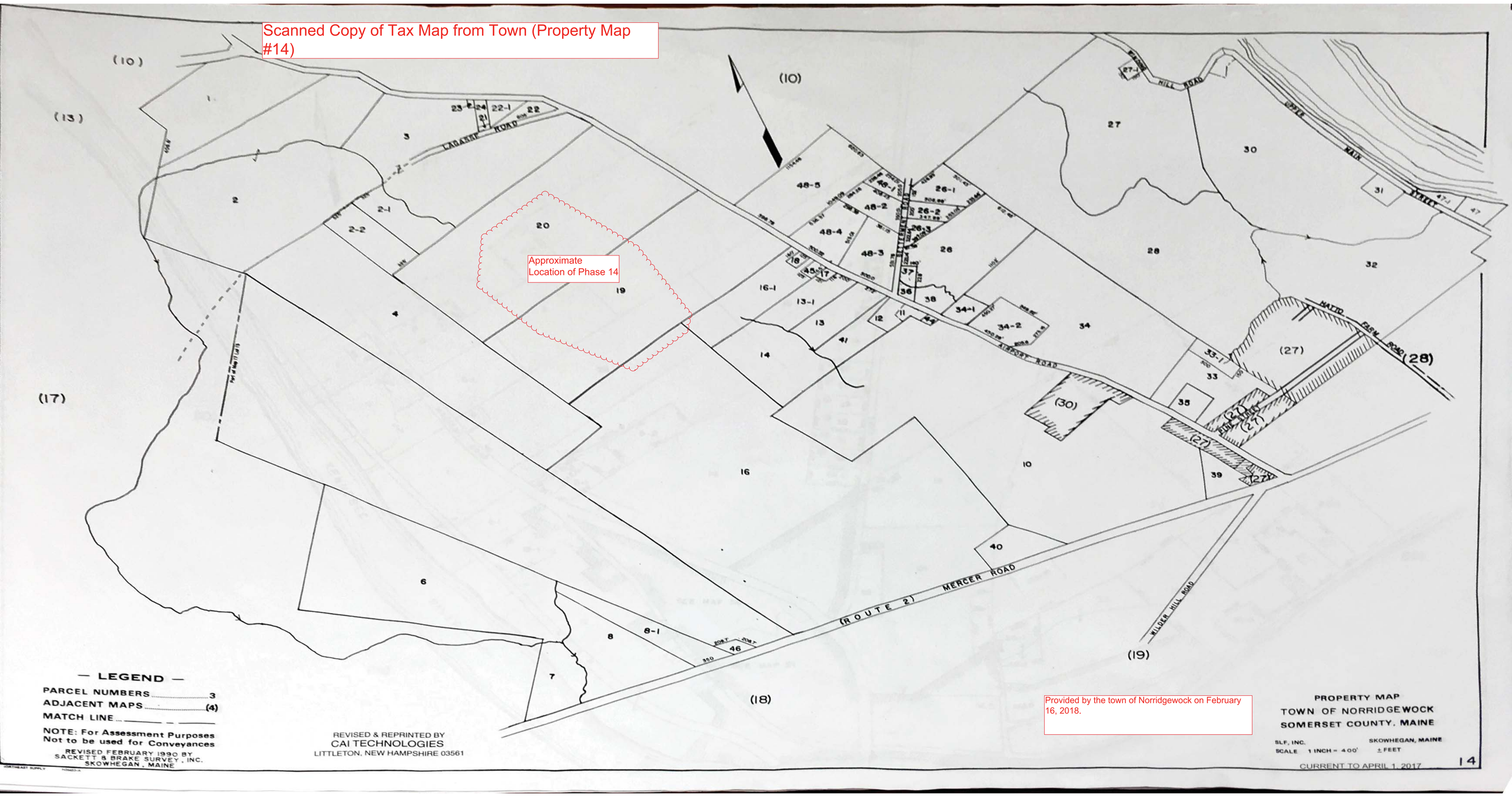
SLF, INC. SKOWHEGAN, MAINE

SCALE 1 INCH = 400' ± FEET

10

NORTHEAST SUPPLY N26653-A

Scanned Copy of Tax Map from Town (Property Map #14)



— LEGEND —

PARCEL NUMBERS 3
ADJACENT MAPS ..... (4)
MATCH LINE ..... _ _ _ _ _

NOTE: For Assessment Purposes Not to be used for Conveyances

REVISED FEBRUARY 1990 BY SACKETT & BRAKE SURVEY, INC. SKOWHEGAN, MAINE

REVISED & REPRINTED BY
CAI TECHNOLOGIES
LITTLETON, NEW HAMPSHIRE 03561

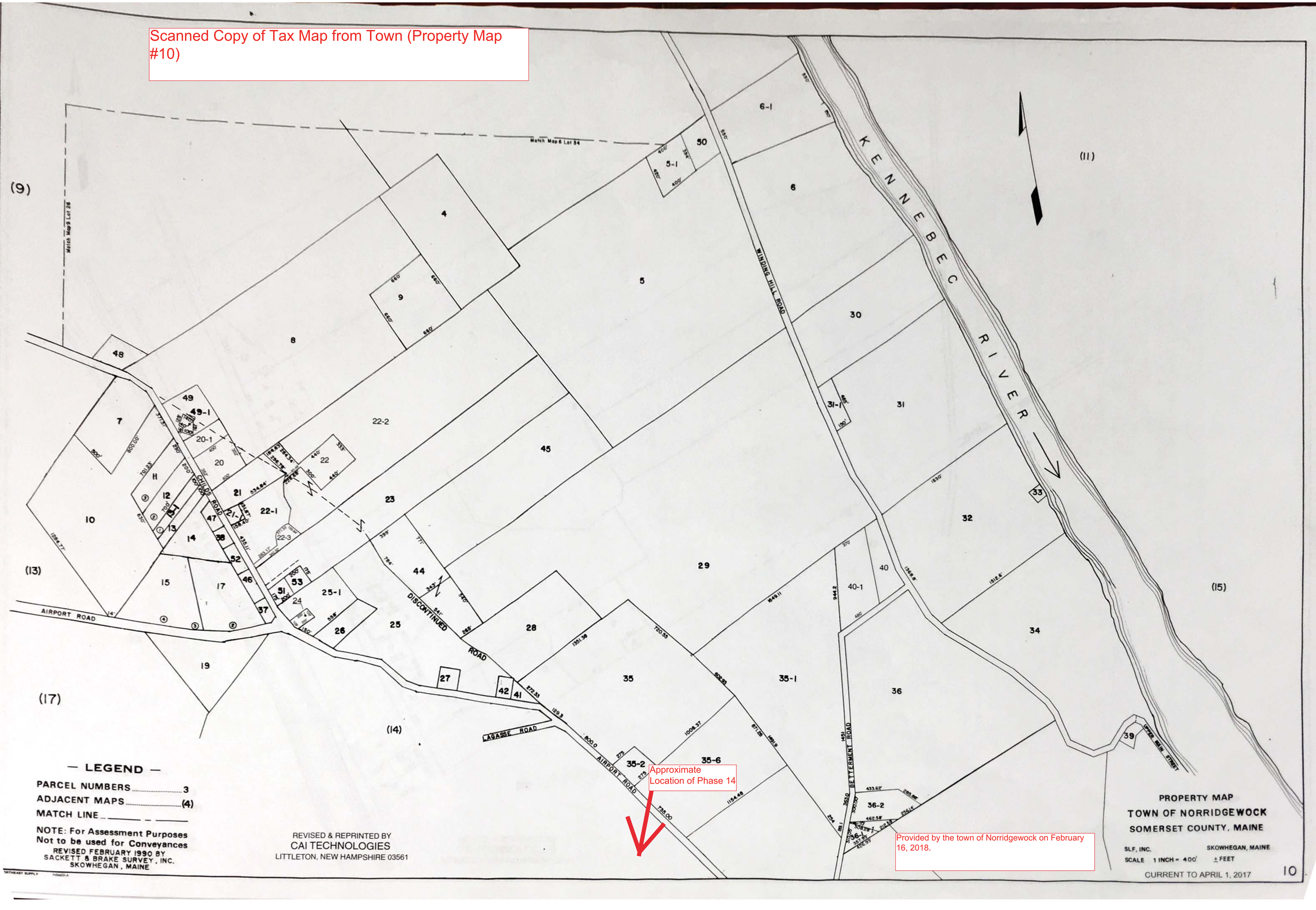
Provided by the town of Norridgewock on February 16, 2018.

PROPERTY MAP
TOWN OF NORRIDGEWOCK
SOMERSET COUNTY, MAINE

SLF, INC. SKOWHEGAN, MAINE
SCALE 1 INCH = 400' ± FEET

CURRENT TO APRIL 1, 2017

Scanned Copy of Tax Map from Town (Property Map #10)



— LEGEND —

PARCEL NUMBERS 3
ADJACENT MAPS ..... (4)
MATCH LINE ..... — — —

NOTE: For Assessment Purposes Not to be used for Conveyances

REVISED FEBRUARY 1990 BY SACKETT & BRAKE SURVEY, INC. SKOWHEGAN, MAINE

REVISED & REPRINTED BY
CAI TECHNOLOGIES
LITTLETON, NEW HAMPSHIRE 03561

PROPERTY MAP
TOWN OF NORRIDGEWOCK
SOMERSET COUNTY, MAINE

SLF, INC. SKOWHEGAN, MAINE
SCALE 1 INCH = 400' ± FEET

CURRENT TO APRIL 1, 2017

10

APPENDIX 2C
Abutters List

Waste Management Abutters List 2019

Tax Map	Lot #	Name	Mailing Address
10	35-6	Glenn A. Jones	232 Airport Rd. Norridgewock, ME 04957
10	10	Joseph D. & Susan M. Cloutier	P.O. Box 369 Norridgewock, ME 04957
10	15	Winston L. & Linda J. Ford	251 Haynes Way Cambridge, NY 12816
10	35	Linda S. Roderick	275 Airport Rd. Norridgewock, ME 04957
10	42	Pamela L. Whitten	317 Airport Rd. Norridgewock, ME 04957
10	19	Waste Management Disposal Services of Maine, Inc.	P.O. Box 1450 Chicago, IL 60690-1450
10	24	Daren Turner*	P.O. Box 865 Skowhegan, ME 04976
13	3-1 & 3-3	Heidi Chamberland Trustee	9 Tracy Cove Circle Rome, ME 04963
13	3-5	Paul & Rebecca Alves	P.O. Box 2547 Orleans, MA 02653-6547
13	8	Norridgewock Municipal Airport	603 Airport Rd. Norridgewock, ME 04957
13	13-1	Forrest & Wilma Stevens & Julie S. McCarthy	P.O. Box 659 Norridgewock, ME 04957
13	3-2	Tammy J. Ferland	511 Airport Rd. Norridgewock, ME 04957
14	1, 2, 2-1, 2-2, 46	Waste Management Disposal Services of Maine, Inc.	P.O. Box 1450 Chicago, IL 60690-1450
14	3	Christopher J. Clark	P.O. Box 793 Norridgewock, ME 04957
14	17	Carol Decker*	180 Airport Rd. Norridgewock, ME 04957
14	13-1	Floyd Whitmore	P.O. Box 877 Norridgewock, ME 04957
14	13 & 41	Letty N. Brann	156 Airport Rd. Norridgewock, ME 04957
14	45	Rita Chaykowsky	P.O. Box 658 Norridgewock, ME 04957
14	48-4 & 48-5	Elizabeth A. Skidgell	P.O. Box 93 Smithfield, ME 04978
14	4, 6, 8-1	Edward & Gloria Frederick	362 Mercer Rd. Norridgewock, ME 04957
14	40	Lebanon Masonic Lodge	251 Mercer Rd. Norridgewock, ME 04957
14	10	Northern NE Conference of 7th Day Adventists	P.O. Box 689 Norridgewock, ME 04957
17	17-1, 20, 16	Waste Management Disposal Services of Maine, Inc.	P.O. Box 1450 Chicago, IL 60690-1450
17	12	Avis & Alice E. Emery	229 Frederick Corner Rd. Norridgewock, Me 04957
17	19	Edward & Gloria Frederick Trustee	362 Mercer Rd. Norridgewock, ME 04957

*Not an abutter but being notified with abutters.

18	7	Waste Management Disposal Services of Maine, Inc.	P.O. Box 1450 Chicago, IL 60690-1450
18	35	Edward & Gloria Frederick Trustee	362 Mercer Rd. Norridgewock, ME 04957
18	8	Parker & Rachel Parsons	134 Frederick Corner Rd. Norridgewock, ME 04957
19	66	Lois & Scott Von Husen	9415 99th Avenue #1013 Peoria, AZ 85345
19	2-5	Krista L. Bowman	290 Mercer Rd. Norridgewock, ME 04957
19	65	Richard & Lelia Von Husen	282 Mercer Rd. Norridgewock, ME 04957

*Not an abutter but being notified with abutters.

Airport Road

Frederick Corner Road

Mercer Road / Route 2

Winding Hill Road

Weeden Hill Road

Waste Management
Book 1116, Page 71
12-22-1983
Book 1116, Page 79
12-22-1983
Tax Map 17 Lot 13

Waste Management
Book 1206, Page 266
7-10-1985
Tax Map 17, Lot 14

Waste Management
Book 1511, Page 89
4-14-1989
Tax Map 17, Lot 15

Waste Management
Book 1581, Page 215
1-18-1990
Tax Map 17, Lot 17

Waste Management
Book 5174, Page 341
6-20-2012
Tax Map 14 Lot 20

Waste Management
Book 1801, Page 118
6-14-1993
Tax Map 14, Lot 18

Waste Management
Book 1671, Page 61
1-11-1993
Tax Map 14, Lot 19

Waste Management
Book 1801, Page 116
1-18-1993
Tax Map 14, Lot 10-1

Waste Management
Book 1671, Page 61
1-11-1993
Tax Map 14, Lot 14

Waste Management
Book 1636, Page 126
11-20-1992
Tax Map 14, Lot 16

LEGEND

- TRAVELED WAY
- PROPERTY BOUNDARY
- EXISTING WASTE MANAGEMENT FACILITY
- ABUTTING PROPERTY
- ABUTTING PROPERTY OF WMDSM
- ADDITIONAL AREA ASSOCIATED WITH PHASE 14

500 250 0 500 1000 1500
SCALE IN FEET

STATE OF MAINE
Somerset ss. Registry of Deeds
Received _____, 20____
at _____ h. _____ M., and Recorded
in Plan file _____ Page _____
Attest: _____ Register

12016					
DRAWN:	9/18	CHECKED:	9/18	SCALE:	9/18

SHEET TITLE:
Waste Management Property
Narrow Definition of Existing Facility

SITE LOCATION:
Mercer Road
Norridgewock, Maine

SCALE: 1" = 500'

September 3, 2019

RECORD OWNER:
WASTE MANAGEMENT
"Think green"
CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE 04957

PLAN PREPARED BY:
Boynton & Pickett L.L.C.
PROFESSIONAL LAND SURVEYOR
"When you want Professional Work, On Time, and Affordable!"
922 East River Road Skowhegan, Maine 04976
Phone: (207) 474-0016 Cell: 207-399-7517
Email: whboynton@aol.com
www.BoyntonPickett.com

Job #: WM06272018ABUTTERS

STATE OF MAINE
JOHN
PICKETT
351
REGISTERED
PROFESSIONAL
LAND SURVEYOR

APPENDIX 3A
Waste Management Annual Report

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UNITED STATES SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

Form 10-K

(Mark One)

☑ **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES AND EXCHANGE ACT OF 1934**

For the fiscal year ended December 31, 2018

OR

☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES AND EXCHANGE ACT OF 1934**

For the transition period from to

Commission file number 1-12154

Waste Management, Inc.

(Exact name of registrant as specified in its charter)

Delaware	**73-1309529**
(State or other jurisdiction of incorporation or organization)	*(I.R.S. Employer Identification No.)*
1001 Fannin Street **Houston, Texas**	**77002**
(Address of principal executive offices)	*(Zip code)*

Registrant's telephone number, including area code:
(713) 512-6200

Securities registered pursuant to Section 12(b) of the Act:

Title of Each Class	**Name of Each Exchange on Which Registered**
Common Stock, $0.01 par value	New York Stock Exchange

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined by Rule 405 of the Securities Act. Yes ☑ No ☐

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. Yes ☐ No ☑

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes ☑ No ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulations S-T (§ 232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files). Yes ☑ No ☐

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulations S-K (§ 229.405 of this chapter) is not contained herein, and will not be contained, to the best of Registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K. ☑

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, smaller reporting company or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company" and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer	☑	Accelerated filer ☐
Non-accelerated filer	☐	Smaller reporting company ☐
		Emerging growth company ☐

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Act). Yes ☐ No ☑

The aggregate market value of the voting stock held by non-affiliates of the registrant as of June 30, 2018 was approximately $34.8 billion. The aggregate market value was computed by using the closing price of the common stock as of that date on the New York Stock Exchange ("NYSE"). (For purposes of calculating this amount only, all directors and executive officers of the registrant have been treated as affiliates.)

The number of shares of Common Stock, $0.01 par value, of the registrant outstanding as of February 8, 2019 was 423,779,540 (excluding treasury shares of 206,502,921).

DOCUMENTS INCORPORATED BY REFERENCE

Document	**Incorporated as to**
Proxy Statement for the 2019 Annual Meeting of Stockholders	Part III

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PART I

Item 1. *Business.*

General

Waste Management, Inc. is a holding company and all operations are conducted by its subsidiaries. When the terms "the Company," "we," "us" or "our" are used in this document, those terms refer to Waste Management, Inc., its consolidated subsidiaries and consolidated variable interest entities. When we use the term "WM," we are referring only to Waste Management, Inc., the parent holding company.

WM was incorporated in Oklahoma in 1987 under the name "USA Waste Services, Inc." and was reincorporated as a Delaware company in 1995. In a 1998 merger, the Illinois-based waste services company formerly known as Waste Management, Inc. became a wholly-owned subsidiary of WM and changed its name to Waste Management Holdings, Inc. ("WM Holdings"). At the same time, our parent holding company changed its name from USA Waste Services to Waste Management, Inc. Like WM, WM Holdings is a holding company and all operations are conducted by subsidiaries. For details on the financial position, results of operations and cash flows of WM, WM Holdings and their subsidiaries, see Note 21 to the Consolidated Financial Statements.

Our principal executive offices are located at 1001 Fannin Street, Houston, Texas 77002. Our telephone number is (713) 512-6200. Our website address is www.wm.com. Our annual reports on Form 10-K, quarterly reports on Form 10-Q and current reports on Form 8-K are all available, free of charge, on our website as soon as practicable after we file the reports with the SEC. Our stock is traded on the New York Stock Exchange under the symbol "WM."

We are North America's leading provider of comprehensive waste management environmental services. We partner with our residential, commercial, industrial and municipal customers and the communities we serve to manage and reduce waste at each stage from collection to disposal, while recovering valuable resources and creating clean, renewable energy. Our "Solid Waste" business is operated and managed locally by our subsidiaries that focus on distinct geographic areas and provides collection, transfer, disposal, and recycling and resource recovery services. Our "Traditional Solid Waste" business excludes our recycling and resource recovery services. Through our subsidiaries, we are also a leading developer, operator and owner of landfill gas-to-energy facilities in the United States ("U.S."). During 2018, our largest customer represented 1% of annual revenues. We employed approximately 43,700 people as of December 31, 2018.

We own or operate 252 landfill sites, which is the largest network of landfills in North America. In order to make disposal more practical for larger urban markets, where the distance to landfills is typically farther, we manage 314 transfer stations that consolidate, compact and transport waste efficiently and economically. We also use waste to create energy, recovering the gas produced naturally as waste decomposes in landfills and using the gas in generators to make electricity. We are a leading recycler in North America, handling materials that include paper, cardboard, glass, plastic and metal. We provide cost-efficient, environmentally sound recycling programs for municipalities, businesses and households across the U.S. and Canada as well as other services that supplement our Traditional Solid Waste business.

Our Company's goals are targeted at serving our customers, our employees, the environment, the communities in which we work and our stockholders. Increasingly, customers want more of their waste materials recovered while waste streams are becoming more complex, and our aim is to address the current needs, while anticipating the expanding and evolving needs of our customers.

We believe we are uniquely equipped to meet the challenges of the changing waste industry and our customers' waste management needs, both today and as we work together to envision and create a more sustainable future. As the waste industry leader, we have the expertise necessary to collect and handle our customers' waste efficiently and responsibly by delivering environmental performance — maximizing resource value, while minimizing environmental impact — so that both our economy and our environment can thrive.

Our fundamental strategy has not changed; we remain dedicated to providing long-term value to our stockholders by successfully executing our core strategy of focused differentiation and continuous improvement. Our strategic planning processes appropriately consider that the future of our business and the industry can be influenced by changes in economic conditions, the competitive landscape, the regulatory environment, asset and resource availability and technology. We believe that focused differentiation, which is driven by capitalizing on our unique and extensive network of assets, will deliver profitable growth and position us to leverage competitive advantages. Simultaneously, we believe the combination of cost control, process improvement and operational efficiency will deliver on the Company's strategy of continuous improvement and yield an attractive total cost structure and enhanced service quality. While we will continue to monitor emerging diversion technologies that may generate additional value and related market dynamics, our current attention will be on improving existing diversion technologies, such as our recycling operations.

We believe that execution of our strategy will deliver shareholder value and leadership in a dynamic industry. In addition, we intend to continue to return value to our stockholders through dividend payments and our common stock repurchase program. In December 2018, we announced that our Board of Directors expects to increase the quarterly dividend from $0.465 to $0.5125 per share for dividends declared in 2019, which is a 10.2% increase from the quarterly dividends we declared in 2018. This is an indication of our ability to generate strong and consistent cash flows and marks the 16th consecutive year of dividend increases. All quarterly dividends will be declared at the discretion of our Board of Directors and depend on various factors, including our net earnings, financial condition, cash required for future business plans, growth and acquisitions and other factors the Board of Directors may deem relevant.

Operations

General

We evaluate, oversee and manage the financial performance of our Solid Waste business subsidiaries through our 17 Areas. See Note 19 to the Consolidated Financial Statements for additional information about our reportable segments. We also provide additional services that are not managed through our Solid Waste business, as described below. These operations are presented in this report as "Other." The services we currently provide include collection, landfill (solid and hazardous waste landfills), transfer, recycling and resource recovery and other services, as described below.

Collection. Our commitment to customers begins with a vast waste collection network. Collection involves picking up and transporting waste and recyclable materials from where it was generated to a transfer station, material recovery facility ("MRF") or disposal site. We generally provide collection services under one of two types of arrangements:

- For commercial and industrial collection services, typically we have a three-year service agreement. The fees under the agreements are influenced by factors such as collection frequency, type of collection equipment we furnish, type and volume or weight of the waste collected, distance to the disposal facility, labor costs, cost of disposal and general market factors. As part of the service, we provide steel containers to most customers to store their solid waste between pick-up dates. Containers vary in size and type according to the needs of our customers and the restrictions of their communities. Many are designed to be lifted mechanically and either emptied into a truck's compaction hopper or directly into a disposal site. By using these containers, we can service most of our commercial and industrial customers with trucks operated by only one employee.
- For most residential collection services, we have a contract with, or a franchise granted by, a municipality, homeowners' association or some other regional authority that gives us the exclusive right to service all or a portion of the homes in an area. These contracts or franchises are typically for periods of three to ten years. We also provide services under individual monthly subscriptions directly to households. The fees for residential collection are either paid by the municipality or authority from their tax revenues or service charges, or are paid directly by the residents receiving the service.

Landfill. Landfills are the main depositories for solid waste in North America. As of December 31, 2018, we owned or operated 247 solid waste landfills and five secure hazardous waste landfills, which represents the largest network of landfills in North America. Solid waste landfills are constructed and operated on land with engineering safeguards that limit the possibility of water and air pollution, and are operated under procedures prescribed by regulation. A landfill must

meet federal, state or provincial, and local regulations during its design, construction, operation and closure. The operation and closure activities of a solid waste landfill include excavation, construction of liners, continuous spreading and compacting of waste, covering of waste with earth or other acceptable material and constructing final capping of the landfill. These operations are carefully planned to maintain environmentally safe conditions and to maximize the use of the airspace.

All solid waste management companies must have access to a disposal facility, such as a solid waste landfill. The significant capital requirements of developing and operating a landfill serve as a barrier to landfill ownership and, thus, third-party haulers often dispose of waste at our landfills. It is usually preferable for our collection operations to use disposal facilities that we own or operate, a practice we refer to as internalization, rather than using third-party disposal facilities. Internalization generally allows us to realize higher consolidated margins and stronger operating cash flows. The fees charged at disposal facilities, which are referred to as tipping fees, are based on several factors, including competition and the type and weight or volume of solid waste deposited.

Under environmental laws, the federal government (or states with delegated authority) must issue permits for all hazardous waste landfills. All of our hazardous waste landfills have obtained the required permits, although some can accept only certain types of hazardous waste. These landfills must also comply with specialized operating standards. Only hazardous waste in a stable, solid form, which meets regulatory requirements, can be deposited in our secure disposal cells. In some cases, hazardous waste can be treated before disposal. Generally, these treatments involve the separation or removal of solid materials from liquids and chemical treatments that transform waste into inert materials that are no longer hazardous. Our hazardous waste landfills are sited, constructed and operated in a manner designed to provide long-term containment of waste. We also operate a hazardous waste facility at which we isolate treated hazardous waste in liquid form by injection into deep wells that have been drilled in certain acceptable geologic formations far below the base of fresh water to a point that is safely separated by other substantial geological confining layers.

Transfer. As of December 31, 2018, we owned or operated 314 transfer stations in North America. We deposit waste at these stations, as do other waste haulers. The solid waste is then consolidated and compacted to reduce the volume and increase the density of the waste and transported by transfer trucks or by rail to disposal sites.

Access to transfer stations is critical to haulers who collect waste in areas not in close proximity to disposal facilities. Fees charged to third parties at transfer stations are usually based on the type and volume or weight of the waste deposited at the transfer station, the distance to the disposal site, market rates for disposal costs and other general market factors.

The utilization of our transfer stations by our own collection operations improves internalization by allowing us to retain fees that we would otherwise pay to third parties for the disposal of the waste we collect. It enables us to manage costs associated with waste disposal because (i) transfer trucks, railcars or rail containers have larger capacities than collection trucks, allowing us to deliver more waste to the disposal facility in each trip; (ii) waste is accumulated and compacted at transfer stations that are strategically located to increase the efficiency of our network of operations and (iii) we can retain the volume by managing the transfer of the waste to one of our own disposal sites.

The transfer stations that we operate but do not own generally are operated through lease agreements under which we lease property from third parties. There are some instances where transfer stations are operated under contract, generally for municipalities. In most cases, we own the permits and will be responsible for any regulatory requirements relating to the operation and closure of the transfer station.

Recycling. Our recycling operations provide communities and businesses with an alternative to traditional landfill disposal and support our strategic goals to extract more value from the materials we manage. We were the first major solid waste company to focus on residential single-stream recycling, which allows customers to mix recyclable paper, plastic and glass in one bin. Residential single-stream programs have greatly increased the recycling volumes. Single-stream recycling is possible through the use of various mechanized screens and optical sorting technologies. We have also been advancing the single-stream recycling programs for commercial applications. Recycling involves the separation of

reusable materials from the waste stream for processing and resale or other disposition. Our recycling operations include the following:

Materials processing — Through our collection operations, we collect recyclable materials from residential, commercial and industrial customers and direct these materials to one of our MRFs for processing. As of December 31, 2018, we operated 102 MRFs where paper, cardboard, metals, plastics, glass, construction and demolition materials and other recycling commodities are recovered for resale or redirected for other purposes.

Recycling commodities — We market and resell recycling commodities globally. We manage the marketing of recycling commodities that are processed in our facilities by maintaining comprehensive service centers that continuously analyze market prices, logistics, market demands and product quality.

Recycling brokerage services — We also provide recycling brokerage services, which involve managing the marketing of recyclable materials for third parties. The experience of our recycling operations in managing recycling commodities for our own operations gives us the expertise needed to effectively manage volumes for third parties. Utilizing the resources and knowledge of our recycling operations' service centers, we can assist customers in marketing and selling their recycling commodities with minimal capital requirements.

Some of the recyclable materials processed in our MRFs are purchased from various sources, including third parties and our own operations. The price we pay for recyclable materials is often referred to as a "rebate." In some cases, rebates are based on fixed contractual rates or on defined minimum per-ton rates but are generally based upon the price we receive for sales of processed goods, market conditions and transportation costs. As a result, changes in commodity prices for recycled materials also significantly affect the rebates we pay to our suppliers and depending on the key terms of the agreement are recorded as either operating expenses or a reduction in operating revenues within our Consolidated Statements of Operations, subsequent to the adoption of Accounting Standards Update ("ASU") 2014-09 on January 1, 2018. See Note 2 to the Consolidated Financial Statements for additional information. In recent years, we have been focused on revising our rebate structures to ensure that we cover our cost of handling and processing the materials and generate an acceptable margin on the materials we process and sell.

Other. Other services we provide include the following:

Although many waste management services such as collection and disposal are local services, our strategic accounts organization, which is managed by our Strategic Business Solutions ("WMSBS") organization, works with customers whose locations span the U.S. and Canada. Our strategic accounts program provides centralized customer service, billing and management of accounts to streamline the administration of customers multiple locations' waste management needs.

Our Energy and Environmental Services ("EES") organization offers our customers in all Areas a variety of services in collaboration with our Area and strategic accounts programs, including (i) construction and remediation services; (ii) services associated with the disposal of fly ash, residue generated from the combustion of coal and other fuel stocks; (iii) in-plant services, where our employees work full-time inside our customers' facilities to provide full-service waste management solutions and consulting services; this service is managed through our EES organization but reflected principally in our collection line of business and (iv) specialized disposal services for oil and gas exploration and production operations; revenues for this service are also reflected principally in our collection line of business. Our vertically integrated waste management operations enable us to provide customers with full management of their waste. The breadth of our service offerings and the familiarity we have with waste management practices gives us the unique ability to assist customers in minimizing the amount of waste they generate, identifying recycling opportunities, determining the most efficient means available for waste collection and disposal and ensuring that disposal is achieved in a manner that is both reflective of the current regulatory environment and environmentally friendly.

We develop, operate and promote projects for the beneficial use of landfill gas through our WM Renewable Energy organization. Landfill gas is produced naturally as waste decomposes in a landfill. The methane component of the landfill gas is a readily available, renewable energy source that can be gathered and used beneficially as an alternative to fossil fuel. The U.S. Environmental Protection Agency ("EPA") endorses landfill gas as a renewable energy resource, in the

same category as wind, solar and geothermal resources. As of December 31, 2018, we had 130 landfill gas beneficial use projects producing commercial quantities of methane gas at owned or operated landfills. For 101 of these projects, the processed gas is used to fuel electricity generators. The electricity is then sold to public utilities, municipal utilities or power cooperatives. For 15 of these projects, the landfill gas is processed to pipeline-quality natural gas and then sold to natural gas suppliers. For 14 of these projects, the gas is used at the landfill or delivered by pipeline to industrial customers as a direct substitute for fossil fuels in industrial processes.

We continue to invest in businesses and technologies that are designed to offer services and solutions ancillary or supplementary to our current operations. These investments include joint ventures, acquisitions and partial ownership interests. The solutions and services include the collection of project waste, including construction debris and household or yard waste, through our Bagster® program; the development, operation and marketing of plasma gasification facilities; operation of a landfill gas-to-liquid natural gas plant; solar powered trash compactors and organic waste-to-fuel conversion technology. We also have expanded service offerings and solutions including fluorescent bulb and universal waste mail-back through our LampTracker® program; portable restroom servicing under the name Port-o-Let®; and street and parking lot sweeping services.

Competition

We encounter intense competition from governmental, quasi-governmental and private sources in all aspects of our operations. We principally compete with large national waste management companies, counties and municipalities that maintain their own waste collection and disposal operations and regional and local companies of varying sizes and financial resources. The industry also includes companies that specialize in certain discrete areas of waste management, operators of alternative disposal facilities, companies that seek to use parts of the waste stream as feedstock for renewable energy and other by-products, and waste brokers that rely upon haulers in local markets to address customer needs. In recent years, the industry has seen some additional consolidation, though the industry remains intensely competitive.

Operating costs, disposal costs and collection fees vary widely throughout the areas in which we operate. The prices that we charge are determined locally, and typically vary by volume and weight, type of waste collected, treatment requirements, risk of handling or disposal, frequency of collections, distance to final disposal sites, the availability of airspace within the geographic region, labor costs and amount and type of equipment furnished to the customer. We face intense competition in our Solid Waste business based on pricing and quality of service. We have also begun competing for business based on breadth of service offerings. As companies, individuals and communities look for ways to be more sustainable, we are investing in greener technologies and promoting our comprehensive services that go beyond our core business of collecting and disposing of waste.

Seasonal Trends

Our operating revenues tend to be somewhat higher in summer months, primarily due to the higher construction and demolition waste volumes. The volumes of industrial and residential waste in certain regions where we operate also tend to increase during the summer months. Our second and third quarter revenues and results of operations typically reflect these seasonal trends.

Service disruptions caused by severe storms, extended periods of inclement weather or climate extremes resulting from climate change can significantly affect the operating results of the Areas affected. On the other hand, certain destructive weather and climate conditions, such as wildfires in the Western U.S. and hurricanes that most often impact our operations in the Southern and Eastern U.S. during the second half of the year, can increase our revenues in the Areas affected. While weather-related and other event driven special projects can boost revenues through additional work for a limited time, as a result of significant start-up costs and other factors, such revenue can generate earnings at comparatively lower margins.

Employees

As of December 31, 2018, we had approximately 43,700 full-time employees, of which approximately 8,200 were employed in administrative and sales positions and the balance in operations. Approximately 8,300 of our employees are covered by collective bargaining agreements.

Financial Assurance and Insurance Obligations

Financial Assurance

Municipal and governmental waste service contracts generally require contracting parties to demonstrate financial responsibility for their obligations under the contract. Financial assurance is also a requirement for (i) obtaining or retaining disposal site or transfer station operating permits; (ii) supporting certain variable-rate tax-exempt debt and (iii) estimated final capping, closure, post-closure and environmental remedial obligations at many of our landfills. We establish financial assurance using surety bonds, letters of credit, insurance policies, trust and escrow agreements and financial guarantees. The type of assurance used is based on several factors, most importantly: the jurisdiction, contractual requirements, market factors and availability of credit capacity.

Surety bonds and insurance policies are supported by (i) a diverse group of third-party surety and insurance companies; (ii) an entity in which we have a noncontrolling financial interest or (iii) a wholly-owned insurance captive, the sole business of which is to issue surety bonds and/or insurance policies on our behalf. Letters of credit generally are supported by our long-term U.S. and Canadian revolving credit facility ("$2.75 billion revolving credit facility") and other credit facilities established for that purpose.

Insurance

We carry a broad range of insurance coverages, including general liability, automobile liability, workers' compensation, real and personal property, directors' and officers' liability, pollution legal liability and other coverages we believe are customary to the industry. Our exposure to loss for insurance claims is generally limited to the per-incident deductible under the related insurance policy. In December 2017, we elected to use a wholly-owned insurance captive to insure the deductibles for our general liability, automobile liability and workers' compensation claims programs. As of December 31, 2018, both our commercial General Liability Insurance Policy and our workers' compensation insurance program carried self-insurance exposures of up to $5 million per incident. As of December 31, 2018, our automobile liability insurance program included a per-incident deductible of up to $10 million. We do not expect the impact of any known casualty, property, environmental or other contingency to have a material impact on our financial condition, results of operations or cash flows. Our estimated insurance liabilities as of December 31, 2018 are summarized in Note 10 to the Consolidated Financial Statements.

Regulation

Our business is subject to extensive and evolving federal, state or provincial and local environmental, health, safety and transportation laws and regulations. These laws and regulations are administered by the EPA, Environment Canada, and various other federal, state, provincial and local environmental, zoning, transportation, land use, health and safety agencies in the U.S. and Canada. Many of these agencies regularly examine our operations to monitor compliance with these laws and regulations and have the power to enforce compliance, obtain injunctions or impose civil or criminal penalties in case of violations.

Because the primary mission of our business is to collect and manage solid waste in an environmentally sound manner, a significant amount of our capital expenditures is related, either directly or indirectly, to environmental protection measures, including compliance with federal, state, provincial and local rules. There are costs associated with siting, design, permitting, operations, monitoring, site maintenance, corrective actions, financial assurance, and facility closure and post-closure obligations. With acquisition, development or expansion of a waste management or disposal facility or transfer station, we must often spend considerable time, effort and money to obtain or maintain required permits and

approvals. There are no assurances that we will be able to obtain or maintain required governmental approvals. Once obtained, operating permits are subject to renewal, modification, suspension or revocation by the issuing agency. Compliance with current regulations and future requirements could require us to make significant capital and operating expenditures. However, most of these expenditures are made in the normal course of business and do not place us at any competitive disadvantage.

In recent years, we perceived an increase in both the amount of government regulation and the number of enforcement actions being brought by regulatory entities against operations in the waste services industry. The current U.S. presidential administration has called for substantial changes to foreign trade policy and has generally appeared to be in favor of reducing regulation, including environmental regulation. We cannot predict what impact the current administration will have on regulations impacting our industry, especially given the number of rules currently in litigation, nor can we predict the timing of any such changes. Reduction of regulation may have a favorable impact on our operating costs, but the extensive environmental regulation applicable to landfills is a substantial barrier to entry that benefits our Company. Moreover, the risk reduction provided by stringent regulation is valuable to our customers and the communities we serve.

The primary U.S. federal statutes affecting our business are summarized below:

- The Resource Conservation and Recovery Act of 1976 ("RCRA"), as amended, regulates handling, transporting and disposing of hazardous and non-hazardous waste and delegates authority to states to develop programs to ensure the safe disposal of solid waste. In 1991, the EPA issued final regulations under Subtitle D of RCRA, which set forth minimum federal performance and design criteria for solid waste landfills. These regulations are typically implemented by the states, although states can impose requirements that are more stringent than the Subtitle D standards. We incur costs in complying with these standards in the ordinary course of our operations. In December 2018, the EPA signed a final rule that establishes management standards for pharmaceutical wastes that are classified as hazardous wastes. The requirements of the rule apply primarily to healthcare facilities and reverse distributors of hazardous waste pharmaceuticals and include a broad prohibition on disposal of hazardous waste pharmaceuticals in sewage systems. The rule is not currently anticipated to materially affect our industry, but we do expect that it will create new waste volumes for disposal at facilities permitted to incinerate hazardous waste. Also, in December 2018, the EPA published an Advanced Notice of Proposed Rulemaking to consider whether to propose revisions to the MSW Landfill criteria to support advances in liquids management. The notice does not reopen any existing regulations; we will review the topic for both risks and opportunities for our business and respond appropriately.
- The Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, ("CERCLA") which is also known as Superfund, provides for federal authority to respond directly to releases or threatened releases of hazardous substances into the environment that have created actual or potential environmental hazards. CERCLA's primary means for addressing such releases is to impose strict liability for cleanup of disposal sites upon current and former site owners and operators, generators of the hazardous substances at the site and transporters who selected the disposal site and transported substances thereto. Liability under CERCLA is not dependent on the intentional release of hazardous substances; it can be based upon the release or threatened release of hazardous substances, even resulting from lawful, unintentional and attentive action, as the term is defined by CERCLA and other applicable statutes and regulations. The EPA may issue orders requiring responsible parties to perform response actions at sites, or the EPA may seek recovery of funds expended or to be expended in the future at sites. Liability may include contribution for cleanup costs incurred by a defendant in a CERCLA civil action or by an entity that has previously resolved its liability to federal or state regulators in an administrative or judicially-approved settlement. Liability under CERCLA could also include obligations to a potentially responsible party ("PRP") that voluntarily expends site clean-up costs. Further, liability for damage to publicly-owned natural resources may also be imposed. We are subject to potential liability under CERCLA as an owner or operator of facilities at which hazardous substances have been disposed and as a generator or transporter of hazardous substances disposed of at other locations.
- The Federal Water Pollution Control Act of 1972, as amended, known as the Clean Water Act, regulates the discharge of pollutants into streams, rivers, groundwater, or other surface waters from a variety of sources, including solid and hazardous waste disposal sites. If our operations discharge any pollutants into surface waters, the Clean Water Act requires us to apply for and obtain discharge permits, conduct sampling and monitoring,

and, under certain circumstances, reduce the quantity of pollutants in those discharges. In 1990, the EPA issued additional standards for management of storm water run-off that require landfills and other waste-handling facilities to obtain storm water discharge permits. Also, if a landfill or other facility discharges wastewater through a sewage system to a publicly-owned treatment works, the facility must comply with discharge limits imposed by the treatment works. Further, before the development or expansion of a landfill can alter or affect "wetlands," a permit may have to be obtained providing for mitigation or replacement wetlands. The Clean Water Act provides for civil, criminal and administrative penalties for violations of its provisions.

- The Clean Air Act of 1970, as amended, provides for federal, state and local regulation of the emission of air pollutants. Certain of our operations are subject to the requirements of the Clean Air Act, including large municipal solid waste landfills and landfill gas-to-energy facilities. In 1996 the EPA issued new source performance standards ("NSPS") and emission guidelines controlling landfill gases from new and existing large landfills. In January 2003, the EPA issued Maximum Achievable Control Technology ("MACT") standards for municipal solid waste landfills subject to the NSPS. These regulations impose limits on air emissions from large municipal solid waste landfills, subject most of these landfills to certain operating permit requirements under Title V of the Clean Air Act and, in many instances, require installation of landfill gas collection and control systems to control emissions or to treat and utilize landfill gas on- or off-site. On August 29, 2016, the EPA published two rules with new requirements for landfill gas control and monitoring at both new municipal solid waste landfills (constructed or modified after July 17, 2014) as well as existing landfills (operating after November 8, 1987 and not modified after July 17, 2014). Working with our trade associations and other landfill owners and operators, we identified significant legal, technical and implementation concerns with the rules and together filed a judicial appeal of the rules while also filing administrative petitions asking that the EPA stay the rules and initiate a rulemaking process, which the EPA has convened. The EPA is also reviewing the landfill MACT standards to determine whether revisions are warranted. A court has required that this Risk Technology Review must be completed, and a final rule issued by March 2020. We cannot predict the outcome of either rulemaking process; however, we do not believe regulatory changes, if determined, will have a material adverse impact on our business as a whole.

  The EPA and the Department of Transportation finalized Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium and Heavy-Duty Engines and Vehicles – Phase 2 on August 16, 2016. The rule will increase fuel economy standards and reduce vehicle emissions standards for our collection fleet between model years 2021 and 2027. We expect to be able to purchase fully compliant vehicles that will meet our operational needs, and while the regulations could increase the costs of operating our fleet, we do not believe any such regulations would have a material adverse impact on our business as a whole.

- The Occupational Safety and Health Act of 1970, as amended, ("OSHA") establishes certain employer responsibilities, including maintenance of a workplace free of recognized hazards likely to cause death or serious injury, compliance with standards promulgated by the Occupational Safety and Health Administration, and various reporting and record keeping obligations as well as disclosure and procedural requirements. Various standards for notices of hazards, safety in excavation and demolition work and the handling of asbestos, may apply to our operations. The Department of Transportation and OSHA, along with other federal agencies, have jurisdiction over certain aspects of hazardous materials and hazardous waste, including safety, movement and disposal. Various state and local agencies with jurisdiction over disposal of hazardous waste may seek to regulate movement of hazardous materials in areas not otherwise preempted by federal law.

We are also actively monitoring the following recent regulatory developments affecting our business:

- In 2010, the EPA issued the Prevention of Significant Deterioration ("PSD") and Title V Greenhouse Gas ("GHG") Tailoring Rule, which expanded the EPA's federal air permitting authority to include the six GHGs, including methane and carbon dioxide. The rule sets new thresholds for GHG emissions that define when Clean Air Act permits are required. The requirements of these rules have not significantly affected our operations or cash flows, due to the tailored thresholds and exclusions of certain emissions from regulation.

  Since 2014, decisions from the U.S Supreme Court and U.S. Court of Appeals for the D.C Circuit, as well as EPA policy memorandum, have significantly narrowed the applicability and scope of EPA permitting requirements for GHGs from stationary sources, including with respect to biogenic carbon dioxide ("CO2") permitting. In

2016, the EPA proposed revisions to the PSD and Title V GHG permitting regulations establishing a significant emissions rate ("SER") threshold, below which sources would not be required to implement additional control technologies for their GHG emissions. This SER threshold should prevent most of our operational changes, such as landfill expansions and beneficial gas recovery projects, from being subject to PSD or Title V permit requirements due to our GHG emissions – assuming the EPA classifies biogenic CO2 emissions from municipal solid waste and landfill gas as carbon neutral. The EPA has not yet finalized this rulemaking. The EPA also has not yet finalized its policy for addressing biogenic CO2 emissions from waste management; however, the EPA's independent Science Advisory Board has recommended it treat waste-derived CO2 emissions as carbon-neutral. These recent judicial and regulatory actions have reduced, and are expected to continue to reduce, the potential impact of the PSD and Title V GHG Tailoring Rule on our air permits, compliance and operating requirements. See Item 1A. *Risk Factors — The adoption of climate change legislation or regulations restricting emissions of "greenhouse gases" could increase our costs to operate.*

Other recent regulatory actions to increase the stringency of certain National Ambient Air Quality Standards ("NAAQS") could affect the cost, timeliness and availability of air permits for new and modified large municipal solid waste landfills and landfill gas-to-energy facilities. However, the EPA under the current administration is reviewing the implementation of the new NAAQS and considering revisions to make the regulations less stringent. While we cannot predict the ultimate outcome of potential revisions to NAAQS, we do not believe that the ultimate requirements will have a material adverse impact on our business as a whole.

We continue to anticipate the needs of our customers, which includes investing in and developing ever-more-advanced recycling and reuse technologies. Potential climate change, GHG regulatory, and corporate sustainability initiatives have influenced our business strategy to provide low-carbon services to our customers, and we increasingly view our ability to offer lower carbon services as a key component of our business growth. If the U.S. were to impose a carbon tax or other form of GHG regulation increasing demand for low-carbon service offerings in the future, the services we are developing will be increasingly valuable.

- In December 2014, the EPA issued a final rule regulating the disposal and beneficial use of coal combustion residuals ("CCR"). This codification of the CCR rule provides utilities with a stable regulatory regime and encourages beneficial use of CCR in encapsulated uses (e.g., used in cement or wallboard), and use according to established industry standards (e.g., application of sludge for agricultural enrichment). The EPA also deemed disposal and beneficial use of CCR at permitted municipal solid waste landfills exempt from the new regulations because the RCRA Subtitle D standards applicable at municipal solid waste landfills provide at least equivalent protection. The new standards are consistent with our approach to handling CCR at our sites currently, and the new standards have provided a growth opportunity for the Company. States may impose standards more stringent than the federal program, and under the 2016 Water Infrastructure Improvements for the Nation Act, may receive approval to run permitting programs for CCR in their states. In 2018, the U.S. Court of Appeals for the D.C Circuit vacated significant portions of the 2014 final rule and remanded the rule to the EPA for further revision. Because vacated elements of the rule had allowed for the continued operation of unlined CCR ash ponds, the ongoing EPA rulemaking may further expand the Company's opportunity to provide CCR disposal services.

- In May 2016, the EPA established lifetime health advisories for certain per- and polyfluoroalkyl substances ("PFAS"), a group of man-made chemicals that have been manufactured and used globally since the 1940s in products such as textiles, fire suppressants, cookware, packaging and plastics. PFAS are typically very persistent in the environment and can be found in water, soil and air. Citing concerns about potential adverse human health effects from exposure to PFAS, several states have recently enacted new drinking water, surface water and/or groundwater limits for various PFAS, and the EPA has stated that it will be considering additional regulatory action related to the compounds. We are working with both the EPA and state regulatory agencies to maintain compliance with these evolving PFAS standards and anticipate additional expense that will result from these efforts

State, Provincial and Local Regulations

There are also various state or provincial and local regulations that affect our operations. Each state and province in which we operate has its own laws and regulations governing solid waste disposal, water and air pollution, and, in most

cases, releases and cleanup of hazardous substances and liabilities for such matters. States and provinces have also adopted regulations governing the design, operation, maintenance and closure of landfills and transfer stations. Some counties, municipalities and other local governments have adopted similar laws and regulations. Our facilities and operations are likely to be subject to these types of requirements.

Our landfill operations are affected by the increasing preference for alternatives to landfill disposal. Many state and local governments mandate recycling and waste reduction at the source and prohibit the disposal of certain types of waste, such as yard waste, food waste and electronics at landfills. The number of state and local governments with recycling requirements and disposal bans continues to grow, while the logistics and economics of recycling the items remain challenging.

Various states have enacted, or are considering enacting, laws that restrict the disposal within the state of solid waste generated outside the state. While laws that overtly discriminate against out-of-state waste have been found to be unconstitutional, some laws that are less overtly discriminatory have been upheld in court. From time to time, the U.S. Congress has considered legislation authorizing states to adopt regulations, restrictions, or taxes on the importation of out-of-state or out-of-jurisdiction waste. Additionally, several state and local governments have enacted "flow control" regulations, which attempt to require that all waste generated within the state or local jurisdiction be deposited at specific sites. In 1994, the U.S. Supreme Court ruled that a flow control ordinance that gave preference to a local facility that was privately owned was unconstitutional, but in 2007, the Court ruled that an ordinance directing waste to a facility owned by the local government was constitutional. The U.S. Congress' adoption of legislation allowing restrictions on interstate transportation of out-of-state or out-of-jurisdiction waste or certain types of flow control, or courts' interpretations of interstate waste and flow control legislation, could adversely affect our solid and hazardous waste management services.

Additionally, regulations establishing extended producer responsibility ("EPR") are being considered or implemented in many places around the world, including in the U.S. and Canada. EPR regulations are designed to place either partial or total responsibility on producers to fund the post-use life cycle of the products they create. Along with the funding responsibility, producers may be required to take over management of local recycling programs by taking back their products from end users or managing the collection operations and recycling processing infrastructure. There is no federal law establishing EPR in the U.S. or Canada; however, state, provincial and local governments could take, and in some cases have taken, steps to implement EPR regulations. If wide-ranging EPR regulations were adopted, they could have a fundamental impact on the waste, recycling and other streams we manage and how we operate our business, including contract terms and pricing.

Many states, provinces and local jurisdictions have enacted "fitness" laws that allow the agencies that have jurisdiction over waste services contracts or permits to deny or revoke these contracts or permits based on the applicant's or permit holder's compliance history. Some states, provinces and local jurisdictions go further and consider the compliance history of the parent, subsidiaries or affiliated companies, in addition to the applicant or permit holder. These laws authorize the agencies to make determinations of an applicant's or permit holder's fitness to be awarded a contract to operate, and to deny or revoke a contract or permit because of unfitness, unless there is a showing that the applicant or permit holder has been rehabilitated through the adoption of various operating policies and procedures put in place to assure future compliance with applicable laws and regulations. While fitness laws can present potential increased costs and barriers to entry into market areas, these laws have not, and are not expected to have a material adverse impact on our business as a whole.

Recycling; Foreign Import and Export Regulations

Enforcement or implementation of foreign and domestic regulations can affect our ability to export products. A significant portion of the fiber that we market has been shipped to export markets across the globe, particularly China. In 2013, the Chinese government began to strictly enforce regulations that establish limits on moisture and non-conforming materials that may be contained in imported recycled paper and plastics and restrict the import of certain other plastic recyclables. In 2017, the Chinese government announced a ban on certain materials, including mixed waste paper and mixed plastics, effective January 1, 2018, as well as extremely restrictive quality requirements effective March 1, 2018 that have been difficult for the industry to achieve. Many other markets, both domestic and foreign, have tightened their quality expectations as well. In addition, other countries have limited or restricted the import of certain recyclables.

Single stream MRFs process a wide range of commingled materials and tend to receive a higher percentage of non-recyclables, which results in increased processing and residual disposal costs to achieve quality standards. Also in 2017, the Chinese government began to limit the flow of material into the country by restricting the issuance of required import licenses. The use of restrictions on import licenses to restrict flow into China continued in 2018 and is expected to continue to constrict in 2019. Additionally, increased container weight tracking and port fees have driven up operating costs in the recycling industry and have resulted in increased price volatility. The current U.S. presidential administration has made substantial changes to foreign trade policy and imposed increases in tariffs on international trade. In response, China has imposed new tariffs on the import of recyclable commodities, including wastepaper, plastics and metals. Such restrictions and tariffs may have a significant impact on our recycling operations.

In recent years, we have been revising our service agreements to address increased costs and are working with stakeholders to educate the public on the need to recycle properly. We are investing time and labor and working with customers to help improve quality. However, there is uncertainty about the industry's ability to adapt to the stricter quality expectations. We have been actively working to identify alternative markets for recycled commodities, but it is possible there may not be sufficient demand for all of the material we produce, resulting in price decreases and volatility. Industry trade organizations and government agencies are engaged in discussions to mitigate long-term impacts to recycling programs and the industry as a whole.

With a heightened awareness of the global problems of plastic waste in the environment, an increasing number of cities across the country have passed ordinances banning certain types of plastics from sale or use. Bans on single use plastic bags, straws, and polystyrene food containers have been passed in over 350 cities, and a ban on single use plastic bags has been implemented in the State of California. These bans have increased pressure by manufacturers on our recycling facilities to accept a broader array of materials in curbside recycling programs to alleviate public pressures to ban the sale of those materials. However, with no viable end markets for recycling these materials, we and other recyclers are working to educate and remind customers of the need for end market demand and economic viability to support sustainable recycling programs.

Regulation of Oil and Gas Exploration, Production and Disposal

Our EES organization provides specialized environmental management and disposal services for fluids used and wastes generated by customers engaged in oil and gas exploration and production, and these disposal services include use of underground injection wells. There is heightened federal regulatory focus on emissions of methane that occur during drilling and transportation of natural gas, as well as state attention to protective disposal of drilling residuals. There also remains heightened attention from the public, some states and the EPA to the alleged potential for hydraulic fracturing that occurs during drilling to impact drinking water supplies. Increased regulation of oil and gas exploration and production, including GHG emissions or hydraulic fracturing, could make it more difficult or cost-prohibitive for our EES customers to continue operations, adversely affecting our business.

Additionally, any new regulations regarding the treatment and disposal of wastes associated with exploration and production operations, including through use of injection wells, could increase our costs to provide oilfield services and reduce our margins and revenue from such services. Conversely, any loosening of regulations regarding how such wastes are handled or disposed of could adversely affect our business, as we believe the size, capital structure, regulatory sophistication and established reliability of our Company provide us with an advantage in providing services that must comply with any complex regulatory regime that may govern providing oilfield waste services.

Emissions from Natural Gas Fueling and Infrastructure

We operate a large fleet of natural gas vehicles, and we plan to continue to invest in these assets for our collection fleet. As of December 31, 2018, we were operating 7,621 natural gas trucks and 123 natural gas fueling facilities; 25 of these fueling stations also serve the public, and in some cases our facilities serve the fleet of pre-approved third parties. Concerns have been raised about the potential for emissions from the fueling stations and infrastructure that serve natural gas-fueled vehicles. We have partnered with the environmental organization Environmental Defense Fund, as well as other heavy-duty equipment users and experts, on an emissions study to be made available to policy makers. We anticipate that

this comprehensive study of emissions from our heavy-duty fleet may ultimately help inform regulations that will affect equipment manufacturers and will define operating procedures across the industry. Additional regulation of, or restrictions on, natural gas fueling infrastructure or reductions in associated tax incentives could increase our operating costs. We are not yet able to evaluate potential operating changes or costs associated with such regulations, but we do not anticipate that such regulations would have a material adverse impact on our business or our future investment in natural gas vehicles.

Renewable Fuel Production

We have invested, and continue to invest, in facilities to capture and treat renewable natural gas ("RNG") from the Company's landfills, and we use RNG from landfill biogas in approximately 30% of our natural gas collection vehicles. The Energy Policy Act of 2005 and Energy Independence and Security Act of 2007 authorize the Renewable Fuels Standards ("RFS") program that promotes the production and use of renewable transportation fuels. The Company is an EPA-registered producer of transportation fuel making compressed and liquefied RNG from landfill biogas, which qualifies as a cellulosic biofuel under the RFS program. Oil refiners and importers are required through the RFS program to blend specified volumes of various categories of renewable transportation fuels with gasoline or buy credits, referred to as renewable identification numbers ("RINs"), from renewable fuel producers. The market value for RINs is tied to renewable fuel volumes set by the EPA annually, and the final 2019 required volumes for cellulosic biofuel are 45% higher than in 2018. The EPA is required to develop a rulemaking this year that will set required volume requirements for a three-year period from 2020 through 2022. Based on the overall political framework and the upcoming rulemakings, we anticipate a stable market for the Company's RINs.

Federal, State and Local Climate Change Initiatives; Sustainability

In light of regulatory and business developments related to concerns about climate change, we have identified a strategic business opportunity to provide our public and private sector customers with sustainable solutions to reduce their GHG emissions. As part of our on-going marketing evaluations, we assess customer demand for and opportunities to develop waste services offering verifiable carbon reductions, such as waste reduction, increased recycling, and conversion of landfill gas and discarded materials into electricity and fuel. We use carbon life cycle tools in evaluating potential new services and in establishing the value proposition that makes us attractive as an environmental service provider. We are active in support of public policies that encourage development and use of lower carbon energy and waste services that lower users' carbon footprints. We understand the importance of broad stakeholder engagement in these endeavors, and actively seek opportunities for public policy discussion on more sustainable materials management practices. In addition, we work with stakeholders at the federal and state level in support of legislation that encourages production and use of renewable, low-carbon fuels and electricity. Despite the announcement that the U.S. will withdraw from the Paris Climate Accords, we have seen no reduction in customer demand for services aligned with their GHG reduction goals and strategies. Moreover, we have seen initiatives at the federal, state and local level to enhance the environmental benefits in terms of GHG reductions realized by recycling programs by focusing on reducing contamination in the recyclable material.

We continue to assess the physical risks to company operations from the effects of severe weather events and use risk mitigation planning to increase our resiliency in the face of such events. We are investing in infrastructure to withstand more severe storm events, which may afford us a competitive advantage and reinforce our reputation as a reliable service provider through continued service in the aftermath of such events.

Consistent with our Company's long-standing commitment to corporate sustainability and environmental stewardship, we have published our 2018 Sustainability Report, "Driving Change," which details the GHG emissions reductions we have facilitated to date and our determination to expand these reductions in the future, as well as our commitment to help make the communities in which we live and work safe, resilient and sustainable. The information in this report can be found at our Company website but does not constitute a part of this Form 10-K. The Company actively participates in a number of sustainability reporting programs and frameworks, including the Dow Jones Sustainability Index, where we are "Sector Leader" for Commercial Services, the CDP, where we are among "A List" companies, and the Sustainability Accounting Standards Board, on which we serve as a member of the Board's advisory council.

Item 1A. ***Risk Factors.***

In an effort to keep our stockholders and the public informed about our business, we may make "forward-looking statements." Forward-looking statements usually relate to future events and anticipated revenues, earnings, cash flows or other aspects of our operations or operating results. Forward-looking statements are often identified by the words, "will," "may," "should," "continue," "anticipate," "believe," "expect," "plan," "forecast," "project," "estimate," "intend" and words of a similar nature and generally include statements containing:

- projections about accounting and finances;
- plans and objectives for the future;
- projections or estimates about assumptions relating to our performance; or
- our opinions, views or beliefs about the effects of current or future events, circumstances or performance.

You should view these statements with caution. These statements are not guarantees of future performance, circumstances or events. They are based on facts and circumstances known to us as of the date the statements are made. All aspects of our business are subject to uncertainties, risks and other influences, many of which we do not control. Any of these factors, either alone or taken together, could have a material adverse effect on us and could change whether any forward-looking statement ultimately turns out to be true. Additionally, we assume no obligation to update any forward-looking statement as a result of future events, circumstances or developments. The following discussion should be read together with the Consolidated Financial Statements and the notes thereto. Outlined below are some of the risks that we believe could affect our business and financial statements for 2019 and beyond and that could cause actual results to be materially different from those that may be set forth in forward-looking statements made by the Company.

The waste industry is highly competitive, and if we cannot successfully compete in the marketplace, our business, financial condition and operating results may be materially adversely affected.

We encounter intense competition from governmental, quasi-governmental and private sources in all aspects of our operations. We principally compete with large national waste management companies, counties and municipalities that maintain their own waste collection and disposal operations and regional and local companies of varying sizes and financial resources. The industry also includes companies that specialize in certain discrete areas of waste management, operators of alternative disposal facilities, companies that seek to use parts of the waste stream as feedstock for renewable energy and other by-products, and waste brokers that rely upon haulers in local markets to address customer needs. In recent years, the industry has seen some additional consolidation, though the industry remains intensely competitive. Counties and municipalities may have financial competitive advantages because tax revenues are available to them and tax-exempt financing is more readily available to them. Also, such governmental units may attempt to impose flow control or other restrictions that would give them a competitive advantage. In addition, some of our competitors may have lower financial expectations, allowing them to reduce their prices to expand sales volume or to win competitively-bid contracts, including large national accounts and exclusive franchise arrangements with municipalities. When this happens, we may lose customers and be unable to execute our pricing strategy, resulting in a negative impact to our revenue growth from yield on base business.

If we fail to implement our business strategy, our financial performance and our growth could be materially and adversely affected.

Our future financial performance and success are dependent in large part upon our ability to implement our business strategy successfully. Implementation of our strategy will require effective management of our operational, financial and human resources and will place significant demands on those resources. See Item 1. *Business* for more information on our business strategy.

There are risks involved in pursuing our strategy, including the following:

- Our employees, customers or investors may not embrace and support our strategy.

- We may not be able to hire or retain the personnel necessary to manage our strategy effectively.
- A key element of our strategy is yield management through focus on price leadership, which has presented challenges to keep existing business and win new business at reasonable returns. We have also continued our environmental fee, fuel surcharge and regulatory recovery fee to offset costs. The loss of volumes as a result of price increases and our unwillingness to pursue lower margin volumes may negatively affect our cash flows or results of operations. Additionally, we have in the past and continue to face purported class action lawsuits related to our customer service agreements, prices and fees.
- We may be unsuccessful in implementing improvements to operational efficiency and such efforts may not yield the intended result.
- We may not be able to maintain cost savings achieved through optimization efforts.
- Strategic decisions with respect to our asset portfolio may result in impairments to our assets. See Item 1A. *Risk Factors — We may record material charges against our earnings due to impairments to our assets*.
- Our ability to make strategic acquisitions depends on our ability to identify desirable acquisition targets, negotiate advantageous transactions despite competition for such opportunities, fund such acquisitions on favorable terms, obtain regulatory approvals and realize the benefits we expect from those transactions.
- Acquisitions, investments and/or new service offerings may not increase our earnings in the timeframe anticipated, or at all, due to difficulties operating in new markets or providing new service offerings, failure of emerging technologies to perform as expected, failure to operate within budget, integration issues, or regulatory issues, among others.
- Integration of acquisitions and/or new services offerings could increase our exposure to the risk of inadvertent noncompliance with applicable laws and regulations.
- Liabilities associated with acquisitions, including ones that may exist only because of past operations of an acquired business, may prove to be more difficult or costly to address than anticipated.
- Execution of our strategy, particularly growth through acquisitions, may cause us to incur substantial additional indebtedness, which may divert capital away from our traditional business operations and other financial plans.
- We continue to seek to divest underperforming and non-strategic assets if we cannot improve their profitability. We may not be able to successfully negotiate the divestiture of underperforming and non-strategic operations, which could result in asset impairments or the continued operation of low-margin businesses.

In addition to the risks set forth above, implementation of our business strategy could also be affected by factors beyond our control, such as increased competition, legal developments, government regulation, general economic conditions, increased operating costs or expenses, subcontractor costs and availability and changes in industry trends. We may decide to alter or discontinue certain aspects of our business strategy at any time. If we are not able to implement our business strategy successfully, our long-term growth and profitability may be adversely affected. Even if we are able to implement some or all of the initiatives of our business strategy successfully, our operating results may not improve to the extent we anticipate, or at all.

Compliance with existing or increased future regulations and/or enforcement of such regulations may restrict or change our operations, increase our operating costs or require us to make additional capital expenditures, and a decrease in regulation may lower barriers to entry for our competitors.

Stringent government regulations at the federal, state, provincial and local level in the U.S. and Canada have a substantial impact on our business, and compliance with such regulations is costly. Many complex laws, rules, orders and interpretations govern environmental protection, health, safety, land use, zoning, transportation and related matters.

Among other things, governmental regulations and enforcement actions may restrict our operations and adversely affect our financial condition, results of operations and cash flows by imposing conditions such as:

- limitations on siting and constructing new waste disposal, transfer, recycling or processing facilities or on expanding existing facilities;
- limitations, regulations or levies on collection and disposal prices, rates and volumes;
- limitations or bans on disposal or transportation of out-of-state waste or certain categories of waste;
- mandates regarding the management of solid waste, including requirements to recycle, divert or otherwise process certain waste, recycling and other streams; or
- limitations or restrictions on the recycling, processing or transformation of waste, recycling and other streams.

Regulations affecting the siting, design and closure of landfills could require us to undertake investigatory or remedial activities, curtail operations or close landfills temporarily or permanently. Future changes in these regulations may require us to modify, supplement or replace equipment or facilities. The costs of complying with these regulations could be substantial.

We also have significant financial obligations relating to final capping, closure, post-closure and environmental remediation at our existing landfills. We establish accruals for these estimated costs, but we could underestimate such accruals because of the types of waste collected and manner in which it is transported and disposed of, including actions taken in the past by companies we have acquired or third-party landfill operators or due to new information about waste types previously collected, among other reasons. Environmental regulatory changes could accelerate or increase capping, closure, post-closure and remediation costs, requiring our expenditures to materially exceed our current accruals.

In order to develop, expand or operate a landfill or other waste management facility, we must have various facility permits and other governmental approvals, including those relating to zoning, environmental protection and land use. The permits and approvals are often difficult, time consuming and costly to obtain and could contain conditions that limit our operations.

Various states have enacted, or are considering enacting, laws that restrict the disposal within the state of solid waste generated outside the state. From time to time, the U.S. Congress has considered legislation authorizing states to adopt regulations, restrictions, or taxes on the importation of out-of-state or out-of-jurisdiction waste. Additionally, several state and local governments have enacted “flow control” regulations, which attempt to require that all waste generated within the state or local jurisdiction be deposited at specific sites. The U.S. Congress’ adoption of legislation allowing restrictions on interstate transportation of out-of-state or out-of-jurisdiction waste certain types of flow control, or courts’ interpretations of interstate waste and flow control legislation, could adversely affect our solid and hazardous waste management services.

Additionally, regulations establishing extended producer responsibility (“EPR”) are being considered or implemented in many places around the world, including in the U.S. and Canada. EPR regulations are designed to place either partial or total responsibility on producers to fund the post-use life cycle of the products they create. Along with the funding responsibility, producers may be required to take over management of local recycling programs by taking back their products from end users or managing the collection operations and recycling processing infrastructure. There is no federal law establishing EPR in the U.S. or Canada; however, state, provincial and local governments could, and in some cases have, taken steps to implement EPR regulations. If wide-ranging EPR regulations were adopted, they could have a fundamental impact on the waste streams we manage and how we operate our business, including contract terms and pricing. A significant reduction in the waste, recycling and other streams we manage could have a material adverse effect on our financial condition, results of operations and cash flows.

In recent years, we perceived an increase in both the amount of government regulation and the number of enforcement actions being brought by regulatory entities against operations in the waste services industry. The current U.S. presidential administration has called for substantial changes to foreign trade policy and has generally appeared to be in favor of reducing regulation, including environmental regulation. We cannot predict what impact the current administration will

have on the political and regulatory environment in the U.S., the timing of any such changes, or the impact of any such changes on our business. Reduction of regulation may have a favorable impact on our operating costs, but the extensive environmental regulation applicable to landfills is a substantial barrier to entry that benefits our Company. Moreover, the risk reduction provided by stringent regulation is valuable to our customers and the communities we serve. It is likely that some policies adopted by the current administration will benefit us and others will negatively affect us.

Our revenues, earnings and cash flows will fluctuate based on changes in commodity prices, and commodity prices for recyclable materials are particularly susceptible to volatility based on regulations and tariffs that affect our ability to export products.

Our recycling operations process for sale certain recyclable materials, including fibers, aluminum and plastics, which are subject to significant market price fluctuations. Most of the recyclables that we process for sale are paper fibers, including old corrugated cardboard and old newsprint, and a significant portion of the fiber that we market has been shipped to export markets across the globe, particularly China. In 2013, the Chinese government began to strictly enforce regulations that establish limits on moisture and non-conforming materials that may be contained in imported recycled paper and plastics and restrict the import of certain other plastic recyclables. In 2017, the Chinese government announced a ban on certain materials, including mixed waste paper and mixed plastics, effective January 1, 2018, as well as extremely restrictive quality requirements effective March 1, 2018 that have been difficult for the industry to achieve. Many other markets, both domestic and foreign, have tightened their quality expectations as well. In addition, other countries have limited or restricted the import of certain recyclables. Single stream MRFs process a wide range of commingled materials and tend to receive a higher percentage of non-recyclables, which results in increased processing and residual disposal costs to achieve quality standards. Also in 2017, the Chinese government began to limit the flow of material into the country by restricting the issuance of required import licenses. The use of restrictions on import licenses to restrict flow into China continued in 2018 and is expected to continue in 2019. The current U.S. presidential administration has made substantial changes to foreign trade policy and imposed increases in tariffs on international trade. In response, China has imposed new tariffs on the import of recyclable commodities, including wastepaper, plastics and metals. If the Chinese government's regulations and tariffs or initiatives or other similar regulations, tariffs or initiatives result in further reduced demand or increased operating costs, the profitability of our recycling operations may decline.

We have been actively working to identify alternative markets for recycled commodities, but it is possible there may not be sufficient demand for all of the material we produce, resulting in price decreases and increased volatility. The fluctuations in the market prices or demand for these commodities can affect our operating income and cash flows negatively, as we experienced in 2018 or positively, as we experienced in 2017 and 2016. As we have increased the size of our recycling operations, we have also increased our exposure to commodity price fluctuations.

The decline in market prices in 2018 for recycling commodities resulted in a decrease in revenue of $273 million. The increase in market prices in 2017 and 2016 for recycling commodities resulted in increases in revenue of $237 million and $51 million, respectively. Additionally, under some agreements, our recycling operations are required to pay rebates to suppliers. In some cases, if we experience higher revenues based on increased market prices for recycling commodities, the rebates we pay will also increase. In other circumstances, the rebates may be subject to a floor, such that as market prices decrease, any expected profit margins on materials subject to the rebate floor are reduced or eliminated. As we work to revise service agreements to mitigate the impact of commodity price fluctuations, the potential increase in the cost for recycling services may make it more difficult for us to win bids and may slow the growth of recycling overall.

Fluctuation in energy prices also affects our business, including recycling of plastics manufactured from petroleum products. Significant variations in the price of methane gas, electricity and other energy-related products that are marketed and sold by our landfill gas recovery operations can result in a corresponding significant impact to our revenue from yield from such operations. Additionally, we provide specialized disposal services for oil and gas exploration and production operations through our EES organization. Demand for these services decreases when drilling activity slows due to depressed oil and gas prices, such as the low prices throughout the last few years. Any of the commodity prices to which we are subject may fluctuate substantially and without notice in the future.

Changes in regulations applicable to oil and gas exploration, production and disposal could adversely affect our EES organization.

Our EES organization provides specialized environmental management and disposal services for fluids used and wastes generated by customers engaged in oil and gas exploration and production, and these disposal services include the use of underground injection wells. Demand for these services may be adversely affected if drilling activity slows due to regulation and industry conditions beyond our control, in addition to changes in oil and gas prices. There is heightened federal regulatory focus on emissions of methane that occur during drilling and transportation, as well as state attention to protective disposal of drilling residuals. There also remains heightened attention from the public, some states and the EPA to the alleged potential for hydraulic fracturing that occurs during drilling to impact drinking water supplies. Increased regulation of oil and gas exploration and production, including GHG emissions or hydraulic fracturing, could make it more difficult or cost-prohibitive for our EES customers to continue operations, adversely affecting our business.

Additionally, any new regulations regarding the treatment and disposal of wastes associated with exploration and production operations, including through the use of injection wells, could increase our costs to provide oilfield services and reduce our margins and revenue from such services. Conversely, any loosening of regulations regarding how such wastes are handled or disposed of could adversely impact demand for our EES services.

Changes to the regulatory framework related to renewable fuel standards could affect our financial performance in that sector as a renewable fuel producer.

The Company acts as a renewable fuel producer in the RFS program enacted by Congress under the Energy Policy Act and Energy Independence and Security Act. Oil refiners and importers are required through the RFS program to blend specified volumes of renewable transportation fuels with gasoline or buy credits, referred to as RINs, from renewable fuel producers. The Company has invested, and continues to invest, in facilities to capture and treat renewable natural gas from the Company's landfills so that we can participate in the program. The value of the RINs associated with our landfill gas is set through a market established by the program. Changes in the RFS market or the structure of the RFS program could reduce the value of landfill gas RINs and negatively impact the financial performance of the facilities constructed to capture and treat the gas.

Increasing customer preference for alternatives to landfill disposal and bans on certain types of waste could reduce our landfill volumes and cause our revenues and operating results to decline.

Our customers are increasingly diverting waste to alternatives to landfill disposal, such as recycling and composting, while also working to reduce the amount of waste they generate. In addition, many state and local governments mandate diversion, recycling and waste reduction at the source and prohibit the disposal of certain types of waste, such as yard waste, food waste and electronics at landfills. Where such organic waste is not banned from the landfill, some large customers such as grocery stores and restaurants are choosing to divert their organic waste from landfills. Zero-waste goals (sending no waste to the landfill) have been set by many of North America's largest companies. Although such mandates and initiatives help to protect our environment, these developments reduce the volume of waste going to our landfills which may affect the prices that we can charge for landfill disposal. Our landfills currently provide our highest income from operations margins. If we are not successful in expanding our service offerings and growing lines of businesses to service waste streams that do not go to landfills and to provide services for customers that wish to reduce waste entirely, then our revenues and operating results may decline. Additionally, despite the development of new service offerings and lines of business, it is possible that our revenues and our income from operations margins could be negatively affected due to disposal alternatives.

Additionally, with a heightened awareness of the global problems of plastic waste in the environment, an increasing number of cities across the country have passed ordinances banning certain types of plastics from sale or use. Bans on single use plastic bags, straws, and polystyrene food containers have been passed in over 350 cities, and a ban on single use plastic bags has been implemented in the State of California. These bans have increased pressure by manufacturers on our recycling facilities to accept a broader array of materials in curbside recycling programs to alleviate public pressure to ban the sale of those materials. However, there are currently no viable end markets for recycling these materials and

inclusion of such materials in our recycling stream can increase contamination of the recycling stream and negatively affect the results of our recycling operations.

Developments in technology could trigger a fundamental change in the waste management industry, as waste streams are increasingly viewed as a resource, which may adversely impact volumes at our landfills and our profitability.

Our Company and others have recognized the value of the traditional waste stream as a potential resource. Research and development activities are on-going to provide disposal alternatives that maximize the value of waste, including using waste as a source for renewable energy and other valuable by-products. We and many other companies are investing in these technologies. It is possible that such investments and technological advancements may reduce the cost of waste disposal or the value of landfill gas recovery to a level below our costs and may reduce the demand for landfill space. As a result, our revenues and margins could be adversely affected due to advancements in disposal alternatives.

If we are not able to develop new service offerings and protect intellectual property, or if a competitor develops or obtains exclusive rights to a breakthrough technology, our financial results may suffer.

Our existing and proposed service offerings to customers may require that we invest in, develop or license, and protect new technologies. Research and development of new technologies and investment in emerging technologies often requires significant spending that may divert capital investment away from our traditional business operations. We may experience difficulties or delays in the research, development, production and/or marketing of new products and services or emerging technologies in which we have invested, which may negatively impact our operating results and prevent us from recouping or realizing a return on the investments required to bring new products and services to market. Further, protecting our intellectual property rights and combating unlicensed copying and use of intellectual property is difficult, and any inability to obtain or protect new technologies could impact our services to customers and development of new revenue sources. Our Company and others are increasingly focusing on new technologies that provide alternatives to traditional disposal and maximize the resource value of waste. If a competitor develops or obtains exclusive rights to a “breakthrough technology” that provides a revolutionary change in traditional waste management, or if we have inferior intellectual property to our competitors, our financial results may suffer.

Our business depends on our reputation and the value of our brand.

We believe we have developed a reputation for high-quality service, reliability and social and environmental responsibility, and we believe our brand symbolizes these attributes. The Waste Management brand name, trademarks and logos and our reputation are powerful sales and marketing tools, and we devote significant resources to promoting and protecting them. Adverse publicity, whether or not justified, relating to activities by our operations, employees or agents could tarnish our reputation and reduce the value of our brand. Damage to our reputation and loss of brand equity could reduce demand for our services. This reduction in demand, together with the dedication of time and expense necessary to defend our reputation, could have an adverse effect on our financial condition, liquidity and results of operations, as well as require additional resources to rebuild our reputation and restore the value of our brand.

Our operations are subject to environmental, health and safety laws and regulations, as well as contractual obligations that may result in significant liabilities.

There is risk of incurring significant environmental liabilities in the use, treatment, storage, transfer and disposal of waste materials. Under applicable environmental laws and regulations, we could be liable if our operations cause environmental damage to our properties or to the property of other landowners, particularly as a result of the contamination of air, drinking water or soil. Under current law, we could also be held liable for damage caused by conditions that existed before we acquired the assets or operations involved and for conditions resulting from waste types or compounds previously considered non-hazardous but later determined to present possible threat to public health or the environment. The risks of successor liability and emerging contaminants are of particular concern as we execute our growth strategy, partially though acquisitions, because we may be unsuccessful in identifying and assessing potential liabilities during our due diligence investigations. Further, the counterparties in such transactions may be unable to perform their

indemnification obligations owed to us. Any substantial liability for environmental damage could have a material adverse effect on our financial condition, results of operations and cash flows.

In the ordinary course of our business, we have in the past, we are currently, and we may in the future, become involved in legal and administrative proceedings relating to land use and environmental laws and regulations. These include proceedings in which:

- agencies of federal, state, local or foreign governments seek to impose liability on us under applicable statutes, sometimes involving civil or criminal penalties for violations, or to revoke or deny renewal of a permit we need; and
- local communities, citizen groups, landowners or governmental agencies oppose the issuance of a permit or approval we need, allege violations of the permits under which we operate or laws or regulations to which we are subject, or seek to impose liability on us for environmental damage.

We generally seek to work with the authorities or other persons involved in these proceedings to resolve any issues raised. If we are not successful, the adverse outcome of one or more of these proceedings could result in, among other things, material increases in our costs or liabilities as well as material charges for asset impairments.

Further, we often enter into agreements with landowners imposing obligations on us to meet certain regulatory or contractual conditions upon site closure or upon termination of the agreements. Compliance with these agreements inherently involves subjective determinations and may result in disputes, including litigation. Costs to remediate or restore the condition of closed sites may be significant.

General economic conditions can directly and adversely affect our revenues and our income from operations margins.

Our business is directly affected by changes in national and general economic factors that are outside of our control, including consumer confidence, interest rates and access to capital markets. A weak economy generally results in decreased consumer spending and decreases in volumes of waste generated, which negatively impacts the ability to grow through new business or service upgrades, and may result in customer turnover and reduction in customers' waste service needs. Consumer uncertainty and the loss of consumer confidence may also reduce the number and variety of services requested by customers. Additionally, a weak market for consumer goods can significantly decrease demand by paper mills for recycled corrugated cardboard used in packaging; such decrease in demand can negatively impact commodity prices and our operating income and cash flows.

A decrease in waste volumes generated results in an increase in competitive pricing pressure, and such economic conditions may also interfere with our ability to implement our pricing strategy. Many of our contracts have price adjustment provisions that are tied to an index such as the Consumer Price Index, and our costs may increase more than the increase, if any, in the Consumer Price Index. This is partially due to our relatively high fixed-cost structure, which is difficult to quickly adjust to match shifting volume levels and vendor costs, which may not correlate with the Consumer Price Index or the waste industry.

Some of our customers, including governmental entities, have suffered financial difficulties affecting their credit risk, which could negatively impact our operating results.

We provide service to a number of governmental entities and municipalities, some of which have suffered significant financial difficulties in recent years, due in part to reduced tax revenue and/or high cost structures. Some of these entities could be unable to pay amounts owed to us or renew contracts with us at previous or increased rates.

Many non-governmental customers have also suffered serious financial difficulties, including bankruptcy in some cases. Purchasers of our recycling commodities can be particularly vulnerable to financial difficulties in times of commodity price volatility. The inability of our customers to pay us in a timely manner or to pay increased rates, particularly large national accounts, could negatively affect our operating results.

In addition, the financial difficulties of municipalities could result in a decline in investors' demand for municipal bonds and a correlating increase in interest rates. As of December 31, 2018, we had $705 million of tax-exempt bonds with term interest rate periods that expire within the next 12 months and $513 million of variable-rate tax-exempt bonds with interest rates reset on either a daily or a weekly basis. If market dynamics resulted in repricing of our tax-exempt bonds at significantly higher interest rates, we would incur increased interest expenses that may negatively affect our operating results and cash flows.

We may be unable to obtain or maintain required permits or to expand existing permitted capacity of our landfills, which could decrease our revenue and increase our costs.

Our ability to meet our financial and operating objectives depends in part on our ability to obtain and maintain the permits necessary to operate landfill sites. Permits to build, operate and expand solid waste management facilities, including landfills and transfer stations, have become more difficult and expensive to obtain and maintain. Permits often take years to obtain as a result of numerous hearings and compliance requirements with regard to zoning, environmental and other regulations. These permits are also often subject to resistance from citizen or other groups and other political pressures. Local communities and citizen groups, adjacent landowners or governmental agencies may oppose the issuance of a permit or approval we may need, allege violations of the permits under which we currently operate or laws or regulations to which we are subject, or seek to impose liability on us for environmental damage. Responding to these challenges has, at times, increased our costs and extended the time associated with establishing new facilities and expanding existing facilities. In addition, failure to receive regulatory and zoning approval may prohibit us from establishing new facilities or expanding existing facilities. Our failure to obtain the required permits to operate our landfills could have a material adverse impact on our financial condition, results of operations and cash flows.

Significant shortages in diesel fuel supply or increases in diesel fuel prices will increase our operating expenses.

The price and supply of diesel fuel can fluctuate significantly based on international, political and economic circumstances, as well as other factors outside our control, such as actions by the Organization of the Petroleum Exporting Countries ("OPEC") and other oil and gas producers, regional production patterns, weather conditions and environmental concerns. We need diesel fuel to run a significant portion of our collection and transfer trucks and our equipment used in our landfill operations. Supply shortages could substantially increase our operating expenses. Additionally, if fuel prices increase, our direct operating expenses increase and many of our vendors raise their prices to offset their own rising costs. We have in place a fuel surcharge program, designed to offset increased fuel expenses; however, we may not be able to pass through all of our increased costs and some customers' contracts prohibit any pass-through of the increased costs. Additionally, lawsuits have challenged our fuel and environmental charges included on our invoices. Regardless of any offsetting surcharge programs, increased operating costs due to higher diesel fuel prices will decrease our income from operations margins.

We have an extensive natural gas truck fleet, which makes us partially dependent on the availability of natural gas and fueling infrastructure and vulnerable to natural gas prices.

We operate a large fleet of natural gas vehicles, and we plan to continue to invest in these assets for our collection fleet. However, natural gas fueling infrastructure is not yet broadly available in North America; as a result, we have constructed and operate natural gas fueling stations, some of which also serve the public or pre-approved third parties. It will remain necessary for us to invest capital in fueling infrastructure in order to power our natural gas fleet. Concerns have been raised about the potential for emissions from fueling infrastructure that serve natural gas-fueled vehicles. New regulation of, or restrictions on, natural gas fueling infrastructure or reductions in associated tax incentives could increase our operating costs. Additionally, fluctuations in the price and supply of natural gas could substantially increase our operating expenses, and a reduction in the existing cost differential between natural gas and diesel fuel could materially reduce the benefits we anticipate from our investment in natural gas vehicles. Further, our fuel surcharge program is currently indexed to diesel fuel prices, and price fluctuations for natural gas may not effectively be recovered by this program.

We are increasingly dependent on technology in our operations and if our technology fails, our business could be adversely affected.

We may experience problems with the operation of our current information technology systems or the technology systems of third parties on which we rely, as well as the development and deployment of new information technology systems, that could adversely affect, or even temporarily disrupt, all or a portion of our operations until resolved. Inabilities and delays in implementing new systems can also affect our ability to realize projected or expected cost savings. Additionally, any systems failures could impede our ability to timely collect and report financial results in accordance with applicable laws and regulations.

A cybersecurity incident could negatively impact our business and our relationships with customers and expose us to litigation risk.

Substantially all aspects of our business operations rely on digital technology. We use computers, mobile devices, social networking and other online platforms to connect with our employees and our customers. Such uses give rise to cybersecurity risks, including security breach, espionage, system disruption, theft and inadvertent release of information. Our business involves the storage and transmission of numerous classes of sensitive and/or confidential information and intellectual property, including customers' personal information, private information about employees, and financial and strategic information about the Company and its business partners. We also rely on a Payment Card Industry compliant third party to protect our customers' credit card information.

We are regularly the target of attempted cyber intrusions, and we must commit substantial resources to continuously monitor and further develop our networks and infrastructure to prevent, detect, and address the risk of unauthorized access, misuse, computer viruses and other events. Our preventative measures and incident response efforts may not be effective in all cases. The theft, destruction, loss, misappropriation, or release of sensitive and/or confidential information or intellectual property, or interference with our information technology systems or the technology systems of third parties on which we rely, could result in business disruption, direct financial loss, negative publicity, brand damage, violation of privacy laws, loss of customers, potential litigation and liability and competitive disadvantage.

Further, as the Company pursues its strategy to grow through acquisitions and to pursue new initiatives that improve our operations and cost structure, the Company is also expanding and improving its information technologies, resulting in a larger technological presence and corresponding exposure to cybersecurity risk. Certain new technologies, such as use of autonomous vehicles, remote-controlled equipment and virtual reality, present new and significant cybersecurity safety risks that must be analyzed and addressed before implementation. If we fail to assess and identify cybersecurity risks associated with acquisitions and new initiatives, we may become increasingly vulnerable to such risks.

Our operating expenses could increase as a result of labor unions organizing or changes in regulations related to labor unions.

Labor unions continually attempt to organize our employees, and these efforts will likely continue in the future. Certain groups of our employees are currently represented by unions, and we have negotiated collective bargaining agreements with these unions. Additional groups of employees may seek union representation in the future, and, if successful, would enhance organized labor's leverage to obtain higher than expected wage and benefits costs and resist the introduction of new technology and other initiatives, which can result in increased operating expenses and lower net income. If we are unable to negotiate acceptable collective bargaining agreements, our operating expenses could increase significantly as a result of work stoppages, including strikes. Any of these matters could adversely affect our financial condition, results of operations and cash flows.

We could face significant liabilities for withdrawal from Multiemployer Pension Plans.

We are a participating employer in a number of trustee-managed multiemployer defined benefit pension plans ("Multiemployer Pension Plans") for employees who are covered by collective bargaining agreements. In the event of our withdrawal from a Multiemployer Pension Plan, we may incur expenses associated with our obligations for unfunded

vested benefits at the time of the withdrawal. Depending on various factors, future withdrawals could have a material adverse effect on results of operations or cash flows for a particular reporting period. We have previously withdrawn from certain underfunded Multiemployer Pension Plans, and we recognized related expenses of $3 million and $12 million in 2018 and 2017, respectively. In 2016, we did not recognize any charges for the withdrawal from Multiemployer Pension Plans. See Notes 9 and 10 to the Consolidated Financial Statements for more information related to our participation in Multiemployer Pension Plans.

Our business is subject to operational and safety risks, including the risk of personal injury to employees and others.

Providing environmental and waste management services, including constructing and operating landfills, transfer stations, MRFs and other disposal facilities, involves risks such as truck accidents, equipment defects, malfunctions and failures. Additionally, we closely monitor and manage landfills to minimize the risk of waste mass instability, releases of hazardous materials, and odors that could be triggered by weather or natural disasters. There may also be risks presented by the potential for subsurface heat reactions causing elevated landfill temperatures and increased production of leachate, landfill gas and odors. We also build and operate natural gas fueling stations, some of which also serve the public or third parties. Operation of fueling stations and landfill gas collection and control systems involves additional risks of fire and explosion. Any of these risks could potentially result in injury or death of employees and others, a need to shut down or reduce operation of facilities, increased operating expense and exposure to liability for pollution and other environmental damage, and property damage or destruction.

While we seek to minimize our exposure to such risks through comprehensive training, compliance and response and recovery programs, as well as vehicle and equipment maintenance programs, if we were to incur substantial liabilities in excess of any applicable insurance, our business, results of operations and financial condition could be adversely affected. Any such incidents could also tarnish our reputation and reduce the value of our brand. Additionally, a major operational failure, even if suffered by a competitor, may bring enhanced scrutiny and regulation of our industry, with a corresponding increase in operating expense.

We have substantial financial assurance and insurance requirements, and increases in the costs of obtaining adequate financial assurance, or the inadequacy of our insurance coverages, could negatively impact our liquidity and increase our liabilities.

The amount of insurance we are required to maintain for environmental liability is governed by statutory requirements. We believe that the cost for such insurance is high relative to the coverage it would provide and, therefore, our coverages are generally maintained at the minimum statutorily-required levels. We face the risk of incurring additional costs for environmental damage if our insurance coverage is ultimately inadequate to cover those damages. We also carry a broad range of other insurance coverages that are customary for a company our size. We use these programs to mitigate risk of loss, thereby enabling us to manage our self-insurance exposure associated with claims. The inability of our insurers to meet their commitments in a timely manner and the effect of significant claims or litigation against insurance companies may subject us to additional risks. To the extent our insurers are unable to meet their obligations, or our own obligations for claims are more than we estimated, there could be a material adverse effect to our financial results.

In addition, to fulfill our financial assurance obligations with respect to variable-rate tax-exempt debt, final capping, closure, post-closure and environmental remediation obligations, we generally obtain letters of credit or surety bonds, rely on insurance, including captive insurance, fund trust and escrow accounts or rely upon WM financial guarantees. We currently have in place all financial assurance instruments necessary for our operations. Our financial position, which can be negatively affected by asset impairments, our credit profile and general economic factors, may adversely affect the cost of our current financial assurance instruments, and changes in regulations may impose stricter requirements on the types of financial assurance that will be accepted. Additionally, in the event we are unable to obtain sufficient surety bonding, letters of credit or third-party insurance coverage at reasonable cost, or one or more states cease to view captive insurance as adequate coverage, we would need to rely on other forms of financial assurance. It is possible that we could be forced to deposit cash to collateralize our obligations. Other forms of financial assurance could be more expensive to obtain, and any requirements to use cash to support our obligations would negatively impact our liquidity and capital resources and could affect our ability to meet our obligations as they become due.

We may record material charges against our earnings due to impairments to our assets.

In accordance with U.S. Generally Accepted Accounting Principles ("GAAP"), we capitalize certain expenditures and advances relating to disposal site development, expansion projects, acquisitions, software development costs and other projects. Events that could, in some circumstances, lead to an impairment include, but are not limited to, shutting down a facility or operation or abandoning a development project or the denial of an expansion permit. Additionally, declining waste volumes and development of, and customer preference for, alternatives to traditional waste disposal could warrant asset impairments. If we determine an asset or expansion project is impaired, we will charge against earnings any unamortized capitalized expenditures and advances relating to such asset or project reduced by any portion of the capitalized costs that we estimate will be recoverable, through sale or otherwise. We also carry a significant amount of goodwill on our Consolidated Balance Sheets, which is required to be assessed for impairment annually, and more frequently in the case of certain triggering events. We may be required to incur charges against earnings if such impairment tests indicate that the fair value of a reporting unit is below its carrying amount. Any such charges could have a material adverse effect on our results of operations.

Our capital requirements and our business strategy could increase our expenses, cause us to change our growth and development plans, or result in an inability to maintain our desired credit profile.

If economic conditions or other risks and uncertainties cause a significant reduction in our cash flows from operations, we may reduce or suspend capital expenditures, growth and acquisition activity, implementation of our business strategy, dividend declarations or share repurchases. We may choose to incur indebtedness to pay for these activities, although our access to capital markets is not assured and we may not be able to incur indebtedness at a cost that is consistent with current borrowing rates. We also may need to incur indebtedness to refinance scheduled debt maturities, and it is possible that the cost of financing could increase significantly, thereby increasing our expenses and decreasing our net income. Further, our ability to execute our financial strategy and our ability to incur indebtedness is somewhat dependent upon our ability to maintain investment grade credit ratings on our senior debt. The credit rating process is contingent upon our credit profile and several other factors, many of which are beyond our control, including methodologies established and interpreted by third-party rating agencies. If we were unable to maintain our investment grade credit ratings in the future, our interest expense would increase and our ability to obtain financing on favorable terms could be adversely affected.

Additionally, we have $2.2 billion of debt as of December 31, 2018 that is exposed to changes in market interest rates within the next 12 months because of the combined impact of our tax-exempt bonds, outstanding borrowings under our commercial paper program and our $2.75 billion revolving credit facility. If interest rates increase, our interest expense would also increase, lowering our net income and decreasing our cash flow.

We may use our $2.75 billion revolving credit facility to meet our cash needs, to the extent available, until maturity in June 2023. As of December 31, 2018, we had C$15 million, or $11 million, of Canadian borrowings outstanding borrowings under this facility. We had $587 million of letters of credit issued and $990 million of outstanding borrowings under our commercial paper program, both supported by this facility, leaving unused and available credit capacity of $1.2 billion as of December 31, 2018. In the event of a default under our credit facility, we could be required to immediately repay all outstanding borrowings and make cash deposits as collateral for all obligations the facility supports, which we may not be able to do. Additionally, any such default could cause a default under many of our other credit agreements and debt instruments. Without waivers from lenders party to those agreements, any such default would have a material adverse effect on our ability to continue to operate.

The adoption of climate change legislation or regulations restricting emissions of "greenhouse gases" could increase our costs to operate.

Our landfill operations emit methane, identified as a GHG. There are a number of legislative and regulatory efforts at the state, regional and federal levels to curtail the emission of GHGs to ameliorate the effect of climate change. Should comprehensive federal climate change legislation be enacted, we expect it could impose costs on our operations that might not be offset by the revenue increases associated with our lower-carbon service options, the materiality of which we cannot predict. In 2010, the EPA published a Prevention of Significant Deterioration and Title V GHG Tailoring Rule, which

expanded the EPA's federal air permitting authority to include the six GHGs. The rule sets new thresholds for GHG emissions that define when Clean Air Act permits are required. The current requirements of these rules have not significantly affected our operations or cash flows, due to the tailored thresholds and exclusions of certain emissions from regulation. However, if certain changes to these regulations were enacted, such as lowering the thresholds or the inclusion of biogenic emissions, then the amendments could have an adverse effect on our operating costs.

The seasonal nature of our business, severe weather events and event driven special projects cause our results to fluctuate, and prior performance is not necessarily indicative of our future results.

Our operating revenues tend to be somewhat higher in summer months, primarily due to the higher construction and demolition waste volumes. The volumes of industrial and residential waste in certain regions where we operate also tend to increase during the summer months. Our second and third quarter revenues and results of operations typically reflect these seasonal trends.

Service disruptions caused by severe storms, extended periods of inclement weather or climate extremes resulting from climate change can significantly affect the operating results of the Areas affected. On the other hand, certain destructive weather and climate conditions, such as wildfires in the Western U.S. and hurricanes that most often impact our operations in the Southern and Eastern U.S. during the second half of the year, can increase our revenues in the Areas affected. While weather-related and other event driven special projects can boost revenues through additional work for a limited time, due to significant start-up costs and other factors, such revenue can generate earnings at comparatively lower margins.

For these and other reasons, operating results in any interim period are not necessarily indicative of operating results for an entire year, and operating results for any historical period are not necessarily indicative of operating results for a future period. Our stock price may be negatively impacted by interim variations in our results.

We could be subject to significant fines and penalties, and our reputation could be adversely affected, if our businesses, or third parties with whom we have a relationship, were to fail to comply with U.S. or foreign laws or regulations.

Some of our projects and new business may be conducted in countries where corruption has historically been prevalent. It is our policy to comply with all applicable anti-bribery laws, such as the U.S. Foreign Corrupt Practices Act, and with applicable local laws of the foreign countries in which we operate, and we monitor our local partners' compliance with such laws as well. Our reputation may be adversely affected if we were reported to be associated with corrupt practices or if we or our local partners failed to comply with such laws. Such damage to our reputation could adversely affect our ability to grow our business. Additionally, violations of such laws could subject us to significant fines and penalties.

Currently pending or future litigation or governmental proceedings could result in material adverse consequences, including judgments or settlements.

From time to time we are involved in governmental proceedings relating to the conduct of our business. We are also party to civil litigation. As a large company with operations across the U.S. and Canada, we are subject to various proceedings, lawsuits, disputes and claims arising in the ordinary course of our business. Actions that have been filed against us, and that may be filed against us in the future, include personal injury, property damage, commercial, customer, and employment-related claims, including purported state and national class action lawsuits related to:

- alleged environmental contamination, including releases of hazardous materials and odors;
- sales and marketing practices, customer service agreements, prices and fees; and
- federal and state wage and hour and other laws.

The timing of the final resolutions to these types of matters is often uncertain. Additionally, the possible outcomes or resolutions to these matters could include adverse judgments or settlements, either of which could require substantial payments, adversely affecting our liquidity.

We may experience adverse impacts on our reported results of operations as a result of adopting new accounting standards or interpretations.

Our implementation of and compliance with changes in accounting rules, including new accounting rules and interpretations, could adversely affect our reported financial position or operating results or cause unanticipated fluctuations in our reported operating results in future periods.

Item 1B. ***Unresolved Staff Comments.***

None.

Item 2. ***Properties.***

Our principal executive offices are in Houston, Texas, where we occupy approximately 345,000 square feet under leases expiring through 2020. We also have administrative offices in Arizona, Connecticut, Illinois and India. We own or lease real property in most locations where we have operations or administrative functions. We have operations in all 50 states except Montana, the District of Columbia and throughout Canada.

Our principal property and equipment consists of land (primarily landfills and other disposal facilities, transfer stations and bases for collection operations), buildings, vehicles and equipment. We believe that our operating properties, vehicles and equipment are adequately maintained and sufficient for our current operations. However, we expect to continue to make investments in additional property and equipment for expansion, for the replacement of aging assets and investment in assets that support our strategy of continuous improvement through efficiency and innovation. For more information, see Item 7. *Management's Discussion and Analysis of Financial Condition and Results of Operations* included within this report.

The following table summarizes our various operations as of December 31:

	2018	2017
Landfills owned or operated (a)	252	249
Transfer stations	314	305
Material recovery facilities	102	90

(a) As of December 31, 2018 and 2017, our landfills owned or operated consisted of total acreage of 157,369 and 156,784; permitted acreage of 42,730 and 42,590; and expansion acreage of 944 and 821, respectively. Total acreage includes permitted acreage, expansion acreage, other acreage available for future disposal that has not been permitted, buffer land and other land. Permitted acreage consists of all acreage at the landfill encompassed by an active permit to dispose of waste. Expansion acreage consists of unpermitted acreage where the related expansion efforts meet our criteria to be included as expansion airspace. A discussion of the related criteria is included within Item 7. *Management's Discussion and Analysis of Financial Condition and Results of Operations — Critical Accounting Estimates and Assumptions* included within this report.

Item 3. ***Legal Proceedings.***

Information regarding our legal proceedings can be found under the *Environmental Matters* and *Litigation* sections of Note 10 to the Consolidated Financial Statements included within this report.

Item 4. ***Mine Safety Disclosures.***

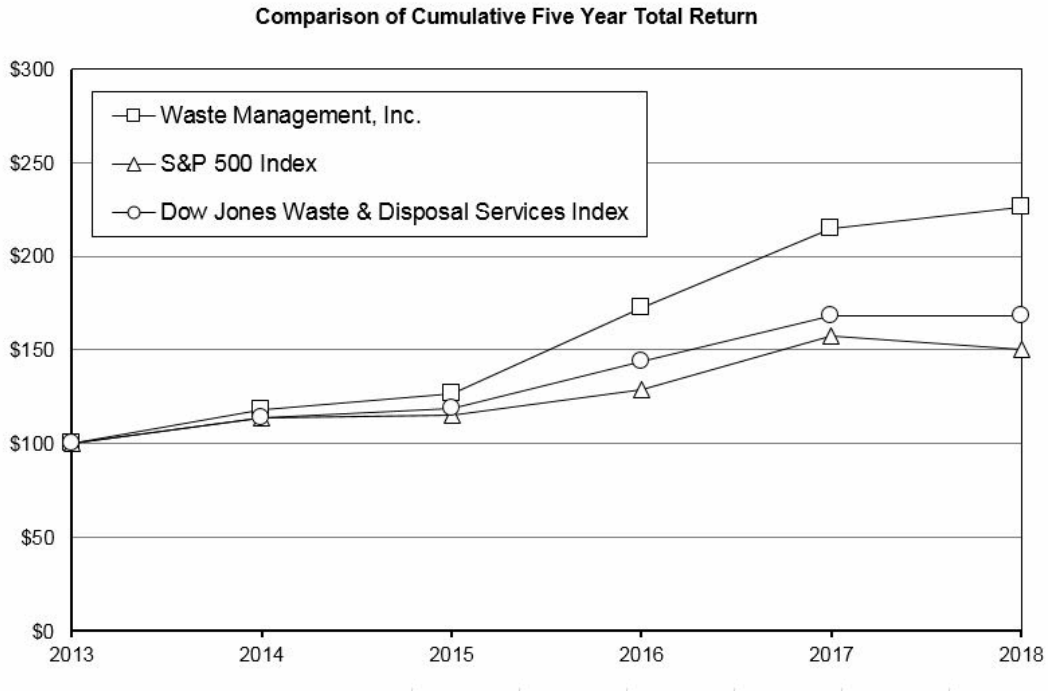
Information concerning mine safety and other regulatory matters required by Section 1503(a) of the Dodd-Frank Wall Street Reform and Consumer Protection Act and Item 104 of Regulation S-K is included in Exhibit 95 to this annual report.

PART II

Item 5. ***Market for Registrant's Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities.***

Our common stock is traded on the New York Stock Exchange ("NYSE") under the symbol "WM." The number of holders of record of our common stock on February 8, 2019 was 8,942.

The graph below shows the relative investment performance of Waste Management, Inc. common stock, the S&P 500 Index and the Dow Jones Waste & Disposal Services Index for the last five years, assuming reinvestment of dividends at date of payment into the common stock. The graph is presented pursuant to SEC rules and is not meant to be an indication of our future performance.



	12/31/13	12/31/14	12/31/15	12/31/16	12/31/17	12/31/18
Waste Management, Inc.	$ 100	$ 118	$ 127	$ 173	$ 215	$ 226
S&P 500 Index	$ 100	$ 114	$ 115	$ 129	$ 157	$ 150
Dow Jones Waste & Disposal Services Index	$ 100	$ 114	$ 119	$ 144	$ 168	$ 168

The Company repurchases shares of its common stock as part of capital allocation programs authorized by our Board of Directors. We announced in December 2017 that the Board of Directors authorized up to $1.25 billion in future share repurchases. During 2018, we repurchased an aggregate of $1,008 million of our common stock under accelerated share repurchase ("ASR") agreements and open market repurchases, which equated to 11.7 million shares with a weighted average price per share of $86.35. See Note 13 to the Consolidated Financial Statements for additional information.

The following table summarizes common stock repurchases made during the fourth quarter of 2018 (shares in millions):

Issuer Purchases of Equity Securities

Period	Total Number of Shares Purchased	Average Price Paid per Share	Total Number of Shares Purchased as Part of Publicly Announced Plans or Programs	Approximate Maximum Dollar Value of Shares that May Yet be Purchased Under the Plans or Programs
October 1 — 31	2.8	$ 89.60 (a)	2.8	$ 252 million
November 1 — 30	—	$ —	—	$ 252 million
December 1 — 31	0.5	$ 88.88 (b)	0.5	$ 1.5 billion (c)
Total	3.3	$ 89.49	3.3	

(a) In October 2018, we completed an ASR agreement that was entered into in July 2018 to repurchase $200 million of our common stock. At the beginning of the repurchase period, we delivered $200 million in cash and received 1.8 million shares. The ASR agreement completed in October 2018, at which time we received 0.4 million additional shares. At the beginning of October, subsequent to the completion of the July 2018 ASR agreement, we repurchased 0.5 million shares of our common stock in open market transactions in compliance with Rule 10b5-1 and Rule 10b-18 of the Exchange Act for $48 million, inclusive of per-share commissions.

At the end of October 2018, we entered into a new ASR agreement to repurchase $200 million of our common stock. At the beginning of the repurchase period, we delivered $200 million in cash and received 1.9 million shares. The October 2018 ASR agreement completed in December 2018.

The "Average Price Paid per Share" in the table represents the final weighted average price per share paid for the completed ASR agreements and the open market repurchases.

(b) In December 2018, we completed the October 2018 ASR agreement discussed above at which time we received 0.4 million additional shares. Subsequent to the completion of the October 2018 ASR agreement, we repurchased an additional 0.1 million shares of our common stock in open market transactions in compliance with Rule 10b5-1 and Rule 10b-18 of the Exchange Act for $10 million, inclusive of per-share commissions. The "Average Price Paid per Share" in the table represents the final weighted average price per share paid for the completed ASR agreement and the open market repurchases.

(c) We announced in December 2018 that the Board of Directors has authorized up to $1.5 billion in future share repurchases, which supersedes and replaces remaining authority under any prior Board of Directors authorization for share repurchases after the completion of our current open market repurchase plan ending February 15, 2019.

Any future share repurchases will be made at the discretion of management and will depend on various factors including our net earnings, financial condition, cash required for future business plans, and growth and acquisitions.

Item 6. ***Selected Financial Data.***

The information below was derived from the audited Consolidated Financial Statements included within this report and in previous annual reports we filed with the SEC. This information should be read together with those Consolidated Financial Statements and the notes thereto. These historical results are not necessarily indicative of the results to be expected in the future.

	Years Ended December 31,				
	2018(a)	2017(a)	2016(a)	2015	2014
	(In Millions, Except per Share Amounts)				
Statement of Operations Data:					
Operating revenues	$ 14,914	$ 14,485	$ 13,609	$ 12,961	$ 13,996
Consolidated net income	1,923	1,949	1,180	752	1,338
Net income attributable to Waste Management, Inc.	1,925	1,949	1,182	753	1,298
Basic earnings per common share	4.49	4.44	2.66	1.66	2.80
Diluted earnings per common share	4.45	4.41	2.65	1.65	2.79
Cash dividends declared per common share	1.86	1.70	1.64	1.54	1.50
Balance Sheet Data:					
Working capital (deficit) (b)	$ (463)	$ (568)	$ (418)	$ (165)	$ 41
Total assets	22,650	21,829	20,859	20,367	21,252
Long-term debt, including current portion	10,026	9,491	9,310	8,929	9,390
Total Waste Management, Inc. stockholders' equity	6,275	6,019	5,297	5,345	5,866
Total equity	6,276	6,042	5,320	5,367	5,889

(a) For more information see Item 7. *Management's Discussion and Analysis of Financial Condition and Results of Operations.*

(b) Prior year information was revised to conform to our current year presentation.

Item 7. ***Management's Discussion and Analysis of Financial Condition and Results of Operations.***

This section includes a discussion of our results of operations for the three years ended December 31, 2018. This discussion may contain forward-looking statements that anticipate results based on management's plans that are subject to uncertainty. We discuss in more detail various factors that could cause actual results to differ materially from expectations in Item 1A. *Risk Factors*. The following discussion should be read considering those disclosures and together with the Consolidated Financial Statements and the notes thereto.

Overview

We are North America's leading provider of comprehensive waste management environmental services. We partner with our residential, commercial, industrial and municipal customers and the communities we serve to manage and reduce waste at each stage from collection to disposal, while recovering valuable resources and creating clean, renewable energy. We own or operate the largest network of landfills in North America. In order to make disposal more practical for larger urban markets, where the distance to landfills is typically farther, we manage transfer stations that consolidate, compact and transport waste efficiently and economically. We also use waste to create energy, recovering the gas produced naturally as waste decomposes in landfills and using the gas in generators to make electricity. Additionally, we are a leading recycler in North America, handling materials that include paper, cardboard, glass, plastic and metal. Our "Solid Waste" business is operated and managed locally by our subsidiaries that focus on distinct geographic areas and provides collection, transfer, disposal, and recycling and resource recovery services. Our "Traditional Solid Waste" business excludes our recycling and resource recovery services. Through our subsidiaries, we are also a leading developer, operator and owner of landfill gas-to-energy facilities in the U.S.

Our Solid Waste operating revenues are primarily generated from fees charged for our collection, transfer, disposal, and recycling and resource recovery services, and from sales of commodities by our recycling and landfill gas-to-energy operations. Revenues from our collection operations are influenced by factors such as collection frequency, type of collection equipment furnished, type and volume or weight of the waste collected, distance to the disposal facility or material recovery facility and our disposal costs. Revenues from our landfill operations consist of tipping fees, which are generally based on the type and weight or volume of waste being disposed of at our disposal facilities. Fees charged at transfer stations are generally based on the weight or volume of waste deposited, taking into account our cost of loading, transporting and disposing of the solid waste at a disposal site. Recycling revenues generally consist of tipping fees and the sale of recycling commodities to third parties. The fees we charge for our services generally include our environmental fee, fuel surcharge and regulatory recovery fee which are intended to pass through to customers direct and indirect costs incurred. We also provide additional services that are not managed through our Solid Waste business, described under *Results of Operations* below.

Business Environment

The waste industry is a comparatively mature and stable industry. However, customers increasingly expect more of their waste materials to be recovered and those waste streams are becoming more complex. In addition, many state and local governments mandate diversion, recycling and waste reduction at the source and prohibit the disposal of certain types of waste at landfills. Due to this, we monitor these developments to adapt our services offerings. As companies, individuals and communities look for ways to be more sustainable, we are promoting our comprehensive services that go beyond our core business of collecting and disposing of waste in order to meet their needs.

Despite some industry consolidation in recent years, we encounter intense competition from governmental, quasi-governmental and private service providers based on pricing, service quality, customer experience and breadth of service offerings. We also encounter competition for acquisition and growth opportunities. Our industry is directly affected by changes in general economic factors, as increases and decreases in consumer spending, business expansions and construction starts generally correlate to volumes of waste generated and our revenues. Negative economic conditions, in addition to competitor actions, can make it more challenging to negotiate, renew or expand service contracts with acceptable margins and customers may reduce their service needs. General economic factors and the market for consumer goods, in addition to regulatory developments, can also significantly impact commodity prices for recyclable materials we sell. Our operating expenses are directly impacted by volume levels; as volume levels shift, due to economic and other factors, we must manage our network capacity and cost structure accordingly.

The generally favorable macro-economic environment, including steady spending by consumers and businesses and construction starts, has benefited our volume growth and gross margins in recent quarters. We are not expecting any significant shift in the near term, but there is increased market volatility and uncertainty about longer-term macro-economic indicators. Disruptions in the global movement of recycling commodities, due in part to actions by the Chinese government, resulted in significantly lower average markets prices in 2018 compared to 2017; however, we currently expect market price declines for recycling commodities to moderate in 2019. The recycling industry is continuing to adapt to the heightened quality standards and regulations. In addition, we are also focusing on managing processing costs, developing alternative markets and educating customers to reduce contamination in the recycling stream.

Current Year Financial Results

During 2018, we continued to produce strong operating results from our Traditional Solid Waste business, driven by strong yield and volume growth in our collection and disposal business. Net income and earnings per diluted share both increased primarily as a result of the strong operating results from our Traditional Solid Waste business as well as the favorable impact on our effective tax rate due to enactment of tax reform. The Company continued its commitment to supporting both organic and inorganic growth during 2018, allocating $1,694 million of available cash to capital expenditures and $466 million to the acquisition of solid waste businesses. We also allocated $1,806 million to our shareholders during 2018 through common stock repurchases and dividends.

Key items of our 2018 financial results include:

- Revenues of $14,914 million for 2018 compared with $14,485 million in 2017, an increase of $429 million, or 3.0%. This increase is primarily attributable to (i) higher volumes due to improving market conditions; (ii) increased yield in our collection and disposal business and (iii) increased recycling brokerage volumes, partially offset by (i) lower market prices for recycling commodities and (ii) fluctuations in foreign currency and other;
- Operating expenses of $9,249 million in 2018, or 62.0% of revenues, compared with $9,021 million, or 62.3% of revenues, in 2017. This increase of $228 million is primarily attributable to higher volumes and cost inflation in the current year period, partially offset by (i) changes in accounting for rebates and certain franchise fees required by the adoption of ASU 2014-09 and (ii) decreased cost of goods sold due to lower market prices for recycling commodities;
- Selling, general and administrative expenses of $1,453 million in 2018, or 9.7% of revenues, compared with $1,468 million, or 10.1% of revenues, in 2017. This decrease of $15 million is primarily attributable to lower incentive compensation accruals partially offset by increased professional fees and bad debt expense;
- Income from operations of $2,789 million, or 18.7% of revenues, in 2018 compared with $2,636 million, or 18.2% of revenues, in 2017, an increase of $153 million;
- Net income attributable to Waste Management, Inc. of $1,925 million, or $4.45 per diluted share, for 2018 as compared with $1,949 million, or $4.41 per diluted share, for 2017. The comparability is impacted by an increase in the effective income tax rate in the current year period of 19% compared with 11% in the prior year period primarily due to the one-time impacts associated with enactment of tax reform in late 2017. The current year was favorably impacted by (i) improved operating results in our Traditional Solid Waste business and (ii) net gains associated with the sale of certain hauling and ancillary operations. Partially offsetting these increases was lower earnings from our recycling line of business due to lower market prices for recycling commodities and the impairment of a landfill;
- Net cash provided by operating activities was $3,570 million in 2018 compared with $3,180 million in 2017; and
- Free cash flow was $2,084 million in 2018 compared with $1,770 million in 2017. The $314 million increase was a result of (i) higher earnings from our Traditional Solid Waste business; (ii) lower income tax payments associated with enactment of tax reform in late 2017 and timing of income tax payments and (iii) divestitures of certain hauling and ancillary operations partially offset by higher capital expenditures to support organic growth in our business. Free cash flow is a non-GAAP measure of liquidity. Refer to *Free Cash Flow* below for our definition of free cash flow, additional information about our use of this measure, and a reconciliation to net cash provided by operating activities, which is the most comparable GAAP measure.

Results of Operations

Operating Revenues

Our operating revenues set forth below are primarily generated from fees charged for our collection, transfer, disposal, and recycling and resource recovery services, and from sales of commodities by our recycling and landfill gas-to-energy operations. We also provide additional services that are not managed through our Solid Waste business, including both our WMSBS and EES organizations, recycling brokerage services, landfill gas-to-energy services and certain other

expanded service offerings and solutions. These operations are presented in our "Other" segment in the table below. The following table summarizes revenues during the years ended December 31 (in millions):

	2018	2017	2016
Solid Waste	$ 15,537	$ 14,832	$ 13,968
Other	2,487	2,538	2,278
Intercompany	(3,110)	(2,885)	(2,637)
Total	$ 14,914	$ 14,485	$ 13,609

The mix of operating revenues from our major lines of business is reflected in the table below for the years ended December 31 (in millions):

	2018	2017	2016
Commercial	$ 3,972	$ 3,714	$ 3,480
Residential	2,529	2,528	2,487
Industrial	2,773	2,583	2,412
Other	450	439	423
Total collection	9,724	9,264	8,802
Landfill	3,560	3,370	3,110
Transfer	1,711	1,591	1,512
Recycling	1,293	1,432	1,221
Other (a)	1,736	1,713	1,601
Intercompany (b)	(3,110)	(2,885)	(2,637)
Total	$ 14,914	$ 14,485	$ 13,609

(a) The "Other" line of business includes (i) our WMSBS organization; (ii) our landfill gas-to-energy operations; (iii) certain services within our EES organization, including our construction and remediation services and our services associated with the disposal of fly ash and (iv) certain other expanded service offerings and solutions. In addition, our "Other" line of business reflects the results of non-operating entities that provide financial assurance and self-insurance support, net of intercompany activity.

(b) Intercompany revenues between lines of business are eliminated in the Consolidated Financial Statements included within this report.

The following table provides details associated with the period-to-period change in revenues and average yield (dollars in millions):

	2018 vs. 2017				2017 vs. 2016			
	Amount	As a % of Related Business(a)	Amount	As a % of Total Company(b)	Amount	As a % of Related Business(a)	Amount	As a % of Total Company(b)
Collection and disposal	$ 291	2.3 %			$ 241	2.0 %		
Recycling commodities	(273)	(19.1)			237	20.1		
Fuel surcharges and mandated fees	111	21.3			73	16.3		
Total average yield (c)			$ 129	0.9 %			$ 551	4.1 %
Volume			478	3.3			289	2.1
Internal revenue growth			607	4.2			840	6.2
Acquisitions			199	1.4			48	0.3
Divestitures			(133)	(0.9)			(27)	(0.2)
Foreign currency translation and other			(244)	(1.7)			15	0.1
Total			$ 429	3.0 %			$ 876	6.4 %

(a) Calculated by dividing the increase or decrease for the current year by the prior year's related business revenue adjusted to exclude the impacts of divestitures for the current year.

(b) Calculated by dividing the increase or decrease for the current year by the prior year's total Company revenue adjusted to exclude the impacts of divestitures for the current year.

(c) The amounts reported herein represent the changes in our revenue attributable to average yield for the total Company.

The following provides further details about our period-to-period change in revenues:

Average Yield

Collection and Disposal Average Yield — This measure reflects the effect on our revenue from the pricing activities of our collection, transfer and landfill operations, exclusive of volume changes. Revenue growth from collection and disposal average yield includes not only base rate changes and environmental and service fee increases, but also (i) certain average price changes related to the overall mix of services, which are due to the types of services provided; (ii) changes in average price from new and lost business and (iii) price decreases to retain customers.

Revenue growth from collection and disposal average yield was $291 million, or 2.3%, and $241 million, or 2.0%, for the years ended December 31, 2018 and 2017, respectively. We experienced growth in yield for all of our collection and disposal lines of business in both 2018 and 2017. The period-to-period changes are as follows (dollars in millions):

	2018 vs. 2017		2017 vs. 2016	
	Amount	As a % of Related Business	Amount	As a % of Related Business
Commercial	$ 99	2.9 %	$ 99	3.0 %
Industrial	107	4.4	69	3.1
Residential	47	1.9	44	1.8
Total collection	253	2.9	212	2.6
Landfill	22	1.1	17	0.9
Transfer	16	1.9	12	1.5
Total collection and disposal	$ 291	2.3 %	$ 241	2.0 %

Our increase in collection and disposal yield for the years ended December 31, 2018 and 2017, compared with the prior years, includes increased revenues from our environmental fees of $74 million and $67 million, respectively.

Recycling Commodities — Fluctuations in the market prices for recycling commodities resulted in revenue decline of $273 million and revenue growth of $237 million for the years ended December 31, 2018 and 2017, respectively, as compared with the prior years. Disruptions in the global movement of recycling commodities began in September 2017 and continued throughout 2018. Average market prices for recycling commodities at the Company's facilities were 40% lower in 2018 compared to 2017. We currently expect market prices for recycling commodities to moderate in 2019.

Fuel Surcharges and Mandated Fees — These revenues, which are predominantly generated by our fuel surcharge program, increased $111 million and $73 million for the years ended December 31, 2018 and 2017, respectively, as compared with the prior years. These revenues fluctuate in response to changes in the national average prices for diesel fuel on which our surcharge is based. Market prices for diesel fuel increased 20% and 15% for the years ended December 31, 2018 and 2017, respectively, compared with the prior years. The mandated fees included in this line item are primarily related to fees and taxes assessed by various state, county and municipal government agencies at our landfills and transfer stations where we are the primary obligor in the contractual arrangement.

Volume

Our revenues from volume increased $478 million, or 3.3%, and $289 million, or 2.1%, for the years ended December 31, 2018 and 2017, respectively, as compared with the prior years. The comparison does not include volumes from acquisitions.

We experienced higher volumes throughout 2018 and 2017 due to our focus on customer service and disciplined growth, combined with favorable market conditions in our Traditional Solid Waste business. We have experienced significant volume growth with existing customers, particularly in our commercial collection business. The volume growth is the result of proactive efforts taken to work with our customers as their businesses expand and grow to identify service upgrade opportunities. Contributors to our volume increase in both 2018 and 2017 included a large new contract addition in the second half of 2017 that continued to favorably impact volume growth for our commercial collection business into 2018. Additionally, a large contract executed in the second half of 2017 increased our volumes at our transfer stations with incremental volume additions during 2018 that will continue to favorably impact our volumes into 2019. The clean-up efforts of natural disasters throughout the U.S. in the second half of 2017 favorably affected our landfill volumes primarily in the fourth quarter of 2017 as compared with 2016 but negatively impacted the comparability of volumes for 2018. Furthermore, our WMSBS organization experienced favorable volume growth in both 2018 and 2017.

Additionally, a volume increase from our recycling brokerage services affected the comparability of volumes for 2018 and 2017. Drivers affecting the comparability of volumes for 2017 and 2016 included a volume increase from an eleven-month outage at a waste-to-energy facility in Virginia that ended in mid-December 2017 offset, in part, by one less workday in 2017 that negatively impacted our volume growth.

Foreign Currency Translation and Other

Fluctuations in foreign currency affect revenues from our Canadian operations. We also experienced revenue decline associated with the adoption of ASU 2014-09 and other changes. See Notes 2 and 3 to the Consolidated Financial Statements for further discussion.

Operating Expenses

Our operating expenses are comprised of (i) labor and related benefits costs (excluding labor costs associated with maintenance and repairs discussed below), which include salaries and wages, bonuses, related payroll taxes, insurance and benefits costs and the costs associated with contract labor; (ii) transfer and disposal costs, which include tipping fees paid to third-party disposal facilities and transfer stations; (iii) maintenance and repairs costs relating to equipment, vehicles and facilities and related labor costs; (iv) subcontractor costs, which include the costs of independent haulers who transport waste collected by us to disposal facilities and are affected by variables such as volumes, distance and fuel prices; (v) costs of goods sold, which includes the cost to purchase recycling materials for our recycling line of business, including certain rebates paid to suppliers; (vi) fuel costs, which represent the costs of fuel and oil to operate our truck fleet and landfill

operating equipment; (vii) disposal and franchise fees and taxes, which include landfill taxes, municipal franchise fees, host community fees, contingent landfill lease payments and royalties; (viii) landfill operating costs, which include interest accretion on landfill liabilities, interest accretion on and discount rate adjustments to environmental remediation liabilities and recovery assets, leachate and methane collection and treatment, landfill remediation costs and other landfill site costs; (ix) risk management costs, which include general liability, automobile liability and workers' compensation claims programs costs and (x) other operating costs, which include gains and losses on sale of assets, telecommunications, equipment and facility lease expenses, property taxes, utilities and supplies.

The following table summarizes the major components of our operating expenses for the years ended December 31 (dollars in millions):

	2018	Period-to-Period Change		2017	Period-to-Period Change		2016
Labor and related benefits	$2,703	$ 203	8.1 %	$2,500	$ 90	3.7 %	$2,410
Transfer and disposal costs	1,105	109	10.9	996	22	2.3	974
Maintenance and repairs	1,255	85	7.3	1,170	94	8.7	1,076
Subcontractor costs	1,375	139	11.2	1,236	43	3.6	1,193
Cost of goods sold	783	(186)	(19.2)	969	111	12.9	858
Fuel	409	34	9.1	375	75	25.0	300
Disposal and franchise fees and taxes	598	(155)	(20.6)	753	51	7.3	702
Landfill operating costs	331	3	0.9	328	(24)	(6.8)	352
Risk management	235	16	7.3	219	27	14.1	192
Other	455	(20)	(4.2)	475	46	10.7	429
	$9,249	$ 228	2.5 %	$9,021	$ 535	6.3 %	$8,486
Percentage of revenues	62.0 %			62.3 %			62.4 %

The increase in volumes in the current year periods, as discussed above in *Operating Revenues*, affect the comparability of operating expenses for the periods presented. In addition, cost inflation affects the comparability of operating expenses particularly between 2018 and 2017.

Other significant items affecting the comparison of operating expenses between reported periods include:

Labor and Related Benefits — The increase in labor and related benefits costs in 2018 as compared with 2017 was driven by (i) volume growth in our collection line of business; (ii) a bonus plan established in early 2018 targeted at improving employee retention and (iii) merit increases. The increase in labor and related benefits costs in 2017 as compared with 2016 was due to (i) merit increases; (ii) increased headcount driven by higher volumes and (iii) charges for the withdrawal from certain underfunded Multiemployer Pension Plans. These cost increases were partially offset by one less workday in 2017.

Maintenance and Repairs — The increase in maintenance and repairs costs in 2018 and 2017 as compared with the prior year periods was primarily driven by (i) higher labor costs from volume growth and cost inflation and (ii) higher third-party service and parts costs.

Cost of Goods Sold — The decrease in cost of goods sold in 2018 as compared with 2017 was primarily driven by (i) lower market prices for recycling commodities and (ii) a change in accounting for certain customer rebates due to the adoption of ASU 2014-09 in the current year period. See Notes 2 and 3 to the Consolidated Financial Statements for further discussion of ASU 2014-09. The increase in cost of goods sold in 2017 as compared with 2016 was due to higher market prices for recycling commodities, partially offset by lower costs due to (i) continued efforts to restructure recycling rebates paid to customers and (ii) the divestiture of a majority-owned organics company in 2016.

Fuel — The increase in fuel costs in 2018 as compared with 2017 was due to higher market prices for diesel fuel, partially offset by the recognition of a $28 million benefit from the extension of federal natural gas fuel credits. We recognized the benefit in the first quarter of 2018 when the legislation was passed, though the credits relate to 2017 business

activity and these credits were not extended into 2018. The increase in fuel costs in 2017 as compared with 2016 was primarily due to (i) higher market prices for diesel fuel; (ii) the expiration of certain natural gas fuel excise tax credits as of December 31, 2016 and (iii) higher volumes in our collection line of business. These cost increases were partially offset by (i) lower costs resulting from the continued conversion of our fleet to natural gas vehicles and (ii) reduced fuel consumption due to efficiency gains in the routing of our fleet.

Disposal and Franchise Fees and Taxes — The decrease in disposal and franchise fees and taxes in 2018 as compared with 2017 was driven by the adoption of ASU 2014-09 in the current year period; specifically, certain franchise fees were treated as disposal fees and taxes in the prior year periods and are treated as a reduction in operating revenues in the current year period. See Notes 2 and 3 to the Consolidated Financial Statements for further discussion of ASU 2014-09. The increase in disposal and franchise fees and taxes in 2017 as compared with 2016 is primarily due to higher landfill volumes and increased municipal franchise fees.

Risk Management — The increase in risk management costs in 2018 and 2017 was primarily due to increases in losses within our self-insured retention.

Other — The decrease in other operating costs in 2018 as compared with 2017 was primarily driven by net gains on sales of certain assets in the current year period. The increase in other operating costs in 2017 as compared with 2016 was principally driven by favorable adjustments to our contingent consideration liabilities associated with certain acquisitions in 2016 and higher operating lease expenses in 2017.

Selling, General and Administrative Expenses

Our selling, general and administrative expenses consist of (i) labor and related benefits costs, which include salaries, bonuses, related insurance and benefits, contract labor, payroll taxes and equity-based compensation; (ii) professional fees, which include fees for consulting, legal, audit and tax services; (iii) provision for bad debts, which includes allowances for uncollectible customer accounts and collection fees and (iv) other selling, general and administrative expenses, which include, among other costs, facility-related expenses, voice and data telecommunication, advertising, bank charges, computer costs, travel and entertainment, rentals, postage and printing. In addition, the financial impacts of litigation settlements generally are included in our "Other" selling, general and administrative expenses.

The following table summarizes the major components of our selling, general and administrative expenses for the years ended December 31 (dollars in millions):

	2018	Period-to-Period Change		2017	Period-to-Period Change		2016
Labor and related benefits	$ 957	$ (43)	(4.3)%	$1,000	$ 32	3.3 %	$ 968
Professional fees	113	11	10.8	102	5	5.2	97
Provision for bad debts	53	11	26.2	42	2	5.0	40
Other	330	6	1.9	324	19	6.2	305
	$1,453	$ (15)	(1.0)%	$1,468	$ 58	4.1 %	$1,410
Percentage of revenues	9.7 %			10.1 %			10.4 %

Significant items affecting the comparison of our selling, general and administrative expenses between reported periods include:

Labor and Related Benefits — The decrease in labor and related benefits costs in 2018 compared with 2017 was primarily due to (i) lower incentive compensation accruals in the current year period and (ii) severance costs for former executives incurred in 2017 partially offset by merit increases and a bonus plan established in early 2018 targeted at improving employee retention. The increase in labor and related benefits costs in 2017 compared with 2016 was primarily due to (i) merit increases; (ii) higher incentive compensation accruals and (iii) higher severance costs for former executives in 2017.

Professional Fees — The increase in professional fees in 2018 compared with 2017 was primarily due to the investments we are making in technology to improve our operations and our customer service and higher legal fees.

Provision for Bad Debts — Our provision for bad debts increased in 2018 compared with 2017 primarily due to (i) an increase in revenues and (ii) the bankruptcy of a strategic customer in our WMSBS organization.

Other — The increase in other expenses in 2018 compared with 2017 was primarily due to higher litigation settlements in 2018, which were partially offset by lower costs associated with advertising and travel and entertainment as we continued to focus on controlling costs. The increase in other expenses in 2017 compared with 2016 was primarily due to favorable litigation settlements in 2016 and charitable contributions made for hurricane relief efforts in 2017.

Depreciation and Amortization Expenses

The following table summarizes the components of our depreciation and amortization expenses for the years ended December 31 (dollars in millions):

	2018	Period-to-Period Change		2017	Period-to-Period Change		2016
Depreciation of tangible property and equipment	$ 838	$ 55	7.0 %	$ 783	$ 10	1.3 %	$ 773
Amortization of landfill airspace	538	41	8.2	497	69	16.1	428
Amortization of intangible assets	101	5	5.2	96	(4)	(4.0)	100
	$1,477	$ 101	7.3 %	$1,376	$ 75	5.8 %	$1,301
Percentage of revenues	9.9 %			9.5 %			9.6 %

The increase in depreciation of tangible property and equipment during 2018 as compared to 2017 is primarily due to increased capital expenditures to support organic growth in our business. The increase in amortization of landfill airspace during 2018 and 2017 as compared with the prior year periods is primarily due to higher volumes at our landfills and changes in our landfill estimates.

(Gain) Loss from Divestitures, Asset Impairments and Unusual Items, Net

The following table summarizes the major components of (gain) loss from divestitures, asset impairments and unusual items, net for the years ended December 31 (in millions):

	2018	2017	2016
(Gain) loss from divestitures	$ (96)	$ (38)	$ 9
Asset impairments	38	41	59
Other	—	(19)	44
	$ (58)	$ (16)	$ 112

During the year ended December 31, 2018, we recognized net gains of $58 million, primarily related to (i) a $52 million gain associated with the sale of certain hauling operations in Tier 1 and (ii) net gains of $44 million substantially all from divestitures of certain ancillary operations. These gains were partially offset by (i) a $30 million charge to impair a landfill in Tier 3 based on an internally developed discounted projected cash flow analysis, taking into account continued volume decreases and revised capping cost estimates and (ii) $8 million of impairment charges primarily related to our LampTracker® reporting unit.

During the year ended December 31, 2017, we recognized net gains of $16 million, primarily related to (i) gains of $31 million from the sale of certain oil and gas producing properties and (ii) a $30 million reduction in post-closing, performance-based contingent consideration obligations associated with an acquired business in our EES organization. These gains were partially offset by (i) $34 million of goodwill impairment charges primarily related to our EES organization; (ii) $11 million of charges to adjust our subsidiary's estimated potential share of an environmental

remediation liability and related costs for a closed site in Harris County, Texas, as discussed in Note 10 to the Consolidated Financial Statements and (iii) $7 million of charges to write down certain renewable energy assets.

During the year ended December 31, 2016, we recognized net charges of $112 million, primarily related to (i) $44 million of charges to adjust our subsidiary's estimated potential share of an environmental remediation liability and related costs for a closed site in Harris County, Texas, as discussed in Note 10 to the Consolidated Financial Statements; (ii) a $43 million charge to impair a landfill in Tier 3 due to a loss of expected volumes; (iii) $12 million of goodwill impairment charges primarily related to our LampTracker® reporting unit and (iv) an $8 million loss on the sale of a majority-owned organics company.

See Note 3 to the Consolidated Financial Statements for additional information related to the accounting policy and analysis involved in identifying and calculating impairments.

Income from Operations

The following table summarizes income from operations for the years ended December 31 (dollars in millions):

	2018	Period-to-Period Change		2017	Period-to-Period Change		2016
Solid Waste:							
Tier 1	$ 1,642	$ 104	6.8 %	$ 1,538	$ 108	7.6 %	$ 1,430
Tier 2	542	(10)	(1.8)	552	30	5.7	522
Tier 3	1,211	12	1.0	1,199	205	20.6	994
Solid Waste	3,395	106	3.2	3,289	343	11.6	2,946
Other	(66)	2	(2.9)	(68)	32	(32.0)	(100)
Corporate and Other	(540)	45	(7.7)	(585)	(35)	6.4	(550)
Total	$ 2,789	$ 153	5.8 %	$ 2,636	$ 340	14.8 %	$ 2,296
Percentage of revenues	18.7 %			18.2 %			16.9 %

Our segments are discussed further in Note 19 to the Consolidated Financial Statements.

Solid Waste — The most significant items affecting the results of operations of our Solid Waste business during the three years ended December 31, 2018 are summarized below:

The following items affected both comparable periods:

- Our Solid Waste business benefited from internal revenue growth offset, in part, by merit increases and increased maintenance and repair costs.

In addition, the following items affected 2018 when compared with 2017:

- Our income from operations for our Solid Waste business benefited from certain federal natural gas fuel credits in the first quarter of 2018 and was negatively impacted by (i) lower market prices for recycling commodities; (ii) higher operating costs, including a bonus plan established in early 2018 targeted at improving employee retention and (iii) increased depreciation and amortization expenses to support growth of our business. During 2018, Tier 1 also benefited from the divestiture of certain hauling operations and Tier 3 was negatively impacted by an impairment of a landfill.

In addition, the following items affected 2017 when compared with 2016:

- Our Solid Waste business benefited from (i) higher market prices for recycling commodities; (ii) decreased landfill leachate management costs in Tier 3 and (iii) an impairment charge for a landfill in Tier 3 in 2016. However, our income from operations was negatively impacted by (i) charges for the withdrawal from certain underfunded Multiemployer Pension Plans, primarily in Tier 3 and (ii) increased landfill amortization expense related to higher volumes at our landfills and changes in our landfill estimates, primarily in Tier 3.

Other — In 2018 compared with 2017, our Other segment benefited from net gains from divestitures of certain ancillary operations and improved results in our EES and WM Renewable Energy businesses, partially offset by higher risk management costs. A reduction in contingent consideration obligations in our EES business favorably affected 2017 when compared with 2016.

Corporate and Other — Corporate and other was affected by charges in 2016, and to a lesser extent in 2017, to adjust our subsidiary's estimated potential share of an environmental remediation liability and related costs for a closed site in Harris County, Texas.

In addition, the following items affected 2018 when compared with 2017:

- Decreased expenses in 2018 as a result of lower incentive compensation accruals and severance costs for former executives incurred in 2017. These decreases were offset, in part, by higher professional fees primarily due to the investments we are making in technology to improve our operations and our customer service in 2018.

In addition, the following items affected 2017 when compared with 2016:

- Increased expenses in 2017 as a result of higher incentive compensation accruals and severance costs. These increases were offset, in part, by a favorable litigation settlement in 2016.

Interest Expense, Net

Our interest expense, net was $374 million, $363 million and $376 million in 2018, 2017 and 2016, respectively. Our 2017 interest expense benefited from higher capitalized interest on certain projects under development and the early repayment of high-coupon senior notes and issuance of new senior notes at lower coupon interest rates in 2017.

Equity in Net Losses of Unconsolidated Entities

We recognized equity in net losses of unconsolidated entities of $41 million, $68 million and $44 million in 2018, 2017 and 2016, respectively. The amount in 2017 includes impairment charges of $29 million to write down equity method investments in waste diversion technology companies to their estimated fair values. The remaining losses for each period are primarily related to our noncontrolling interests in entities established to invest in and manage low-income housing properties and a refined coal facility. We generate tax benefits, including tax credits, from the losses incurred from these investments, which are discussed further in Note 8 to the Consolidated Financial Statements.

Other, Net

We recognized other, net income of $2 million in 2018 compared to other, net expense of $14 million and $54 million in 2017 and 2016, respectively. The expenses for 2017 and 2016 were impacted by impairment charges of $11 million and $42 million, respectively, related to other-than-temporary declines in the value of minority-owned investments in waste diversion technology companies. In addition, we also recognized (i) $8 million of expense during 2016 associated with the termination of our cross-currency swaps, which is discussed further in Note 7 to the Consolidated Financial Statements and (ii) a loss on early extinguishment of debt of $6 million and $4 million in 2017 and 2016, respectively.

Income Tax Expense

We recorded income tax expense of $453 million, $242 million and $642 million in 2018, 2017 and 2016, respectively, resulting in effective income tax rates of 19.0%, 11.0% and 35.2% for the years ended December 31, 2018, 2017 and 2016, respectively. The comparability of our income tax expense for the reported periods has been primarily affected by the following:

- *Enactment of Tax Reform* — For the year ended December 31, 2018, we recognized measurement period adjustments related to enactment of the Tax Cuts and Jobs Act primarily due to the filing of our income tax returns resulting in a reduction in our income tax expense of $12 million. The reduction consisted of a net income tax benefit of (i) $7 million for the remeasurement of our deferred income tax assets and liabilities and other reserves

due to the decrease in the federal corporate income tax rate and (ii) a $5 million adjustment for the one-time, mandatory transition tax. For the year ended December 31, 2017, we recognized a reduction in our income tax expense of $529 million consisting of a net tax benefit of $595 million for the initial remeasurement of our deferred income tax assets and liabilities due to the decrease in the federal corporate income tax rate, partially offset by income tax expense of $66 million for the one-time, mandatory transition tax.

- *Other Adjustments* – We recognized reductions in our income tax expense of $92 million, $7 million and $21 million for the years ended December 31, 2018, 2017 and 2016, respectively, associated with adjustments to accruals and related deferred taxes and tax audit settlements.

See Note 8 to the Consolidated Financial Statements for more information related to income taxes.

Landfill and Environmental Remediation Discussion and Analysis

We owned or operated 247 solid waste and five secure hazardous waste landfills as of December 31, 2018 and 244 solid waste and five secure hazardous waste landfills as of December 31, 2017. For these landfills, the following table reflects changes in capacity, as measured in tons of waste, for the years ended December 31 and remaining capacity, measured in cubic yards of waste, as of December 31 (in millions):

	2018			2017		
	Remaining Permitted Capacity	Expansion Capacity	Total Capacity	Remaining Permitted Capacity	Expansion Capacity	Total Capacity
Balance as of beginning of year (in tons)	4,799	186	4,985	4,754	219	4,973
Acquisitions, divestitures, newly permitted landfills and closures	5	—	5	6	—	6
Changes in expansions pursued (a)	—	72	72	—	65	65
Expansion permits granted (b)	42	(42)	—	98	(98)	—
Airspace consumed	(116)	—	(116)	(112)	—	(112)
Changes in engineering estimates and other (c)	32	4	36	53	—	53
Balance as of end of year (in tons)	4,762	220	4,982	4,799	186	4,985
Balance as of end of year (in cubic yards)	4,735	194	4,929	4,815	169	4,984

(a) Amounts reflected here relate to the combined impacts of (i) new expansions pursued; (ii) increases or decreases in the airspace being pursued for ongoing expansion efforts; (iii) adjustments for differences between the airspace being pursued and airspace granted and (iv) decreases due to decisions to no longer pursue expansion permits, if any.

(b) We received expansion permits at six of our landfills during 2018 and nine of our landfills during 2017, demonstrating our continued success in working with municipalities and regulatory agencies to expand the disposal capacity of our existing landfills.

(c) Changes in engineering estimates can result in changes to the estimated available remaining capacity of a landfill or changes in the utilization of such landfill capacity, affecting the number of tons that can be placed in the future. Estimates of the amount of waste that can be placed in the future are reviewed annually by our engineers and are based on a number of factors, including standard engineering techniques and site-specific factors such as current and projected mix of waste type; initial and projected waste density; estimated number of years of life remaining; depth of underlying waste; anticipated access to moisture through precipitation or recirculation of landfill leachate and operating practices. We continually focus on improving the utilization of airspace through efforts that may include recirculating landfill leachate where allowed by permit; optimizing the placement of daily cover materials and increasing initial compaction through improved landfill equipment, operations and training.

The tons received at our landfills are shown below (tons in thousands):

	2018			2017		
	# of Sites	Total Tons	Tons per Day	# of Sites	Total Tons	Tons per Day
Solid waste landfills	247 (a)	115,972	426	244	112,849	415
Hazardous waste landfills	5	739	3	5	584	2
	252	116,711	429	249	113,433	417
Solid waste landfills closed, divested or contract expired during related year	1	424		1	139	
		117,135 (b)			113,572 (b)	

(a) In 2018, we acquired four landfills and closed one landfill.

(b) These amounts include 1.5 million tons and 1.8 million tons as of December 31, 2018 and 2017, respectively, that were received at our landfills but were used for beneficial purposes and generally were redirected from the permitted airspace to other areas of the landfill. Waste types that are frequently identified for beneficial use include green waste for composting and clean dirt for on-site construction projects.

When a landfill we own or operate receives certification of closure from the applicable regulatory agency, we generally transfer the management of the site, including any remediation activities, to our environmental legacy management group. As of December 31, 2018, our environmental legacy management group managed 207 closed landfills.

Based on remaining permitted airspace as of December 31, 2018 and projected annual disposal volumes, the weighted average remaining landfill life for all of our owned or operated landfills is approximately 41 years. Many of our landfills have the potential for expanded disposal capacity beyond what is currently permitted. We monitor the availability of permitted disposal capacity at each of our landfills and evaluate whether to pursue an expansion at a given landfill based on estimated future waste volumes, disposal prices, construction and operating costs, remaining capacity and likelihood of obtaining an expansion permit. We are seeking expansion permits at 15 of our landfills that meet the expansion criteria outlined in the *Critical Accounting Estimates and Assumptions — Landfills* section below. Although no assurances can be made that all future expansions will be permitted or permitted as designed, the weighted average remaining landfill life for all owned or operated landfills is approximately 43 years when considering remaining permitted airspace, expansion airspace and projected annual disposal volume.

The number of landfills owned or operated as of December 31, 2018, segregated by their estimated operating lives based on remaining permitted and expansion capacity and projected annual disposal volume, was as follows:

	# of Landfills
0 to 5 years	30
6 to 10 years	16
11 to 20 years	35
21 to 40 years	68
41+ years	103
Total	252 (a)

(a) Of the 252 landfills, 204 are owned, 35 are operated under lease agreements and 13 are operated under other contractual agreements. For the landfills not owned, we are usually responsible for final capping, closure and post-closure obligations.

As of December 31, 2018, we have 16 landfills which are not currently accepting waste. During the year ended December 31, 2018, we performed tests of recoverability for seven of these landfills with an aggregate net recorded capitalized landfill asset cost of $270 million, for which the undiscounted expected future cash flows resulting from our

probability-weighted estimation approach exceeded the carrying values. We did not perform recoverability tests for the remaining nine landfills as the net recorded capitalized landfill asset cost was not material.

Landfill Assets — We capitalize various costs that we incur to prepare a landfill to accept waste. These costs generally include expenditures for land (including the landfill footprint and required landfill buffer property), permitting, excavation, liner material and installation, landfill leachate collection systems, landfill gas collection systems, environmental monitoring equipment for groundwater and landfill gas, directly related engineering, capitalized interest, and on-site road construction and other capital infrastructure costs. The cost basis of our landfill assets also includes estimates of future costs associated with landfill final capping, closure and post-closure activities, which are discussed further below.

The changes to the cost basis of our landfill assets and accumulated landfill airspace amortization for the year ended December 31, 2018 are reflected in the table below:

	Cost Basis of Landfill Assets	Accumulated Landfill Airspace Amortization	Landfill Assets
December 31, 2017	$ 14,904	$ (8,788)	$ 6,116
Capital additions	513	—	513
Asset retirement obligations incurred and capitalized	83	—	83
Acquisitions	2	—	2
Amortization of landfill airspace	—	(538)	(538)
Foreign currency translation	(89)	35	(54)
Asset retirements and other adjustments	(173)	134	(39)
December 31, 2018	$ 15,240	$ (9,157)	$ 6,083

As of December 31, 2018, we estimate that we will spend approximately $600 million in 2019, and approximately $1.25 billion in 2020 and 2021 combined, for the construction and development of our landfill assets. The specific timing of landfill capital spending is dependent on future events and spending estimates are subject to change due to fluctuations in landfill waste volumes, changes in environmental requirements and other factors impacting landfill operations.

Landfill and Environmental Remediation Liabilities — As we accept waste at our landfills, we incur significant asset retirement obligations, which include liabilities associated with landfill final capping, closure and post-closure activities. These liabilities are accounted for in accordance with authoritative guidance on accounting for asset retirement obligations and are discussed in Note 3 to the Consolidated Financial Statements. We also have liabilities for the remediation of properties that have incurred environmental damage, which generally was caused by operations or for damage caused by conditions that existed before we acquired operations or a site. We recognize environmental remediation liabilities when we determine that the liability is probable and the estimated cost for the likely remedy can be reasonably estimated.

The changes to landfill and environmental remediation liabilities for the year ended December 31, 2018 are reflected in the table below (in millions):

	Landfill	Environmental Remediation
December 31, 2017	$ 1,675	$ 251
Obligations incurred and capitalized	83	—
Obligations settled	(108)	(26)
Interest accretion	95	5
Revisions in estimates and interest rate assumptions (a) (b)	(3)	9
Acquisitions, divestitures and other adjustments (c)	18	(2)
December 31, 2018	$ 1,760	$ 237

(a) The amount reported for our landfill liabilities includes a net decrease of $15 million primarily related to our year-end annual review of landfill final capping, closure and post-closure obligations partially offset by an increase of

$12 million due to the acceleration of the expected timing of capping activities for a landfill. See Note 11 to the Consolidated Financial Statements for discussion of the impairment charge related to this landfill.

(b) The amount reported for our environmental remediation liabilities includes changes in cost estimates associated with environmental remediation projects resulting in an increase in the required obligation. These charges were partially offset by a decrease of $3 million in our environmental remediation liabilities due to an increase in the risk-free discount rate used to measure our liabilities from 2.5% at December 31, 2017 to 2.75% at December 31, 2018.

(c) The amount reported for our landfill liabilities includes an increase of $27 million due to landfill acquisitions partially offset by landfill divestitures and other adjustments.

Landfill Operating Costs — The following table summarizes our landfill operating costs for the years ended December 31 (in millions):

	2018	2017	2016
Interest accretion on landfill liabilities	$ 95	$ 92	$ 91
Interest accretion on and discount rate adjustments to environmental remediation liabilities and recovery assets	(2)	3	—
Leachate and methane collection and treatment	150	143	176
Landfill remediation costs	13	14	15
Other landfill site costs	75	76	70
Total landfill operating costs	$ 331	$ 328	$ 352

Amortization of Landfill Airspace — Amortization of landfill airspace, which is included as a component of depreciation and amortization expenses, includes the following:

- the amortization of landfill capital costs, including (i) costs that have been incurred and capitalized and (ii) estimated future costs for landfill development and construction required to develop our landfills to their remaining permitted and expansion airspace; and
- the amortization of asset retirement costs arising from landfill final capping, closure and post-closure obligations, including (i) costs that have been incurred and capitalized and (ii) projected asset retirement costs.

Amortization expense is recorded on a units-of-consumption basis, applying cost as a rate per ton. The rate per ton is calculated by dividing each component of the amortizable basis of a landfill by the number of tons needed to fill the corresponding asset's airspace. Landfill capital costs and closure and post-closure asset retirement costs are generally incurred to support the operation of the landfill over its entire operating life and are, therefore, amortized on a per-ton basis using a landfill's total airspace capacity. Final capping asset retirement costs are related to a specific final capping event and are, therefore, amortized on a per-ton basis using each discrete final capping event's estimated airspace capacity. Accordingly, each landfill has multiple per-ton amortization rates.

The following table presents our landfill airspace amortization expense on a per-ton basis for the years ended December 31:

	2018	2017	2016
Amortization of landfill airspace (in millions)	$ 538	$ 497	$ 428
Tons received, net of redirected waste (in millions)	116	112	104
Average landfill airspace amortization expense per ton	$ 4.64	$ 4.44	$ 4.10

Different per-ton amortization rates are applied at each of our 252 landfills, and per-ton amortization rates vary significantly from one landfill to another due to (i) inconsistencies that often exist in construction costs and provincial, state and local regulatory requirements for landfill development and landfill final capping, closure and post-closure activities and (ii) differences in the cost basis of landfills that we develop versus those that we acquire. Accordingly, our landfill airspace amortization expense measured on a per-ton basis can fluctuate due to changes in the mix of volumes we receive across the Company each year.

Liquidity and Capital Resources

The Company consistently generates cash flow from operations that meets and exceeds its working capital needs, the payments of its dividend and investment in the business through capital expenditures and acquisitions. We continually monitor our actual and forecasted cash flows, our liquidity and our capital resources, enabling us to plan for our present needs and fund unbudgeted business activities that may arise during the year as a result of changing business conditions or new opportunities. The Company believes that its investment grade credit ratings, large value of unencumbered assets and modest leverage enable it to obtain adequate financing to meet its ongoing capital, operating and other liquidity requirements.

Summary of Cash and Cash Equivalents, Restricted Trust and Escrow Accounts and Debt Obligations

The following is a summary of our cash and cash equivalents, restricted trust and escrow accounts and debt balances as of December 31 (in millions):

	2018	2017
Cash and cash equivalents	$ 61	$ 22
Restricted trust and escrow accounts:		
Insurance reserves (a)	$ 252	$ 203
Final capping, closure, post-closure and environmental remediation funds	103	101
Other	11	15
Total restricted trust and escrow accounts	$ 366	$ 319
Debt:		
Current portion	$ 432	$ 739
Long-term portion	9,594	8,752
Total debt	$ 10,026	$ 9,491

(a) Includes $70 million as of December 31, 2018 and 2017 in other current assets in our Consolidated Balance Sheets.

We use long-term borrowings in addition to the cash we generate from operations as part of our overall financial strategy to support and grow our business. We primarily use senior notes and tax-exempt bonds to borrow on a long-term basis, but we also use other instruments and facilities, when appropriate. The components of our borrowings as of December 31, 2018 are described in Note 7 to the Consolidated Financial Statements.

Changes in our outstanding debt balances from December 31, 2017 to December 31, 2018 were primarily attributable to (i) net debt cash borrowings of $313 million; (ii) our recent federal low-income housing investment discussed in Note 8 to the Consolidated Financial Statements and new capital leases, which increased our debt obligations by $250 million and (iii) the impacts of other non-cash changes in our debt balances such as divestitures, debt issuance costs, discounts, premiums, foreign currency translation and terminated interest rate derivatives.

As of December 31, 2018, we had $1.9 billion of debt maturing within the next 12 months, including (i) $990 million of short-term borrowings under our commercial paper program; (ii) $705 million of tax-exempt bonds with term interest rate periods that expire within the next 12 months, which is prior to their scheduled maturities; (iii) $161 million of other debt with scheduled maturities within the next 12 months, including $106 million of tax-exempt bonds and (iv) C$15 million, or $11 million, of Canadian borrowings under our $2.75 billion revolving credit facility. Of the $990 million of short-term borrowings outstanding under our commercial paper program as of December 31, 2018 that are supported by our $2.75 billion revolving credit facility, we have the intent and ability to refinance or maintain approximately $730 million of these borrowings on a long-term basis, and we have classified these amounts as long-term debt. As of December 31, 2018, we have classified an additional $705 million of debt maturing in the next 12 months as long-term because we have the intent and ability to refinance these borrowings on a long-term basis as supported by the forecasted available capacity under our $2.75 billion revolving credit facility, as discussed below. The remaining $432 million of debt maturing in the next 12 months is classified as current obligations.

As of December 31, 2018, we also have $268 million of variable-rate tax-exempt bonds that are supported by letters of credit under our $2.75 billion revolving credit facility. The interest rates on our variable-rate tax-exempt bonds are generally reset on either a daily or weekly basis through a remarketing process. All recent tax-exempt bond remarketings have successfully placed Company bonds with investors at market-driven rates and we currently expect future remarketings to be successful. However, if the remarketing agent is unable to remarket our bonds, the remarketing agent can put the bonds to us. In the event of a failed remarketing, we have the availability under our $2.75 billion revolving credit facility to fund these bonds until they are remarketed successfully. Accordingly, we have also classified these borrowings as long-term in our Consolidated Balance Sheet as of December 31, 2018.

We have credit facilities in place to support our liquidity and financial assurance needs. The following table summarizes our outstanding letters of credit, categorized by type of facility as of December 31 (in millions):

	2018	2017
Revolving credit facility (a)	$ 587	$ 642
Other letter of credit facilities (b)	556	507
	$ 1,143	$ 1,149

(a) As of December 31, 2018, we had an unused and available credit capacity of $1.2 billion.

(b) As of December 31, 2018, these other letter of credit facilities are both committed and uncommitted with terms extending through December 2020.

Refinancing of Revolving Credit Facility

In June 2018, we entered into the $2.75 billion revolving credit facility, which amended and restated our prior long-term U.S. revolving credit facility. Amendments to the credit agreement included (i) increasing total capacity under the facility from $2.25 billion to $2.75 billion; (ii) establishment of a $750 million accordion feature that may be used to increase total capacity in future periods; (iii) extending the term through June 2023 and (iv) inclusion of two one-year extension options. Waste Management of Canada Corporation and WM Quebec Inc., each an indirect wholly-owned subsidiary of WM, were added as additional borrowers under the $2.75 billion revolving credit facility, and the agreement permits borrowing in Canadian dollars up to the U.S. dollar equivalent of $375 million, with such borrowings to be repaid in Canadian dollars. WM Holdings, a wholly-owned subsidiary of WM, guarantees all of the obligations under the $2.75 billion revolving credit facility.

Summary of Cash Flow Activity

The following is a summary of our cash flows for the years ended December 31 (in millions):

	2018	2017(a)	2016(a)
Net cash provided by operating activities	$ 3,570	$ 3,180	$ 3,003
Net cash used in investing activities	$ (2,169)	$ (1,620)	$ (1,929)
Net cash used in financing activities	$ (1,508)	$ (1,361)	$ (1,084)

(a) Prior year information was revised to reflect the adoption of ASU 2016-15 and ASU 2016-18 and conform to our current year presentation. See Note 2 to the Consolidated Financial Statements for further discussion.

Net Cash Provided by Operating Activities — Our operating cash flows increased by $390 million for the year ended December 31, 2018, as compared with the prior year period, as a result of (i) higher earnings from our Traditional Solid Waste business and (ii) lower income tax payments of $213 million, driven by enactment of tax reform and timing of income tax payments partially offset by lower earnings from our recycling line of business.

Our operating cash flows increased by $177 million for the year ended December 31, 2017, as compared with the prior year period, as a result of higher earnings from our Traditional Solid Waste business and recycling line of business.

This increase is partially offset by cash paid for income taxes, which was $120 million higher in 2017, largely driven by higher earnings and timing of income tax payments.

Net Cash Used in Investing Activities — The most significant items affecting the comparison of our investing cash flows for the periods presented are summarized below:

- *Acquisitions* — Our spending on acquisitions was $466 million, $200 million and $611 million in 2018, 2017 and 2016, respectively, of which $460 million, $198 million and $608 million, respectively, are considered cash used in investing activities. The remaining spend is either cash used in a financing or an operating activity related to the timing of contingent consideration paid subsequent to the adoption of ASU 2016-15. Substantially all of these acquisitions are related to our Solid Waste business. Our acquisitions in 2016 included $525 million for certain operations and business assets of Southern Waste Systems/Sun Recycling. See Notes 2 and 17 to the Consolidated Financial Statements for additional information. We continue to focus on accretive acquisitions and growth opportunities that will enhance and expand our existing service offerings.
- *Capital Expenditures* — We used $1,694 million, $1,509 million and $1,339 million for capital expenditures in 2018, 2017 and 2016, respectively. The Company continues to maintain a disciplined focus on capital management and fluctuations in our capital expenditures are a result of new business opportunities, growth in our existing business, the timing of replacement of aging assets and investment in assets that support our strategy of continuous improvement through efficiency and innovation.
- *Proceeds from Divestitures* — Proceeds from divestitures of businesses and other assets (net of cash divested) were $208 million, $99 million and $43 million in 2018, 2017 and 2016, respectively. In 2018, 2017 and 2016, $153 million, $62 million and $2 million of these divestitures, respectively, were made as part of our continuous focus on improving or divesting certain non-strategic or underperforming operations, with the remaining amounts generally related to the sale of fixed assets.
- *Other, Net* — Our spending within other, net was $223 million, $12 million, and $25 million in 2018, 2017 and 2016, respectively. The increase in 2018 is primarily due to changes in our investments portfolio associated with our wholly-owned insurance captive from restricted cash and cash equivalents to available-for-sale securities. See Note 16 to the Consolidated Financial Statements for additional information.

Net Cash Used in Financing Activities — The most significant items affecting the comparison of our financing cash flows for the periods presented are summarized below:

- *Debt Borrowings (Repayments)* — The following summarizes our cash borrowings and repayments of debt (excluding our commercial paper program discussed below) for the years ended December 31 (in millions):

	2018	2017(a)	2016(a)
Borrowings:			
Revolving credit facility (b)	$ 119	$ 302	$ 1,889
Canadian term loan and revolving credit facility	8	9	347
Senior notes	—	745	496
Tax-exempt bonds	185	299	143
Other debt	47	124	182
	$ 359	$ 1,479	$ 3,057
Repayments:			
Revolving credit facility (b)	$ (108)	$ (728)	$ (1,483)
Canadian term loan and revolving credit facility	(117)	(146)	(193)
Senior notes	—	(590)	(510)
Tax-exempt bonds	(167)	(251)	(289)
Other debt	(107)	(192)	(207)
	$ (499)	$ (1,907)	$ (2,682)
Net cash borrowings (repayments)	$ (140)	$ (428)	$ 375

(a) Prior year information was revised to reflect the adoption of ASU 2016-18 and conform to our current year presentation. See Note 2 to the Consolidated Financial Statements for further discussion.

(b) Our revolving credit facility was amended and restated in June 2018.

During 2018, we had $250 million of non-cash financing activities from our recent federal low-income housing investment discussed in Note 8 to the Consolidated Financial Statements and new capital leases. During 2017 and 2016, we did not have any significant non-cash investing and financing activities. Non-cash investing and financing activities are generally excluded from the Consolidated Statements of Cash Flows.

Refer to Note 7 to the Consolidated Financial Statements for additional information related to our debt borrowings and repayments.

- *Commercial Paper Program* — During 2018 and 2017, we had net cash borrowings of $453 million and $513 million (net of the related discounts on issuance), respectively, under our commercial paper program. Borrowings were primarily to support new business opportunities and for general corporate purposes.

- *Common Stock Repurchase Program* — For the periods presented, all share repurchases have been made in accordance with financial plans approved by our Board of Directors. We repurchased $1,008 million, $750 million and $725 million of our common stock during 2018 (including $4 million paid in January 2019), 2017 and 2016, respectively. See Note 13 to the Consolidated Financial Statements for additional information.

  We announced in December 2018 that our Board of Directors has authorized up to $1.5 billion in future share repurchases. Any future share repurchases will be made at the discretion of management and will depend on factors similar to those considered by the Board of Directors in making dividend declarations.

- *Cash Dividends* — For the periods presented, all dividends have been declared by our Board of Directors.

  We paid aggregate cash dividends of $802 million, $750 million and $726 million during 2018, 2017 and 2016, respectively. The increase in dividend payments is due to our quarterly per share dividend increasing from $0.41 in 2016 to $0.425 in 2017 and to $0.465 in 2018 and has been offset, in part, by a reduction in our common stock outstanding as a result of our common stock repurchase program.

In December 2018, we announced that our Board of Directors expects to increase the quarterly dividend from $0.465 to $0.5125 per share for dividends declared in 2019. However, all future dividend declarations are at the discretion of the Board of Directors and depend on various factors, including our net earnings, financial condition, cash required for future business plans, growth and acquisitions and other factors the Board of Directors may deem relevant.

- *Proceeds from the Exercise of Common Stock Options* — The exercise of common stock options generated financing cash inflows of $52 million, $95 million and $63 million during 2018, 2017 and 2016, respectively. The year-over-year changes are generally due to the number of stock options exercised and the exercise price of those options.

Free Cash Flow

As is our practice, we are presenting free cash flow, which is a non-GAAP measure of liquidity, in our disclosures because we use this measure in the evaluation and management of our business. We define free cash flow as net cash provided by operating activities, less capital expenditures, plus proceeds from divestitures of businesses and other assets (net of cash divested). We believe it is indicative of our ability to pay our quarterly dividends, repurchase common stock, fund acquisitions and other investments and, in the absence of refinancings, to repay our debt obligations. Free cash flow is not intended to replace net cash provided by operating activities, which is the most comparable GAAP measure. We believe free cash flow gives investors useful insight into how we view our liquidity, but the use of free cash flow as a liquidity measure has material limitations because it excludes certain expenditures that are required or that we have committed to, such as declared dividend payments and debt service requirements.

Our calculation of free cash flow and reconciliation to net cash provided by operating activities is shown in the table below for the years ended December 31 (in millions), and may not be calculated the same as similarly-titled measures presented by other companies:

	2018	2017	2016
Net cash provided by operating activities (a)	$ 3,570	$ 3,180	$ 3,003
Capital expenditures	(1,694)	(1,509)	(1,339)
Proceeds from divestitures of businesses and other assets (net of cash divested)	208	99	43
Free cash flow (a)	$ 2,084	$ 1,770	$ 1,707

(a) Prior year information was revised to reflect the adoption of ASU 2016-18 and conform to our current year presentation. See Note 2 to the Consolidated Financial Statements.

Summary of Contractual Obligations

The following table summarizes our contractual obligations as of December 31, 2018 and the anticipated effect of these obligations on our liquidity in future years (in millions):

	2019	2020	2021	2022	2023	Thereafter	Total
Recorded Obligations:							
Expected environmental liabilities: (a)							
Final capping, closure and post-closure	$ 143	$ 170	$ 132	$ 105	$ 98	$ 2,450	$ 3,098
Environmental remediation	26	19	65	37	13	81	241
	169	189	197	142	111	2,531	3,339
Debt payments (b) (c) (d)	1,166	780	584	622	614	6,382	10,148
Unrecorded Obligations: (e)							
Interest on debt (f)	340	319	291	278	254	2,101	3,583
Non-cancelable operating lease obligations	74	69	54	40	37	370	644
Estimated unconditional purchase obligations (g)	138	121	110	45	41	399	854
Anticipated liquidity impact as of December 31, 2018	$ 1,887	$ 1,478	$ 1,236	$ 1,127	$ 1,057	$ 11,783	$ 18,568

(a) Environmental liabilities include final capping, closure, post-closure and environmental remediation costs recorded in our Consolidated Balance Sheet as of December 31, 2018, without the impact of discounting and inflation. Our recorded environmental liabilities for final capping, closure and post-closure will increase as we continue to place additional tons within the permitted airspace at our landfills.

(b) These amounts represent the scheduled principal payments related to our long-term debt, excluding interest.

(c) Our debt obligations as of December 31, 2018 include $705 million of tax-exempt bonds with term interest rate periods that expire within the next 12 months. If the remarketings of our bonds are unsuccessful, then the bonds can be put to us, requiring immediate repayment. We have classified the anticipated cash flows for these contractual obligations based on the scheduled maturity of the borrowings for purposes of this disclosure. For additional information regarding the classification of these borrowings in our Consolidated Balance Sheet as of December 31, 2018, refer to Note 7 to the Consolidated Financial Statements.

(d) Our recorded debt obligations include non-cash adjustments associated with debt issuance costs, discounts, premiums and fair value adjustments attributable to terminated interest rate derivatives. These amounts have been excluded as they will not impact our liquidity in future periods.

(e) Our unrecorded obligations represent operating lease obligations and purchase commitments from which we expect to realize an economic benefit in future periods and interest payable on our debt. We have also made certain guarantees, as discussed in Note 10 to the Consolidated Financial Statements, that we do not expect to materially affect our current or future financial position, results of operations or liquidity.

(f) Interest on our fixed-rate debt was calculated based on contractual rates and interest on our variable-rate debt was calculated based on interest rates as of December 31, 2018. For debt balances outstanding under our commercial paper program, we have reflected limited interest amounts due to the short-term nature of the borrowings. For debt balances outstanding under our $2.75 billion revolving credit facility, we have reflected interest based on the current outstanding principal assuming the amount remains unchanged through maturity. As of December 31, 2018, we had $82 million of accrued interest related to our debt obligations.

(g) Our unconditional purchase obligations are for various contractual obligations that we generally incur in the ordinary course of our business. Certain of our obligations are quantity driven. For contracts that require us to purchase minimum quantities of goods or services, we have estimated our future minimum obligations based on the current market values of the underlying products or services. Accordingly, the amounts reported in the table are subject to change and actual cash flow obligations in the near future may be different. See Note 10 to the Consolidated Financial Statements for discussion of the nature and terms of our unconditional purchase obligations.

Critical Accounting Estimates and Assumptions

In preparing our financial statements, we make numerous estimates and assumptions that affect the accounting for and recognition and disclosure of assets, liabilities, equity, revenues and expenses. We must make these estimates and assumptions because certain information that we use is dependent on future events, cannot be calculated with precision from available data or simply cannot be calculated. In some cases, these estimates are difficult to determine, and we must exercise significant judgment. In preparing our financial statements, the most difficult, subjective and complex estimates and the assumptions that present the greatest amount of uncertainty relate to our accounting for landfills, environmental remediation liabilities, long-lived asset impairments and reserves associated with our insured and self-insured claims. Each of these items is discussed in additional detail below and in Note 3 to the Consolidated Financial Statements. Actual results could differ materially from the estimates and assumptions that we use in the preparation of our financial statements.

Landfills

Accounting for landfills requires that significant estimates and assumptions be made regarding (i) the cost to construct and develop each landfill asset; (ii) the estimated fair value of final capping, closure and post-closure asset retirement obligations, which must consider both the expected cost and timing of these activities; (iii) the determination of each landfill's remaining permitted and expansion airspace and (iv) the airspace associated with each final capping event.

Landfill Costs — We estimate the total cost to develop each of our landfill sites to its remaining permitted and expansion capacity. This estimate includes such costs as landfill liner material and installation, excavation for airspace, landfill leachate collection systems, landfill gas collection systems, environmental monitoring equipment for groundwater and landfill gas, directly related engineering, capitalized interest, on-site road construction and other capital infrastructure costs. Additionally, landfill development includes all land purchases for the landfill footprint and required landfill buffer property. The projection of these landfill costs is dependent, in part, on future events. The remaining amortizable basis of each landfill includes costs to develop a site to its remaining permitted and expansion capacity and includes amounts previously expended and capitalized, net of accumulated airspace amortization, and projections of future purchase and development costs.

Final Capping Costs — We estimate the cost for each final capping event based on the area to be capped and the capping materials and activities required. The estimates also consider when these costs are anticipated to be paid and factor in inflation and discount rates. Our engineering personnel allocate landfill final capping costs to specific final capping events. The landfill capacity associated with each final capping event is then quantified and the final capping costs for each event are amortized over the related capacity associated with the event as waste is disposed of at the landfill. We review these costs annually, or more often if significant facts change. Changes in estimates, such as timing or cost of construction, for final capping events immediately impact the required liability and the corresponding asset. When the change in estimate relates to a fully consumed asset, the adjustment to the asset must be amortized immediately through expense. When the change in estimate relates to a final capping event that has not been fully consumed, the adjustment to the asset is recognized in income prospectively as a component of landfill airspace amortization.

Closure and Post-Closure Costs — We base our estimates for closure and post-closure costs on our interpretations of permit and regulatory requirements for closure and post-closure monitoring and maintenance. The estimates for landfill closure and post-closure costs also consider when the costs are anticipated to be paid and factor in inflation and discount rates. The possibility of changing legal and regulatory requirements and the forward-looking nature of these types of costs make any estimation or assumption less certain. Changes in estimates for closure and post-closure events immediately impact the required liability and the corresponding asset. When the change in estimate relates to a fully consumed asset, the adjustment to the asset must be amortized immediately through expense. When the change in estimate relates to a landfill asset that has not been fully consumed, the adjustment to the asset is recognized in income prospectively as a component of landfill airspace amortization.

Remaining Permitted Airspace — Our engineers, in consultation with third-party engineering consultants and surveyors, are responsible for determining remaining permitted airspace at our landfills. The remaining permitted airspace

is determined by an annual survey, which is used to compare the existing landfill topography to the expected final landfill topography.

Expansion Airspace — We also include currently unpermitted expansion airspace in our estimate of remaining permitted and expansion airspace in certain circumstances. First, to include airspace associated with an expansion effort, we must generally expect the initial expansion permit application to be submitted within one year and the final expansion permit to be received within five years. Second, we must believe that obtaining the expansion permit is likely, considering the following criteria:

- Personnel are actively working on the expansion of an existing landfill, including efforts to obtain land use and local, state or provincial approvals;
- We have a legal right to use or obtain land to be included in the expansion plan;
- There are no significant known technical, legal, community, business, or political restrictions or similar issues that could negatively affect the success of such expansion; and
- Financial analysis has been completed based on conceptual design, and the results demonstrate that the expansion meets Company criteria for investment.

For unpermitted airspace to be initially included in our estimate of remaining permitted and expansion airspace, the expansion effort must meet all the criteria listed above. These criteria are evaluated by our field-based engineers, accountants, managers and others to identify potential obstacles to obtaining the permits. Once the unpermitted airspace is included, our policy provides that airspace may continue to be included in remaining permitted and expansion airspace even if certain of these criteria are no longer met as long as we continue to believe we will ultimately obtain the permit, based on the facts and circumstances of a specific landfill. In these circumstances, continued inclusion must be approved through a landfill-specific review process that includes approval by our Chief Financial Officer and a review by the Audit Committee of our Board of Directors on a quarterly basis.

When we include the expansion airspace in our calculations of remaining permitted and expansion airspace, we also include the projected costs for development, as well as the projected asset retirement costs related to final capping, closure and post-closure of the expansion in the amortization basis of the landfill.

Once the remaining permitted and expansion airspace is determined in cubic yards, an airspace utilization factor ("AUF") is established to calculate the remaining permitted and expansion capacity in tons. The AUF is established using the measured density obtained from previous annual surveys and is then adjusted to account for future settlement. The amount of settlement that is forecasted will take into account several site-specific factors including current and projected mix of waste type, initial and projected waste density, estimated number of years of life remaining, depth of underlying waste, anticipated access to moisture through precipitation or recirculation of landfill leachate and operating practices. In addition, the initial selection of the AUF is subject to a subsequent multi-level review by our engineering group and the AUF used is reviewed on a periodic basis and revised as necessary. Our historical experience generally indicates that the impact of settlement at a landfill is greater later in the life of the landfill when the waste placed at the landfill approaches its highest point under the permit requirements.

After determining the costs and remaining permitted and expansion capacity at each of our landfills, we determine the per ton rates that will be expensed as waste is received and deposited at the landfill by dividing the costs by the corresponding number of tons. We calculate per ton amortization rates for each landfill for assets associated with each final capping event, for assets related to closure and post-closure activities and for all other costs capitalized or to be capitalized in the future. These rates per ton are updated annually, or more often, as significant facts change.

It is possible that actual results, including the amount of costs incurred, the timing of final capping, closure and post-closure activities, our airspace utilization or the success of our expansion efforts could ultimately turn out to be significantly different from our estimates and assumptions. To the extent that such estimates, or related assumptions, prove to be significantly different than actual results, lower profitability may be experienced due to higher amortization rates or higher expenses; or higher profitability may result if the opposite occurs. Most significantly, if it is determined that

expansion capacity should no longer be considered in calculating the recoverability of a landfill asset, we may be required to recognize an asset impairment or incur significantly higher amortization expense. If at any time management makes the decision to abandon the expansion effort, the capitalized costs related to the expansion effort are expensed immediately.

Environmental Remediation Liabilities

We are subject to an array of laws and regulations relating to the protection of the environment. Under current laws and regulations, we may have liabilities for environmental damage caused by operations, or for damage caused by conditions that existed before we acquired a site. These liabilities include PRP investigations, settlements, and certain legal and consultant fees, as well as costs directly associated with site investigation and clean up, such as materials, external contractor costs and incremental internal costs directly related to the remedy. We provide for expenses associated with environmental remediation obligations when such amounts are probable and can be reasonably estimated. We routinely review and evaluate sites that require remediation and determine our estimated cost for the likely remedy based on a number of estimates and assumptions.

Where it is probable that a liability has been incurred, we estimate costs required to remediate sites based on site-specific facts and circumstances. We routinely review and evaluate sites that require remediation, considering whether we were an owner, operator, transporter, or generator at the site, the amount and type of waste hauled to the site and the number of years we were associated with the site. Next, we review the same type of information with respect to other named and unnamed PRPs. Estimates of the costs for the likely remedy are then either developed using our internal resources or by third-party environmental engineers or other service providers. Internally developed estimates are based on:

- Management's judgment and experience in remediating our own and unrelated parties' sites;
- Information available from regulatory agencies as to costs of remediation;
- The number, financial resources and relative degree of responsibility of other PRPs who may be liable for remediation of a specific site; and
- The typical allocation of costs among PRPs, unless the actual allocation has been determined.

Long-Lived Asset Impairments

We assess our long-lived assets for impairment as required under the applicable accounting standards. If necessary, impairments are recorded in (gain) loss from divestitures, asset impairments and unusual items, net in our Consolidated Statement of Operations.

Property and Equipment, Including Landfills and Definite-Lived Intangible Assets — We monitor the carrying value of our long-lived assets for potential impairment on an ongoing basis and test the recoverability of such assets generally using significant unobservable ("Level 3") inputs whenever events or changes in circumstances indicate that their carrying amounts may not be recoverable. These events or changes in circumstances, including management decisions pertaining to such assets, are referred to as impairment indicators. If an impairment indicator occurs, we perform a test of recoverability by comparing the carrying value of the asset or asset group to its undiscounted expected future cash flows. If cash flows cannot be separately and independently identified for a single asset, we will determine whether an impairment has occurred for the group of assets for which we can identify the projected cash flows. If the carrying values are in excess of undiscounted expected future cash flows, we measure any impairment by comparing the fair value of the asset or asset group to its carrying value and the difference is recorded in the period that the impairment indicator occurs. Fair value is generally determined by considering (i) internally developed discounted projected cash flow analysis of the asset or asset group; (ii) actual third-party valuations and/or (iii) information available regarding the current market for similar assets. Estimating future cash flows requires significant judgment and projections may vary from the cash flows eventually realized, which could impact our ability to accurately assess whether an asset has been impaired.

The assessment of impairment indicators and the recoverability of our capitalized costs associated with landfills and related expansion projects require significant judgment due to the unique nature of the waste industry, the highly regulated

permitting process and the sensitive estimates involved. During the review of a landfill expansion application, a regulator may initially deny the expansion application although the expansion permit is ultimately granted. In addition, management may periodically divert waste from one landfill to another to conserve remaining permitted landfill airspace, or a landfill may be required to cease accepting waste, prior to receipt of the expansion permit. However, such events occur in the ordinary course of business in the waste industry and do not necessarily result in impairment of our landfill assets because, after consideration of all facts, such events may not affect our belief that we will ultimately obtain the expansion permit. As a result, our tests of recoverability, which generally make use of a probability-weighted cash flow estimation approach, may indicate that no impairment loss should be recorded.

Indefinite-Lived Intangible Assets, Including Goodwill — At least annually, and more frequently if warranted, we assess the indefinite-lived intangible assets including the goodwill of our reporting units for impairment using Level 3 inputs.

Beginning in 2018, we first performed a qualitative assessment to determine if it was more likely than not that the fair value of a reporting unit was less than its carrying value. If the assessment indicated a possible impairment, we completed a quantitative review, comparing the estimated fair value of a reporting unit to its carrying amount, including goodwill. An impairment charge was recognized if the asset's estimated fair value was less than its carrying amount. Fair value is typically estimated using an income approach. However, when appropriate, we may also use a market approach. The income approach is based on the long-term projected future cash flows of the reporting units. We discount the estimated cash flows to present value using a weighted average cost of capital that considers factors such as market assumptions, the timing of the cash flows and the risks inherent in those cash flows. We believe that this approach is appropriate because it provides a fair value estimate based upon the reporting units' expected long-term performance considering the economic and market conditions that generally affect our business. The market approach estimates fair value by measuring the aggregate market value of publicly-traded companies with similar characteristics to our business as a multiple of their reported earnings. We then apply that multiple to the reporting units' earnings to estimate their fair values. We believe that this approach may also be appropriate in certain circumstances because it provides a fair value estimate using valuation inputs from entities with operations and economic characteristics comparable to our reporting units.

Fair value is computed using several factors, including projected future operating results, economic projections, anticipated future cash flows, comparable marketplace data and the cost of capital. There are inherent uncertainties related to these factors and to our judgment in applying them in our analysis. However, we believe our methodology for estimating the fair value of our reporting units is reasonable.

See Item 7. *Management's Discussion and Analysis of Financial Condition and Results of Operations — (Gain) Loss from Divestitures, Asset Impairments and Unusual Items, Net* and Note 6 to the Consolidated Financial Statements for information related to goodwill impairments recognized during the reported periods.

Insured and Self-Insured Claims

We have retained a significant portion of the risks related to our health and welfare, general liability, automobile liability and workers' compensation claims programs. The exposure for unpaid claims and associated expenses, including incurred but not reported losses, are based on an actuarial valuations and internal estimates. The accruals for these liabilities could be revised if future occurrences or loss developments significantly differ from our assumptions used. Estimated recoveries associated with our insured claims are recorded as assets when we believe that the receipt of such amounts is probable.

In December 2017, we elected to use a wholly-owned insurance captive to insure the deductibles for our general liability, automobile liability and workers' compensation claims programs. We continue to maintain conventional insurance policies with third-party insurers. In addition to certain business and operating benefits of having a wholly-owned insurance captive, we expect to receive certain cash flow benefits related to the timing of tax deductions related to these claims. WM will pay an annual premium to the insurance captive, typically in the first quarter of the year, for the estimated losses based on the external actuarial analysis. These premiums are held in a restricted escrow account to be

used solely for paying insurance claims, resulting in a transfer of risk from WM to the insurance captive and are allocated between current and long-term assets in our Consolidated Balance Sheets depending on timing on the use of funds.

Off-Balance Sheet Arrangements

We have financial interests in unconsolidated variable interest entities as discussed in Note 18 to the Consolidated Financial Statements. Additionally, we are party to guarantee arrangements with unconsolidated entities as discussed in the *Guarantees* section of Note 10 to the Consolidated Financial Statements. These arrangements have not materially affected our financial position, results of operations or liquidity during the year ended December 31, 2018, nor are they expected to have a material impact on our future financial position, results of operations or liquidity.

New Accounting Standard Pending Adoption

Leases — In February 2016, the FASB issued ASU 2016-02 associated with lease accounting. There have been further amendments, including practical expedients, with the issuance of ASU 2018-01 in January 2018, ASU 2018-11 in July 2018 and ASU 2018-20 in December 2018. The amended guidance requires the recognition of lease assets and lease liabilities on the balance sheet for those leases with terms in excess of 12 months and currently classified as operating leases. Disclosure of key information about leasing arrangements will also be required. We elected the optional transition method which allows entities to continue to apply historical accounting guidance in the comparative periods presented in the year of adoption.

At transition, lessees and lessors may elect to apply a package of practical expedients permitting entities not to reassess: (i) whether any expired or existing contracts are or contain leases; (ii) lease classification for any expired or existing leases and (iii) whether initial direct costs for any expired or existing leases qualify for capitalization under the amended guidance. These practical expedients must be elected as a package and consistently applied. We have elected to apply the package of practical expedients upon adoption.

We identified our leases or other contracts impacted by the new standard and are currently in the process of (i) finalizing our implementation of a software solution to manage and account for leases under the new standard and (ii) updating our business processes and related policies, systems and controls to support recognition and disclosure under the new standard.

Upon adoption of the amended guidance, we expect to recognize right-of-use assets and related liabilities of approximately $300 million to $350 million for our contracts which contain an operating lease. We currently do not expect the amended guidance to have any other material impacts on our consolidated financial statements.

Inflation

While inflationary increases in costs can affect our income from operations margins, we believe that inflation generally has not had, and in the near future is not expected to have, any material adverse effect on our results of operations. However, as of December 31, 2018, approximately 35% of our collection revenues are generated under long-term agreements with price adjustments based on various indices intended to measure inflation. Additionally, management's estimates associated with inflation have had, and will continue to have, an impact on our accounting for landfill and environmental remediation liabilities.

Item 7A. Quantitative and Qualitative Disclosures about Market Risk.

In the normal course of business, we are exposed to market risks, including changes in interest rates, certain commodity prices and Canadian currency rates. From time to time, we use derivatives to manage some portion of these risks. The Company had no derivatives outstanding as of December 31, 2018.

Interest Rate Exposure — Our exposure to market risk for changes in interest rates relates primarily to our financing activities. As of December 31, 2018, we had $10.1 billion of long-term debt, excluding the impacts of accounting for debt issuance costs, discounts, premiums and fair value adjustments attributable to terminated interest rate derivatives. We have $2.2 billion of debt that is exposed to changes in market interest rates within the next 12 months comprised of (i) $990 million of short-term borrowings under our commercial paper program; (ii) $705 million of tax-exempt bonds with term interest rate periods that expire within the next 12 months; (iii) $513 million of variable-rate tax-exempt bonds that are subject to repricing on either a daily or weekly basis and (iv) C$15 million, or $11 million, of Canadian borrowings under our $2.75 billion revolving credit facility. We currently estimate that a 100-basis point increase in the interest rates of our outstanding variable-rate debt obligations would increase our 2019 interest expense by $19 million.

Our remaining outstanding debt obligations have fixed interest rates through either the scheduled maturity of the debt or, for certain of our fixed-rate tax-exempt bonds, through the end of a term interest rate period that exceeds 12 months. The fair value of our fixed-rate debt obligations can increase or decrease significantly if market interest rates change.

We performed a sensitivity analysis to determine how market rate changes might affect the fair value of our market risk-sensitive debt instruments. This analysis is inherently limited because it reflects a singular, hypothetical set of assumptions. Actual market movements may vary significantly from our assumptions. An instantaneous, 100-basis point increase in interest rates across all maturities attributable to these instruments would have decreased the fair value of our debt by approximately $575 million as of December 31, 2018.

We are also exposed to interest rate market risk from our cash and cash equivalent balances, as well as assets held in restricted trust funds and escrow accounts. These assets are generally invested in high quality, liquid instruments including money market funds that invest in U.S. government obligations with original maturities of three months or less. We believe that our exposure to changes in fair value of these assets due to interest rate fluctuations is insignificant as the fair value generally approximates our cost basis. We also invest a portion of our restricted trust and escrow account balances in available-for-sale securities, including U.S. Treasury securities, U.S. agency securities, municipal securities, mortgage- and asset-backed securities and equity securities.

Commodity Price Exposure — In the normal course of our business, we are subject to operating agreements that expose us to market risks arising from changes in the prices for commodities such as diesel fuel; recyclable materials, including old corrugated cardboard, old newsprint and plastics; and electricity, which generally correlates with natural gas prices in many of the markets in which we operate. We attempt to manage these risks through operational strategies that focus on capturing our costs in the prices we charge our customers for the services provided. Accordingly, as the market prices for these commodities increase or decrease, our revenues may also increase or decrease.

Currency Rate Exposure — We have operations in Canada as well as certain support functions in India. Where significant, we have quantified and described the impact of foreign currency translation on components of income, including operating revenue and operating expenses. However, the impact of foreign currency has not materially affected our results of operations.

Item 8. ***Financial Statements and Supplementary Data.***

INDEX TO

CONSOLIDATED FINANCIAL STATEMENTS

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

The Board of Directors and Stockholders of Waste Management, Inc.

Opinion on Internal Control over Financial Reporting
We have audited Waste Management, Inc.'s internal control over financial reporting as of December 31, 2018, based on criteria established in Internal Control-Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework) (the COSO criteria). In our opinion, Waste Management, Inc. (the Company) maintained, in all material respects, effective internal control over financial reporting as of December 31, 2018, based on the COSO criteria.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the 2018 consolidated financial statements of the Company, and our report dated February 14, 2019 expressed an unqualified opinion thereon.

Basis for Opinion
The Company's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting included in the accompanying Management's Report on Internal Control Over Financial Reporting. Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects.

Our audit included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, testing and evaluating the design and operating effectiveness of internal control based on the assessed risk, and performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

Definition and Limitations of Internal Control Over Financial Reporting
A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ ERNST & YOUNG LLP

Houston, Texas
February 14, 2019

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

The Board of Directors and Stockholders of Waste Management, Inc.

Opinion on the Financial Statements
We have audited the accompanying consolidated balance sheets of Waste Management, Inc. (the Company) as of December 31, 2018 and 2017, the related consolidated statements of operations, comprehensive income, cash flows, and changes in equity for each of the three years in the period ended December 31, 2018, and the related notes (collectively referred to as the "consolidated financial statements"). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company at December 31, 2018 and 2017, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2018, in conformity with U.S. generally accepted accounting principles.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the Company's internal control over financial reporting as of December 31, 2018, based on criteria established in Internal Control-Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework), and our report dated February 14, 2019 expressed an unqualified opinion thereon.

Basis for Opinion
These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's financial statements based on our audits. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ ERNST & YOUNG LLP

We have served as the Company's auditor since 2002.

Houston, Texas
February 14, 2019

WASTE MANAGEMENT, INC.

CONSOLIDATED BALANCE SHEETS
(In Millions, Except Share and Par Value Amounts)

	December 31, 2018	December 31, 2017
ASSETS		
Current assets:		
Cash and cash equivalents	$ 61	$ 22
Accounts receivable, net of allowance for doubtful accounts of $29 and $21, respectively	1,931	1,805
Other receivables	344	569
Parts and supplies	102	96
Other assets	207	202
Total current assets	2,645	2,694
Property and equipment, net of accumulated depreciation and amortization of $18,264 and $17,704, respectively	11,942	11,559
Goodwill	6,430	6,247
Other intangible assets, net	572	547
Restricted trust and escrow accounts	296	249
Investments in unconsolidated entities	406	269
Other assets	359	264
Total assets	$ 22,650	$ 21,829
LIABILITIES AND EQUITY		
Current liabilities:		
Accounts payable	$ 1,037	$ 1,040
Accrued liabilities	1,117	980
Deferred revenues	522	503
Current portion of long-term debt	432	739
Total current liabilities	3,108	3,262
Long-term debt, less current portion	9,594	8,752
Deferred income taxes	1,291	1,248
Landfill and environmental remediation liabilities	1,828	1,770
Other liabilities	553	755
Total liabilities	16,374	15,787
Commitments and contingencies		
Equity:		
Waste Management, Inc. stockholders' equity:		
Common stock, $0.01 par value; 1,500,000,000 shares authorized; 630,282,461 shares issued	6	6
Additional paid-in capital	4,993	4,933
Retained earnings	9,797	8,588
Accumulated other comprehensive income (loss)	(87)	8
Treasury stock at cost, 206,299,352 and 196,963,558 shares, respectively	(8,434)	(7,516)
Total Waste Management, Inc. stockholders' equity	6,275	6,019
Noncontrolling interests	1	23
Total equity	6,276	6,042
Total liabilities and equity	$ 22,650	$ 21,829

See Notes to Consolidated Financial Statements.

WASTE MANAGEMENT, INC.

CONSOLIDATED STATEMENTS OF OPERATIONS
(In Millions, Except per Share Amounts)

	Years Ended December 31,		
	2018	2017	2016
Operating revenues	$ 14,914	$ 14,485	$ 13,609
Costs and expenses:			
Operating	9,249	9,021	8,486
Selling, general and administrative	1,453	1,468	1,410
Depreciation and amortization	1,477	1,376	1,301
Restructuring	4	—	4
(Gain) loss from divestitures, asset impairments and unusual items, net	(58)	(16)	112
	12,125	11,849	11,313
Income from operations	2,789	2,636	2,296
Other income (expense):			
Interest expense, net	(374)	(363)	(376)
Equity in net losses of unconsolidated entities	(41)	(68)	(44)
Other, net	2	(14)	(54)
	(413)	(445)	(474)
Income before income taxes	2,376	2,191	1,822
Income tax expense	453	242	642
Consolidated net income	1,923	1,949	1,180
Less: Net loss attributable to noncontrolling interests	(2)	—	(2)
Net income attributable to Waste Management, Inc.	$ 1,925	$ 1,949	$ 1,182
Basic earnings per common share	$ 4.49	$ 4.44	$ 2.66
Diluted earnings per common share	$ 4.45	$ 4.41	$ 2.65
Cash dividends declared per common share	$ 1.86	$ 1.70	$ 1.64

CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME
(In Millions)

	Years Ended December 31,		
	2018	2017	2016
Consolidated net income	$ 1,923	$ 1,949	$ 1,180
Other comprehensive income (loss), net of tax:			
Derivative instruments, net	8	7	12
Available-for-sale securities, net	5	2	5
Foreign currency translation adjustments	(105)	76	28
Post-retirement benefit obligation, net	2	3	2
Other comprehensive income (loss), net of tax	(90)	88	47
Comprehensive income	1,833	2,037	1,227
Less: Comprehensive loss attributable to noncontrolling interests	(2)	—	(2)
Comprehensive income attributable to Waste Management, Inc.	$ 1,835	$ 2,037	$ 1,229

See Notes to Consolidated Financial Statements.

WASTE MANAGEMENT, INC.

CONSOLIDATED STATEMENTS OF CASH FLOWS
(In Millions)

	Years Ended December 31,		
	2018	**2017**	**2016**
Cash flows from operating activities:			
Consolidated net income	$ 1,923	$ 1,949	$ 1,180
Adjustments to reconcile consolidated net income to net cash provided by operating activities:			
Depreciation and amortization	1,477	1,376	1,301
Deferred income tax expense (benefit)	25	(251)	73
Interest accretion on landfill liabilities	95	92	91
Provision for bad debts	54	43	42
Equity-based compensation expense	89	101	90
Net gain on disposal of assets	(47)	(20)	(24)
(Gain) loss from divestitures, asset impairments and other, net	(58)	49	114
Equity in net losses of unconsolidated entities, net of dividends	41	39	44
Change in operating assets and liabilities, net of effects of acquisitions and divestitures:			
Receivables	(16)	(271)	(78)
Other current assets	(16)	50	(12)
Other assets	(14)	(66)	75
Accounts payable and accrued liabilities	203	126	192
Deferred revenues and other liabilities	(186)	(37)	(85)
Net cash provided by operating activities	3,570	3,180	3,003
Cash flows from investing activities:			
Acquisitions of businesses, net of cash acquired	(460)	(198)	(608)
Capital expenditures	(1,694)	(1,509)	(1,339)
Proceeds from divestitures of businesses and other assets (net of cash divested)	208	99	43
Other, net	(223)	(12)	(25)
Net cash used in investing activities	(2,169)	(1,620)	(1,929)
Cash flows from financing activities:			
New borrowings	359	1,479	3,057
Debt repayments	(499)	(1,907)	(2,682)
Net commercial paper borrowings	453	513	—
Common stock repurchase program	(1,004)	(750)	(725)
Cash dividends	(802)	(750)	(726)
Exercise of common stock options	52	95	63
Tax payments associated with equity-based compensation transactions	(29)	(47)	(30)
Other, net	(38)	6	(41)
Net cash used in financing activities	(1,508)	(1,361)	(1,084)
Effect of exchange rate changes on cash, cash equivalents and restricted cash and cash equivalents	(3)	—	—
Increase (decrease) in cash, cash equivalents and restricted cash and cash equivalents	(110)	199	(10)
Cash, cash equivalents and restricted cash and cash equivalents at beginning of period	293	94	104
Cash, cash equivalents and restricted cash and cash equivalents at end of period	$ 183	$ 293	$ 94
Reconciliation of cash, cash equivalents and restricted cash and cash equivalents at end of period:			
Cash and cash equivalents	$ 61	$ 22	$ 32
Restricted cash and cash equivalents included in other current assets	49	70	—
Restricted cash and cash equivalents included in restricted trust and escrow accounts	73	201	62
Cash, cash equivalents and restricted cash and cash equivalents at end of period	$ 183	$ 293	$ 94

See Notes to Consolidated Financial Statements.

WASTE MANAGEMENT, INC.

CONSOLIDATED STATEMENTS OF CHANGES IN EQUITY
(In Millions, Except Shares in Thousands)

		Waste Management, Inc. Stockholders' Equity							
		Common Stock		Additional Paid-In	Retained	Accumulated Other Comprehensive	Treasury Stock		Noncontrolling
	Total	Shares	Amounts	Capital	Earnings	Income (Loss)	Shares	Amounts	Interests
Balance, December 31, 2015	$ 5,367	630,282	$ 6	$ 4,827	$ 6,939	$ (127)	(183,105)	$ (6,300)	$ 22
Consolidated net income	1,180	—	—	—	1,182	—	—	—	(2)
Other comprehensive income (loss), net of tax	47	—	—	—	—	47	—	—	—
Cash dividends	(726)	—	—	—	(726)	—	—	—	—
Equity-based compensation transactions, net of tax	186	—	—	69	(7)	—	3,556	124	—
Common stock repurchase program	(725)	—	—	(45)	—	—	(11,241)	(680)	—
Other, net	(9)	—	—	(1)	—	—	(177)	(11)	3
Balance, December 31, 2016	$ 5,320	630,282	$ 6	$ 4,850	$ 7,388	$ (80)	(190,967)	$ (6,867)	$ 23
Consolidated net income	1,949	—	—	—	1,949	—	—	—	—
Other comprehensive income (loss), net of tax	88	—	—	—	—	88	—	—	—
Cash dividends	(750)	—	—	—	(750)	—	—	—	—
Equity-based compensation transactions, net	185	—	—	38	1	—	4,064	146	—
Common stock repurchase program	(750)	—	—	45	—	—	(10,058)	(795)	—
Other, net	—	—	—	—	—	—	(3)	—	—
Balance, December 31, 2017	$ 6,042	630,282	$ 6	$ 4,933	$ 8,588	$ 8	(196,964)	$ (7,516)	$ 23
Adoption of new accounting standards	80	—	—	—	85	(5)	—	—	—
Consolidated net income	1,923	—	—	—	1,925	—	—	—	(2)
Other comprehensive income (loss), net of tax	(90)	—	—	—	—	(90)	—	—	—
Cash dividends	(802)	—	—	—	(802)	—	—	—	—
Equity-based compensation transactions, net	151	—	—	60	1	—	2,345	90	—
Common stock repurchase program	(1,008)	—	—	—	—	—	(11,673)	(1,008)	—
Divestiture of noncontrolling interest	(19)	—	—	—	—	—	—	—	(19)
Other, net	(1)	—	—	—	—	—	(7)	—	(1)
Balance, December 31, 2018	$ 6,276	630,282	$ 6	$ 4,993	$ 9,797	$ (87)	(206,299)	$ (8,434)	$ 1

See Notes to Consolidated Financial Statements.

WASTE MANAGEMENT, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
Years Ended December 31, 2018, 2017 and 2016

1. Business

The financial statements presented in this report represent the consolidation of Waste Management, Inc., a Delaware corporation; its wholly-owned and majority-owned subsidiaries; and certain variable interest entities for which Waste Management, Inc. or its subsidiaries are the primary beneficiaries as described in Note 18. Waste Management, Inc. is a holding company and all operations are conducted by its subsidiaries. When the terms "the Company," "we," "us" or "our" are used in this document, those terms refer to Waste Management, Inc., its consolidated subsidiaries and consolidated variable interest entities. When we use the term "WM," we are referring only to Waste Management, Inc., the parent holding company.

We are North America's leading provider of comprehensive waste management environmental services. We partner with our residential, commercial, industrial and municipal customers and the communities we serve to manage and reduce waste at each stage from collection to disposal, while recovering valuable resources and creating clean, renewable energy. Our "Solid Waste" business is operated and managed locally by our subsidiaries that focus on distinct geographic areas and provides collection, transfer, disposal, and recycling and resource recovery services. Through our subsidiaries, we are also a leading developer, operator and owner of landfill gas-to-energy facilities in the United States ("U.S.").

We evaluate, oversee and manage the financial performance of our Solid Waste business subsidiaries through our 17 Areas. We also provide additional services that are not managed through our Solid Waste business, which are presented in this report as "Other." Additional information related to our segments is included in Note 19.

2. New Accounting Standards and Reclassifications

Adoption of New Accounting Standards

Revenue Recognition — In May 2014, the Financial Accounting Standards Board ("FASB") issued Accounting Standards Update ("ASU") 2014-09 associated with revenue recognition. On January 1, 2018, we adopted ASU 2014-09 using the modified retrospective approach for all ongoing customer contracts. Our results of operations for the reported periods after January 1, 2018 are presented under this amended guidance, while prior period amounts are not adjusted and continue to be reported in accordance with historical accounting guidance.

The impact of adopting the amended guidance primarily relates to (i) the deferral of certain sales incentives, which previously were expensed as incurred, but under the new guidance are capitalized as other assets and amortized to selling, general and administrative expenses over the expected life of the customer relationship and (ii) the recognition of certain consideration payable to our customers as a reduction in operating revenues, which under historical guidance was recorded as operating expenses. We recognized a net $80 million increase to our retained earnings as of January 1, 2018 for the cumulative impact of adopting the amended guidance associated with the capitalization of sales incentives as contract acquisition costs consisting of a $108 million asset and a related $28 million deferred tax liability. There were no material impacts on our consolidated financial statements, which include these changes, as a result of our adoption of this amended guidance.

For contracts with an effective term greater than one year, we applied the standard's practical expedient that permits the exclusion of unsatisfied performance obligations as our right to consideration corresponds directly to the value provided to the customer for services completed to date and all future variable consideration is allocated to wholly unsatisfied performance obligations. We also applied the standard's optional exemption for performance obligations related to contracts that have an original expected duration of one year or less. See Note 3 for additional information and disclosures related to this amended guidance.

WASTE MANAGEMENT, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

Financial Instruments — In January 2016, the FASB issued ASU 2016-01 associated with the recognition and measurement of financial assets and liabilities with further clarifications made in February 2018 with the issuance of ASU 2018-03. The amended guidance requires certain equity investments that are not consolidated and not accounted for under the equity method to be measured at fair value with changes in fair value recognized in net income rather than as a component of accumulated other comprehensive income (loss). It further states that an entity may choose to measure equity investments that do not have readily determinable fair values using a quantitative approach, or measurement alternative, which is equal to its cost minus impairment, if any, plus or minus changes resulting from observable price changes in orderly transactions for the identical or a similar investment of the same issuer. The Company adopted this amended guidance on January 1, 2018 using a prospective transition approach, which did not have an impact on our consolidated financial statements.

We concluded that all equity investments within the scope of ASU 2016-01, which primarily relate to equity securities previously accounted for under the cost method, do not have readily determinable fair values. Accordingly, the value of these investments beginning January 1, 2018 has been measured using a quantitative approach, or the measurement alternative, as noted above. See Note 3 for additional information and disclosures related to this amended guidance.

Statement of Cash Flows — In August 2016, the FASB issued ASU 2016-15 associated with the classification of certain cash receipts and cash payments in the statement of cash flows. In November 2016, the FASB issued ASU 2016-18 associated with the presentation of restricted cash and cash equivalents in the statement of cash flows. The objective of the amended guidance was to reduce existing diversity in practice. This amended guidance was retrospectively adopted on January 1, 2018 and required the following disclosures and changes to the presentation of our financial statements:

- Cash, cash equivalents and restricted cash and cash equivalents reported on the Consolidated Statements of Cash Flows now includes restricted cash and cash equivalents of $65 million, $62 million and $271 million as of December 31, 2015, 2016 and 2017, respectively, in restricted trust and escrow accounts and other current assets in our Consolidated Balance Sheets as well as previously reported cash and cash equivalents.
- Cash payments made within 120 days of the acquisition date of a business combination to settle a contingent consideration liability are classified as cash outflows from investing activities. Thereafter, cash payments up to the amount of the contingent consideration liability recognized at the acquisition date (including measurement period adjustments) are classified as cash outflows from financing activities and any excess is classified as cash outflows from operating activities. The adoption of this amended guidance did not have a material impact on our Consolidated Statements of Cash Flows.

Our restricted cash and cash equivalents generally consist of funds deposited into specific accounts for purposes of funding insurance claims and demonstrating our ability to meet our landfill final capping, closure, post-closure and environmental remediation obligations.

Reclassification of Certain Tax Effects from Accumulated Other Comprehensive Income — In February 2018, the FASB issued ASU 2018-02 associated with the reclassification of certain tax effects from accumulated other comprehensive income (loss). This amended guidance allows a reclassification from accumulated other comprehensive income (loss) to retained earnings for stranded tax effects resulting from the Tax Cuts and Jobs Act (the "Act") which was signed into law on December 22, 2017. We early adopted this amended guidance on January 1, 2018, and as a result, elected to reclassify $5 million of stranded tax effects from accumulated other comprehensive income (loss) to retained earnings using a specific identification approach. See Note 12 for additional disclosures related to this amended guidance.

Income Taxes — In March 2018, the FASB issued ASU 2018-05 associated with the accounting and disclosures around the enactment of the Act and the Securities and Exchange Commission's Staff Accounting Bulletin No. 118, Income Tax Accounting Implications of the Tax Cuts and Jobs Act ("SAB 118"), which the Company has adopted. See Note 8 for the disclosures related to this amended guidance.

WASTE MANAGEMENT, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

New Accounting Standards Pending Adoption

Financial Instrument Credit Losses — In June 2016, the FASB issued ASU 2016-13 associated with the measurement of credit losses on financial instruments. The amended guidance replaces the current incurred loss impairment methodology of recognizing credit losses when a loss is probable, with a methodology that reflects expected credit losses and requires consideration of a broader range of reasonable and supportable information to assess credit loss estimates. The amended guidance is effective for the Company on January 1, 2020. We are assessing the provisions of this amended guidance and evaluating the impact on our consolidated financial statements.

Leases — In February 2016, the FASB issued ASU 2016-02 associated with lease accounting. There have been further amendments, including practical expedients, with the issuance of ASU 2018-01 in January 2018, ASU 2018-11 in July 2018 and ASU 2018-20 in December 2018. The amended guidance requires the recognition of lease assets and lease liabilities on the balance sheet for those leases with terms in excess of 12 months and currently classified as operating leases. Disclosure of key information about leasing arrangements will also be required. We elected the optional transition method which allows entities to continue to apply historical accounting guidance in the comparative periods presented in the year of adoption.

At transition, lessees and lessors may elect to apply a package of practical expedients permitting entities not to reassess: (i) whether any expired or existing contracts are or contain leases; (ii) lease classification for any expired or existing leases and (iii) whether initial direct costs for any expired or existing leases qualify for capitalization under the amended guidance. These practical expedients must be elected as a package and consistently applied. We have elected to apply the package of practical expedients upon adoption.

We identified our leases or other contracts impacted by the new standard and are currently in the process of (i) finalizing our implementation of a software solution to manage and account for leases under the new standard and (ii) updating our business processes and related policies, systems and controls to support recognition and disclosure under the new standard.

Upon adoption of the amended guidance, we expect to recognize right-of-use assets and related liabilities of approximately $300 million to $350 million for our contracts which contain an operating lease. We currently do not expect the amended guidance to have any other material impacts on our consolidated financial statements.

Reclassifications

When necessary, reclassifications have been made to our prior period financial information to conform to the current year presentation and are not material to our consolidated financial statements.

3. Summary of Significant Accounting Policies

Principles of Consolidation

The accompanying Consolidated Financial Statements include the accounts of WM, its wholly-owned and majority-owned subsidiaries and certain variable interest entities for which we have determined that we are the primary beneficiary. All material intercompany balances and transactions have been eliminated. Investments in unconsolidated entities are accounted for under the appropriate method of accounting.

WASTE MANAGEMENT, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

Estimates and Assumptions

In preparing our financial statements, we make numerous estimates and assumptions that affect the accounting for and recognition and disclosure of assets, liabilities, equity, revenues and expenses. We must make these estimates and assumptions because certain information that we use is dependent on future events, cannot be calculated with precision from available data or simply cannot be calculated. In some cases, these estimates are difficult to determine, and we must exercise significant judgment. In preparing our financial statements, the most difficult, subjective and complex estimates and the assumptions that present the greatest amount of uncertainty relate to our accounting for landfills, environmental remediation liabilities, long-lived asset impairments and reserves associated with our insured and self-insured claims. Each of these items is discussed in additional detail below. Actual results could differ materially from the estimates and assumptions that we use in the preparation of our financial statements.

Cash and Cash Equivalents

Cash in excess of current operating requirements is invested in short-term interest-bearing instruments with maturities of three months or less at the date of purchase and is stated at cost, which approximates market value.

Concentrations of Credit Risk

Financial instruments that potentially subject us to concentrations of credit risk consist primarily of cash and cash equivalents, investments held within our restricted trust and escrow accounts, and accounts receivable. We make efforts to control our exposure to credit risk associated with these instruments by (i) placing our assets and other financial interests with a diverse group of credit-worthy financial institutions; (ii) holding high-quality financial instruments while limiting investments in any one instrument and (iii) maintaining strict policies over credit extension that include credit evaluations, credit limits and monitoring procedures, although generally we do not have collateral requirements for credit extensions. We also control our exposure associated with trade receivables by discontinuing service, to the extent allowable, to non-paying customers. However, our overall credit risk associated with trade receivables is limited due to the large number and diversity of customers we serve. As of December 31, 2018 and 2017, no single customer represented greater than 5% of total accounts receivable.

Accounts and Other Receivables

Our receivables, which are recorded when billed, when services are performed or when cash is advanced, are claims against third parties that will generally be settled in cash. The carrying value of our receivables, net of the allowance for doubtful accounts, represents the estimated net realizable value. We estimate our allowance for doubtful accounts based on historical collection trends; type of customer, such as municipal or commercial; the age of outstanding receivables and existing economic conditions. If events or changes in circumstances indicate that specific receivable balances may be impaired, further consideration is given to the collectability of those balances and the allowance is adjusted accordingly. The activity within our allowance for doubtful accounts was not material for the reported periods. Past-due receivable balances are written off when our internal collection efforts have been unsuccessful. Also, we recognize interest income on long-term interest-bearing notes receivable as the interest accrues under the terms of the notes. We no longer accrue interest once the notes are deemed uncollectible.

Other receivables, as of December 31, 2018 and 2017, include receivables related to income tax payments in excess of our current income tax obligations of $284 million and $504 million, respectively.

Parts and Supplies

Parts and supplies consist primarily of spare parts, fuel, tires, lubricants and processed recycling materials. Our parts and supplies are stated at the lower of cost, using the average cost method, or market.

Landfill Accounting

Cost Basis of Landfill Assets — We capitalize various costs that we incur to make a landfill ready to accept waste. These costs generally include expenditures for land (including the landfill footprint and required landfill buffer property); permitting; excavation; liner material and installation; landfill leachate collection systems; landfill gas collection systems; environmental monitoring equipment for groundwater and landfill gas; and directly related engineering, capitalized interest, on-site road construction and other capital infrastructure costs. The cost basis of our landfill assets also includes asset retirement costs, which represent estimates of future costs associated with landfill final capping, closure and post-closure activities. These costs are discussed below.

Final Capping, Closure and Post-Closure Costs — Following is a description of our asset retirement activities and our related accounting:

- *Final Capping* — Involves the installation of flexible membrane liners and geosynthetic clay liners, drainage and compacted soil layers and topsoil over areas of a landfill where total airspace capacity has been consumed. Final capping asset retirement obligations are recorded on a units-of-consumption basis as airspace is consumed related to the specific final capping event with a corresponding increase in the landfill asset. Each final capping event is accounted for as a discrete obligation and recorded as an asset and a liability based on estimates of the discounted cash flows and capacity associated with each final capping event.
- *Closure* — Includes the construction of the final portion of methane gas collection systems (when required), demobilization and routine maintenance costs. These are costs incurred after the site ceases to accept waste, but before the landfill is certified as closed by the applicable state regulatory agency. These costs are recorded as an asset retirement obligation as airspace is consumed over the life of the landfill with a corresponding increase in the landfill asset. Closure obligations are recorded over the life of the landfill based on estimates of the discounted cash flows associated with performing closure activities.
- *Post-Closure* — Involves the maintenance and monitoring of a landfill site that has been certified closed by the applicable regulatory agency. Generally, we are required to maintain and monitor landfill sites for a 30-year period. These maintenance and monitoring costs are recorded as an asset retirement obligation as airspace is consumed over the life of the landfill with a corresponding increase in the landfill asset. Post-closure obligations are recorded over the life of the landfill based on estimates of the discounted cash flows associated with performing post-closure activities.

We develop our estimates of these obligations using input from our operations personnel, engineers and accountants. Our estimates are based on our interpretation of current requirements and proposed regulatory changes and are intended to approximate fair value. Absent quoted market prices, the estimate of fair value is based on the best available information, including the results of present value techniques. In many cases, we contract with third parties to fulfill our obligations for final capping, closure and post-closure. We use historical experience, professional engineering judgment and quoted or actual prices paid for similar work to determine the fair value of these obligations. We are required to recognize these obligations at market prices whether we plan to contract with third parties or perform the work ourselves. In those instances where we perform the work with internal resources, the incremental profit margin realized is recognized as a component of operating income when the work is completed.

Once we have determined final capping, closure and post-closure costs, we inflate those costs to the expected time of payment and discount those expected future costs back to present value. During the years ended December 31, 2018, 2017 and 2016, we inflated these costs in current dollars to the expected time of payment using an inflation rate of 2.5%. We discounted these costs to present value using the credit-adjusted, risk-free rate effective at the time an obligation is incurred, consistent with the expected cash flow approach. Any changes in expectations that result in an upward revision to the estimated cash flows are treated as a new liability and discounted at the current rate while downward revisions are discounted at the historical weighted average rate of the recorded obligation. As a result, the credit-adjusted, risk-free discount rate used to calculate the present value of an obligation is specific to each individual asset retirement obligation. The weighted average rate applicable to our long-term asset retirement obligations as of December 31, 2018 was approximately 5.50%.

We record the estimated fair value of final capping, closure and post-closure liabilities for our landfills based on the capacity consumed through the current period. The fair value of final capping obligations is developed based on our estimates of the airspace consumed to date for each final capping event and the expected timing of each final capping event. The fair value of closure and post-closure obligations is developed based on our estimates of the airspace consumed to date for the entire landfill and the expected timing of each closure and post-closure activity. Because these obligations are measured at estimated fair value using present value techniques, changes in the estimated cost or timing of future final capping, closure and post-closure activities could result in a material change in these liabilities, related assets and results of operations. We assess the appropriateness of the estimates used to develop our recorded balances annually, or more often if significant facts change.

Changes in inflation rates or the estimated costs, timing or extent of future final capping, closure and post-closure activities typically result in both (i) a current adjustment to the recorded liability and landfill asset and (ii) a change in liability and asset amounts to be recorded prospectively over either the remaining capacity of the related discrete final capping event or the remaining permitted and expansion airspace (as defined below) of the landfill. Any changes related to the capitalized and future cost of the landfill assets are then recognized in accordance with our amortization policy, which would generally result in amortization expense being recognized prospectively over the remaining capacity of the final capping event or the remaining permitted and expansion airspace of the landfill, as appropriate. Changes in such estimates associated with airspace that has been fully utilized result in an adjustment to the recorded liability and landfill assets with an immediate corresponding adjustment to landfill airspace amortization expense.

Interest accretion on final capping, closure and post-closure liabilities is recorded using the effective interest method and is recorded as final capping, closure and post-closure expense, which is included in operating expenses within our Consolidated Statements of Operations.

Amortization of Landfill Assets — The amortizable basis of a landfill includes (i) amounts previously expended and capitalized; (ii) capitalized landfill final capping, closure and post-closure costs; (iii) projections of future purchase and development costs required to develop the landfill site to its remaining permitted and expansion capacity and (iv) projected asset retirement costs related to landfill final capping, closure and post-closure activities.

Amortization is recorded on a units-of-consumption basis, applying expense as a rate per ton. The rate per ton is calculated by dividing each component of the amortizable basis of a landfill by the number of tons needed to fill the corresponding asset's airspace. For landfills that we do not own, but operate through lease or other contractual agreements, the rate per ton is calculated based on expected capacity to be utilized over the lesser of the contractual term of the underlying agreement or the life of the landfill.

We apply the following guidelines in determining a landfill's remaining permitted and expansion airspace:

- *Remaining Permitted Airspace* — Our engineers, in consultation with third-party engineering consultants and surveyors, are responsible for determining remaining permitted airspace at our landfills. The remaining permitted

airspace is determined by an annual survey, which is used to compare the existing landfill topography to the expected final landfill topography.

- *Expansion Airspace* — We also include currently unpermitted expansion airspace in our estimate of remaining permitted and expansion airspace in certain circumstances. First, to include airspace associated with an expansion effort, we must generally expect the initial expansion permit application to be submitted within one year and the final expansion permit to be received within five years. Second, we must believe that obtaining the expansion permit is likely, considering the following criteria:
  - Personnel are actively working on the expansion of an existing landfill, including efforts to obtain land use and local, state or provincial approvals;
  - We have a legal right to use or obtain land to be included in the expansion plan;
  - There are no significant known technical, legal, community, business, or political restrictions or similar issues that could negatively affect the success of such expansion; and
  - Financial analysis has been completed based on conceptual design, and the results demonstrate that the expansion meets Company criteria for investment.

For unpermitted airspace to be initially included in our estimate of remaining permitted and expansion airspace, the expansion effort must meet all the criteria listed above. These criteria are evaluated by our field-based engineers, accountants, managers and others to identify potential obstacles to obtaining the permits. Once the unpermitted airspace is included, our policy provides that airspace may continue to be included in remaining permitted and expansion airspace even if certain of these criteria are no longer met as long as we continue to believe we will ultimately obtain the permit, based on the facts and circumstances of a specific landfill. In these circumstances, continued inclusion must be approved through a landfill-specific review process that includes approval by our Chief Financial Officer and a review by the Audit Committee of our Board of Directors on a quarterly basis. Of the 15 landfill sites with expansions included as of December 31, 2018, two landfills required the Chief Financial Officer to approve the inclusion of the unpermitted airspace because the permit application process did not meet the one- or five-year requirements.

When we include the expansion airspace in our calculations of remaining permitted and expansion airspace, we also include the projected costs for development, as well as the projected asset retirement costs related to final capping, closure and post-closure of the expansion in the amortization basis of the landfill.

Once the remaining permitted and expansion airspace is determined in cubic yards, an airspace utilization factor ("AUF") is established to calculate the remaining permitted and expansion capacity in tons. The AUF is established using the measured density obtained from previous annual surveys and is then adjusted to account for future settlement. The amount of settlement that is forecasted will take into account several site-specific factors including current and projected mix of waste type, initial and projected waste density, estimated number of years of life remaining, depth of underlying waste, anticipated access to moisture through precipitation or recirculation of landfill leachate and operating practices. In addition, the initial selection of the AUF is subject to a subsequent multi-level review by our engineering group and the AUF used is reviewed on a periodic basis and revised as necessary. Our historical experience generally indicates that the impact of settlement at a landfill is greater later in the life of the landfill when the waste placed at the landfill approaches its highest point under the permit requirements.

After determining the costs and remaining permitted and expansion capacity at each of our landfills, we determine the per ton rates that will be expensed as waste is received and deposited at the landfill by dividing the costs by the corresponding number of tons. We calculate per ton amortization rates for each landfill for assets associated with each final capping event, for assets related to closure and post-closure activities and for all other costs capitalized or to be capitalized in the future. These rates per ton are updated annually, or more often, as significant facts change.

It is possible that actual results, including the amount of costs incurred, the timing of final capping, closure and post-closure activities, our airspace utilization or the success of our expansion efforts could ultimately turn out to be significantly different from our estimates and assumptions. To the extent that such estimates, or related assumptions, prove to be significantly different than actual results, lower profitability may be experienced due to higher amortization rates or higher expenses; or higher profitability may result if the opposite occurs. Most significantly, if it is determined that expansion capacity should no longer be considered in calculating the recoverability of a landfill asset, we may be required to recognize an asset impairment or incur significantly higher amortization expense. If at any time management makes the decision to abandon the expansion effort, the capitalized costs related to the expansion effort are expensed immediately.

Environmental Remediation Liabilities

A significant portion of our operating costs and capital expenditures could be characterized as costs of environmental protection. The nature of our operations, particularly with respect to the construction, operation and maintenance of our landfills, subjects us to an array of laws and regulations relating to the protection of the environment. Under current laws and regulations, we may have liabilities for environmental damage caused by our operations, or for damage caused by conditions that existed before we acquired a site. In addition to remediation activity required by state or local authorities, such liabilities include potentially responsible party ("PRP") investigations. The costs associated with these liabilities can include settlements, certain legal and consultant fees, as well as incremental internal and external costs directly associated with site investigation and clean up.

Where it is probable that a liability has been incurred, we estimate costs required to remediate sites based on site-specific facts and circumstances. We routinely review and evaluate sites that require remediation, considering whether we were an owner, operator, transporter, or generator at the site, the amount and type of waste hauled to the site and the number of years we were associated with the site. Next, we review the same type of information with respect to other named and unnamed PRPs. Estimates of the costs for the likely remedy are then either developed using our internal resources or by third-party environmental engineers or other service providers. Internally developed estimates are based on:

- Management's judgment and experience in remediating our own and unrelated parties' sites;
- Information available from regulatory agencies as to costs of remediation;
- The number, financial resources and relative degree of responsibility of other PRPs who may be liable for remediation of a specific site; and
- The typical allocation of costs among PRPs, unless the actual allocation has been determined.

Estimating our degree of responsibility for remediation is inherently difficult. We recognize and accrue for an estimated remediation liability when we determine that such liability is both probable and reasonably estimable. Determining the method and ultimate cost of remediation requires that a number of assumptions be made. There can sometimes be a range of reasonable estimates of the costs associated with the likely site remediation alternatives identified in the environmental impact investigation. In these cases, we use the amount within the range that is our best estimate. If no amount within a range appears to be a better estimate than any other, we use the amount that is the low end of such range. If we used the high ends of such ranges, our aggregate potential liability would be approximately $140 million higher than the $237 million recorded in the Consolidated Balance Sheet as of December 31, 2018. Our ultimate responsibility may differ materially from current estimates. It is possible that technological, regulatory or enforcement developments, the results of environmental studies, the inability to identify other PRPs, the inability of other PRPs to contribute to the settlements of such liabilities, or other factors could require us to record additional liabilities. Our ongoing review of our remediation liabilities, in light of relevant internal and external facts and circumstances, could result in revisions to our accruals that could cause upward or downward adjustments to our balance sheet and income from operations. These adjustments could be material in any given period.

WASTE MANAGEMENT, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

Where we believe that both the amount of a particular environmental remediation liability and the timing of the payments are fixed or reliably determinable, we inflate the cost in current dollars (by 2.5% as of December 31, 2018 and 2017) until the expected time of payment and discount the cost to present value using a risk-free discount rate, which is based on the rate for U.S. Treasury bonds with a term approximating the weighted average period until settlement of the underlying obligation. We determine the risk-free discount rate and the inflation rate on an annual basis unless interim changes would materially impact our results of operations. For remedial liabilities that have been discounted, we include interest accretion, based on the effective interest method, in operating expenses in our Consolidated Statements of Operations. The following table summarizes the impacts of revisions in the risk-free discount rate applied to our environmental remediation liabilities and recovery assets for the years ended December 31 (in millions) and the risk-free discount rate applied as of December 31:

	2018	2017	2016
Decrease in operating expenses	$ (2)	$ —	$ (2)
Risk-free discount rate applied to environmental remediation liabilities and recovery assets	2.75 %	2.5 %	2.5 %

The portion of our recorded environmental remediation liabilities that were not subject to inflation or discounting, as the amounts and timing of payments are not fixed or reliably determinable, was $35 million and $47 million as of December 31, 2018 and 2017, respectively. Had we not inflated and discounted any portion of our environmental remediation liability, the amount recorded would have increased $3 million as of December 31, 2018 and remained the same as of December 31, 2017.

Property and Equipment (Exclusive of Landfills, Discussed Above)

We record property and equipment at cost. Expenditures for major additions and improvements are capitalized and maintenance activities are expensed as incurred. We depreciate property and equipment over the estimated useful life of the asset using the straight-line method. We assume no salvage value for our depreciable property and equipment. When property and equipment are retired, sold or otherwise disposed of, the cost and accumulated depreciation are removed from our accounts and any resulting gain or loss is included in results of operations as an offset or increase to operating expense for the period.

The estimated useful lives for significant property and equipment categories are as follows (in years):

	Useful Lives
Vehicles — excluding rail haul cars	3 to 10
Vehicles — rail haul cars	10 to 30
Machinery and equipment — including containers	3 to 30
Buildings and improvements	5 to 40
Furniture, fixtures and office equipment	3 to 10

We include capitalized costs associated with developing or obtaining internal-use software within furniture, fixtures and office equipment. These costs include direct external costs of materials and services used in developing or obtaining the software and internal costs for employees directly associated with the software development project.

Leases

We lease property and equipment in the ordinary course of our business. Our most significant lease obligations are for property and equipment specific to our industry, including real property operated as a landfill or transfer station. Our leases have varying terms. Some may include renewal or purchase options, escalation clauses, restrictions, penalties or

other obligations that we consider in determining minimum lease payments. The leases are classified as either operating leases or capital leases, as appropriate. See Note 2 for information related to the pending adoption of ASU 2016-02.

Operating Leases (Excluding Landfill Leases Discussed Below) — The majority of our leases are operating leases. This classification generally can be attributed to either (i) relatively low fixed minimum lease payments as a result of real property lease obligations that vary based on the volume of waste we receive or process or (ii) minimum lease terms that are much shorter than the assets' economic useful lives. Management expects that in the normal course of business our operating leases will be renewed, replaced by other leases, or replaced with fixed asset expenditures. Our rent expense during each of the last three years and our future minimum operating lease payments for each of the next five years for which we are contractually obligated as of December 31, 2018 are disclosed in Note 10.

Capital Leases (Excluding Landfill Leases Discussed Below) — Assets under capital leases are capitalized using interest rates determined at the inception of each lease and are amortized over either the useful life of the asset or the lease term, as appropriate, on a straight-line basis. The present value of the related lease payments is recorded as a debt obligation. Our future minimum annual capital lease payments are included in our future debt obligations as disclosed in Note 7.

Landfill Leases — From an operating perspective, landfills that we lease are similar to landfills we own because generally we will operate the landfill for the life of the operating permit. The most significant portion of our rental obligations for landfill leases is contingent upon operating factors such as disposal volumes and often there are no contractual minimum rental obligations. Contingent rental obligations are expensed as incurred. For landfill capital leases that provide for minimum contractual rental obligations, we record the present value of the minimum obligation as part of the landfill asset, which is amortized on a units-of-consumption basis over the shorter of the lease term or the life of the landfill.

Acquisitions

We generally recognize assets acquired and liabilities assumed in business combinations, including contingent assets and liabilities, based on fair value estimates as of the date of acquisition.

Contingent Consideration — In certain acquisitions, we agree to pay additional amounts to sellers contingent upon achievement by the acquired businesses of certain negotiated goals, such as targeted revenue levels, targeted disposal volumes or the issuance of permits for expanded landfill airspace. We have recognized liabilities for these contingent obligations based on their estimated fair value as of the date of acquisition with any differences between the acquisition-date fair value and the ultimate settlement of the obligations being recognized as an adjustment to income from operations.

Acquired Assets and Assumed Liabilities — Assets and liabilities arising from contingencies such as pre-acquisition environmental matters and litigation are recognized at their acquisition-date fair value when their respective fair values can be determined. If the fair values of such contingencies cannot be determined, they are recognized as of the acquisition date if the contingencies are probable and an amount can be reasonably estimated.

Acquisition-date fair value estimates are revised as necessary if, and when, additional information regarding these contingencies becomes available to further define and quantify assets acquired and liabilities assumed. Subsequent to finalization of purchase accounting, these revisions are accounted for as adjustments to income from operations. All acquisition-related transaction costs are expensed as incurred.

Goodwill and Other Intangible Assets

Goodwill is the excess of our purchase cost over the fair value of the net assets of acquired businesses. We do not amortize goodwill, but as discussed in the *Long-Lived Asset Impairments* section below, we assess our goodwill for impairment at least annually.

Other intangible assets consist primarily of customer and supplier relationships, covenants not-to-compete, licenses, permits (other than landfill permits, as all landfill-related intangible assets are combined with landfill tangible assets and amortized using our landfill amortization policy), and other contracts. Other intangible assets are recorded at fair value on the acquisition date and are generally amortized using either a 150% declining balance approach or a straight-line basis as we determine appropriate. Customer and supplier relationships are typically amortized over a term of ten years. Covenants not-to-compete are amortized over the term of the non-compete covenant, which is generally two to five years. Licenses, permits and other contracts are amortized over the definitive terms of the related agreements. If the underlying agreement does not contain definitive terms and the useful life is determined to be indefinite, the asset is not amortized.

Long-Lived Asset Impairments

We assess our long-lived assets for impairment as required under the applicable accounting standards. If necessary, impairments are recorded in (gain) loss from divestitures, asset impairments and unusual items, net in our Consolidated Statement of Operations.

Property and Equipment, Including Landfills and Definite-Lived Intangible Assets — We monitor the carrying value of our long-lived assets for potential impairment on an ongoing basis and test the recoverability of such assets generally using significant unobservable ("Level 3") inputs whenever events or changes in circumstances indicate that their carrying amounts may not be recoverable. These events or changes in circumstances, including management decisions pertaining to such assets, are referred to as impairment indicators. If an impairment indicator occurs, we perform a test of recoverability by comparing the carrying value of the asset or asset group to its undiscounted expected future cash flows. If cash flows cannot be separately and independently identified for a single asset, we will determine whether an impairment has occurred for the group of assets for which we can identify the projected cash flows. If the carrying values are in excess of undiscounted expected future cash flows, we measure any impairment by comparing the fair value of the asset or asset group to its carrying value and the difference is recorded in the period that the impairment indicator occurs. Fair value is generally determined by considering (i) internally developed discounted projected cash flow analysis of the asset or asset group; (ii) actual third-party valuations and/or (iii) information available regarding the current market for similar assets. Estimating future cash flows requires significant judgment and projections may vary from the cash flows eventually realized, which could impact our ability to accurately assess whether an asset has been impaired.

The assessment of impairment indicators and the recoverability of our capitalized costs associated with landfills and related expansion projects require significant judgment due to the unique nature of the waste industry, the highly regulated permitting process and the sensitive estimates involved. During the review of a landfill expansion application, a regulator may initially deny the expansion application although the expansion permit is ultimately granted. In addition, management may periodically divert waste from one landfill to another to conserve remaining permitted landfill airspace, or a landfill may be required to cease accepting waste, prior to receipt of the expansion permit. However, such events occur in the ordinary course of business in the waste industry and do not necessarily result in impairment of our landfill assets because, after consideration of all facts, such events may not affect our belief that we will ultimately obtain the expansion permit. As a result, our tests of recoverability, which generally make use of a probability-weighted cash flow estimation approach, may indicate that no impairment loss should be recorded.

Indefinite-Lived Intangible Assets, Including Goodwill — At least annually, and more frequently if warranted, we assess the indefinite-lived intangible assets including the goodwill of our reporting units for impairment using Level 3 inputs.

Beginning in 2018, we first performed a qualitative assessment to determine if it was more likely than not that the fair value of a reporting unit was less than its carrying value. If the assessment indicated a possible impairment, we completed a quantitative review, comparing the estimated fair value of a reporting unit to its carrying amount, including goodwill. An impairment charge was recognized if the asset's estimated fair value was less than its carrying amount. Fair value is typically estimated using an income approach. However, when appropriate, we may also use a market approach. The income approach is based on the long-term projected future cash flows of the reporting units. We discount the estimated cash flows to present value using a weighted average cost of capital that considers factors such as market assumptions, the timing of the cash flows and the risks inherent in those cash flows. We believe that this approach is appropriate because it provides a fair value estimate based upon the reporting units' expected long-term performance considering the economic and market conditions that generally affect our business. The market approach estimates fair value by measuring the aggregate market value of publicly-traded companies with similar characteristics to our business as a multiple of their reported earnings. We then apply that multiple to the reporting units' earnings to estimate their fair values. We believe that this approach may also be appropriate in certain circumstances because it provides a fair value estimate using valuation inputs from entities with operations and economic characteristics comparable to our reporting units.

Fair value is computed using several factors, including projected future operating results, economic projections, anticipated future cash flows, comparable marketplace data and the cost of capital. There are inherent uncertainties related to these factors and to our judgment in applying them in our analysis. However, we believe our methodology for estimating the fair value of our reporting units is reasonable.

Refer to Note 11 for information related to impairments recognized during the reported periods.

Insured and Self-Insured Claims

We have retained a significant portion of the risks related to our health and welfare, general liability, automobile liability and workers' compensation claims programs. The exposure for unpaid claims and associated expenses, including incurred but not reported losses, generally is estimated with the assistance of external actuaries and by factoring in pending claims and historical trends and data. The gross estimated liability associated with settling unpaid claims is included in accrued liabilities in our Consolidated Balance Sheets if expected to be settled within one year; otherwise, it is included in other long-term liabilities. Estimated insurance recoveries related to recorded liabilities are reflected as other current receivables or other long-term assets in our Consolidated Balance Sheets when we believe that the receipt of such amounts is probable.

In December 2017, we elected to use a wholly-owned insurance captive to insure the deductibles for our general liability, automobile liability and workers' compensation claims programs. We continue to maintain conventional insurance policies with third-party insurers. In addition to certain business and operating benefits of having a wholly-owned insurance captive, we expect to receive certain cash flow benefits related to the timing of tax deductions related to these claims. WM will pay an annual premium to the insurance captive, typically in the first quarter of the year, for the estimated losses based on the external actuarial analysis. These premiums are held in a restricted escrow account to be used solely for paying insurance claims, resulting in a transfer of risk from WM to the insurance captive and are allocated between current and long-term assets depending on timing on the use of funds.

WASTE MANAGEMENT, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

Restricted Trust and Escrow Accounts

Our restricted trust and escrow accounts consist principally of funds deposited for purposes of funding insurance claims and settling landfill final capping, closure, post-closure and environmental remediation obligations. These funds are allocated between cash, money market funds and available-for-sale securities depending on the estimated timing and purpose of the use of funds. In December 2017, we elected to use a wholly-owned insurance captive to insure the deductibles for certain claims programs, as discussed above in *Insured and Self-Insured Claims*, and the premiums paid were directly deposited into a restricted escrow account to be used solely for paying insurance claims. At several of our landfills, we provide financial assurance by depositing cash into restricted trust or escrow accounts for purposes of settling final capping, closure, post-closure and environmental remediation obligations. Balances maintained in these restricted trust and escrow accounts will fluctuate based on (i) changes in statutory requirements; (ii) future deposits made to comply with contractual arrangements; (iii) the ongoing use of funds; (iv) acquisitions or divestitures and (v) changes in the fair value of the financial instruments held in the restricted trust or escrow accounts.

See Note 18 for additional discussion related to restricted trust and escrow accounts for final capping, closure, post-closure or environmental remediation obligations.

Investments in Unconsolidated Entities

Investments in unconsolidated entities over which the Company has significant influence are accounted for under the equity method of accounting. Prior to 2018, investments in entities in which the Company does not have the ability to exert significant influence over the investees' operating and financing activities were accounted for under the cost method of accounting. On January 1, 2018, we adopted ASU 2016-01, which resulted in certain equity investments previously accounted for under the cost method to be measured using a quantitative approach as we concluded these investments did not have readily determinable fair values. The quantitative approach, or measurement alternative, is equal to its cost minus impairment, if any, plus or minus changes resulting from observable price changes in orderly transactions for the identical or a similar investment of the same issuer. See Note 2 for additional information related to this amended guidance. The fair value of our redeemable preferred stock has been measured based on third-party investors' recent or pending transactions in these securities, which are considered the best evidence of fair value. The following table summarizes our investments in unconsolidated entities as of December 31 (in millions):

	2018	2017
Equity method investments	$ 257	$ 127
Investments without readily determinable fair values	83	87
Redeemable preferred stock	66	55
Investments in unconsolidated entities	$ 406	$ 269

We monitor and assess the carrying value of our investments throughout the year for potential impairment and write them down to their fair value when other-than-temporary declines exist. Fair value is generally based on (i) other third-party investors' recent transactions in the securities; (ii) other information available regarding the current market for similar assets; (iii) a market or income approach, as deemed appropriate and/or (iv) a quantitative approach, or measurement alternative, as noted above. Impairments of our investments are recorded in equity in net losses of unconsolidated entities or other, net in the Consolidated Statements of Operations in accordance with appropriate accounting guidance.

Refer to Notes 11 and 16 for information related to impairments and other adjustments recognized during the reported periods.

WASTE MANAGEMENT, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

Foreign Currency

We have operations in Canada, as well as certain support functions in India. Local currencies generally are considered the functional currencies of our operations and investments outside the U.S. The assets and liabilities of our foreign operations are translated to U.S. dollars using the exchange rate as of the balance sheet date. Revenues and expenses are translated to U.S. dollars using the average exchange rate during the period. The resulting translation difference is reflected as a component of other comprehensive income (loss).

Cross-Currency Swaps

From time to time, we will use derivative financial instruments to manage our risk associated with fluctuations in foreign currency exchange rates. Through March 2016, we used cross-currency swaps to hedge our exposure to fluctuations in exchange rates for anticipated intercompany cash transactions between Waste Management Holdings, Inc., a wholly-owned subsidiary ("WM Holdings"), and its Canadian subsidiaries.

Our cross-currency swaps had been designated as cash flow hedges for accounting purposes, which resulted in the unrealized changes in the fair value of the derivative instruments being recorded in accumulated other comprehensive income (loss) within our Consolidated Balance Sheets. The associated balance in accumulated other comprehensive income (loss) was reclassified to earnings as the hedged cash flows affected earnings. The financial statement impacts of our cross-currency swaps are discussed in Note 7.

Revenue Recognition

Our Solid Waste operating revenues are primarily generated from fees charged for our collection, transfer, disposal, and recycling and resource recovery services, and from sales of commodities by our recycling and landfill gas-to-energy operations. Revenues from our collection operations are influenced by factors such as collection frequency, type of collection equipment furnished, type and volume or weight of the waste collected, distance to the disposal facility or material recovery facility and our disposal costs. Revenues from our landfill operations consist of tipping fees, which are generally based on the type and weight or volume of waste being disposed of at our disposal facilities. Fees charged at transfer stations are generally based on the weight or volume of waste deposited, taking into account our cost of loading, transporting and disposing of the solid waste at a disposal site. Recycling revenues generally consist of tipping fees and the sale of recycling commodities to third parties. The fees we charge for our services generally include our environmental fee, fuel surcharge and regulatory recovery fee, which are intended to pass through to customers direct and indirect costs incurred. We also provide additional services that are not managed through our Solid Waste business, including operations managed by both our Strategic Business Solutions ("WMSBS") and Energy and Environmental Services ("EES") organizations, recycling brokerage services, landfill gas-to-energy services and certain other expanded service offerings and solutions.

Our revenue from sources other than customer contracts primarily relates to lease revenue associated with compactors and balers. Revenue from these leasing arrangements was not material and represented approximately 1% of total revenue for each of the reported periods.

We generally recognize revenue as services are performed or products are delivered. For example, revenue typically is recognized as waste is collected, tons are received at our landfills or transfer stations, or recycling commodities are collected or delivered as product. We bill for certain services prior to performance. Such services include, among others, certain commercial and residential contracts and equipment rentals. These advance billings are included in deferred revenues and recognized as revenue in the period service is provided.

See Note 19 for additional information related to revenue by reportable segment and major lines of business.

Deferred Revenues

We record deferred revenues when cash payments are received or due in advance of our performance and classify them as current since they are earned within a year and there are no significant financing components. Substantially all our deferred revenues during the reported periods are realized as revenues within one to three months, when the related services are performed.

Contract Acquisition Costs

Our incremental direct costs of obtaining a contract, which consist primarily of sales incentives, are generally deferred and amortized to selling, general and administrative expense over the estimated life of the relevant customer relationship, ranging from 5 to 13 years. Contract acquisition costs that are paid to the customer are deferred and amortized as a reduction in revenue over the contract life. Our contract acquisition costs are classified as current or noncurrent based on the timing of when we expect to recognize amortization and are included in other assets in our Consolidated Balance Sheet.

As of December 31, 2018, we had $145 million of deferred contract costs, of which $109 million was related to deferred sales incentives. During the year ended December 31, 2018, we amortized $22 million of sales incentives to selling, general and administrative expense and $35 million of other contract acquisition costs as a reduction in revenue.

Long-Term Contracts

Approximately 25% of our total revenue is derived from contracts with a remaining term greater than one year. The consideration for these contracts is primarily variable in nature. The variable elements of these contracts primarily include the number of homes and businesses served and annual rate changes based on consumer price index, fuel prices or other operating costs. Such contracts are generally within our collection, recycling and other lines of business and have a weighted average remaining contract life of approximately four years. We do not disclose the value of unsatisfied performance obligations for these contracts as our right to consideration corresponds directly to the value provided to the customer for services completed to date and all future variable consideration is allocated to wholly unsatisfied performance obligations.

Capitalized Interest

We capitalize interest on certain projects under development, including landfill expansion projects, certain assets under construction, including operating landfills and landfill gas-to-energy projects and internal-use software. During 2018, 2017 and 2016, total interest costs were $400 million, $383 million and $394 million, respectively, of which $16 million, $15 million and $9 million was capitalized in 2018, 2017 and 2016, respectively.

Income Taxes

The Company is subject to income tax in the U.S. and Canada. Current tax obligations associated with our income tax expense are reflected in the accompanying Consolidated Balance Sheets as a component of accrued liabilities and our deferred tax obligations are reflected in deferred income taxes.

Deferred income taxes are based on the difference between the financial reporting and tax basis of assets and liabilities. Deferred income tax expense represents the change during the reporting period in the deferred tax assets and liabilities, net of the effect of acquisitions and dispositions. Deferred tax assets include tax loss and credit carry-forwards and are reduced by a valuation allowance if, based on available evidence, it is more likely than not that some portion or all of the deferred tax assets will not be realized. We establish reserves for uncertain tax positions when, despite our belief that our tax return positions are fully supportable, we believe that certain positions may be challenged and potentially disallowed. When facts and circumstances change, we adjust these reserves through our income tax expense.

Should interest and penalties be assessed by taxing authorities on any underpayment of income tax, such amounts would be accrued and classified as a component of our income tax expense in our Consolidated Statements of Operations.

See Note 8 for discussion of the impacts of enactment of the Act which was signed into law on December 22, 2017 and is generally effective for tax years beginning January 1, 2018.

Contingent Liabilities

We estimate the amount of potential exposure we may have with respect to claims, assessments and litigation in accordance with authoritative guidance on accounting for contingencies. We are party to pending or threatened legal proceedings covering a wide range of matters in various jurisdictions. It is difficult to predict the outcome of litigation, as it is subject to many uncertainties. Additionally, it is not always possible for management to make a meaningful estimate of the potential loss or range of loss associated with such contingencies. See Note 10 for discussion of our commitments and contingencies.

Supplemental Cash Flow Information

The following table shows supplemental cash flow information for the years ended December 31 (in millions):

	2018	2017	2016
Interest, net of capitalized interest	$ 339	$ 380	$ 375
Income taxes	349	562	442

During 2018, we had $250 million of non-cash financing activities from our recent federal low-income housing investment discussed in Note 8 and new capital leases. During 2017 and 2016, we did not have any significant non-cash investing and financing activities. Non-cash investing and financing activities are generally excluded from the Consolidated Statements of Cash Flows.

4. Landfill and Environmental Remediation Liabilities

Liabilities for landfill and environmental remediation costs as of December 31 are presented in the table below (in millions):

	2018			2017		
	Landfill	Environmental Remediation	Total	Landfill	Environmental Remediation	Total
Current (in accrued liabilities)	$ 143	$ 26	$ 169	$ 128	$ 28	$ 156
Long-term	1,617	211	1,828	1,547	223	1,770
	$ 1,760	$ 237	$ 1,997	$ 1,675	$ 251	$ 1,926

WASTE MANAGEMENT, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

The changes to landfill and environmental remediation liabilities for the year ended December 31, 2018 are reflected in the table below (in millions):

	Landfill	Environmental Remediation
December 31, 2017	$ 1,675	$ 251
Obligations incurred and capitalized	83	—
Obligations settled	(108)	(26)
Interest accretion	95	5
Revisions in estimates and interest rate assumptions (a) (b)	(3)	9
Acquisitions, divestitures and other adjustments (c)	18	(2)
December 31, 2018	$ 1,760	$ 237

(a) The amount reported for our landfill liabilities includes a net decrease of $15 million primarily related to our year-end annual review of landfill final capping, closure and post-closure obligations partially offset by an increase of $12 million due to the acceleration of the expected timing of capping activities for a landfill. See Note 11 for discussion of the impairment charge related to this landfill.

(b) The amount reported for our environmental remediation liabilities includes changes in cost estimates associated with environmental remediation projects resulting in an increase in the required obligation. These charges were partially offset by a decrease of $3 million in our environmental remediation liabilities due to an increase in the risk-free discount rate used to measure our liabilities from 2.5% at December 31, 2017 to 2.75% at December 31, 2018.

(c) The amount reported for our landfill liabilities includes an increase of $27 million due to landfill acquisitions partially offset by landfill divestitures and other adjustments.

Our recorded liabilities as of December 31, 2018 include the impacts of inflating certain of these costs based on our expectations of the timing of cash settlement and of discounting certain of these costs to present value. Anticipated payments of currently identified environmental remediation liabilities, as measured in current dollars, are $26 million in 2019, $19 million in 2020, $65 million in 2021, $37 million in 2022, $13 million in 2023 and $81 million thereafter.

At several of our landfills, we provide financial assurance by depositing cash into restricted trust funds or escrow accounts for purposes of settling final capping, closure, post-closure and environmental remediation obligations. Generally, these trust funds are established to comply with statutory requirements and operating agreements. See Notes 16 and 18 for additional information related to these trusts.

WASTE MANAGEMENT, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

5. Property and Equipment

Property and equipment as of December 31 consisted of the following (in millions):

	2018	2017
Land	$ 656	$ 624
Landfills	15,240	14,904
Vehicles	5,059	4,750
Machinery and equipment	2,988	2,824
Containers	2,588	2,571
Buildings and improvements	2,998	2,846
Furniture, fixtures and office equipment	677	744
	30,206	29,263
Less: Accumulated depreciation of tangible property and equipment	(9,107)	(8,916)
Less: Accumulated amortization of landfill airspace	(9,157)	(8,788)
Property and equipment, net	$ 11,942	$ 11,559

Depreciation and amortization expense, including amortization expense for assets recorded as capital leases, consisted of the following for the years ended December 31 (in millions):

	2018	2017	2016
Depreciation of tangible property and equipment	$ 838	$ 783	$ 773
Amortization of landfill airspace	538	497	428
Depreciation and amortization expense	$ 1,376	$ 1,280	$ 1,201

6. Goodwill and Other Intangible Assets

Goodwill was $6,430 million and $6,247 million as of December 31, 2018 and 2017, respectively. The $183 million increase in goodwill during 2018 is primarily related to acquisitions partially offset by translation adjustments related to our Canadian operations, divestitures and an impairment charge, which is discussed below.

As discussed more fully in Note 3, we perform our annual impairment test of goodwill balances for our reporting units using a measurement date of October 1. We will also perform interim tests if an impairment indicator exists. During the fourth quarter of 2018, we recorded a goodwill impairment charge of $6 million related to our LampTracker® reporting unit, as a result of our annual impairment test, as the carrying value including goodwill exceeded the estimated fair value. Fair value was estimated using an income approach based on long-term projected discounted future cash flows of the reporting unit.

See Notes 11, 17 and 19 for additional information related to goodwill.

WASTE MANAGEMENT, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

Our other intangible assets consisted of the following as of December 31 (in millions):

	Customer and Supplier Relationships	Covenants Not-to-Compete	Licenses, Permits and Other	Total
2018				
Intangible assets	$ 949	$ 60	$ 109	$ 1,118
Less: Accumulated amortization	(461)	(24)	(61)	(546)
	$ 488	$ 36	$ 48	$ 572
2017				
Intangible assets	$ 880	$ 48	$ 124	$ 1,052
Less: Accumulated amortization	(422)	(21)	(62)	(505)
	$ 458	$ 27	$ 62	$ 547

Amortization expense for other intangible assets was $101 million, $96 million and $100 million for 2018, 2017 and 2016, respectively. As of December 31, 2018, we had $18 million of licenses, permits and other intangible assets that are not subject to amortization because they do not have stated expirations or have routine, administrative renewal processes. Additional information related to other intangible assets acquired through business combinations is included in Note 17. As of December 31, 2018, we expect annual amortization expense related to other intangible assets to be $105 million in 2019, $94 million in 2020, $79 million in 2021, $63 million in 2022 and $55 million in 2023.

7. Debt

The following table summarizes the major components of debt as of each balance sheet date (in millions) and provides the maturities and interest rate ranges of each major category as of December 31:

	2018	2017
Revolving credit facility (weighted average interest rate of 3.1% as of December 31, 2018)	$ 11	$ —
Commercial paper program (weighted average interest rate of 2.9% as of December 31, 2018 and 1.9% as of December 31, 2017)	990	515
Canadian term loan and revolving credit facility (weighted average effective interest rate of 2.5% as of December 31, 2017)	—	113
Senior notes, maturing through 2045, interest rates ranging from 2.4% to 7.75% (weighted average interest rate of 4.3% as of December 31, 2018 and December 31, 2017)	6,222	6,222
Tax-exempt bonds, maturing through 2048, fixed and variable interest rates ranging from 1.35% to 4.3% (weighted average interest rate of 2.35% as of December 31, 2018 and 2.0% as of December 31, 2017)	2,388	2,370
Capital leases and other, maturing through 2040, interest rates up to 12%	467	327
Debt issuance costs, discounts and other	(52)	(56)
	10,026	9,491
Current portion of long-term debt	432	739
	$ 9,594	$ 8,752

Debt Classification

As of December 31, 2018, we had $1.9 billion of debt maturing within the next 12 months, including (i) $990 million of short-term borrowings under our commercial paper program; (ii) $705 million of tax-exempt bonds with term interest rate periods that expire within the next 12 months, which is prior to their scheduled maturities; (iii) $161 million of other debt with scheduled maturities within the next 12 months, including $106 million of tax-exempt bonds and

(iv) C$15 million, or $11 million, of Canadian borrowings under our long-term U.S. and Canadian revolving credit facility ("$2.75 billion revolving credit facility"). Of the $990 million of short-term borrowings outstanding under our commercial paper program as of December 31, 2018 that are supported by our $2.75 billion revolving credit facility, we have the intent and ability to refinance or maintain approximately $730 million of these borrowings on a long-term basis, and we have classified these amounts as long-term debt. As of December 31, 2018, we have classified an additional $705 million of debt maturing in the next 12 months as long-term because we have the intent and ability to refinance these borrowings on a long-term basis as supported by the forecasted available capacity under our $2.75 billion revolving credit facility, as discussed below. The remaining $432 million of debt maturing in the next 12 months is classified as current obligations.

As of December 31, 2018, we also have $268 million of variable-rate tax-exempt bonds that are supported by letters of credit under our $2.75 billion revolving credit facility. The interest rates on our variable-rate tax-exempt bonds are generally reset on either a daily or weekly basis through a remarketing process. All recent tax-exempt bond remarketings have successfully placed Company bonds with investors at market-driven rates and we currently expect future remarketings to be successful. However, if the remarketing agent is unable to remarket our bonds, the remarketing agent can put the bonds to us. In the event of a failed remarketing, we have the availability under our $2.75 billion revolving credit facility to fund these bonds until they are remarketed successfully. Accordingly, we have also classified these borrowings as long-term in our Consolidated Balance Sheet as of December 31, 2018.

Access to and Utilization of Credit Facilities and Commercial Paper Program

$2.75 Billion Revolving Credit Facility — In June 2018, we entered into the $2.75 billion revolving credit facility, which amended and restated our prior long-term U.S. revolving credit facility. Amendments to the credit agreement included (i) increasing total capacity under the facility from $2.25 billion to $2.75 billion; (ii) establishment of a $750 million accordion feature that may be used to increase total capacity in future periods; (iii) extending the term through June 2023 and (iv) inclusion of two one-year extension options. Waste Management of Canada Corporation and WM Quebec Inc., each an indirect wholly-owned subsidiary of WM, were added as additional borrowers under the $2.75 billion revolving credit facility, and the agreement permits borrowing in Canadian dollars up to the U.S. dollar equivalent of $375 million, with such borrowings to be repaid in Canadian dollars. WM Holdings, a wholly-owned subsidiary of WM, guarantees all the obligations under the $2.75 billion revolving credit facility.

The $2.75 billion revolving credit facility provides us with credit capacity to be used for either cash borrowings or to support letters of credit or commercial paper. The rates we pay for outstanding U.S. or Canadian loans are generally based on LIBOR or CDOR, respectively, plus a spread depending on the Company's debt rating assigned by Moody's Investors Service and Standard and Poor's. The spread above LIBOR or CDOR ranges from 0.69% to 1.05%. Our $2.75 billion revolving credit facility was drafted in anticipation of the phaseout of LIBOR and contains provisions to replace LIBOR with an appropriate alternate benchmark rate as needed. As of December 31, 2018, we had C$15 million, or $11 million, of Canadian borrowings outstanding under this facility. We had $587 million of letters of credit issued and $990 million of outstanding borrowings under our commercial paper program, both supported by this facility, leaving unused and available credit capacity of $1.2 billion as of December 31, 2018.

Commercial Paper Program — We have a commercial paper program that enables us to borrow funds for up to 397 days at competitive interest rates. The rates we pay for outstanding borrowings are based on the term of the notes. The commercial paper program is fully supported by our $2.75 billion revolving credit facility. In June 2018, we amended our commercial paper program, increasing our ability to borrow funds from $1.5 billion to $2.75 billion, provided that the aggregate outstanding amount of commercial paper borrowings, together with borrowings and issued letters of credit under the $2.75 billion revolving credit facility, shall not at any time exceed the aggregate authorized borrowing capacity of such facility. As of December 31, 2018, we had $990 million of outstanding borrowings under our commercial paper program.

WASTE MANAGEMENT, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

Canadian Term Loan and Revolving Credit Facility — In August 2018, we terminated our Canadian credit agreement, as discussed further below. Prior to its termination, the Canadian credit agreement provided the Company with (i) C$50 million of revolving credit capacity to be used for borrowings or letters of credit and (ii) C$460 million of non-revolving term credit that was prepayable without penalty.

Other Letter of Credit Facilities — As of December 31, 2018, we had utilized $556 million of other letter of credit facilities, which are both committed and uncommitted, with terms maturing through December 2020.

Debt Borrowings and Repayments

Revolving Credit Facility — During the first half of 2018, we borrowed and repaid $28 million under our revolving credit facility, which we amended in June 2018, as discussed above. During the second half of 2018, we had net cash Canadian borrowings of C$15 million, or $11 million, under our $2.75 billion revolving credit facility, a portion of which was used to repay net advances under our Canadian term loan, as discussed below.

Commercial Paper Program — During the year ended December 31, 2018, we had net cash borrowings of $453 million (net of the related discount on issuance) for general corporate purposes.

Canadian Term Loan — Through August 2018, we repaid the remaining balance of C$142 million, or $109 million, under our Canadian term loan and revolving credit facility and subsequently terminated our Canadian credit agreement. The remaining change in the carrying value of outstanding borrowings under our Canadian term loan and revolving credit facility is due to foreign currency translation.

Tax-Exempt Bonds — We issued $80 million of new tax-exempt bonds in 2018. The proceeds from the issuance of these bonds were deposited directly into a restricted trust fund and may only be used for the specific purpose for which the money was raised, which is generally to finance expenditures for landfill and solid waste disposal facility construction and development. Additionally, during the year ended December 31, 2018, we repaid $62 million of our tax-exempt bonds with available cash at their scheduled maturities. In the fourth quarter of 2018, we elected to refund and reissue $105 million of tax-exempt bonds to extend the maturities.

Capital Leases and Other — The increase in our capital leases and other debt obligations in 2018 is related to our recent federal low-income housing investment discussed in Note 8 and new capital leases, which increased our debt obligations by $250 million, offset by $60 million of net cash repayments and $50 million in divestitures.

Scheduled Debt Payments

Principal payments of our debt and capital leases for the next five years and thereafter, based on scheduled maturities are as follows: $1,166 million in 2019, $780 million in 2020, $584 million in 2021, $622 million in 2022, $614 million in 2023 and $6,382 million thereafter. Our recorded debt and capital lease obligations include non-cash adjustments associated with debt issuance costs, discounts, premiums and fair value adjustments attributable to terminated interest rate derivatives, which have been excluded from these amounts because they will not result in cash payments.

Cross-Currency Swaps

In March 2016, our Canadian subsidiaries repaid C$370 million of intercompany debt to WM Holdings with proceeds from our Canadian term loan. Concurrent with the repayment of the intercompany debt, we terminated the related cross-currency swaps and received $67 million in cash. The cash received from our termination of these swaps was classified as a change in other current assets and other assets within net cash provided by operating activities in the Consolidated

Statement of Cash Flows. In addition, we recognized $8 million of expense associated with the termination of these swaps in 2016, which was included in other, net in the Consolidated Statement of Operations.

Secured Debt

Our debt balances are generally unsecured, except for capital leases and the notes payable associated with our investments in low-income housing properties.

Debt Covenants

The terms of certain of our financing arrangements require that we comply with financial and other covenants. Our most restrictive financial covenant is the one contained in our $2.75 billion revolving credit facility, which sets forth a maximum total debt to consolidated earnings before interest, taxes, depreciation and amortization ratio (the "Leverage Ratio"). This covenant requires that the Leverage Ratio for the preceding four fiscal quarters will not be more than 3.5 to 1, provided that if an acquisition permitted under the $2.75 billion revolving credit facility involving aggregate consideration in excess of $200 million occurs during the fiscal quarter, the Company shall have the right to increase the Leverage Ratio to 4.0 to 1 during such fiscal quarter and for the following three fiscal quarters (the "Elevated Leverage Ratio Period"). There shall be no more than two Elevated Leverage Ratio Periods during the term of the $2.75 billion revolving credit facility, and the Leverage Ratio must return to 3.5 to 1 for at least one fiscal quarter between Elevated Leverage Ratio Periods. The calculation of all components used in the Leverage Ratio covenant are as defined in the $2.75 billion revolving credit facility.

Our $2.75 billion revolving credit facility, senior notes and other financing arrangements also contain certain restrictions on the ability of the Company's subsidiaries to incur additional indebtedness as well as restrictions on the ability of the Company and its subsidiaries to, among other things, incur liens; engage in sale-leaseback transactions; make certain investments and engage in mergers and consolidations. We monitor our compliance with these restrictions, but do not believe that they significantly impact our ability to enter into investing or financing arrangements typical for our business. As of December 31, 2018 and 2017, we were in compliance with all covenants and restrictions under our financing arrangements that may have a material effect on our Consolidated Financial Statements.

8. Income Taxes

Income Tax Expense

Our income tax expense consisted of the following for the years ended December 31 (in millions):

	2018	2017	2016
Current:			
Federal	$ 256	$ 400	$ 443
State	132	56	88
Foreign	40	37	38
	428	493	569
Deferred:			
Federal	59	(316)	57
State	(32)	62	17
Foreign	(2)	3	(1)
	25	(251)	73
Income tax expense	$ 453	$ 242	$ 642

WASTE MANAGEMENT, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

The U.S. federal statutory income tax rate is reconciled to the effective income tax rate for the years ended December 31 as follows:

	2018	2017	2016
Income tax expense at U.S. federal statutory rate	21.00 %	35.00 %	35.00 %
State and local income taxes, net of federal income tax benefit	4.41	3.25	3.31
Impacts of enactment of tax reform	(0.51)	(24.14)	—
Federal tax credits	(2.44)	(2.31)	(3.08)
Taxing authority audit settlements and other tax adjustments	(3.85)	0.03	(0.53)
Tax impact of equity-based compensation transactions	(0.54)	(1.45)	—
Tax impact of impairments	0.03	0.66	0.80
Tax rate differential on foreign income	0.43	(0.55)	(0.63)
Other	0.51	0.55	0.36
Effective income tax rate	19.04 %	11.04 %	35.23 %

The comparability of our income tax expense for the reported periods has been primarily affected by (i) variations in our income before income taxes; (ii) impacts of enactment of tax reform; (iii) federal tax credits; (iv) tax audit settlements; (v) adjustments to our accruals and related deferred taxes; (vi) the realization of state net operating losses and credits; (vii) excess tax benefits associated with equity-based compensation transactions and (viii) the tax implications of impairments.

For financial reporting purposes, income before income taxes by source for the years ended December 31 was as follows (in millions):

	2018	2017	2016
Domestic	$ 2,235	$ 2,040	$ 1,681
Foreign	141	151	141
Income before income taxes	$ 2,376	$ 2,191	$ 1,822

Enactment of Tax Reform – The Act was signed into law on December 22, 2017. The most significant impacts of the Act to the Company include a decrease in the federal corporate income tax rate from 35% to 21% effective January 1, 2018 and a one-time, mandatory transition tax on deemed repatriation of previously tax-deferred and unremitted foreign earnings.

In accordance with ASU 2018-05 and SAB 118, the Company recognized the provisional tax impacts of the Act to the Company in 2017. For the year ended December 31, 2017, we recognized a reduction in our income tax expense of $529 million consisting of a net tax benefit of $595 million for the remeasurement of our deferred income tax assets and liabilities due to the decrease in the federal corporate income tax rate, partially offset by income tax expense of $66 million for the one-time, mandatory transition tax.

For the year ended December 31, 2018, we recognized measurement period adjustments to the provisional tax impacts, as discussed above, primarily due to the filing of our income tax returns resulting in a reduction in our income tax expense of $12 million. The reduction consisted of a net income tax benefit of (i) $7 million for the remeasurement of our deferred income tax assets and liabilities and other reserves due to the decrease in the federal corporate income tax rate and (ii) a $5 million adjustment for the one-time, mandatory transition tax. The Company has completed the accounting for the impacts of the Act, although adjustments may be necessary in future periods due to potential technical corrections to the Act and/or regulatory guidance that may be issued by the Internal Revenue Service ("IRS").

The Act provides for a territorial tax system, and it includes two new U.S. tax base erosion provisions, the global intangible low-taxed income ("GILTI") tax and the base erosion and anti-abuse tax ("BEAT"). For the year ended December 31, 2018, we did not have a material impact to our consolidated financial statements from GILTI and no minimum tax from BEAT. The Company does not expect that it will be subject to any material incremental U.S. tax on GILTI in future periods and has elected to account for any potential GILTI tax in the period in which it is incurred, therefore no deferred income tax impacts of GILTI are provided in our consolidated financial statements for the year ended December 31, 2018. In addition, the Company does not expect it will be subject to minimum tax pursuant to the BEAT.

Investments Qualifying for Federal Tax Credits — We have significant financial interests in entities established to invest in and manage low-income housing properties and a refined coal facility. On September 28, 2018 we acquired an additional noncontrolling interest in a limited liability company established to invest in and manage low-income housing properties. Our consideration for this investment totaled $157 million, which was comprised of a $139 million note payable and an initial cash payment of $18 million. We support the operations of these entities in exchange for a pro-rata share of the tax credits they generate. The low-income housing investments and the coal facility's refinement processes qualify for federal tax credits that we expect to realize through 2030 under Sections 42 and 45D, and through 2019 under Section 45, respectively, of the Internal Revenue Code.

We account for our investments in these entities using the equity method of accounting, recognizing our share of each entity's results of operations and other reductions in the value of our investments in equity in net losses of unconsolidated entities, within our Consolidated Statements of Operations. During the years ended December 31, 2018, 2017 and 2016, we recognized $30 million, $30 million and $31 million of net losses and a reduction in our income tax expense of $57 million, $51 million and $55 million, respectively, primarily due to tax credits realized from these investments. Interest expense associated with our investments in low-income housing properties was not material for the periods presented. See Note 18 for additional information related to these unconsolidated variable interest entities.

Other Federal Tax Credits — During 2018, 2017 and 2016, we recognized federal tax credits in addition to the tax credits realized from our investments in low-income housing properties and the refined coal facility, resulting in a reduction in our income tax expense of $10 million, $13 million and $14 million, respectively.

Tax Audit Settlements — We file income tax returns in the U.S. and Canada, as well as various state and local jurisdictions. We are currently under audit by the IRS, the Canada Revenue Agency and various state and local taxing authorities. Our audits are in various stages of completion. During the reported periods, we closed various tax audits and the settlements resulted in a reduction in our income tax expense of $40 million, $2 million and $11 million for the years ended December 31, 2018, 2017 and 2016, respectively.

We participate in the IRS's Compliance Assurance Process, which means we work with the IRS throughout the year towards resolving any material issues prior to the filing of our annual tax return. Any unresolved issues as of the tax return filing date are subject to routine examination procedures. We are currently in the examination phase of IRS audits for the 2017 and 2018 tax years and expect these audits to be completed within the next 15 months. We are also currently undergoing audits by various state and local jurisdictions for tax years that date back to 2011. Additionally, we are under audit by the Canada Revenue Agency for the 2014 tax year.

Adjustments to Accruals and Related Deferred Taxes — Adjustments to our accruals and related deferred taxes due to the filing of our income tax returns and changes in state laws resulted in a reduction in our income tax expense of $35 million, $5 million and $10 million for the years ended December 31, 2018, 2017 and 2016, respectively.

An adjustment to our deferred taxes to reduce our deferred tax liability based on an analysis of certain deferred tax balances also resulted in a net reduction of our income tax expense of $17 million for the year ended December 31, 2018 and is not material to our consolidated financial statements for the reported period.

WASTE MANAGEMENT, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

State Net Operating Losses and Credits — During 2018, 2017 and 2016, we recognized state net operating losses and credits resulting in a reduction in our income tax expense of $22 million, $12 million and $10 million, respectively.

Equity-Based Compensation — During 2018 and 2017, we recognized excess tax benefits related to the vesting or exercise of equity-based compensation awards resulting in a reduction in our income tax expense of $17 million and $37 million, respectively.

Tax Implications of Impairments — Portions of the impairment charges recognized during the reported periods are not deductible for tax purposes. Had the charges been fully deductible, our income tax expense would have been reduced by $1 million, $15 million and $15 million for the years ended December 31, 2018, 2017 and 2016, respectively. See Note 11 for more information related to our impairment charges.

Unremitted Earnings in Foreign Subsidiaries — No additional income taxes have been provided for any remaining undistributed foreign earnings not subject to the one-time, mandatory transition tax, or any additional outside basis difference, as these amounts continue to be indefinitely reinvested in foreign operations.

Deferred Tax Assets (Liabilities)

The components of net deferred tax liabilities as of December 31 are as follows (in millions):

	2018	2017
Deferred tax assets:		
Net operating loss, capital loss and tax credit carry-forwards	$ 258	$ 259
Landfill and environmental remediation liabilities	143	121
Miscellaneous and other reserves, net	175	96
Subtotal	576	476
Valuation allowance	(261)	(264)
Deferred tax liabilities:		
Property and equipment	(752)	(595)
Goodwill and other intangibles	(854)	(865)
Net deferred tax liabilities	$ (1,291)	$ (1,248)

The valuation allowance decreased by $3 million in 2018 primarily due to non-benefited foreign tax credit carry-forwards.

As of December 31, 2018, we had $1.9 billion of state net operating loss carry-forwards with expiration dates through 2038. We also had $443 million of federal capital loss carry-forwards with expiration dates through 2021, $35 million of foreign tax credit carry-forwards with expiration dates through 2028 and $20 million of state tax credit carry-forwards with expiration dates through 2034.

We have established valuation allowances for uncertainties in realizing the benefit of certain tax loss and credit carry-forwards and other deferred tax assets. While we expect to realize the deferred tax assets, net of the valuation allowances, changes in estimates of future taxable income or in tax laws may alter this expectation.

Liabilities for Uncertain Tax Positions

A reconciliation of the beginning and ending amount of gross unrecognized tax benefits, including accrued interest, is as follows (in millions):

	2018	2017	2016
Balance as of January 1	$ 109	$ 82	$ 71
Additions based on tax positions related to the current year	6	19	19
Additions based on tax positions of prior years	12	11	4
Accrued interest	2	4	2
Reductions for tax positions of prior years	—	—	(7)
Settlements	(88)	(1)	—
Lapse of statute of limitations	(5)	(6)	(7)
Balance as of December 31	$ 36	$ 109	$ 82

These liabilities are included as a component of other long-term liabilities in our Consolidated Balance Sheets because the Company does not anticipate that settlement of the liabilities will require payment of cash within the next 12 months. As of December 31, 2018, we have $31 million of net unrecognized tax benefits that, if recognized in future periods, would impact our effective income tax rate.

We recognize interest expense related to unrecognized tax benefits in our income tax expense, which was not material for the reported periods. We did not have any accrued liabilities or expense for penalties related to unrecognized tax benefits for the reported periods.

9. Employee Benefit Plans

Defined Contribution Plans — Waste Management sponsors a 401(k) retirement savings plan that covers employees, except those working subject to collective bargaining agreements that do not provide for coverage under the plan. U.S. employees who are not subject to such collective bargaining agreements are generally eligible to participate in the plan following a 90-day waiting period after hire and may contribute as much as 50% of their eligible annual compensation and 80% of their annual incentive plan bonus, subject to annual contribution limitations established by the IRS. Under the retirement savings plan, for non-union employees, we match 100% of employee contributions on the first 3% of their eligible annual compensation and 50% of employee contributions on the next 3% of their eligible annual compensation, resulting in a maximum match of 4.5% of eligible annual compensation. Non-union employees hired on or after January 1, 2018 are automatically enrolled in the plan at a 3% contribution rate upon eligibility. Both employee and Company contributions are in cash and vest immediately. Certain U.S. employees who are subject to collective bargaining agreements may participate in the 401(k) retirement savings plan under terms specified in their collective bargaining agreement. Certain employees outside the U.S., including those in Canada, participate in defined contribution plans maintained by the Company in compliance with laws of the appropriate jurisdiction. Charges to operating and selling, general and administrative expenses for our defined contribution plans totaled $80 million, $70 million and $64 million for the years ended December 31, 2018, 2017 and 2016, respectively.

Defined Benefit Plans (other than multiemployer defined benefit pension plans discussed below) — WM Holdings sponsors a defined benefit plan for certain employees who are subject to collective bargaining agreements that provide for participation in this plan. Further, certain of our Canadian subsidiaries sponsor defined benefit plans that are frozen to new participants. As of December 31, 2018, the combined benefit obligation of these pension plans was $120 million, and the plans had $117 million of combined plan assets, resulting in an aggregate unfunded benefit obligation for these plans of $3 million. As of December 31, 2017, the combined benefit obligation of these pension plans was $126 million, and the

plans had $120 million of combined plan assets, resulting in an aggregate unfunded benefit obligation for these plans of $6 million.

In addition, WM Holdings and certain of its subsidiaries provided post-retirement health care and other benefits to eligible retirees. In conjunction with our acquisition of WM Holdings in July 1998, we limited participation in these plans to participating retirees as of December 31, 1998. The unfunded benefit obligation for these plans was $18 million and $23 million as of December 31, 2018 and 2017, respectively.

Our accrued benefit liabilities for our defined benefit pension and other post-retirement plans were $21 million and $29 million as of December 31, 2018 and 2017, respectively, and are included as components of accrued liabilities and long-term other liabilities in our Consolidated Balance Sheets.

Multiemployer Defined Benefit Pension Plans — We are a participating employer in a number of trustee-managed multiemployer defined benefit pension plans ("Multiemployer Pension Plans") for employees who are covered by collective bargaining agreements. The risks of participating in these Multiemployer Pension Plans are different from single-employer plans in that (i) assets contributed to the Multiemployer Pension Plan by one employer may be used to provide benefits to employees or former employees of other participating employers; (ii) if a participating employer stops contributing to the plan, the unfunded obligations of the plan may be required to be assumed by the remaining participating employers and (iii) if we choose to stop participating in any of our Multiemployer Pension Plans, we may be required to pay those plans a withdrawal amount based on the underfunded status of the plan. The following table outlines our participation in Multiemployer Pension Plans considered to be individually significant (dollar amounts in millions):

Pension Fund	EIN/Pension Plan Number	Pension Protection Act Reported Status(a) 2018	Pension Protection Act Reported Status(a) 2017	FIP/RP Status(b)(c)	Company Contributions(d) 2018	Company Contributions(d) 2017	Company Contributions(d) 2016	Expiration Date of Collective Bargaining Agreement(s)
Automotive Industries Pension Plan	EIN: 94-1133245; Plan Number: 001	Critical and Declining	Critical and Declining	Implemented	$ 1	$ 1	$ 1	9/30/2021
Suburban Teamsters of Northern Illinois Pension Plan	EIN: 36-6155778; Plan Number: 001	Endangered	Endangered	Implemented	3	3	3	Various dates through 3/31/2023
Western Conference of Teamsters Pension Plan	EIN: 91-6145047; Plan Number: 001	Not Endangered or Critical	Not Endangered or Critical	Not Applicable	29	27	25	Various dates through 10/20/2023
Western Pennsylvania Teamsters and Employers Pension Plan	EIN: 25-6029946; Plan Number: 001	Critical and Declining	Critical	Implemented	—	1	1	(f)
					$ 33	$ 32	$ 30	
Contributions to other Multiemployer Pension Plans					14	15	17	
Total contributions to Multiemployer Pension Plans (e)					$ 47	$ 47	$ 47	

(a) The most recent Pension Protection Act zone status available in 2018 and 2017 is for the plan's year-end as of December 31, 2017 and 2016, respectively. The zone status is based on information that we received from the plan and is certified by the plan's actuary. As defined in the Pension Protection Act of 2006, among other factors, plans reported as critical are generally less than 65% funded and plans reported as endangered are generally less than 80% funded. Under the Multiemployer Pension Reform Act of 2014, a plan is generally in critical and declining status if it (i) is certified to be in critical status pursuant to the Pension Protection Act of 2006 and (ii) is projected to be insolvent within the next 15 years or, in certain circumstances, 20 years.

As of the date the financial statements were issued, Forms 5500 were not available for the plan years ended in 2018.

(b) The "FIP/RP Status" column indicates plans for which a Funding Improvement Plan ("FIP") or a Rehabilitation Plan ("RP") has been implemented.

(c) A Multiemployer Pension Plan that has been certified as endangered, seriously endangered or critical may begin to levy a statutory surcharge on contribution rates. Once authorized, the surcharge is at the rate of 5% for the first 12 months and 10% for any periods thereafter. Contributing employers, however, may eliminate the surcharge by entering into a collective bargaining agreement that meets the requirements of the applicable FIP or RP.

(d) Of the Multiemployer Pension Plans considered to be individually significant, the Company was listed in the Form 5500 of the Suburban Teamsters of Northern Illinois Pension Plan as providing more than 5% of the total contributions for plan years ending December 31, 2017 and 2016.

(e) Total contributions to Multiemployer Pension Plans excludes contributions related to withdrawal liabilities discussed below.

(f) The Company had a complete withdrawal from this plan during 2017 and correspondingly accrued a liability of $11 million relating to such withdrawal. In 2018, the Company received the final withdrawal liability assessment from the plan and accrued an additional $2 million. The total accrual was paid as of December 31, 2018.

Our portion of the projected benefit obligation, plan assets and unfunded liability for the Multiemployer Pension Plans is not material to our financial position. However, the failure of participating employers to remain solvent could affect our portion of the plans' unfunded liability. Specific benefit levels provided by union pension plans are not negotiated with or known by the employer contributors.

In connection with our ongoing renegotiations of various collective bargaining agreements, we may discuss and negotiate for the complete or partial withdrawal from one or more of these pension plans. Further, business events, such as the discontinuation or nonrenewal of a customer contract, the decertification of a union, or relocation, reduction or discontinuance of certain operations, which result in the decline of Company contributions to a Multiemployer Pension Plan could trigger a partial or complete withdrawal. In the event of a withdrawal, we may incur expenses associated with our obligations for unfunded vested benefits at the time of the withdrawal. In 2018 and 2017, we recognized charges of $3 million and $12 million, respectively, to operating expenses for the withdrawal from certain underfunded Multiemployer Pension Plans. In 2016, we did not recognize any charges for the withdrawal from Multiemployer Pension Plans. Refer to Note 10 for additional information related to our obligations to Multiemployer Pension Plans for which we have withdrawn or partially withdrawn.

Multiemployer Plan Benefits Other Than Pensions — During the years ended December 31, 2018, 2017 and 2016, the Company made contributions of $43 million, $42 million and $40 million, respectively, to multiemployer health and welfare plans that also provide other post-retirement employee benefits. Funding of benefit payments for plan participants are made at negotiated rates in the respective collective bargaining agreements as costs are incurred.

10. Commitments and Contingencies

Financial Instruments — We have obtained letters of credit, surety bonds and insurance policies and have established trust funds and issued financial guarantees to support tax-exempt bonds, contracts, performance of landfill final capping, closure and post-closure requirements, environmental remediation and other obligations. Letters of credit generally are supported by our $2.75 billion revolving credit facility and other credit facilities established for that purpose. These facilities are discussed further in Note 7. Surety bonds and insurance policies are supported by (i) a diverse group of third-party surety and insurance companies; (ii) an entity in which we have a noncontrolling financial interest or (iii) a wholly-owned insurance captive, the sole business of which is to issue surety bonds and/or insurance policies on our behalf.

Management does not expect that any claims against or draws on these instruments would have a material adverse effect on our financial condition, results of operations or cash flows. We have not experienced any unmanageable difficulty in obtaining the required financial assurance instruments for our current operations. In an ongoing effort to mitigate risks

of future cost increases and reductions in available capacity, we continue to evaluate various options to access cost-effective sources of financial assurance.

Insurance — We carry insurance coverage for protection of our assets and operations from certain risks including general liability, automobile liability, workers' compensation, real and personal property, directors' and officers' liability, pollution legal liability and other coverages we believe are customary to the industry. Our exposure to loss for insurance claims is generally limited to the per-incident deductible under the related insurance policy. Our exposure could increase if our insurers are unable to meet their commitments on a timely basis.

We have retained a significant portion of the risks related to our general liability, automobile liability and workers' compensation claims programs. "General liability" refers to the self-insured portion of specific third-party claims made against us that may be covered under our commercial General Liability Insurance Policy. For our self-insured portions, the exposure for unpaid claims and associated expenses, including incurred but not reported losses, is based on an actuarial valuation or internal estimates. The accruals for these liabilities could be revised if future occurrences or loss development significantly differ from such valuations and estimates. In December 2017, we elected to use a wholly-owned insurance captive to insure the deductibles for our general liability, automobile liability and workers' compensation claims programs. As of December 31, 2018, both our commercial General Liability Insurance Policy and our workers' compensation insurance program carried self-insurance exposures of up to $5 million per incident. As of December 31, 2018, our automobile liability insurance program included a per-incident deductible of up to $10 million. Our receivable balance associated with insurance claims was $130 million and $153 million as of December 31, 2018 and 2017, respectively. The changes to our insurance reserves for the years ended December 31 are summarized below (in millions):

	2018(a)	2017
Balance as of January 1	$ 582	$ 588
Self-insurance expense	142	142
Cash paid and other	(157)	(148)
Balance as of December 31	$ 567	$ 582
Current portion as of December 31	$ 137	$ 107
Long-term portion as of December 31	$ 430	$ 475

(a) Based on current estimates, we anticipate that most of our insurance reserves will be settled in cash over the next six years.

We do not expect the impact of any known casualty, property, environmental or other contingency to have a material impact on our financial condition, results of operations or cash flows.

Operating Leases — Operating lease expense was $129 million, $134 million and $125 million during 2018, 2017 and 2016, respectively. Minimum contractual payments due for our operating lease obligations are $74 million in 2019, $69 million in 2020, $54 million in 2021, $40 million in 2022, $37 million in 2023 and $370 million thereafter. Our minimum contractual payments for lease agreements during future periods is less than current year operating lease expense primarily due to the effect of short-term leases. See Note 2 for information related to the pending adoption of ASU 2016-02.

Other Commitments

- *Disposal* — We have several agreements expiring at various dates through 2052 that require us to dispose of a minimum number of tons at third-party disposal facilities. Under these put-or-pay agreements, we are required to pay for the agreed upon minimum volumes regardless of the actual number of tons placed at the facilities. Following the 2014 divestiture of our Wheelabrator business, which provides waste-to-energy services and manages waste-to-energy facilities and independent power production plants, we entered into several agreements to dispose of a minimum number of tons of waste at certain Wheelabrator facilities. These agreements generally

provide for fixed volume commitments with certain market price resets through 2021. We generally fulfill our minimum contractual obligations by disposing of volumes collected in the ordinary course of business at these disposal facilities.

- *Waste Paper* — We are party to waste paper purchase agreements expiring at various dates through 2023 that require us to purchase a minimum number of tons of waste paper. The cost per ton we pay is based on market prices.
- *Royalties* — We have various arrangements that require us to make royalty payments to third parties including prior land owners, lessors or host communities where our operations are located. Our obligations generally are based on per ton rates for waste actually received at our transfer stations or landfills. Royalty agreements that are non-cancelable and require fixed or minimum payments are included in our capital leases and other debt obligations in our Consolidated Balance Sheets as disclosed in Note 7.

Our unconditional purchase obligations are generally established in the ordinary course of our business and are structured in a manner that provides us with access to important resources at competitive, market-driven rates. As of December 31, 2018, our estimated minimum obligations associated with unconditional purchase obligations, which are not recognized in our Consolidated Balance Sheets, were $138 million in 2019, $121 million in 2020, $110 million in 2021, $45 million in 2022, $41 million in 2023 and $399 million thereafter. We may also establish unconditional purchase obligations in conjunction with acquisitions or divestitures. Our actual future minimum obligations under these outstanding purchase agreements are generally quantity driven and, as a result, our associated financial obligations are not fixed as of December 31, 2018. For contracts that require us to purchase minimum quantities of goods or services, we have estimated our future minimum obligations based on the current market values of the underlying products or services. We currently expect the products and services provided by these agreements to continue to meet the needs of our ongoing operations. Therefore, we do not expect these established arrangements to materially impact our future financial position, results of operations or cash flows.

Guarantees — We have entered into the following guarantee agreements associated with our operations:

- As of December 31, 2018, WM Holdings has fully and unconditionally guaranteed all of WM's senior indebtedness, including its senior notes, $2.75 billion revolving credit facility and certain letter of credit facilities, which mature through 2045. WM has fully and unconditionally guaranteed the senior indebtedness of WM Holdings, which matures in 2026. Performance under these guarantee agreements would be required if either party defaulted on their respective obligations. No additional liabilities have been recorded for these intercompany guarantees because all of the underlying obligations are reflected in our Consolidated Balance Sheets. See Note 21 for further discussion.
- WM and WM Holdings have guaranteed subsidiary debt obligations, including tax-exempt bonds, capital leases and other indebtedness. If a subsidiary fails to meet its obligations associated with its debt agreements as they come due, WM or WM Holdings will be required to perform under the related guarantee agreement. No additional liabilities have been recorded for these intercompany guarantees because all of the underlying obligations are reflected in our Consolidated Balance Sheets. See Note 7 for information related to the balances and maturities of these debt obligations.
- Before the divestiture of our Wheelabrator business in 2014, WM had guaranteed certain operational and financial performance obligations of Wheelabrator and its subsidiaries in the ordinary course of business. In conjunction with the divestiture, certain WM guarantees of Wheelabrator obligations were terminated, but others continued and are now guarantees of third-party obligations. When possible, Wheelabrator seeks to have the applicable third-party beneficiaries release WM from these guarantees, but until such efforts are successful, or the underlying financial commitments are restructured, WM has agreed to retain the guarantees and, in exchange, receive a credit support fee or other financial assurances guaranteed by a third-party financial institution to protect WM in the event of non-compliance by Wheelabrator. The most significant of these guarantees specifically define WM's

maximum financial obligation over the course of the relevant agreements. As of December 31, 2018, WM's maximum future payments under these guarantees were $85 million. WM's exposure under certain of the performance guarantees is variable and a maximum exposure is not defined. We have recorded the fair value of the operational and financial performance guarantees, some of which could extend through 2038 if not terminated, in our Consolidated Balance Sheets. We currently do not expect the financial impact of such operational and financial performance guarantees to materially exceed the recorded fair value.

- Certain of our subsidiaries have guaranteed the market or contractually-determined value of certain homeowners' properties that are adjacent to or near certain of our landfills. These guarantee agreements extend over the life of the respective landfill. Under these agreements, we would be responsible for the difference, if any, between the sale value and the guaranteed market or contractually-determined value of the homeowners' properties. As of December 31, 2018, we have agreements guaranteeing certain market value losses for approximately 775 homeowners' properties adjacent to or near 19 of our landfills. We do not believe that these contingent obligations will have a material adverse effect on the Company's financial position, results of operations or cash flows.
- We have indemnified the purchasers of businesses or divested assets for the occurrence of specified events under certain of our divestiture agreements. Other than certain identified items that are currently recorded as obligations, we do not believe that it is possible to determine the contingent obligations associated with these indemnities. Additionally, under certain of our acquisition agreements, we have provided for additional consideration to be paid to the sellers if established financial targets or other market conditions are achieved post-closing and we have recognized liabilities for these contingent obligations based on an estimate of the fair value of these contingencies at the time of acquisition. We do not currently believe that contingent obligations to provide indemnification or pay additional post-closing consideration in connection with our divestitures or acquisitions will have a material adverse effect on the Company's business, financial condition, results of operations or cash flows.
- WM and WM Holdings guarantee the service, lease, financial and general operating obligations of certain of their subsidiaries. If such a subsidiary fails to meet its contractual obligations as they come due, the guarantor has an unconditional obligation to perform on its behalf. No additional liability has been recorded for service, financial or general operating guarantees because the subsidiaries' obligations are properly accounted for as costs of operations as services are provided or general operating obligations as incurred. No additional liability has been recorded for the lease guarantees because the subsidiaries' obligations are properly accounted for as operating or capital leases, as appropriate.

Environmental Matters — A significant portion of our operating costs and capital expenditures could be characterized as costs of environmental protection. The nature of our operations, particularly with respect to the construction, operation and maintenance of our landfills, subjects us to an array of laws and regulations relating to the protection of the environment. Under current laws and regulations, we may have liabilities for environmental damage caused by our operations, or for damage caused by conditions that existed before we acquired a site. In addition to remediation activity required by state or local authorities, such liabilities include PRP investigations. The costs associated with these liabilities can include settlements, certain legal and consultant fees, as well as incremental internal and external costs directly associated with site investigation and clean-up.

As of December 31, 2018, we have been notified by the government that we are a PRP in connection with 75 locations listed on the Environmental Protection Agency's ("EPA's") Superfund National Priorities List ("NPL"). Of the 75 sites at which claims have been made against us, 15 are sites we own. Each of the NPL sites we own was initially developed by others as a landfill disposal facility. At each of these facilities, we are working in conjunction with the government to evaluate or remediate identified site problems, and we have either agreed with other legally liable parties on an arrangement for sharing the costs of remediation or are working toward a cost-sharing agreement. We generally expect to receive any amounts due from other participating parties at or near the time that we make the remedial expenditures. The other 60 NPL

sites, which we do not own, are at various procedural stages under the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, known as CERCLA or Superfund.

The majority of proceedings involving NPL sites that we do not own are based on allegations that certain of our subsidiaries (or their predecessors) transported hazardous substances to the sites, often prior to our acquisition of these subsidiaries. CERCLA generally provides for liability for those parties owning, operating, transporting to or disposing at the sites. Proceedings arising under Superfund typically involve numerous waste generators and other waste transportation and disposal companies and seek to allocate or recover costs associated with site investigation and remediation, which costs could be substantial and could have a material adverse effect on our consolidated financial statements. At some of the sites at which we have been identified as a PRP, our liability is well defined as a consequence of a governmental decision and an agreement among liable parties as to the share each will pay for implementing that remedy. At other sites, where no remedy has been selected or the liable parties have been unable to agree on an appropriate allocation, our future costs are uncertain.

On October 11, 2017, the EPA issued its Record of Decision ("ROD") with respect to the previously proposed remediation plan for the San Jacinto waste pits in Harris County, Texas. McGinnes Industrial Maintenance Corporation ("MIMC"), an indirect wholly-owned subsidiary of WM, operated some of the waste pits from 1965 to 1966 and has been named as a site PRP. In 1998, WM acquired the stock of the parent entity of MIMC. MIMC has been working with the EPA and other named PRPs as the process of addressing the site proceeds. On April 9, 2018, MIMC and International Paper Company entered into an Administrative Order on Consent agreement with the EPA to develop a remedial design for the EPA's selected remedy for the site. Allocation of responsibility among the PRPs for the proposed remedy has not been established. As of December 31, 2018 and 2017, our recorded liability for MIMC's estimated potential share of the EPA's proposed remedy and related costs was $55 million. MIMC's ultimate liability could be materially different from current estimates.

Item 103 of the SEC's Regulation S-K requires disclosure of certain environmental matters when a governmental authority is a party to the proceedings, or such proceedings are known to be contemplated, unless we reasonably believe that the matter will result in no monetary sanctions, or in monetary sanctions, exclusive of interest and costs, of less than $100,000. The following matters are disclosed in accordance with that requirement. We do not currently believe that the eventual outcome of any such matters, individually or in the aggregate, could have a material adverse effect on the Company's business, financial condition, results of operations or cash flows.

On July 10, 2013, the EPA issued a Notice of Violation ("NOV") to Waste Management of Wisconsin, Inc., an indirect wholly-owned subsidiary of WM, alleging violations of the Resource Conservation Recovery Act concerning acceptance of certain waste that was not permitted to be disposed of at the Metro Recycling & Disposal Facility in Franklin, Wisconsin. The parties are exchanging information and working to resolve the NOV.

The Hawaii Department of Health and the EPA have asserted civil penalty claims against Waste Management of Hawaii, Inc. ("WMHI"), an indirect wholly-owned subsidiary of WM, based on stormwater discharges at the Waimanalo Gulch Sanitary Landfill following two major rainstorms in December 2010 and January 2011 and alleged violations of stormwater permit requirements prior to and after the storms. WMHI operates the landfill for the City and County of Honolulu.

From time to time, we are also named as defendants in personal injury and property damage lawsuits, including purported class actions, on the basis of having owned, operated or transported waste to a disposal facility that is alleged to have contaminated the environment or, in certain cases, on the basis of having conducted environmental remediation activities at sites. Some of the lawsuits may seek to have us pay the costs of monitoring of allegedly affected sites and health care examinations of allegedly affected persons for a substantial period of time even where no actual damage is proven. While we believe we have meritorious defenses to these lawsuits, the ultimate resolution is often substantially

uncertain due to the difficulty of determining the cause, extent and impact of alleged contamination (which may have occurred over a long period of time), the potential for successive groups of complainants to emerge, the diversity of the individual plaintiffs' circumstances, and the potential contribution or indemnification obligations of co-defendants or other third parties, among other factors. Additionally, we often enter into agreements with landowners imposing obligations on us to meet certain regulatory or contractual conditions upon site closure or upon termination of the agreements. Compliance with these agreements inherently involves subjective determinations and may result in disputes, including litigation.

Litigation — As a large company with operations across the U.S. and Canada, we are subject to various proceedings, lawsuits, disputes and claims arising in the ordinary course of our business. Many of these actions raise complex factual and legal issues and are subject to uncertainties. Actions that have been filed against us, and that may be filed against us in the future, include personal injury, property damage, commercial, customer, and employment-related claims, including purported state and national class action lawsuits related to: alleged environmental contamination, including releases of hazardous material and odors; sales and marketing practices, customer service agreements and prices and fees; and federal and state wage and hour and other laws. The plaintiffs in some actions seek unspecified damages or injunctive relief, or both. These actions are in various procedural stages, and some are covered in part by insurance. We currently do not believe that the eventual outcome of any such actions will have a material adverse effect on the Company's business, financial condition, results of operations or cash flows.

WM's charter and bylaws provide that WM shall indemnify against all liabilities and expenses, and upon request shall advance expenses to any person, who is subject to a pending or threatened proceeding because such person is or was a director or officer of the Company. Such indemnification is required to the maximum extent permitted under Delaware law. Accordingly, the director or officer must execute an undertaking to reimburse the Company for any fees advanced if it is later determined that the director or officer was not permitted to have such fees advanced under Delaware law. Additionally, the Company has direct contractual obligations to provide indemnification to each of the members of WM's Board of Directors and each of WM's executive officers. The Company may incur substantial expenses in connection with the fulfillment of its advancement of costs and indemnification obligations in connection with actions or proceedings that may be brought against its former or current officers, directors and employees.

Multiemployer Defined Benefit Pension Plans — About 20% of our workforce is covered by collective bargaining agreements with various local unions across the U.S. and Canada. As a result of some of these agreements, certain of our subsidiaries are participating employers in a number of Multiemployer Pension Plans for the covered employees. Refer to Note 9 for additional information about our participation in Multiemployer Pension Plans considered individually significant. In connection with our ongoing renegotiation of various collective bargaining agreements, we may discuss and negotiate for the complete or partial withdrawal from one or more of these Multiemployer Pension Plans. A complete or partial withdrawal from a Multiemployer Pension Plan may also occur if employees covered by a collective bargaining agreement vote to decertify a union from continuing to represent them. Any other circumstance resulting in a decline in Company contributions to a Multiemployer Pension Plan through a reduction in the labor force, whether through attrition over time or through a business event (such as the discontinuation or nonrenewal of a customer contract, the decertification of a union, or relocation, reduction or discontinuance of certain operations) may also trigger a complete or partial withdrawal from one or more of these pension plans.

In 2018 and 2017, we recognized $3 million and $12 million, respectively, of charges to operating expenses for the withdrawal from certain underfunded Multiemployer Pension Plans. In 2016, we did not recognize any charges for the withdrawal from Multiemployer Pension Plans.

We do not believe that any future liability relating to our past or current participation in, or withdrawals from, the Multiemployer Pension Plans to which we contribute will have a material adverse effect on our business, financial condition or liquidity. However, liability for future withdrawals could have a material adverse effect on our results of operations or cash flows for a particular reporting period, depending on the number of employees withdrawn and the financial condition of the Multiemployer Pension Plan(s) at the time of such withdrawal(s).

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

Tax Matters — We maintain a liability for uncertain tax positions, the balance of which management believes is adequate. Results of audit assessments by taxing authorities are not currently expected to have a material adverse effect on our financial condition, results of operations or cash flows. See Note 8 for additional discussion regarding income taxes.

11. Asset Impairments and Unusual Items

(Gain) Loss from Divestitures, Asset Impairments and Unusual Items, Net

The following table summarizes the major components of (gain) loss from divestitures, asset impairments and unusual items, net for the years ended December 31 (in millions):

	2018	2017	2016
(Gain) loss from divestitures	$ (96)	$ (38)	$ 9
Asset impairments	38	41	59
Other	—	(19)	44
	$ (58)	$ (16)	$ 112

During the year ended December 31, 2018, we recognized net gains of $58 million, primarily related to (i) a $52 million gain associated with the sale of certain hauling operations in our Tier 1 segment and (ii) net gains of $44 million substantially all from divestitures of certain ancillary operations. These gains were partially offset by (i) a $30 million charge to impair a landfill in our Tier 3 segment based on an internally developed discounted projected cash flow analysis, taking into account continued volume decreases and revised capping cost estimates and (ii) $8 million of impairment charges primarily related to our LampTracker® reporting unit.

During the year ended December 31, 2017, we recognized net gains of $16 million, primarily related to (i) gains of $31 million from the sale of certain oil and gas producing properties and (ii) a $30 million reduction in post-closing, performance-based contingent consideration obligations associated with an acquired business in our EES organization. These gains were partially offset by (i) $34 million of goodwill impairment charges primarily related to our EES organization; (ii) $11 million of charges to adjust our subsidiary's estimated potential share of an environmental remediation liability and related costs for a closed site in Harris County, Texas, as discussed in Note 10 and (iii) $7 million of charges to write down certain renewable energy assets.

During the year ended December 31, 2016, we recognized net charges of $112 million, primarily related to (i) $44 million of charges to adjust our subsidiary's estimated potential share of an environmental remediation liability and related costs for a closed site in Harris County, Texas, as discussed in Note 10; (ii) a $43 million charge to impair a landfill in our Tier 3 segment due to a loss of expected volumes; (iii) $12 million of goodwill impairment charges primarily related to our LampTracker® reporting unit and (iv) an $8 million loss on the sale of a majority-owned organics company.

See Note 3 for additional information related to the accounting policy and analysis involved in identifying and calculating impairments and see Note 19 for additional information related to the impact of impairments on the results of operations of our reportable segments.

Equity in Net Losses of Unconsolidated Entities

During the year ended December 31, 2017, we recognized $29 million of impairment charges to write down equity method investments in waste diversion technology companies to their estimated fair values.

Other, Net

During the years ended December 31, 2017 and 2016, we recognized impairment charges of $11 million and $42 million, respectively, related to other-than-temporary declines in the value of minority-owned investments in waste diversion technology companies. We wrote down our investments to their estimated fair values which was primarily determined using an income approach based on estimated future cash flow projections and, to a lesser extent, third-party investors' recent transactions in these securities.

12. Accumulated Other Comprehensive Income (Loss)

The changes in the balances of each component of accumulated other comprehensive income (loss), net of tax, which is included as a component of Waste Management, Inc. stockholders' equity, are as follows (in millions, with amounts in parentheses representing decreases to accumulated other comprehensive income):

	Derivative Instruments	Available-for-Sale Securities	Foreign Currency Translation Adjustments	Post-Retirement Benefit Obligations	Total
Balance, December 31, 2015	$ (52)	$ 8	$ (75)	$ (8)	$ (127)
Other comprehensive income (loss) before reclassifications, net of tax expense (benefit) of $(4), $3, $0 and $0, respectively	(7)	5	26	—	24
Amounts reclassified from accumulated other comprehensive (income) loss, net of tax (expense) benefit of $12, $0, $0 and $1, respectively	19	—	2	2	23
Net current period other comprehensive income (loss)	12	5	28	2	47
Balance, December 31, 2016	$ (40)	$ 13	$ (47)	$ (6)	$ (80)
Other comprehensive income (loss) before reclassifications, net of tax expense (benefit) of $0, $2, $0 and $1, respectively	—	3	76	3	82
Amounts reclassified from accumulated other comprehensive (income) loss, net of tax (expense) benefit of $5, $(1), $0 and $0, respectively	7	(1)	—	—	6
Net current period other comprehensive income (loss)	7	2	76	3	88
Balance, December 31, 2017	$ (33)	$ 15	$ 29	$ (3)	$ 8
Other comprehensive income (loss) before reclassifications, net of tax expense (benefit) of $0, $2, $0 and $1, respectively	—	5	(105)	2	(98)
Amounts reclassified from accumulated other comprehensive (income) loss, net of tax (expense) benefit of $3, $0, $0 and $0, respectively	8	—	—	—	8
Net current period other comprehensive income (loss)	8	5	(105)	2	(90)
Adoption of new accounting standard (a)	(7)	3	—	(1)	(5)
Balance, December 31, 2018	$ (32)	$ 23	$ (76)	$ (2)	$ (87)

(a) As of January 1, 2018, we adopted ASU 2018-02 and reclassified stranded tax effects to retained earnings. See Note 2 for further discussion of ASU 2018-02.

There have been no derivatives outstanding subsequent to March 31, 2016. For the year ended December 31, 2016, other comprehensive loss before reclassifications associated with the effective portion of derivatives designated as cash flow hedges for foreign currency derivatives was $7 million, net of tax benefit of $4 million.

The significant amounts reclassified out of each component of accumulated other comprehensive income (loss) associated with our previously terminated cash flow hedges for the years ended December 31 are as follows (in millions, with amounts in parentheses representing debits to the statement of operations classification):

	2018	2017	2016	Statement of Operations Classification
Forward-starting interest rate swaps	$ (10)	$ (11)	$ (10)	Interest expense, net
Treasury rate locks	(1)	(1)	(1)	Interest expense, net
Foreign currency derivatives	—	—	(20)	Other, net
	(11)	(12)	(31)	Total before tax
	3	5	12	Tax (expense) benefit
Total reclassifications for the period	$ (8)	$ (7)	$ (19)	Net of tax

13. Capital Stock, Dividends and Common Stock Repurchase Program

Capital Stock

We have 1.5 billion shares of authorized common stock with a par value of $0.01 per common share. As of December 31, 2018, we had 424.0 million shares of common stock issued and outstanding. The Board of Directors is authorized to issue preferred stock in series, and with respect to each series, to fix its designation, relative rights (including voting, dividend, conversion, sinking fund, and redemption rights), preferences (including dividends and liquidation) and limitations. We have 10 million shares of authorized preferred stock, $0.01 par value, none of which is currently outstanding.

Dividends

Our quarterly dividends have been declared by our Board of Directors. Cash dividends declared and paid were $802 million in 2018, or $1.86 per common share, $750 million in 2017, or $1.70 per common share, and $726 million in 2016, or $1.64 per common share.

In December 2018, we announced that our Board of Directors expects to increase the quarterly dividend from $0.465 to $0.5125 per share for dividends declared in 2019. However, all future dividend declarations are at the discretion of the Board of Directors and depend on various factors, including our net earnings, financial condition, cash required for future business plans, growth and acquisitions and other factors the Board of Directors may deem relevant.

Common Stock Repurchase Program

The Company repurchases shares of its common stock as part of capital allocation programs authorized by our Board of Directors. Share repurchases during the reported periods were completed through accelerated share repurchase (“ASR”) agreements and, to a lesser extent, open market transactions. The terms of these ASR agreements required that we deliver cash at the beginning of each ASR repurchase period. In exchange, we received a portion of the total shares expected to be repurchased based on the then-current market price of our common stock. The remaining shares repurchased over the course of each repurchase period are delivered to us once the repurchase period is complete. Shares repurchased are

reflected in the period the shares are delivered to us. The following is a summary of our share repurchases under our common stock repurchase program for the years ended December 31:

	2018(a)	2017(b)	2016(c)
Shares repurchased (in thousands)	11,673	10,058	11,241
Weighted average price per share	$ 86.35	$ 77.67	$ 60.49
Total repurchases (in millions)	$ 1,008	$ 750	$ 725

(a) During 2018, we executed and completed four ASR agreements to repurchase $850 million of our common stock and we received 9.8 million shares in connection with these ASR agreements.

During 2018, we repurchased an additional 1.9 million shares of our common stock in open market transactions in compliance with Rule 10b5-1 and Rule 10b-18 of the Exchange Act for $158 million, inclusive of per-share commissions, which includes $4 million paid in 2019.

(b) During 2017, we executed and completed two ASR agreements to repurchase $750 million of our common stock. Our "Shares repurchased" includes the 0.4 million shares related to the ASR agreement executed in November 2016, discussed further below.

(c) During 2016, we executed four ASR agreements to repurchase $725 million of our common stock. The ASR agreement entered into in November 2016 was for the repurchase of $225 million of our common stock and was completed in February 2017. We received a total of 3.2 million shares based on a final weighted average price per share during the repurchase period of $69.43.

Through February 8, 2019, we repurchased an additional 0.6 million shares of our common stock in open market transactions in compliance with Rule 10b5-1 and Rule 10b-18 of the Exchange Act for $54 million, inclusive of per-share commissions, under our prior $1.25 billion Board of Directors authorization announced in December 2017.

We announced in December 2018 that the Board of Directors has authorized up to $1.5 billion in future share repurchases, which supersedes and replaces remaining authority under any prior Board of Directors authorization for share repurchases after the completion of our current open market repurchase plan ending February 15, 2019. Any future share repurchases will be made at the discretion of management and will depend on factors similar to those considered by the Board of Directors in making dividend declarations, including our net earnings, financial condition and cash required for future business plans, growth and acquisitions.

14. Equity-Based Compensation

Employee Stock Purchase Plan

We have an Employee Stock Purchase Plan ("ESPP") under which employees that have been employed for at least 30 days may purchase shares of our common stock at a discount. The plan provides for two offering periods for purchases: January through June and July through December. At the end of each offering period, enrolled employees purchase shares of our common stock at a price equal to 85% of the lesser of the market value of the stock on the first and last day of such offering period. The purchases are made at the end of an offering period with funds accumulated through payroll deductions over the course of the offering period. Subject to limitations set forth in the plan and under IRS regulations, eligible employees may elect to have up to 10% of their base pay deducted during the offering period. The total number of shares issued under the plan for the offering periods in 2018, 2017 and 2016 was approximately 582,000, 594,000 and 647,000, respectively. After the January 2019 issuance of shares associated with the July to December 2018 offering period, 1.3 million shares remain available for issuance under the ESPP.

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

Accounting for our ESPP increased annual compensation expense by $9 million, or $7 million net of tax expense, for 2018 and $7 million, or $4 million net of tax expense, for 2017 and 2016.

Employee Stock Incentive Plans

In May 2014, our stockholders approved our 2014 Stock Incentive Plan (the "2014 Plan") to replace our 2009 Stock Incentive Plan (the "2009 Plan"). The 2014 Plan authorized 23.8 million shares of our common stock for issuance pursuant to the 2014 Plan, plus the approximately 1.1 million shares that then remained available for issuance under the 2009 Plan, and any shares subject to outstanding awards under both incentive plans that are subsequently cancelled, forfeited, terminate, expire or lapse. As of December 31, 2018, approximately 20.8 million shares were available for future grants under the 2014 Plan. All of our equity-based compensation awards described herein have been made pursuant to either our 2009 Plan or our 2014 Plan, collectively referred to as the "Incentive Plans." We currently utilize treasury shares to meet the needs of our equity-based compensation programs.

Pursuant to the Incentive Plans, we have the ability to issue stock options, stock appreciation rights and stock awards, including restricted stock, restricted stock units ("RSUs") and performance share units ("PSUs"). The terms and conditions of equity awards granted under the Incentive Plans are determined by the Management Development and Compensation Committee of our Board of Directors.

The 2018 annual Incentive Plan awards granted to the Company's senior leadership team, which generally includes the Company's executive officers, included a combination of PSUs and stock options. The annual Incentive Plan awards granted to other eligible employees included a combination of PSUs, RSUs and stock options in 2018. The Company also periodically grants RSUs to employees working on key initiatives, in connection with new hires and promotions and to field-based managers.

Restricted Stock Units — A summary of our RSUs is presented in the table below (units in thousands):

	Units	Weighted Average Per Share Fair Value
Unvested as of January 1, 2018	444	$ 61.20
Granted	116	$ 85.52
Vested	(154)	$ 55.03
Forfeited	(14)	$ 69.19
Unvested as of December 31, 2018	392	$ 70.52

The total fair market value of RSUs that vested during the years ended December 31, 2018, 2017 and 2016 was $13 million, $12 million and $12 million, respectively. During the year ended December 31, 2018, we issued approximately 106,000 shares of common stock for these vested RSUs, net of approximately 48,000 units deferred or used for payment of associated taxes.

RSUs may not be voted or sold by award recipients until time-based vesting restrictions have lapsed. RSUs primarily provide for three-year cliff vesting and include dividend equivalents accumulated during the vesting period. Unvested units are subject to forfeiture in the event of voluntary or for-cause termination. RSUs are subject to pro-rata vesting upon an employee's retirement or involuntary termination other than for cause and generally payout at the end of the three-year vesting period and become immediately vested in the event of an employee's death or disability.

Compensation expense associated with RSUs is measured based on the grant-date fair value of our common stock and is recognized on a straight-line basis over the required employment period, which is generally the vesting period.

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

Compensation expense is only recognized for those awards that we expect to vest, which we estimate based upon an assessment of expected forfeitures.

Performance Share Units — Two types of PSUs are currently outstanding: (i) PSUs for which payout is dependent on total shareholder return relative to the S&P 500 ("TSR PSUs") and (ii) PSUs for which payout is dependent on the Company's performance against pre-established adjusted cash flow metrics ("Cash Flow PSUs"). Both types of PSUs are payable in shares of common stock after the end of a three-year performance period, when the Company's financial performance for the entire performance period is reported, typically in mid- to late-February of the succeeding year. At the end of the performance period, the number of shares awarded can range from 0% to 200% of the targeted amount, depending on the performance against the pre-established targets. A summary of our PSUs, at 100% of the targeted amount, is presented in the table below (units in thousands):

	Units	Weighted Average Per Share Fair Value
Unvested as of January 1, 2018	1,299	$ 84.78
Granted	371	$ 98.45
Vested	(459)	$ 82.22
Forfeited	(47)	$ 87.59
Unvested as of December 31, 2018	1,164	$ 90.17

The determination of achievement of performance results and corresponding vesting of PSUs for the three-year performance period ended December 31, 2018 was performed by the Management Development and Compensation Committee in February 2019. Accordingly, vesting information for such awards is not included in the table above as of December 31, 2018. The "vested" PSUs are for the three-year performance period ended December 31, 2017, as achievement of performance results and corresponding vesting was determined in February 2018. The Company's financial results, as measured for purposes of these awards, achieved the maximum performance criteria. Accordingly, recipients of these PSU awards were entitled to receive a payout of 200% of the vested TSR PSUs and Cash Flow PSUs. In February 2018, approximately 918,000 PSUs vested and we issued approximately 575,000 shares of common stock for these vested PSUs, net of units deferred or used for payment of associated taxes. The shares of common stock that were issued or deferred during the years ended December 31, 2018, 2017 and 2016 for prior PSU award grants had a fair market value of $78 million, $80 million and $50 million, respectively.

PSUs have no voting rights. PSUs receive dividend equivalents that are paid out in cash based on the number of shares that vest at the end of the awards' performance period. Subject to attainment of the performance metrics described above, PSUs are payable to an employee (or his beneficiary) upon death or disability as if that employee had remained employed until the end of the performance period. PSUs are generally subject to pro-rata vesting upon an employee's involuntary termination other than for cause and are subject to forfeiture in the event of voluntary or for-cause termination. With respect to outstanding PSUs granted prior to 2018, such awards generally vest on a pro-rata basis upon retirement; whereas, the terms of the award agreements for outstanding PSUs granted in 2018 provide for continued vesting following retirement as if the employee had remained employed until the end of the performance period. As a result, beginning in 2018, compensation expense for PSUs granted to retirement-eligible employees is accelerated over the period that the recipient becomes retirement-eligible plus a defined service requirement.

Prior to 2017, compensation expense associated with our Cash Flow PSUs was primarily measured based on the fair value of our common stock at the end of each reporting period until the performance period ends. Beginning in 2017, compensation expense associated with our Cash Flow PSUs is based on the grant-date fair value of our common stock. Compensation expense is recognized ratably over the performance period based on our estimated achievement of the established performance criteria. Compensation expense is only recognized for those awards that we expect to vest, which we estimate based upon an assessment of both the probability that the performance criteria will be achieved and expected

forfeitures. The grant-date fair value of our TSR PSUs is based on a Monte Carlo valuation and compensation expense is recognized on a straight-line basis over the vesting period. Compensation expense is recognized for all TSR PSUs whether or not the market conditions are achieved less expected forfeitures.

Deferred Units — Certain employees can elect to defer some or all of the vested RSU or PSU awards until a specified date or dates they choose. Deferred units are not invested, nor do they earn interest, but deferred amounts do receive dividend equivalents paid in cash during deferral at the same time and at the same rate as dividends on the Company's common stock. Deferred amounts are paid out in shares of common stock at the end of the deferral period. As of December 31, 2018, we had approximately 262,000 vested deferred units outstanding.

Stock Options — Stock options granted vest primarily in 25% increments on the first two anniversaries of the date of grant with the remaining 50% vesting on the third anniversary. The exercise price of the options is the average of the high and low market value of our common stock on the date of grant, and the options have a term of ten years. A summary of our stock options is presented in the table below (options in thousands):

	Options	Weighted Average Per Share Exercise Price
Outstanding as of January 1, 2018	4,885	$ 53.46
Granted	779	$ 85.34
Exercised	(1,125)	$ 50.64
Forfeited or expired	(98)	$ 67.53
Outstanding as of December 31, 2018 (a)	4,441	$ 59.46
Exercisable as of December 31, 2018 (b)	2,269	$ 46.86

(a) Stock options outstanding as of December 31, 2018 have a weighted average remaining contractual term of 6.4 years and an aggregate intrinsic value of $131 million based on the market value of our common stock on December 31, 2018.

(b) Stock options exercisable as of December 31, 2018 have an aggregate intrinsic value of $96 million based on the market value of our common stock on December 31, 2018.

We received cash proceeds of $52 million, $95 million and $63 million during the years ended December 31, 2018, 2017 and 2016, respectively, from employee stock option exercises. The aggregate intrinsic value of stock options exercised during the years ended December 31, 2018, 2017 and 2016 was $41 million, $71 million and $67 million, respectively.

Stock options exercisable as of December 31, 2018 were as follows (options in thousands):

Range of Exercise Prices	Options	Weighted Average Per Share Exercise Price	Weighted Average Remaining Years
$33.49-$50.00	1,288	$ 37.89	3.5
$50.01-$70.00	797	$ 55.20	6.5
$70.01-$85.34	184	$ 73.40	8.2
$33.49-$85.34	2,269	$ 46.86	4.9

All unvested stock options shall become exercisable upon the award recipient's death or disability. In the event of a recipient's retirement, stock options shall continue to vest pursuant to the original schedule set forth in the award agreement. If the recipient is terminated by the Company without cause or voluntarily resigns, the recipient shall be entitled

to exercise all stock options outstanding and exercisable within a specified time frame after such termination. All outstanding stock options, whether exercisable or not, are forfeited upon termination for cause.

We account for our employee stock options under the fair value method of accounting using a Black-Scholes valuation model to measure stock option expense at the date of grant. The weighted average grant-date fair value of stock options granted during the years ended December 31, 2018, 2017 and 2016 was $12.16, $11.71 and $6.31, respectively. The fair value of stock options at the date of grant is amortized to expense over the vesting period less expected forfeitures, except for stock options granted to retirement-eligible employees, for which expense is accelerated over the period that the recipient becomes retirement-eligible. The following table presents the weighted average assumptions used to value employee stock options granted during the years ended December 31 under the Black-Scholes valuation model:

	2018	2017	2016
Expected option life	4.3 years	3.5 years	4.7 years
Expected volatility	17.9 %	15.3 %	18.4 %
Expected dividend yield	2.2 %	2.3 %	2.9 %
Risk-free interest rate	2.6 %	1.7 %	1.3 %

The Company bases its expected option life on the expected exercise and termination behavior of its optionees and an appropriate model of the Company's future stock price. The expected volatility assumption is derived from the historical volatility of the Company's common stock over the most recent period commensurate with the estimated expected life of the Company's stock options, combined with other relevant factors including implied volatility in market-traded options on the Company's stock. The dividend yield is the annual rate of dividends per share over the exercise price of the option as of the grant date.

For the years ended December 31, 2018, 2017 and 2016, we recognized $79 million, $92 million and $81 million, respectively, of compensation expense associated with RSU, PSU and stock option awards as a component of selling, general and administrative expenses in our Consolidated Statements of Operations. Our income tax expense for the years ended December 31, 2018, 2017 and 2016 includes related deferred income tax benefits of $17 million, $36 million and $32 million, respectively. We have not capitalized any equity-based compensation costs during the reported periods.

Compensation expense increased in 2017 primarily due to charges related to the retirement treatment for unexercised stock options of certain former employees. As of December 31, 2018, we estimate that $44 million of currently unrecognized compensation expense will be recognized over a weighted average period of 1.4 years for our unvested RSU, PSU and stock option awards issued and outstanding.

Non-Employee Director Plan

Our non-employee directors currently receive annual grants of shares of our common stock, generally payable in two equal installments, under the 2014 Plan described above.

15. Earnings Per Share

Basic and diluted earnings per share were computed using the following common share data for the years ended December 31 (shares in millions):

	2018	2017	2016
Number of common shares outstanding at end of period	424.0	433.3	439.3
Effect of using weighted average common shares outstanding	5.1	5.5	4.2
Weighted average basic common shares outstanding	429.1	438.8	443.5
Dilutive effect of equity-based compensation awards and other contingently issuable shares (a)	3.1	3.1	3.0
Weighted average diluted common shares outstanding	432.2	441.9	446.5
Potentially issuable shares	7.4	8.1	9.8
Number of anti-dilutive potentially issuable shares excluded from diluted common shares outstanding	1.5	1.9	1.0

(a) As of January 1, 2017, we adopted ASU 2016-09 prospectively and no longer include excess tax benefits as assumed proceeds.

16. Fair Value Measurements

Assets and Liabilities Accounted for at Fair Value

Fair value is defined as the price that would be received from selling an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. When measuring assets and liabilities that are required to be recorded at fair value, the Company considers the principal or most advantageous market in which the Company would transact. Fair value is estimated by applying the following hierarchy, which prioritizes the inputs used to measure fair value into three levels and bases the categorization within the hierarchy upon the lowest level of input that is available and significant to the fair value measurement:

Level 1 — Quoted prices in active markets for identical assets or liabilities.

Level 2 — Observable inputs other than quoted prices in active markets for identical assets and liabilities, quoted prices for identical or similar assets or liabilities in inactive markets, or other inputs that are observable or can be corroborated by observable market data for substantially the full term of the assets or liabilities.

Level 3 — Inputs that are generally unobservable and typically reflect management's estimate of assumptions that market participants would use in pricing the asset or liability.

We use valuation techniques that maximize the use of observable inputs and minimize the use of unobservable inputs. In measuring the fair value of our assets and liabilities, we use market data or assumptions that we believe market

participants would use in pricing an asset or liability, including assumptions about risk when appropriate. Our assets and liabilities that are measured at fair value on a recurring basis include the following as of December 31 (in millions):

	2018	2017
Fair Value Measurements Using:		
Quoted prices in active markets (Level 1):		
Money market funds	$ 70	$ 225
	70	225
Significant other observable inputs (Level 2):		
Available-for-sale securities	288	96
	288	96
Significant unobservable inputs (Level 3):		
Redeemable preferred stock	66	55
	66	55
Total Assets	$ 424	$ 376

Money Market Funds

We invest portions of our restricted trust and escrow account balances in money market funds. We measure the fair value of these investments using quoted prices in active markets for identical assets. The fair value of our money market funds approximates our cost basis in the investments. The decrease in 2018 is primarily attributable to changes in our investments portfolio associated with our wholly-owned insurance captive from money market funds to available-for-sale securities.

Available-for-Sale Securities

Our available-for-sale securities include restricted trust and escrow account balances and an investment in an unconsolidated entity, as discussed in Note 18. We invest primarily in debt securities, including U.S. Treasury securities, U.S. agency securities, municipal securities and mortgage- and asset-backed securities. Additionally, some funds are invested in equity securities. We measure the fair value of these securities using quoted prices for identical or similar assets in inactive markets. Any changes in fair value of these trusts related to unrealized gains and losses have been appropriately reflected as a component of accumulated other comprehensive income (loss). The increase in 2018 is primarily attributable to changes in our investments portfolio, as discussed above.

Redeemable Preferred Stock

Redeemable preferred stock is related to noncontrolling investments in unconsolidated entities and is included in investments in unconsolidated entities in our Consolidated Balance Sheets. The fair value of our investments have been measured based on third-party investors' recent or pending transactions in these securities, which are considered the best evidence of fair value. When this evidence is not available, we use other valuation techniques as appropriate and available. These valuation methodologies may include transactions in similar instruments, discounted cash flow techniques, third-party appraisals or industry multiples and public company comparable transactions. During 2018, the unrealized gain in fair value of our redeemable preferred stock of $11 million was based on recent third-party investors' transactions in these securities and was reflected as a component of accumulated other comprehensive income (loss).

Fair Value of Debt

As of December 31, 2018 and 2017, the carrying value of our debt was $10.0 billion and $9.5 billion, respectively. The estimated fair value of our debt was approximately $10.1 billion and $9.9 billion as of December 31, 2018 and 2017, respectively. The increase in the fair value of our debt when comparing December 31, 2018 with December 31, 2017 is primarily related to net borrowings of $563 million during 2018 and fluctuations in current market rates for similar types of instruments.

Although we have determined the estimated fair value amounts using available market information and commonly accepted valuation methodologies, considerable judgment is required in interpreting market data to develop the estimates of fair value. Accordingly, our estimates are not necessarily indicative of the amounts that we, or holders of the instruments, could realize in a current market exchange. The use of different assumptions or estimation methodologies could have a material effect on the estimated fair values. The fair value estimates are based on Level 2 inputs of the fair value hierarchy available as of December 31, 2018 and 2017. These amounts have not been revalued since those dates, and current estimates of fair value could differ significantly from the amounts presented.

17. Acquisitions and Divestitures

Acquisitions

We continue to pursue the acquisition of businesses that are accretive to our Solid Waste business and enhance and expand our existing service offerings. During the year ended December 31, 2018, we acquired 32 businesses primarily related to our Solid Waste business. Total consideration, net of cash acquired, for all acquisitions was $471 million, which included $440 million in cash paid and $31 million of other consideration, primarily purchase price holdbacks. In 2018, we paid $6 million of contingent consideration associated with acquisitions completed prior to 2018. In addition, we paid $20 million of holdbacks, of which $15 million related to current year acquisitions. Contingent consideration obligations are primarily based on achievement by the acquired businesses of certain negotiated goals, which generally include targeted financial metrics.

Total consideration for our 2018 acquisitions was primarily allocated to $115 million of property and equipment, $141 million of other intangible assets and $248 million of goodwill. Other intangible assets included $124 million of customer and supplier relationships, $16 million of covenants not-to-compete and $1 million of other intangible assets. The goodwill is primarily a result of expected synergies from combining the acquired businesses with our existing operations and substantially all is tax deductible.

During the year ended December 31, 2017, we acquired 24 businesses related to our Solid Waste business. Total consideration, net of cash acquired, for all acquisitions was $205 million, which included $183 million in cash paid and other consideration of $22 million, primarily purchase price holdbacks. In 2017, we paid $3 million of contingent consideration associated with acquisitions completed prior to 2017. In addition, we paid $14 million of holdbacks, of which $13 million related to 2017 acquisitions.

Total consideration for our 2017 acquisitions was primarily allocated to $127 million of property and equipment, $46 million of other intangible assets and $39 million of goodwill. Other intangible assets included $39 million of customer and supplier relationships and $7 million of covenants not-to-compete. The goodwill was primarily a result of expected synergies from combining the acquired businesses with our existing operations and was tax deductible.

During the year ended December 31, 2016, we acquired 30 businesses primarily related to our Solid Waste business. Total consideration, net of cash acquired, for all acquisitions was $604 million, which included $581 million in cash paid and other consideration of $23 million, primarily purchase price holdbacks. In 2016, we paid $4 million of contingent

consideration for acquisitions completed prior to 2016. In addition, we paid $26 million of holdbacks, of which $16 million related to 2016 acquisitions.

Total consideration for our 2016 acquisitions was primarily allocated to $115 million of property and equipment, $212 million of other intangible assets and $280 million of goodwill. Other intangible assets included $185 million of customer and supplier relationships, $23 million of covenants not-to-compete and $4 million for a trade name. The goodwill was primarily a result of expected synergies from combining the acquired businesses with our existing operations and was tax deductible.

Southern Waste Systems/Sun Recycling ("SWS") — On January 8, 2016, Waste Management Inc. of Florida, an indirect wholly-owned subsidiary of WM, acquired certain operations and business assets of SWS in Southern Florida for total consideration of $525 million. The acquired business assets include residential, commercial and industrial solid waste collection, processing/recycling and transfer operations, equipment, vehicles, real estate and customer agreements. The acquisition was funded primarily with borrowings under our revolving credit facility.

Total consideration for SWS was allocated to $93 million of property and equipment, $182 million of other intangible assets and $250 million of goodwill. The goodwill was assigned to our Florida Area, in our Tier 3 segment, and was tax deductible. The acquisition accounting for this transaction was finalized in 2016.

The following table presents the fair value assigned to other intangible assets for the SWS acquisition (amounts in millions, except for amortization periods):

	SWS	
	Amount	Weighted Average Amortization Periods (in Years)
Customer and supplier relationships	$ 160	10.0
Covenants not-to-compete	18	5.0
Trade name	4	10.0
Total other intangible assets subject to amortization	$ 182	9.5

Divestitures

In 2018, 2017 and 2016, the aggregate sales price for divestitures of certain hauling and ancillary operations was $153 million, $62 million and $2 million and we recognized net gains of $96 million, net gains of $38 million and net losses of $9 million, respectively. These divestitures were made as part of our continuous focus on improving or divesting certain non-strategic or underperforming operations. The remaining amounts reported in the Consolidated Statements of Cash Flows generally relate to the sale of fixed assets.

18. Variable Interest Entities

Following is a description of our financial interests in unconsolidated and consolidated variable interest entities that we consider significant:

Low-Income Housing Properties and Refined Coal Facility Investments

We do not consolidate our investments in entities established to manage low-income housing properties and a refined coal facility because we are not the primary beneficiary of these entities as we do not have the power to individually direct the activities of these entities. Accordingly, we account for these investments under the equity method of accounting. Our

aggregate investment balance in these entities was $189 million and $59 million as of December 31, 2018 and 2017, respectively. The debt balance related to our investments in low-income housing properties was $151 million and $34 million as of December 31, 2018 and 2017, respectively. Additional information related to these investments is discussed in Note 8.

Trust Funds for Final Capping, Closure, Post-Closure or Environmental Remediation Obligations

Unconsolidated Variable Interest Entities — Trust funds that are established for both the benefit of the Company and the host community in which we operate are not consolidated because we are not the primary beneficiary of these entities as we either do not have the (i) power to direct the significant activities of the trusts or (ii) power over the trusts' significant activities is shared. Our interests in these trusts are accounted for as investments in unconsolidated entities and receivables. These amounts are recorded in other receivables, investments in unconsolidated entities and long-term other assets in our Consolidated Balance Sheets, as appropriate. We also reflect our share of the unrealized gains and losses on available-for-sale securities held by these trusts as a component of our accumulated other comprehensive income (loss). Our investments and receivables related to these trusts had an aggregate carrying value of $92 million and $99 million as of December 31, 2018 and 2017, respectively.

Consolidated Variable Interest Entities — Trust funds for which we are the sole beneficiary are consolidated because we are the primary beneficiary. These trust funds are recorded in restricted trust and escrow accounts in our Consolidated Balance Sheets. Unrealized gains and losses on available-for-sale securities held by these trusts are recorded as a component of accumulated other comprehensive income (loss). These trusts had a fair value of $103 million and $101 million as of December 31, 2018 and 2017, respectively.

19. Segment and Related Information

We evaluate, oversee and manage the financial performance of our Solid Waste business subsidiaries through our 17 Areas. The 17 Areas constitute operating segments and we have evaluated the aggregation criteria and concluded that, based on the similarities between our Areas, including the fact that our Solid Waste business is homogenous across geographies with the same services offered across the Areas, aggregation of our Areas is appropriate for purposes of presenting our reportable segments. Accordingly, we have aggregated our 17 Areas into three tiers that we believe have similar economic characteristics and future prospects based in large part on a review of the Areas' income from operations margins. The economic variations experienced by our Areas are attributable to a variety of factors, including regulatory environment of the Area; economic environment of the Area, including level of commercial and industrial activity; population density; service offering mix and disposal logistics, with no one factor being singularly determinative of an Area's current or future economic performance.

In 2017, we analyzed the Areas' income from operations margins for purposes of segment reporting and realigned our Solid Waste tiers to reflect recent changes in their relative economic characteristics and prospects. These changes are the results of various factors including acquisitions, divestments, business mix and the economic climate of various geographies. In 2018, there was no realignment of our Solid Waste tiers.

Tier 1 is comprised of our operations across the Southern U.S., with the exception of Southern California and the Florida peninsula, and also includes the New England states, the tri-state area of Michigan, Indiana and Ohio and Western Canada. Tier 2 includes Southern California, Eastern Canada, Wisconsin and Minnesota. Tier 3 encompasses all the remaining operations including the Pacific Northwest and Northern California, the Mid-Atlantic region of the U.S., the Florida peninsula, Illinois and Missouri.

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The operating segments not evaluated and overseen through the 17 Areas are presented herein as "Other" as these operating segments do not meet the criteria to be aggregated with other operating segments and do not meet the quantitative criteria to be separately reported.

Summarized financial information concerning our reportable segments as of December 31 and for the years then ended is shown in the following table (in millions):

Years Ended December 31:	Gross Operating Revenues	Intercompany Operating Revenues(c)	Net Operating Revenues	Income from Operations (d)(e)	Depreciation and Amortization	Capital Expenditures (f)	Total Assets (g)(h)
2018							
Solid Waste:							
Tier 1	$ 5,868	$ (1,063)	$ 4,805	$ 1,642	$ 510	$ 595	$ 6,958
Tier 2	2,622	(487)	2,135	542	232	257	3,761
Tier 3	7,047	(1,365)	5,682	1,211	614	547	9,119
Solid Waste	15,537	(2,915)	12,622	3,395	1,356	1,399	19,838
Other (a)	2,487	(195)	2,292	(66)	91	72	1,571
	18,024	(3,110)	14,914	3,329	1,447	1,471	21,409
Corporate and Other (b)	—	—	—	(540)	30	200	1,487
Total	$ 18,024	$ (3,110)	$ 14,914	$ 2,789	$ 1,477	$ 1,671	$ 22,896
2017							
Solid Waste:							
Tier 1	$ 5,576	$ (1,002)	$ 4,574	$ 1,538	$ 451	$ 603	$ 6,528
Tier 2	2,559	(443)	2,116	552	203	185	3,749
Tier 3	6,697	(1,220)	5,477	1,199	574	595	8,727
Solid Waste	14,832	(2,665)	12,167	3,289	1,228	1,383	19,004
Other (a)	2,538	(220)	2,318	(68)	103	93	1,785
	17,370	(2,885)	14,485	3,221	1,331	1,476	20,789
Corporate and Other (b)	—	—	—	(585)	45	92	1,327
Total	$ 17,370	$ (2,885)	$ 14,485	$ 2,636	$ 1,376	$ 1,568	$ 22,116
2016							
Solid Waste:							
Tier 1	$ 5,241	$ (911)	$ 4,330	$ 1,430	$ 424	$ 452	$ 6,188
Tier 2	2,400	(404)	1,996	522	190	157	3,562
Tier 3	6,327	(1,137)	5,190	994	530	589	8,497
Solid Waste	13,968	(2,452)	11,516	2,946	1,144	1,198	18,247
Other (a)	2,278	(185)	2,093	(100)	101	104	1,489
	16,246	(2,637)	13,609	2,846	1,245	1,302	19,736
Corporate and Other (b)	—	—	—	(550)	56	45	1,401
Total	$ 16,246	$ (2,637)	$ 13,609	$ 2,296	$ 1,301	$ 1,347	$ 21,137

(a) Our "Other" net operating revenues and "Other" income from operations include (i) our WMSBS organization; (ii) those elements of our landfill gas-to-energy operations and third-party subcontract and administration revenues managed by our EES and WM Renewable Energy organizations that are not included in the operations of our reportable segments; (iii) our recycling brokerage services and (iv) certain other expanded service offerings and

solutions. In addition, our "Other" segment reflects the results of non-operating entities that provide financial assurance and self-insurance support for our Solid Waste business, net of intercompany activity.

(b) Corporate operating results reflect certain costs incurred for various support services that are not allocated to our reportable segments. These support services include, among other things, treasury, legal, information technology, tax, insurance, centralized service center processes, other administrative functions and the maintenance of our closed landfills. Income from operations for "Corporate and other" also includes costs associated with our long-term incentive program and any administrative expenses or revisions to our estimated obligations associated with divested operations.

(c) Intercompany operating revenues reflect each segment's total intercompany sales, including intercompany sales within a segment and between segments. Transactions within and between segments are generally made on a basis intended to reflect the market value of the service.

(d) For those items included in the determination of income from operations, the accounting policies of the segments are the same as those described in Note 3.

(e) The income from operations provided by our Solid Waste business is generally indicative of the margins provided by our collection, landfill, transfer and recycling lines of business. From time to time, the operating results of our reportable segments are significantly affected by certain transactions or events that management believes are not indicative or representative of our results. Refer to Note 11 for explanations of certain transactions and events affecting our operating results.

(f) Includes non-cash items. Capital expenditures are reported in our reportable segments at the time they are recorded within the segments' property and equipment balances and, therefore, may include amounts that have been accrued but not yet paid.

(g) The reconciliation of total assets reported above to total assets in the Consolidated Balance Sheets as of December 31 is as follows (in millions):

	2018	2017	2016
Total assets, as reported above	$ 22,896	$ 22,116	$ 21,137
Elimination of intercompany investments and advances	(246)	(287)	(278)
Total assets, per Consolidated Balance Sheet	$ 22,650	$ 21,829	$ 20,859

(h) Goodwill is included within each segment's total assets. For segment reporting purposes, our material recovery facilities are included as a component of their respective Areas and our recycling brokerage services are included as

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part of our "Other" operations. The following table presents changes in goodwill during the reported periods by segment (in millions):

	Solid Waste				
	Tier 1	Tier 2	Tier 3	Other	Total
Balance, December 31, 2016	$ 2,203	$ 1,196	$ 2,661	$ 155	$ 6,215
Acquired goodwill	12	20	7	—	39
Divested goodwill	—	(1)	—	—	(1)
Impairments	—	—	—	(34)	(34)
Foreign currency translation	6	22	—	—	28
Balance, December 31, 2017	$ 2,221	$ 1,237	$ 2,668	$ 121	$ 6,247
Acquired goodwill	88	17	142	1	248
Divested goodwill	(6)	—	—	(19)	(25)
Impairments	—	—	—	(6)	(6)
Foreign currency translation	(7)	(27)	—	—	(34)
Balance, December 31, 2018	$ 2,296	$ 1,227	$ 2,810	$ 97	$ 6,430

The mix of operating revenues from our major lines of business for the years ended December 31 are as follows (in millions):

	2018	2017	2016
Commercial	$ 3,972	$ 3,714	$ 3,480
Residential	2,529	2,528	2,487
Industrial	2,773	2,583	2,412
Other	450	439	423
Total collection	9,724	9,264	8,802
Landfill	3,560	3,370	3,110
Transfer	1,711	1,591	1,512
Recycling	1,293	1,432	1,221
Other (a)	1,736	1,713	1,601
Intercompany (b)	(3,110)	(2,885)	(2,637)
Total	$ 14,914	$ 14,485	$ 13,609

(a) The "Other" line of business includes (i) our WMSBS organization; (ii) our landfill gas-to-energy operations; (iii) certain services within our EES organization, including our construction and remediation services and our services associated with the disposal of fly ash and (iv) certain other expanded service offerings and solutions. In addition, our "Other" line of business reflects the results of non-operating entities that provide financial assurance and self-insurance support, net of intercompany activity.

(b) Intercompany revenues between lines of business are eliminated in the Consolidated Financial Statements included within this report.

Net operating revenues relating to operations in the U.S. and Canada for the years ended December 31 are as follows (in millions):

	2018	2017	2016
U.S.	$ 14,167	$ 13,768	$ 12,915
Canada	747	717	694
Total	$ 14,914	$ 14,485	$ 13,609

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

Property and equipment, net of accumulated depreciation and amortization, relating to operations in the U.S. and Canada for the years ended December 31 are as follows (in millions):

	2018	2017	2016
U.S.	$ 11,044	$ 10,591	$ 10,040
Canada	898	968	910
Total	$ 11,942	$ 11,559	$ 10,950

20. Quarterly Financial Data (Unaudited)

The following table summarizes the unaudited quarterly results of operations for 2018 and 2017 (in millions, except per share amounts):

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
2018				
Operating revenues	$ 3,511	$ 3,739	$ 3,822	$ 3,842
Income from operations	608	715	699	767
Consolidated net income	395	499	498	531
Net income attributable to Waste Management, Inc.	396	499	499	531
Basic earnings per common share	0.91	1.16	1.16	1.25
Diluted earnings per common share	0.91	1.15	1.16	1.24
2017				
Operating revenues	$ 3,440	$ 3,677	$ 3,716	$ 3,652
Income from operations	558	673	701	704
Consolidated net income	297	361	388	903
Net income attributable to Waste Management, Inc.	298	362	386	903
Basic earnings per common share	0.68	0.82	0.88	2.08
Diluted earnings per common share	0.67	0.81	0.87	2.06

Basic and diluted earnings per common share for each of the quarters presented above is based on the respective weighted average number of common and dilutive potential common shares outstanding for each quarter and the sum of the quarters may not necessarily be equal to the full year basic and diluted earnings per common share amounts.

Our operating revenues tend to be somewhat higher in summer months, primarily due to the higher construction and demolition waste volumes. The volumes of industrial and residential waste in certain regions where we operate also tend to increase during the summer months. Our second and third quarter revenues and results of operations typically reflect these seasonal trends. Additionally, from time to time, our operating results are significantly affected by certain transactions or events that management believes are not indicative or representative of our ongoing results. The following items significantly impacted our operating results during the periods indicated:

Second Quarter 2018

- The recognition of net pre-tax gains of $40 million related to the sale of certain ancillary operations, which had a favorable impact of $0.07 on our diluted earnings per share.
- An income tax benefit of $33 million due to the settlement of various tax audits, which had a favorable impact of $0.07 on our diluted earnings per share.

WASTE MANAGEMENT, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

Third Quarter 2018

- Income tax benefits of $27 million primarily due to impacts of enactment of tax reform and changes in state laws, which had a favorable impact of $0.06 on our diluted earnings per share.
- The recognition of pre-tax charges of $32 million primarily related to a $29 million charge to impair a landfill in our Tier 3 segment, which is discussed further in Note 11. These charges had a negative impact of $0.05 on our diluted earnings per share.

Fourth Quarter 2018

- The recognition of a pre-tax gain of $52 million associated with the sale of certain hauling operations in our Tier 1 segment and $8 million of impairment charges primarily related to our LampTracker® reporting unit. These items had a favorable impact of $0.07 on our diluted earnings per share.
- A reduction in our income tax expense of $17 million for an adjustment to our deferred taxes to reduce our deferred tax liability based on an analysis of certain deferred tax balances. This item had a favorable impact of $0.04 on our diluted earnings per share.

First Quarter 2017

- A reduction in our income tax expense of $32 million for excess tax benefits related to the vesting or exercise of equity-based compensation awards and a $25 million pre-tax charge to write down an equity method investment in a waste diversion technology company to its fair value. These items had a favorable impact of $0.01 on our diluted earnings per share.

Third Quarter 2017

- The recognition of pre-tax charges including (i) an $11 million charge for the withdrawal from an underfunded Multiemployer Pension Plan and (ii) a $9 million charge to adjust our subsidiary's estimated potential share of an environmental remediation liability and related costs for a closed site in Harris County, Texas. These charges had a negative impact of $0.03 on our diluted earnings per share.

Fourth Quarter 2017

- An income tax benefit of $529 million related to enactment of the Act, consisting of a net tax benefit of $595 million related to the remeasurement of our deferred income tax assets and liabilities, partially offset by income tax expense of $66 million for a one-time, mandatory transition tax on the deemed repatriation of previously tax-deferred and unremitted foreign earnings. This net tax benefit had a favorable impact of $1.21 on our diluted earnings per share.
- The recognition of net pre-tax gains of $26 million primarily related to (i) gains of $31 million from the sale of certain oil and gas producing properties and (ii) a gain of $30 million related to the reduction in post-closing, performance-based contingent consideration obligations associated with an acquired business in our EES organization, partially offset by goodwill impairment charges of $34 million, primarily related to our EES organization. These net gains had a favorable impact of $0.03 on our diluted earnings per share.
- The recognition of pre-tax charges of $11 million related to the impairment of investments in waste diversion technology companies. These impairments were not deductible for income taxes and had a negative impact of $0.02 on our diluted earnings per share.
- The recognition of a pre-tax loss of $6 million associated with the early extinguishment of $590 million of 6.1% senior notes ahead of their scheduled maturity date, which had a negative impact of $0.01 on our diluted earnings per share.

WASTE MANAGEMENT, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

21. Condensed Consolidating Financial Statements

WM Holdings has fully and unconditionally guaranteed all of WM's senior indebtedness. WM has fully and unconditionally guaranteed all of WM Holdings' senior indebtedness. None of WM's other subsidiaries have guaranteed any of WM's or WM Holdings' debt. As a result of these guarantee arrangements, we are required to present the following condensed consolidating financial information (in millions):

CONDENSED CONSOLIDATING BALANCE SHEETS

December 31, 2018

	WM	WM Holdings	Non-Guarantor Subsidiaries	Eliminations	Consolidated
ASSETS					
Current assets:					
Cash and cash equivalents	$ —	$ —	$ 61	$ —	$ 61
Other current assets	2	5	2,577	—	2,584
	2	5	2,638	—	2,645
Property and equipment, net	—	—	11,942	—	11,942
Investments in affiliates	24,676	25,097	—	(49,773)	—
Advances to affiliates	—	—	17,258	(17,258)	—
Other assets	8	31	8,024	—	8,063
Total assets	$ 24,686	$ 25,133	$ 39,862	$ (67,031)	$ 22,650
LIABILITIES AND EQUITY					
Current liabilities:					
Current portion of long-term debt	$ 258	$ —	$ 174	$ —	$ 432
Accounts payable and other current liabilities	82	9	2,585	—	2,676
	340	9	2,759	—	3,108
Long-term debt, less current portion	7,377	304	1,913	—	9,594
Due to affiliates	17,398	146	6,709	(24,253)	—
Other liabilities	5	—	3,667	—	3,672
Total liabilities	25,120	459	15,048	(24,253)	16,374
Equity:					
Stockholders' equity	6,275	24,674	25,099	(49,773)	6,275
Advances to affiliates	(6,709)	—	(286)	6,995	—
Noncontrolling interests	—	—	1	—	1
	(434)	24,674	24,814	(42,778)	6,276
Total liabilities and equity	$ 24,686	$ 25,133	$ 39,862	$ (67,031)	$ 22,650

WASTE MANAGEMENT, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

CONDENSED CONSOLIDATING BALANCE SHEETS (Continued)

December 31, 2017

	WM	WM Holdings	Non-Guarantor Subsidiaries	Eliminations	Consolidated
ASSETS					
Current assets:					
Cash and cash equivalents	$ —	$ —	$ 22	$ —	$ 22
Other current assets	5	5	2,662	—	2,672
	5	5	2,684	—	2,694
Property and equipment, net	—	—	11,559	—	11,559
Investments in affiliates	22,393	22,893	—	(45,286)	—
Advances to affiliates	—	—	15,349	(15,349)	—
Other assets	9	31	7,536	—	7,576
Total assets	$ 22,407	$ 22,929	$ 37,128	$ (60,635)	$ 21,829
LIABILITIES AND EQUITY					
Current liabilities:					
Current portion of long-term debt	$ 537	$ —	$ 202	$ —	$ 739
Accounts payable and other current liabilities	55	9	2,459	—	2,523
	592	9	2,661	—	3,262
Long-term debt, less current portion	6,457	304	1,991	—	8,752
Due to affiliates	15,404	224	6,073	(21,701)	—
Other liabilities	8	—	3,765	—	3,773
Total liabilities	22,461	537	14,490	(21,701)	15,787
Equity:					
Stockholders' equity	6,019	22,392	22,894	(45,286)	6,019
Advances to affiliates	(6,073)	—	(279)	6,352	—
Noncontrolling interests	—	—	23	—	23
	(54)	22,392	22,638	(38,934)	6,042
Total liabilities and equity	$ 22,407	$ 22,929	$ 37,128	$ (60,635)	$ 21,829

WASTE MANAGEMENT, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

CONDENSED CONSOLIDATING STATEMENTS OF OPERATIONS

	WM	WM Holdings	Non-Guarantor Subsidiaries	Eliminations	Consolidated
Years Ended December 31:					
2018					
Operating revenues (a)	$ —	$ —	$ 15,090	$ (176)	$ 14,914
Costs and expenses (a)	176	—	12,125	(176)	12,125
Income from operations	(176)	—	2,965	—	2,789
Other income (expense):					
Interest expense, net	(312)	(20)	(42)	—	(374)
Equity in earnings of subsidiaries, net of tax	2,284	2,298	—	(4,582)	—
Other, net	—	—	(39)	—	(39)
	1,972	2,278	(81)	(4,582)	(413)
Income before income taxes	1,796	2,278	2,884	(4,582)	2,376
Income tax expense (benefit)	(129)	(5)	587	—	453
Consolidated net income	1,925	2,283	2,297	(4,582)	1,923
Less: Net loss attributable to noncontrolling interests	—	—	(2)	—	(2)
Net income attributable to Waste Management, Inc.	$ 1,925	$ 2,283	$ 2,299	$ (4,582)	$ 1,925
2017					
Operating revenues (a)	$ —	$ —	$ 15,040	$ (555)	$ 14,485
Costs and expenses (a)	555	—	11,849	(555)	11,849
Income from operations	(555)	—	3,191	—	2,636
Other income (expense):					
Interest expense, net	(299)	(20)	(44)	—	(363)
Equity in earnings of subsidiaries, net of tax	2,469	2,482	—	(4,951)	—
Other, net	(4)	(1)	(77)	—	(82)
	2,166	2,461	(121)	(4,951)	(445)
Income before income taxes	1,611	2,461	3,070	(4,951)	2,191
Income tax expense (benefit)	(338)	(8)	588	—	242
Consolidated net income	1,949	2,469	2,482	(4,951)	1,949
Less: Net loss attributable to noncontrolling interests	—	—	—	—	—
Net income attributable to Waste Management, Inc.	$ 1,949	$ 2,469	$ 2,482	$ (4,951)	$ 1,949
2016					
Operating revenues	$ —	$ —	$ 13,609	$ —	$ 13,609
Costs and expenses	—	—	11,313	—	11,313
Income from operations	—	—	2,296	—	2,296
Other income (expense):					
Interest expense, net	(303)	(20)	(53)	—	(376)
Equity in earnings of subsidiaries, net of tax	1,367	1,381	—	(2,748)	—
Other, net	(1)	—	(97)	—	(98)
	1,063	1,361	(150)	(2,748)	(474)
Income before income taxes	1,063	1,361	2,146	(2,748)	1,822
Income tax expense (benefit)	(119)	(8)	769	—	642
Consolidated net income	1,182	1,369	1,377	(2,748)	1,180
Less: Net loss attributable to noncontrolling interests	—	—	(2)	—	(2)
Net income attributable to Waste Management, Inc.	$ 1,182	$ 1,369	$ 1,379	$ (2,748)	$ 1,182

(a) For 2018 and 2017, costs and expenses for WM and operating revenues for Non-Guarantor Subsidiaries include insurance premiums for a wholly-owned insurance captive, which are eliminated in consolidation.

WASTE MANAGEMENT, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

CONDENSED CONSOLIDATING STATEMENTS OF COMPREHENSIVE INCOME

	WM	WM Holdings	Non-Guarantor Subsidiaries	Eliminations	Consolidated
Years Ended December 31:					
2018					
Comprehensive income	$ 1,933	$ 2,283	$ 2,199	$ (4,582)	$ 1,833
Less: Comprehensive loss attributable to noncontrolling interests	—	—	(2)	—	(2)
Comprehensive income attributable to Waste Management, Inc.	$ 1,933	$ 2,283	$ 2,201	$ (4,582)	$ 1,835
2017					
Comprehensive income	$ 1,955	$ 2,469	$ 2,564	$ (4,951)	$ 2,037
Less: Comprehensive loss attributable to noncontrolling interests	—	—	—	—	—
Comprehensive income attributable to Waste Management, Inc.	$ 1,955	$ 2,469	$ 2,564	$ (4,951)	$ 2,037
2016					
Comprehensive income	$ 1,189	$ 1,369	$ 1,417	$ (2,748)	$ 1,227
Less: Comprehensive loss attributable to noncontrolling interests	—	—	(2)	—	(2)
Comprehensive income attributable to Waste Management, Inc.	$ 1,189	$ 1,369	$ 1,419	$ (2,748)	$ 1,229

WASTE MANAGEMENT, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

CONDENSED CONSOLIDATING STATEMENTS OF CASH FLOWS

	WM(a)	WM Holdings(a)	Non-Guarantor Subsidiaries(a)	Eliminations	Consolidated
Years Ended December 31:					
2018					
Cash flows provided by (used in):					
Operating activities	$ —	$ —	$ 3,570	$ —	$ 3,570
Investing activities	—	—	(2,169)	—	(2,169)
Financing activities	—	—	(1,508)	—	(1,508)
Effect of exchange rate changes on cash, cash equivalents and restricted cash and cash equivalents	—	—	(3)	—	(3)
Intercompany activity	—	—	—	—	—
Increase (decrease) in cash, cash equivalents and restricted cash and cash equivalents	—	—	(110)	—	(110)
Cash, cash equivalents and restricted cash and cash equivalents at beginning of period	—	—	293	—	293
Cash, cash equivalents and restricted cash and cash equivalents at end of period	$ —	$ —	$ 183	$ —	$ 183
2017					
Cash flows provided by (used in):					
Operating activities	$ —	$ —	$ 3,180	$ —	$ 3,180
Investing activities	—	—	(1,620)	—	(1,620)
Financing activities	—	—	(1,361)	—	(1,361)
Effect of exchange rate changes on cash, cash equivalents and restricted cash and cash equivalents	—	—	—	—	—
Intercompany activity	—	—	—	—	—
Increase (decrease) in cash, cash equivalents and restricted cash and cash equivalents	—	—	199	—	199
Cash, cash equivalents and restricted cash and cash equivalents at beginning of period	—	—	94	—	94
Cash, cash equivalents and restricted cash and cash equivalents at end of period	$ —	$ —	$ 293	$ —	$ 293
2016					
Cash flows provided by (used in):					
Operating activities	$ —	$ —	$ 3,003	$ —	$ 3,003
Investing activities	—	—	(1,929)	—	(1,929)
Financing activities	—	—	(1,084)	—	(1,084)
Effect of exchange rate changes on cash, cash equivalents and restricted cash and cash equivalents	—	—	—	—	—
Intercompany activity	—	—	—	—	—
Increase (decrease) in cash, cash equivalents and restricted cash and cash equivalents	—	—	(10)	—	(10)
Cash, cash equivalents and restricted cash and cash equivalents at beginning of period	—	—	104	—	104
Cash, cash equivalents and restricted cash and cash equivalents at end of period	$ —	$ —	$ 94	$ —	$ 94

(a) Cash receipts and payments of WM and WM Holdings are transacted by Non-Guarantor Subsidiaries.

22. Subsequent Event

On January 31, 2019, we received Hart Scott Rodino antitrust clearance to proceed with the acquisition of landfill assets in West Texas related to our Solid Waste business. This transaction is expected to close in March 2019.

Item 9. ***Changes in and Disagreements with Accountants on Accounting and Financial Disclosure.***

None.

Item 9A. ***Controls and Procedures.***

Effectiveness of Controls and Procedures

Our management, with the participation of our principal executive and financial officers, has evaluated the effectiveness of our disclosure controls and procedures in ensuring that the information required to be disclosed in reports that we file or submit under the Securities Exchange Act of 1934, as amended, is recorded, processed, summarized and reported within the time periods specified in the SEC's rules and forms, including ensuring that such information is accumulated and communicated to management (including the principal executive and financial officers) as appropriate to allow timely decisions regarding required disclosure. Based on such evaluation, our principal executive and financial officers have concluded that such disclosure controls and procedures were effective as of December 31, 2018 (the end of the period covered by this Annual Report on Form 10-K).

Management's Report on Internal Control Over Financial Reporting

Management of the Company, including the principal executive and financial officers, is responsible for establishing and maintaining adequate internal control over financial reporting, as defined in Rules 13a-15(f) and 15d-15(f) of the Securities Exchange Act of 1934, as amended. Our internal controls are designed to provide reasonable assurance as to the reliability of our financial reporting and the preparation of the consolidated financial statements for external purposes in accordance with accounting principles generally accepted in the United States and includes those policies and procedures that:

i. pertain to the maintenance of records that in reasonable detail accurately and fairly reflect the transactions and dispositions of the assets of the Company;

ii. provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the Company are being made only in accordance with authorizations of management and directors of the Company; and

iii. provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use or disposition of the Company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Management of the Company assessed the effectiveness of our internal control over financial reporting as of December 31, 2018 based on the Internal Control — Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework). Based on this assessment, management has concluded that our internal control over financial reporting was effective as of December 31, 2018.

The effectiveness of our internal control over financial reporting has been audited by Ernst & Young LLP, the independent registered public accounting firm that audited our consolidated financial statements, as stated in their report, which is included within this report.

Changes in Internal Control over Financial Reporting

Management, together with our CEO and CFO, evaluated the changes in our internal control over financial reporting during the quarter ended December 31, 2018. We determined that there were no changes in our internal control over financial reporting during the quarter ended December 31, 2018 that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

Item 9B. ***Other Information.***

None.

PART III

Item 10. ***Directors, Executive Officers and Corporate Governance.***

The information required by this Item is incorporated by reference to the sections entitled "Board of Directors," "Section 16(a) Beneficial Ownership Reporting Compliance," and "Executive Officers," in the Company's definitive Proxy Statement for its 2019 Annual Meeting of Stockholders (the "Proxy Statement"), to be held May 14, 2019. The Proxy Statement will be filed with the SEC within 120 days of the end of our fiscal year.

We have adopted a code of ethics that applies to our CEO, CFO and Chief Accounting Officer, as well as other officers, directors and employees of the Company. The code of ethics, entitled "Code of Conduct," is posted on our website at www.wm.com under the section "Corporate Governance" within the "Investor Relations" tab.

Item 11. ***Executive Compensation.***

The information required by this Item is incorporated herein by reference to the sections entitled "Board of Directors — Compensation Committee Report," "— Compensation Committee Interlocks and Insider Participation," "— Non-Employee Director Compensation," "Executive Compensation — Compensation Discussion and Analysis" and "— Executive Compensation Tables" in the Proxy Statement.

Item 12. ***Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters.***

The information required by this Item is incorporated herein by reference to the sections entitled "Executive Compensation — Executive Compensation Tables — Equity Compensation Plan Table," "Director and Officer Stock Ownership," and "Security Ownership of Certain Beneficial Owners" in the Proxy Statement.

Item 13. ***Certain Relationships and Related Transactions, and Director Independence.***

The information required by this Item is incorporated herein by reference to the sections entitled "Board of Directors — Related Party Transactions" and "— Independence of Board Members" in the Proxy Statement.

Item 14. ***Principal Accounting Fees and Services.***

The information required by this Item is incorporated herein by reference to the section entitled "Ratification of Independent Registered Public Accounting Firm — Independent Registered Public Accounting Firm Fee Information" in the Proxy Statement.

PART IV

Item 15. ***Exhibits, Financial Statement Schedules.***

(a) (1) Consolidated Financial Statements:

Reports of Independent Registered Public Accounting Firm
Consolidated Balance Sheets as of December 31, 2018 and 2017
Consolidated Statements of Operations for the years ended December 31, 2018, 2017 and 2016
Consolidated Statements of Comprehensive Income for the years ended December 31, 2018, 2017 and 2016
Consolidated Statements of Cash Flows for the years ended December 31, 2018, 2017 and 2016
Consolidated Statements of Changes in Equity for the years ended December 31, 2018, 2017 and 2016
Notes to Consolidated Financial Statements

(a) (2) Consolidated Financial Statement Schedules:

All schedules have been omitted because the required information is not significant or is included in the financial statements or notes thereto, or is not applicable.

(a) (3) Exhibits:

Exhibit No.		Description
3.1	—	Third Restated Certificate of Incorporation of Waste Management, Inc. [incorporated by reference to Exhibit 3.1 to Form 10-Q for the quarter ended June 30, 2010].
3.2	—	Amended and Restated By-laws of Waste Management, Inc. [incorporated by reference to Exhibit 3.2 to Form 8-K dated February 19, 2018].
4.1	—	Specimen Stock Certificate [incorporated by reference to Exhibit 4.1 to Form 10-K for the year ended December 31, 1998].
4.2	—	Third Restated Certificate of Incorporation of Waste Management Holdings, Inc. [incorporated by reference to Exhibit 4.2 to Form 10-K for the year ended December 31, 2014].
4.3	—	Amended and Restated By-laws of Waste Management Holdings, Inc. [incorporated by reference to Exhibit 4.3 to Form 10-Q for the quarter ended June 30, 2014].
4.4	—	Indenture for Subordinated Debt Securities dated February 3, 1997, among the Registrant and The Bank of New York Mellon Trust Company, N.A. (the current successor to Texas Commerce Bank National Association), as trustee [incorporated by reference to Exhibit 4.1 to Form 8-K dated February 7, 1997].
4.5	—	Indenture for Senior Debt Securities dated September 10, 1997, among the Registrant and The Bank of New York Mellon Trust Company, N.A. (the current successor to Texas Commerce Bank National Association), as trustee [incorporated by reference to Exhibit 4.1 to Form 8-K dated September 10, 1997].
4.6	—	Officers' Certificate delivered pursuant to Section 301 of the Indenture dated September 10, 1997 by and between Waste Management, Inc. and The Bank of New York Mellon Trust Company, N.A., as Trustee, establishing the terms and form of Waste Management, Inc.'s 3.150% Senior Notes due 2027 [incorporated by reference to Exhibit 4.6 to Form 10-K for the year ended December 31, 2017].
4.7	—	Guarantee Agreement by Waste Management Holdings, Inc. in favor of The Bank of New York Mellon Trust Company, N.A., as Trustee for the holders of Waste Management, Inc.'s 3.150% Senior Notes due 2027 [incorporated by reference to Exhibit 4.7 to Form 10-K for the year ended December 31, 2017].

4.8*	—	Schedule of Officers' Certificates delivered pursuant to Section 301 of the Indenture dated September 10, 1997 establishing the terms and form of Waste Management, Inc.'s Senior Notes. Waste Management and its subsidiaries are parties to debt instruments that have not been filed with the SEC under which the total amount of securities authorized under any single instrument does not exceed 10% of the total assets of Waste Management and its subsidiaries on a consolidated basis. Pursuant to paragraph 4(iii)(A) of Item 601(b) of Regulation S-K, Waste Management agrees to furnish a copy of such instruments to the SEC upon request.
10.1†	—	2014 Stock Incentive Plan [incorporated by reference to Exhibit 10.1 to Form 8-K dated May 13, 2014].
10.2†	—	2009 Stock Incentive Plan [incorporated by reference to Appendix B to the Proxy Statement on Schedule 14A filed March 25, 2009].
10.3†	—	2005 Annual Incentive Plan [incorporated by reference to Appendix D to the Proxy Statement on Schedule 14A filed April 8, 2004].
10.4†	—	Waste Management, Inc. Employee Stock Purchase Plan [incorporated by reference to Exhibit 10.1 to Form 8-K dated May 15, 2015].
10.5†	—	First Amendment to Waste Management, Inc. Employee Stock Purchase Plan effective as of July 1, 2015 [incorporated by reference to Exhibit 10.5 to Form 10-K for the year ended December 31, 2015].
10.6†	—	Waste Management, Inc. 409A Deferral Savings Plan as Amended and Restated effective January 1, 2014 [incorporated by reference to Exhibit 10.2 to Form 10-Q for the quarter ended March 31, 2014].
10.7	—	$2.75 Billion Fourth Amended and Restated Revolving Credit Agreement dated as of June 26, 2018 by and among Waste Management, Inc., Waste Management of Canada Corporation, WM Quebec Inc. and Waste Management Holdings, Inc., certain banks party thereto, and Bank of America, N.A., as administrative agent [incorporated by reference to Exhibit 10.1 to Form 8-K filed June 29, 2018].
10.8	—	$2.25 Billion Third Amended and Restated Revolving Credit Agreement dated as of July 10, 2015 by and among Waste Management, Inc. and Waste Management Holdings, Inc. and certain banks party thereto, and Bank of America, N.A., as administrative agent [incorporated by reference to Exhibit 10.1 to Form 8-K dated July 10, 2015].
10.9	—	CDN$509,500,000 Credit Facilities Amended and Restated Credit Agreement by and among Waste Management of Canada Corporation and WM Quebec Inc., as borrowers, Waste Management, Inc. and Waste Management Holdings, Inc., as guarantors, The Bank of Nova Scotia, as administrative agent, JPMorgan Chase Bank, N.A., Bank of America, N.A. and PNC Bank Canada Branch, as co-syndication agents, The Bank of Nova Scotia, JPMorgan Chase Bank, N.A., Merrill Lynch, Pierce, Fenner & Smith Incorporated and PNC Capital Markets LLC, as joint lead arrangers and joint bookrunners and the Lenders from time to time party thereto [incorporated by reference to Exhibit 10.1 to Form 8-K dated March 24, 2016].
10.10	—	Commercial Paper Dealer Agreement, substantially in the form as executed with each of Mizuho Securities USA Inc., Merrill Lynch, Pierce, Fenner & Smith Incorporated, and J.P. Morgan Securities LLC, as Dealer, dated August 22, 2016 [incorporated by reference to Exhibit 10.11 to Form 10-K for the year ended December 31, 2016].
10.11	—	Commercial Paper Issuing and Paying Agent Agreement between Waste Management, Inc. and Bank of America, National Association dated August 15, 2016 [incorporated by reference to Exhibit 10.12 to Form 10-K for the year ended December 31, 2016].
10.12†	—	First Amended and Restated Employment Agreement between USA Waste-Management Resources, LLC and James C. Fish, Jr. dated December 22, 2017 [incorporated by reference to Exhibit 10.2 to Form 8-K dated December 22, 2017].
10.13†	—	Employment Agreement between USA Waste-Management Resources, LLC and Devina A. Rankin dated December 22, 2017 [incorporated by reference to Exhibit 10.3 to Form 8-K dated December 22, 2017].
10.14†	—	Employment Agreement between the Company and James E. Trevathan, Jr. dated June 1, 2000 [incorporated by reference to Exhibit 10.20 to Form 10-K for the year ended December 31, 2000].
10.15†	—	Amendment to Employment Agreement between the Company and James E. Trevathan, Jr. [incorporated by reference to Exhibit 10.3 to Form 8-K dated March 9, 2011].
10.16†	—	Employment Agreement between the Company and Jeff Harris dated December 1, 2006 [incorporated by reference to Exhibit 10.1 to Form 8-K dated December 1, 2006].

10.17†	—	Amendment to Employment Agreement by and between the Company and Jeff Harris [incorporated by reference to Exhibit 10.6 to Form 10-Q for the quarter ended March 31, 2011].
10.18†	—	First Amended and Restated Employment Agreement between USA Waste-Management Resources, LLC and John J. Morris, Jr. [incorporated by reference to Exhibit 10.4 to Form 8-K dated December 22, 2017].
10.19†	—	Employment Agreement between USA Waste-Management Resources, LLC and Charles C. Boettcher dated December 22, 2017 [incorporated by reference to Exhibit 10.23 to Form 10-K for the year ended December 31, 2017].
10.20†	—	Employment Agreement between the Company and Barry H. Caldwell dated September 23, 2002 [incorporated by reference to Exhibit 10.24 to Form 10-K for the year ended December 31, 2002].
10.21†*	—	Separation and Release Agreement between USA Waste-Management Resources, LLC and Barry H. Caldwell.
10.22†	—	Form of Director and Executive Officer Indemnity Agreement [incorporated by reference to Exhibit 10.43 to Form 10-K for the year ended December 31, 2012].
10.23†	—	Waste Management Holdings, Inc. Executive Severance Plan [incorporated by reference to Exhibit 10.1 to Form 8-K dated December 22, 2017].
10.24†	—	Form of 2016 Senior Leadership Team Award Agreement [incorporated by reference to Exhibit 10.1 to Form 8-K dated February 26, 2016].
10.25†	—	Form of 2016 Individual Restricted Stock Unit Award Agreement [incorporated by reference to Exhibit 10.32 to Form 10-K for the year ended December 31, 2016].
10.26†	—	Form of 2017 Senior Leadership Team Award Agreement [incorporated by reference to Exhibit 10.1 to Form 8-K dated February 27, 2017].
10.27†	—	2017 Senior Leadership Team Award Agreement with Mr. James E. Trevathan, Jr. [incorporated by reference to Exhibit 10.2 to Form 8-K dated February 27, 2017].
10.28†	—	Form of 2017 Long Term Incentive Compensation Award Agreement (Mid-Year Award) [incorporated by reference to Exhibit 10.37 to Form 10-K for the year ended December 31, 2017].
10.29†	—	Form of 2018 Senior Leadership Team Award Agreement [incorporated by reference to Exhibit 10.1 to Form 8-K dated February 19, 2018].
21.1*	—	Subsidiaries of the Registrant.
23.1*	—	Consent of Independent Registered Public Accounting Firm.
31.1*	—	Certification Pursuant to Rule 13a-14(a) and 15d-14(a) under the Securities Exchange Act of 1934, as amended, of James C. Fish, Jr., President and Chief Executive Officer.
31.2*	—	Certification Pursuant to Rule 13a-14(a) and 15d-14(a) under the Securities Exchange Act of 1934, as amended, of Devina A. Rankin, Senior Vice President and Chief Financial Officer.
32.1**	—	Certification Pursuant to 18 U.S.C. §1350 of James C. Fish, Jr., President and Chief Executive Officer.
32.2**	—	Certification Pursuant to 18 U.S.C. §1350 of Devina A. Rankin, Senior Vice President and Chief Financial Officer.
95*	—	Mine Safety Disclosures.
101.INS*	—	XBRL Instance Document.
101.SCH*	—	XBRL Taxonomy Extension Schema Document.
101.CAL*	—	XBRL Taxonomy Extension Calculation Linkbase Document.
101.DEF*	—	XBRL Taxonomy Extension Definition Linkbase Document.
101.LAB*	—	XBRL Taxonomy Extension Labels Linkbase Document.
101.PRE*	—	XBRL Taxonomy Extension Presentation Linkbase Document.

* Filed herewith.
** Furnished herewith.
† Denotes management contract or compensatory plan or arrangement.

Item 16. ***Form 10-K Summary.***

None.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the Registrant has duly caused this Report to be signed on its behalf by the undersigned, thereunto duly authorized.

WASTE MANAGEMENT, INC.

By: /s/ JAMES C. FISH, JR.
James C. Fish, Jr.
President, Chief Executive Officer and Director

Date: February 14, 2019

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the Registrant and in the capacities and on the dates indicated.

Signature	Title	Date
/s/ JAMES C. FISH, JR. James C. Fish, Jr.	President, Chief Executive Officer and Director (Principal Executive Officer)	February 14, 2019
/s/ DEVINA A. RANKIN Devina A. Rankin	Senior Vice President and Chief Financial Officer (Principal Financial Officer)	February 14, 2019
/s/ LESLIE K. NAGY Leslie K. Nagy	Vice President and Chief Accounting Officer (Principal Accounting Officer)	February 14, 2019
/s/ FRANK M. CLARK, JR. Frank M. Clark, Jr.	Director	February 14, 2019
/s/ ANDRÉS R. GLUSKI Andrés R. Gluski	Director	February 14, 2019
/s/ PARTICK W. GROSS Patrick W. Gross	Director	February 14, 2019
/s/ VICTORIA M. HOLT Victoria M. Holt	Director	February 14, 2019
/s/ KATHLEEN M. MAZZARELLA Kathleen M. Mazzarella	Director	February 14, 2019
/s/ JOHN C. POPE John C. Pope	Director	February 14, 2019
/s/ THOMAS H. WEIDEMEYER Thomas H. Weidemeyer	Chairman of the Board and Director	February 14, 2019

Exhibit 4.8

Schedule of Officers' Certificates
delivered pursuant to Section 301 of the Indenture dated September 10, 1997
by and between Waste Management, Inc. and The Bank of New York Mellon Trust Company, N.A., as Trustee, establishing the terms and form of Waste Management, Inc.'s Outstanding Senior Notes

Principal Amount Issued	Interest Rate (per annum)	Issue Date	Maturity Date	CUSIP	Interest Payment Dates
$ 600 million*	7.00%	7/17/1998	7/15/2028	902917AH6	January 15; July 15
$ 250 million*	7.375%	12/21/1999	5/15/2029	94106LAG4	May 15; November 15
$ 500 million*	7.75%	5/21/2002	5/15/2032	94106LAN9	May 15; November 15
$ 600 million*	6.125%	11/12/2009	11/30/2039**	94106LAV1	May 30; November 30
$ 600 million	4.75%	6/8/2010	6/30/2020**	94106LAW9	June 30; December 30
$ 400 million	4.60%	2/28/2011	3/1/2021**	941063AQ2	March 1; September 1
$ 500 million	2.90%	9/12/2012	9/15/2022**	94106LAY5	March 15; September 15
$ 350 million	3.50%	5/8/2014	5/15/2024**	94106LAZ2	May 15; November 15
$ 600 million	3.125%	2/26/2015	3/1/2025**	94106LBA6	March 1; September 1
$ 450 million	3.90%	2/26/2015	3/1/2035**	94106LBB4	March 1; September 1
$ 750 million	4.10%	2/26/2015	3/1/2045**	94106LBC2	March 1; September 1
$ 500 million	2.40%	5/16/2016	5/15/2023**	94106LBD0	May 15; November 15
$ 750 million	3.150%	11/8/2017	11/15/2027**	94106LBE8	May 15; November 15

* Each of these series of Senior Notes have been partially redeemed, such that the remaining outstanding principal amount of such Senior Notes as of December 31, 2018 was $394.9 million due 2028, $139.2 million due 2029, $210.4 million due 2032 and $273.6 million due 2039.

** Each of these series of Senior Notes contain a Change of Control Offer covenant that provides, if a change of control triggering event occurs, each holder of the notes may require us to purchase all or a portion of such holder's notes at a price equal to 101% of the principal amount, plus accrued interest, if any, to the date of purchase.

This schedule is provided in accordance with Instruction 2 to Regulation S-K Item 601, as each of the series of Series Notes is governed by an instrument that differs only in the material respects set forth in the schedule above from the Officers' Certificate identified as Exhibit 4.6. Each of the series of Senior Notes identified above is also guaranteed by Waste Management Holdings, Inc. in favor of The Bank of New York Mellon Trust Company, N.A., as Trustee for the holders of Waste Management, Inc.'s Senior Notes.

Exhibit 10.21

Execution Copy

CONFIDENTIAL SEPARATION AND RELEASE AGREEMENT

THIS SEPARATION AND RELEASE AGREEMENT (this "Separation Agreement") is entered into between USA Waste-Management Resources, LLC (the "Company") and Barry H. Caldwell (the "Executive" and, together with the Company, the "parties").

This Separation Agreement is binding upon, and extends to, the parties and their past and present officers, directors, employees, shareholders, parent corporations, subsidiaries, affiliates, partners, agents, representatives, heirs, executors, assigns, administrators, successors, predecessors, family members, d/b/a's, assumed names, and insurers, whether specifically mentioned hereafter or not. A reference to a party in this Separation Agreement necessarily includes those persons and/or entities described in the foregoing sentence.

PREAMBLE

WHEREAS, Waste Management, Inc. (together with any entity that is a direct or indirect majority-owned subsidiary of Waste Management, Inc., "Waste Management") and Executive previously entered into that certain Employment Agreement dated September 2002, as may have been amended from time to time (the "Employment Agreement");

WHEREAS, pursuant to such Employment Agreement, Executive has been continuously employed by the Company or an affiliate thereof since such time;

WHEREAS, the Parties agree that upon his separation, execution and non-revocation of a waiver and release of claims, Executive will receive certain benefits described in Exhibit C of this Separation Agreement;

WHEREAS, the Company and Executive now jointly desire to enter into this Separation Agreement to set forth the terms and conditions of Executive's termination; and

NOW, THEREFORE, in consideration of the premises and agreements contained herein, and for other good and valuable consideration, the Company and Executive hereby agree as follows:

1. Executive's Separation. The employment of Executive with the Company shall terminate on August 11, 2018 ("Employment Termination Date"). The parties agree that, except as otherwise expressly specified herein, the Employment Agreement shall have been deemed terminated as of the Employment Termination Date. Executive acknowledges and agrees that all officer positions he held with any Waste Management entity ceased as of the Employment Termination Date. In addition, Executive shall resign from all industry or charitable board or trade group leadership positions he currently holds by virtue of his employment with the Company (including, without limitation, those positions set forth on Exhibit A).

It is expressly agreed to and acknowledged by the parties that Executive is entitled to the compensation and benefits set forth in Exhibit B, (which, for the avoidance of doubt, shall survive termination of the Employment Agreement hereunder), whether or not he executes this Separation Agreement.

2. Payment of Additional Consideration. In consideration of the premises and promises herein contained, and subject to Executive executing and not revoking this Separation Agreement, it is agreed that the Company will provide Executive those certain benefits specifically detailed in Exhibit C to this Separation Agreement.

It is expressly agreed to and acknowledged by the parties that Executive is not entitled to the benefits set forth in Exhibit C until such time as he executes this Separation Agreement and it becomes effective and irrevocable, by its terms.

The consideration set forth in this Section 2 is in full, final and complete settlement of any and all claims which Executive could make in any complaint, charge, or civil action, whether for actual, nominal, compensatory, or punitive damages (including attorneys' fees). Executive acknowledges that such consideration is being made as consideration for the releases set forth in Section 3 and 5. Executive further acknowledges that the consideration set forth in Exhibit C are separate and distinct of and from each other, and that each such item is independent valuable consideration for the release and waiver set forth in Sections 3 and 5. Without limiting the generality of the foregoing, the Executive acknowledges and agrees that he waives and, except as expressly set forth herein, shall not be entitled to any severance benefits in connection with his termination of employment, whether pursuant to his Employment Agreement, any plan, program, promise or otherwise.

The Company shall pay Executive an additional cash lump sum in the amount of $35,000 in lieu of any obligation to reimburse Executive for his reasonable legal fees in connection with the negotiation of this Separation Agreement. Such reimbursement shall be paid within 10 days from the Employment Termination Date.

3. General Release. In exchange for the consideration provided to Executive pursuant to Section 2, Executive releases and discharges the Company, its past and present parents, subsidiaries, and its and their affiliated companies, managers, partners, agents, directors, officers, accountants, attorneys, employees, and representatives, and all persons acting by, through, under or in concert with the Company (collectively referred to as the "Released Parties"), from any and all causes of action, claims, liabilities, obligations, promises, agreements, controversies, damages, and expenses, known or unknown, which Executive ever had, or now has, against the Released Parties to the date the Executive signs this Separation Agreement. The claims Executive releases include, but are not limited to, claims that any of the Released Parties:

- discriminated against Executive on the basis of Executive's race, color, sex (including sexual harassment), national origin, ancestry, disability, religion, sexual orientation, marital status, parental status, veteran status, source of income, entitlement to benefits, union activities, or any other status protected by local, state or federal laws, constitutions, regulations, ordinances, executive orders, including but not limited to the Massachusetts Fair Employment Practices Act, the New

Jersey Conscientious Employee Protection Act, the New Jersey Law Against Discrimination, the New Jersey Whistleblower Act, North Dakota Century Code §9-13-02,South Dakota Code Laws § 20-7-11 and Chapters 21 and 451 of the Texas Labor Code; or

- discriminated against Executive on the basis of Executive's age or violated any right Executive may have under the Age Discrimination in Employment Act ("ADEA"); or

- failed to give proper notice of this employment termination under the Workers Adjustment and Retraining Notification Act ("WARN"), or any similar state or local statute or ordinance; or

- violated any other federal, state, or local employment statute, such as the Employee Retirement Income Security Act of 1974, which, among other things, protects employee benefits; the Fair Labor Standards Act, which regulates wage and hour matters; the Family and Medical Leave Act, which requires employers to provide leaves of absence under certain circumstances; Title VII of the Civil Rights Act of 1964; the Older Workers Benefits Protection Act; the Americans With Disabilities Act; the Rehabilitation Act; OSHA; and any other laws relating to employment; or

- violated its personnel policies, handbooks, any covenant of good faith and fair dealing, or any contract of employment between Executive and any of the Released Parties; or

- violated public policy or common law, including claims for: personal injury, invasion of privacy, retaliatory discharge, negligent hiring, retention or supervision, defamation, intentional or negligent infliction of emotional distress and/or mental anguish, intentional interference with contract, negligence, detrimental reliance, loss of consortium to Executive or any member of Executive's family, and/or promissory estoppel;

- violated or breached any provision of the Employment Agreement (including, without limitation, any notice or procedural requirements relating to Executive's termination hereunder);

- is otherwise obligated to provide any payment or benefit upon Executive's termination hereunder other than as provided for on Exhibit C herein;

- is obligated to provide any additional vesting or other right with respect to any equity compensation award other than as provided for on Exhibit C herein; or

- is in any way obligated for any reason to pay Executive's damages, expenses, litigation costs (including attorneys' fees), bonuses, commissions, disability benefits, compensatory damages, punitive damages, and/or interest except as otherwise provided by this Separation Agreement.

Executive understands and agrees that this Separation Agreement includes all claims that Executive may have and that Executive does not now know or suspect to exist in Executive's favor against the Released Parties, and that this Separation Agreement extinguishes those claims.

Executive is not prohibited from making or asserting (a) any claim or right under state workers' compensation or unemployment laws; (b) any claim or right, which by law cannot be waived through private agreement; (c) any claims or rights that may arise after Executive executes this Separation Agreement, including any claim to enforce the terms of this Separation Agreement and its Exhibits; or (d) any claim or right to indemnification pursuant to Section 10 of the Employment Agreement (which, for the avoidance of doubt, shall survive termination of the Employment Agreement hereunder).

4. Protected Rights. Notwithstanding the foregoing, nothing in this Separation Agreement prohibits Executive from filing a charge with, or reporting possible violations of federal law or regulation to any governmental agency or entity, including but not limited to the U.S. Equal Opportunity Commission, the Department of Justice, the Securities and Exchange Commission, Congress, and any agency Inspector General, or making other disclosures that are protected under the whistleblower provisions of federal law or regulation. This Separation Agreement does not limit Executive's ability to communicate with any government agencies or participate in any investigation or proceeding that may be conducted by any government agency, including providing documents or other information, without notice to the Company. In addition, this Separation Agreement does not limit Executive's right to receive an award for information provided to any government agencies. Further, Executive is advised that an individual shall not be held criminally or civilly liable under any federal or state trade secret law for the disclosure of a trade secret that (a) is made (i) in confidence to a federal, state, or local government official, either directly or indirectly, or to an attorney; and (ii) solely for the purpose of reporting or investigating a suspected violation of law; or (b) is made in a complaint or other document filed in a lawsuit or other proceeding, if such filing is made under seal. An individual who files a lawsuit for retaliation by an employer for reporting a suspected violation of law may disclose the trade secret to the attorney of the individual and use the trade secret information in the court proceeding, if the individual (A) files any document containing the trade secret under seal; and (B) does not disclose the trade secret, except pursuant to court order. Without limiting the protection set forth in this Section 4 and except as would otherwise violate the Dodd-Frank Wall Street Reform and Consumer Protection Act, Executive represents and covenants that as of the date of this Agreement he is not aware of any instances of material noncompliance with federal, state or local laws by any Released Party.

5. Covenant Not to Sue. For the purpose of giving a full and complete release, Executive covenants and agrees that he has no pending claims or charges against the Released Parties. If Executive has any pending claims in a federal, state or local court, or in an arbitral forum, Executive agrees to promptly file all appropriate papers requesting withdrawal and dismissal of such claims. Executive further agrees not to sue any of the Released Parties or become a party to a lawsuit on the basis of any claims of any type to date that arise out of any aspect of Executive's employment or termination of employment. Executive understands that this is an affirmative promise by Executive not to sue any of the Released Parties, which is in addition to Executive's general release of claims in Section 3 above. Notwithstanding the foregoing, nothing in this Separation Agreement prevents Executive from bringing an action to enforce the claims or rights identified in Sections 3(c) and (d) herein or challenge the validity of this Separation

Agreement or taking any action set forth in Section 4 above, and such action shall not be considered a breach of this Separation Agreement

If Executive breaches this Separation Agreement by suing any of the Released Parties in violation of this Covenant Not to Sue, Executive understands that (i) the Released Parties will be entitled to apply for and receive an injunction to restrain any violation of this paragraph, and (ii) Executive will be required to pay the Released Parties' legal costs and expenses, including reasonable attorney fees, associated with defending against the lawsuit and enforcing the terms of this Separation Agreement.

6. Protective Covenants and Loss of Benefits. Executive acknowledges and agrees that, notwithstanding the termination of the Employment Agreement pursuant to Section 1, the protective and restrictive covenants and related provisions set forth in Sections 8 and 9 of the Employment Agreement (the "Employment Agreement Protective Covenants") shall survive and remain in full force and effect and that the benefits payable under Exhibit C to this Separation Agreement are subject to forfeiture and/or recoupment (a) due to any violation of the Employment Agreement Protective Covenants or breach of this Agreement (including, without limitation, Section 11 thereof), (b) upon discovery of circumstances that would have been grounds for termination for "cause" under Section 5(c) of the Employment Agreement that were unknown to the Company as of the Employment Termination Date (this excludes any subject matter in relation to any investigation commenced prior to the Employment Termination Date), or (c) as provided for under the clawback provisions of the stock and annual incentive plan awards granted to Executive, to the extent disclosed to Executive.

7. Application to all Forms of Relief. This Separation Agreement applies to any relief no matter how called, including without limitation, wages, back pay, front pay, reinstatement, compensatory damages, liquidated damages, punitive damages for pain or suffering, costs and attorney's fees and expenses.

8. No Admissions, Complaints or Other Claims. The Executive acknowledges and agrees that this Separation Agreement is not to be construed in any way as an admission of any liability whatsoever by any Released Party, any such liability being expressly denied. The Executive also acknowledges and agrees that he has not, with respect to any transaction or state of facts existing prior to the date hereof, filed any Actions against any Released Party with any governmental agency, court or tribunal.

9. Acknowledgments. Executive has fully reviewed the terms of this Separation Agreement, acknowledges that he understands its terms, and states that he is entering into this Separation Agreement knowingly, voluntarily, and in full settlement of all claims which existed in the past or which currently exist, that arise out of his employment with the Company or the termination of his employment.

Executive acknowledges that he has had at least twenty-one (21) days to consider this Separation Agreement thoroughly, and Executive understands that he has the right to consult with an attorney, before he signs below and is advised to do so.

If Executive signs and returns this Separation Agreement before the end of the 21-day period, he certifies that his acceptance of a shortened time period is knowing and voluntary, and the Company did not -- through fraud, misrepresentation, a threat to withdraw or alter the offer before the 21-day period expires, or by providing different terms to other employees who sign the release before such time period expires -- improperly encourage Executive to sign.

Executive understands that he may revoke this Separation Agreement within the first seven (7) days after he signs it. Executive's revocation must be in writing and submitted within the seven (7) day period to Kimberly Gee Stith, via hand delivery or via electronic delivery at: KStith@wm.com. If Executive does not revoke this Separation Agreement within the seven (7) day period, it becomes irrevocable. Executive further understands that if he revokes this Separation Agreement, he will not be eligible to receive the benefits described in Exhibit C. All benefits described in Exhibit C will be paid on the dates specified herein, but only if this Separation Agreement has been duly executed and not revoked within its revocation period.

10. **Settlement and Acquisition of Goodwill**. Executive waives and releases any and all claims that the Employment Agreement Protective Covenants are not enforceable or are against public policy. Executive covenants not to file a lawsuit or arbitration proceeding, pursue declaratory relief, or otherwise take any legal action to challenge the enforceability of the Employment Agreement Protective Covenants. The parties agree that the payments and benefits referred to in Exhibit C are, in part, consideration of the settlement of all disputes regarding the enforceability and application of goodwill, trade secrets, and confidential information developed by Executive in the course of his employment with the Company. To help preserve the value of the goodwill, trade secrets, and confidential information acquired herewith, it is agreed that Executive will comply with the Employment Agreement Protective Covenants (incorporated herein by reference) for the periods of time set forth therein. It is specifically agreed that the two-year Restricted Term set forth in Section 8 of the Employment Agreement and the restriction provided for therein shall commence upon the Employment Termination Date.

11. **Assistance and Cooperation**. Executive agrees that he will cooperate fully with the Company and its counsel, upon their request, with respect to any potential or pending proceeding (including, but not limited to, any litigation, arbitration, regulatory proceeding, investigation or governmental action) that relates at least in part to matters with which Executive was involved while he was an employee of the Company or any of its affiliates, or with which he has knowledge. Executive agrees to render such cooperation in a timely fashion and to provide Company personnel and counsel with the full benefit of his knowledge with respect to any such matter, and will make himself reasonably available for interviews, depositions, or court appearances at the request of the Company or its counsel. The Parties agree that Executive's willingness to provide this cooperation is an inducement in the Company's willingness to enter into this agreement and, accordingly, any failure to comply with the requirements of this Section 11 shall constitute a material breach of this Separation Agreement. The Company agrees that it will not claim any breach of this Section 11 by Executive before providing Executive written notice of the specific cooperation requested which Company claims Executive has failed to provide, and it shall give Executive a reasonable opportunity to provide the requested cooperation following delivery of such notice.

12. **Choice of Laws**. This Separation Agreement is made and entered into in the State of Texas, and shall in all respects be interpreted, enforced and governed under the laws of the State of Texas. The language of all parts of this Separation Agreement shall in all cases be construed as a whole, according to its fair meaning, and not strictly for or against any of the parties.

13. **Severability**. Should any provision of this Separation Agreement be declared or be determined by any court to be illegal or invalid, the validity of the remaining parts, terms or provisions shall not be affected thereby and said illegal or invalid part, term, or provision shall be deemed not to be a part of this Separation Agreement.

14. **Tax Withholding; Right of Offset**. The Company shall withhold, or cause to be withheld, from any and all payments made pursuant to this Separation Agreement or any other agreement between Executive and the Company all amounts required to be withheld pursuant to federal, state or local tax laws. The Company may withhold and deduct from any and all payments made pursuant to this Separation Agreement or any other agreement between Executive and the Company all other normal deductions made with respect to the Company's employees generally and any advances made to Executive and owed to the Company. Executive acknowledges that he has been advised to consult his own tax professional regarding the tax consequences of any payments of compensation or other amounts received by Executive pursuant to this Separation Agreement or any other agreement between the Executive and the Company. Furthermore, Executive acknowledges that he is responsible for paying all applicable taxes as are assessed or levied by any governmental entity on any payments of compensation or other amounts received by Executive from the Company. The Company makes no representations regarding the tax consequences of any payments under this Separation Agreement or any other agreement between Executive and the Company, and in no event shall the Company be liable for any portion of any taxes, penalties, interest or other expenses that may be incurred by Executive with respect to any payments under this Separation Agreement or any other agreement between Executive and the Company.

15. **Matters Relating to Section 409A of the Code**. Each payment under this Separation Agreement is intended to be (i) to the greatest extent possible exempt from Section 409A of the Internal Revenue Code, the regulations and other binding guidance promulgated thereunder ("Section 409A"), including, but not limited to, by compliance with the short-term deferral exemption as specified in Treas. Reg. § 1.409A-1(b)(4) and the separation pay plan exemption set forth in Treas. Reg § 1.409A-1(b)(9), or (ii) if not exempt compliant with Section 409A, and the provisions of this Separation Agreement will be administered, interpreted and construed accordingly. Payments under this Separation Agreement in a series of installments shall be treated as a right to receive a series of separate payments for purposes of Section 409A. Executive shall be considered to have incurred a "separation from service" with the Company and its affiliates within the meaning of Treas. Reg. § 1.409A-1(h)(1)(ii) as of the Employment Termination Date.

Notwithstanding any other provision in this Separation Agreement to the contrary, payments and benefits payable under this Separation Agreement due to a "separation from service" within the meaning of Section 409A that are deferred compensation subject to (and not otherwise exempt from) Section 409A that would otherwise be paid or provided during the six-month period commencing on the date of Executive's "separation from service" within the meaning of Section

409A, shall be deferred until the first business day after the date that is six (6) months following Executive's "separation from service" within the meaning of Section 409A.

To the extent that reimbursements or other in-kind benefits under this Separation Agreement constitute "nonqualified deferred compensation" for purposes of Section 409A, (A) all expenses or other reimbursements hereunder shall be made on or prior to the last day of the second taxable year following Executive's "separation from service" pursuant to Treasury Regulation § 1.409A-1(b)(9)(iii)(B), (B) any right to reimbursement or in-kind benefits shall not be subject to liquidation or exchange for another benefit, and (C) no such reimbursement, expenses eligible for reimbursement, or in-kind benefits provided in any taxable year shall in any way affect the expenses eligible for reimbursement, or in-kind benefits to be provided, in any other taxable year.

Amounts payable pursuant to this Separation Agreement are intended to be unfunded for purposes of Section 409A. Although bookkeeping accounts may be established with respect to payments due under the Separation Agreement, any such accounts shall be used merely as a bookkeeping convenience. No provision of this Separation Agreement shall require the Company to purchase assets, place assets in a trust or segregate assets in connection with amounts due under the Separation Agreement.

16. **Arbitration**. The parties agree that any dispute relating to this Agreement, or to the breach of this Agreement, arising between Executive and the Company shall be settled by confidential arbitration in accordance with the Federal Arbitration Act and the commercial arbitration rules of the American Arbitration Association ("AAA"), or any other mutually agreed upon arbitration service; provided, however, that temporary and preliminary injunctive relief to enforce the covenants contained in the Employment Agreement, and related expedited discovery, may be pursued in a court of law to provide temporary injunctive relief pending a final determination of all issues of final relief through arbitration. The arbitration proceeding, including the rendering of an award, shall take place in Houston, Texas, and shall be administered by the AAA (or any other mutually agreed upon arbitration service). There shall be three (3) arbitrators. Each party shall select one arbitrator and the two party-selected arbitrators shall agree on the selection of the third arbitrator. The parties shall each select their arbitrator within thirty (30) days of the notice of dispute, or if the parties cannot agree, in accordance with the commercial arbitration rules of the AAA (or any other mutually agreed upon arbitration service). All fees and expenses associated with the arbitration shall be paid by the Company during the arbitration, including the timely payment of all reasonable attorney's fees and costs of Executive within thirty (30) days of submission of invoice. The arbitrators shall not be authorized to create a cause of action or remedy not recognized by applicable state or federal law. The arbitrator shall be authorized to award final injunctive relief. The award of the arbitrators shall be final and binding upon the parties without appeal or review, except as permitted by the arbitration laws of the State of Texas. The award, inclusive of any and all injunctive relief provided for therein, shall be enforceable through a court of law upon motion of either party.

17. **Dispute Resolution**. The parties hereto agree that the provisions of the Employment Agreement relating to dispute resolution including, without limitation, those provided in Sections 11 and 13 thereto, shall survive and apply to the payments and benefits provided for under this Separation Agreement.

18. **Complete Agreement**. The parties hereto agree that this Separation Agreement contains the full and final expression of their agreements with respect to the matters contained therein, and acknowledge that no other promises than those identified herein have been made to or by any of the parties that are not identified in these Agreements.

The parties agree that neither the offer of, nor the execution of, this Separation Agreement will be construed as an admission of wrongdoing by anyone. Instead, this Separation Agreement is to be construed solely as a reflection of the parties' desire to facilitate a peaceful separation of employment and to make sure there are no unresolved issued between them. This Separation Agreement may be executed in any number of counterparts and by the parties hereto on separate counterparts, each of which when so executed and delivered (including via electronic mail or facsimile) shall be an original but such counterparts together shall constitute one and the same instrument.

[*Signature page follows*]

Please review this document carefully as it contains a release of claims.

IN WITNESS WHEREOF, the Executive has entered into this Separation Agreement, and the Company has caused this Separation Agreement to be executed in its name and on its behalf by its duly authorized officer to be effective as of the date that this Separation Agreement is executed by Executive as set forth beneath the signature below (the "Effective Date").

BARRY CALDWELL
("Executive")

/s/ Barry Caldwell
Signature

Date: 10 August 2018
"Effective Date"

USA WASTE-MANAGEMENT RESOURCES, LLC
(The "Company")

By: */s/ Courtney Tippy*

Title: Vice President

Printed Name: Courtney Tippy
Date: 8/10/18

EXHIBIT A

1. Keep America Beautiful
2. National Waste and Recycling Association
3. National Association of Manufacturers

EXHIBIT B

The employment of Executive shall terminate effective August 11, 2018 (the "Employment Termination Date"). Executive is therefore, entitled to the payments and benefits listed below whether or not he signs this Separation Agreement. These include:

(a) Accrued but unpaid base salary for services rendered through the Employment Termination Date.

(b) Accrued but unpaid expenses required to be reimbursed under the Employment Agreement.

(c) Accrued but unused vacation for the year 2018 through the Employment Termination Date.

(d) Vested amounts owed pursuant to the Waste Management Retirement Savings Plan and the Waste Management 409A Deferral Savings Plan (DSP), including, without limitation, Executive's 20,601 deferred restricted stock unit grants ("DSUs") from the following grant dates:

i January 27, 2006

ii January 27, 2007

iii January 27, 2008

iv February 19, 2008

v January 27, 2009

vi January 26, 2010

Amounts payable under the DSP shall, subject to any required delay under Section 409A of the Code, be paid at such time(s) as set forth in the applicable plan.

(e) The indemnification provided in paragraph 10 of the Employment Agreement.

All payments will be subject to applicable withholdings for federal, state and local income and employment taxes. Executive acknowledges that he shall not be eligible to receive payment with respect to the annual incentive plan for the 2018 plan year.

Executive is entitled to the benefits described above in this Exhibit B whether or not he executes this Separation Agreement.

EXHIBIT C

The employment of Executive shall terminate, effective August 11, 2018 (the "Employment Termination Date") under the terms of this Separation Agreement. In consideration of the premises and promises herein contained, it is agreed that, Executive is entitled to the compensation and benefits set forth below only after he executes and does not revoke this Separation Agreement, and it has become irrevocable.

The payments and benefits to be provided are as follows:

(a) Cash severance equal to $1,925,000 in total, of which (i) $962,500 shall be paid in a lump sum within 10 business days of this Separation Agreement becoming effective and irrevocable (but in no event later than the 60th day following the Employment Termination Date), (ii) $73,839 shall be paid on the 60th day following the Employment Termination Date and (iii) $888,661 shall be paid in substantially equal installments over the period commencing on the first payroll date that occurs after the 60th day following the Employment Termination Date and ending on the two-year anniversary of the Employment Termination Date, in accordance with the Company's normal payroll practices;

(b) Subject to the Executive making a timely election under COBRA, for 18 months the Company will pay the portion of the COBRA premium in excess of the Executive's regular employee premium contribution. Thereafter, he will bear the full cost of any continued COBRA coverage.

(c) Be entitled to exercise any options that are vested as of the Employment Termination Date through the 90-day anniversary of the Employment Termination Date subject to the other terms and requirements thereof.

All payments will be subject to applicable withholdings for federal, state and local income and employment taxes.

Executive acknowledges that he is forfeiting and not receiving a payment in respect of (i) any unvested Performance Share Unit awards and (ii) any options that are unvested and not exercisable as of the Employment Termination Date.

Exhibit 21.1

Entity Name	*Jurisdiction of Formation / Incorporation*
635952 Ontario Inc.	Ontario
8242348 Canada Inc.	Federally Chartered
Acaverde S.A. de C.V.	Mexico
Advanced Environmental Technical Services, L.L.C.	Delaware
Akron Regional Landfill, Inc.	Delaware
Alliance Sanitary Landfill, Inc.	Pennsylvania
Alpharetta Transfer Station, LLC	Georgia
American Landfill, Inc.	Ohio
American Oil Recovery, LLC	Texas
Ameriwaste, LLC	Maryland
Anderson Landfill, Inc.	Delaware
Antelope Valley Recycling and Disposal Facility, Inc.	California
Arden Landfill, Inc.	Pennsylvania
Atlantic Waste Disposal, Inc.	Delaware
Automated Salvage Transport Co., L.L.C.	Delaware
Avalon South, LLC	Delaware
Azusa Land Reclamation, Inc.	California
B&B Landfill, Inc.	Delaware
Big Dipper Enterprises, Inc.	North Dakota
Bluegrass Containment, L.L.C.	Delaware
Burnsville Sanitary Landfill, Inc.	Minnesota
CA Newco, L.L.C.	Delaware
Cal Sierra Disposal	California
California Asbestos Monofill, Inc.	California
Canadian Waste Services Holdings Inc.	Ontario
Capels Landfill, LLC	Delaware
Capital Sanitation Company	Nevada
Capitol Disposal, Inc.	Alaska
Carolina Grading, Inc.	South Carolina
Cedar Ridge Landfill, Inc.	Delaware
Central Disposal Systems, Inc.	Iowa
Chadwick Road Landfill, Inc.	Georgia
Chambers Clearview Environmental Landfill, Inc.	Mississippi
Chambers Development Company, Inc.	Delaware
Chambers Development of Ohio, Inc.	Ohio
Chambers of Georgia, Inc.	Delaware
Chambers of Mississippi, Inc.	Mississippi
Chemical Waste Management of Indiana, L.L.C.	Delaware
Chemical Waste Management of the Northwest, Inc.	Washington
Chemical Waste Management, Inc.	Delaware
Chesser Island Road Landfill, Inc.	Georgia
City Environmental Services, Inc. of Waters	Michigan
Cleburne Landfill Company Corp.	Alabama
Coast Waste Management, Inc.	California
Coastal Recyclers Landfill, LLC	Delaware
Connecticut Valley Sanitary Waste Disposal, Inc.	Massachusetts

Entity Name	*Jurisdiction of Formation / Incorporation*
Conservation Services, Inc.	Colorado
Coshocton Landfill, Inc.	Ohio
Cougar Landfill, Inc.	Texas
Countryside Landfill, Inc.	Illinois
CR Group, LLC	Utah
Curtis Creek Recovery Systems, Inc.	Maryland
Cuyahoga Landfill, Inc.	Delaware
CWM Chemical Services, L.L.C.	Delaware
Dafter Sanitary Landfill, Inc.	Michigan
Dauphin Meadows, Inc.	Pennsylvania
Deep Valley Landfill, Inc.	Delaware
Deer Track Park Landfill, Inc.	Delaware
Deffenbaugh Disposal, Inc.	Delaware
Deffenbaugh Group Holdings, Inc.	Delaware
Deffenbaugh Industries, Inc.	Missouri
Deffenbaugh of Arkansas, LLC	Kansas
Deffenbaugh Recycling Company, L.L.C.	Kansas
Del Almo Landfill, L.L.C.	Delaware
Delaware Recyclable Products, Inc.	Delaware
DHC Land, LLC	Texas
Dickinson Landfill, Inc.	Delaware
Disposal Service, Incorporated	West Virginia
Dolphin Services & Chemicals, LLC	Texas
Dolphin-One, LLC	Texas
Earthmovers Landfill, L.L.C.	Delaware
East Liverpool Landfill, Inc.	Ohio
Eastern One Land Corporation	Delaware
Eco-Vista, LLC	Arkansas
eCycling Services, L.L.C.	Delaware
ELDA Landfill, Inc.	Delaware
Elk River Landfill, Inc.	Minnesota
Energy Injection Services of Mississippi, LLC	Mississippi
Envirofil of Illinois, Inc.	Illinois
EnviroSolutions Dulles, LLC	Virginia
EnviroSolutions Holdings, Inc.	Delaware
EnviroSolutions Real Property Holdings, Inc.	Delaware
Evergreen Landfill, Inc.	Delaware
Evergreen Recycling and Disposal Facility, Inc.	Delaware
Finch Waste Co LLC	Delaware
Firetower Landfill, LLC	Delaware
Fred J. Eckert Sanitary Service, Inc.	Oregon
Furnace Associates, Inc.	Virginia
G.I. Industries	Utah
GA Landfills, Inc.	Delaware
Gallia Landfill, Inc.	Delaware
Garnet of Maryland, Inc.	Maryland
Gateway Transfer Station, LLC	Georgia
Georgia Waste Systems, Inc.	Georgia

Entity Name	*Jurisdiction of Formation / Incorporation*
Giordano Recycling, L.L.C.	Delaware
Glades Landfill, LLC	Florida
Glen's Sanitary Landfill, Inc.	Michigan
Grand Central Sanitary Landfill, Inc.	Pennsylvania
Greenbow, LLC	Alabama
Greenleaf Compaction, Inc.	Arizona
Greenstar Allentown, LLC	Delaware
Greenstar Georgia, LLC	Delaware
Greenstar Managed Services - Connecticut, LLC	Delaware
Greenstar Managed Services - RLWM, LLC	Illinois
Greenstar Mid-America, LLC	Delaware
Greenstar New Jersey, LLC	Delaware
Greenstar Ohio, LLC	Delaware
Greenstar Paterson, LLC	Delaware
Greenstar Pittsburgh, LLC	Delaware
Greenstar Recycled Holdings, LLC	Delaware
Greenstar, LLC	Delaware
Guadalupe Mines Mutual Water Company	California
Guadalupe Rubbish Disposal Co., Inc.	California
Ham Lake Haulers, Inc.	Minnesota
Harris Sanitation, Inc.	Florida
Harwood Landfill, Inc.	Maryland
Hedco Landfill Limited	England
High Mountain Fuels LLC	Delaware
Hillsboro Landfill Inc.	Oregon
Holyoke Sanitary Landfill, Inc.	Massachusetts
IN Landfills, L.L.C.	Delaware
International Environmental Management, Inc.	Georgia
Jahner Sanitation, Inc.	North Dakota
Jay County Landfill, L.L.C.	Delaware
K and W Landfill Inc.	Michigan
Keene Road Landfill, Inc.	Florida
Kelly Run Sanitation, Inc.	Pennsylvania
King George Landfill Properties, LLC	Virginia
King George Landfill, Inc.	Virginia
Kirby Canyon Holdings, LLC	California
L&K Group Holdings LLC	Kansas
Lakeville Recycling, L.P.	Delaware
Land South Holdings, LLC	Delaware
Landfill Services of Charleston, Inc.	West Virginia
Laurel Highlands Landfill, Inc.	Pennsylvania
LCS Services, Inc.	West Virginia
Liberty Landfill, L.L.C.	Delaware
Liquid Waste Management, Inc.	California
Longleaf C&D Disposal Facility, Inc.	Florida
Looney Bins, Inc.	California
Mac Land Disposal, Inc. II	Mississippi
Mahoning Landfill, Inc.	Ohio

Entity Name	*Jurisdiction of Formation / Incorporation*
Mass Gravel Inc.	Massachusetts
Mc Ginnes Industrial Maintenance Corporation	Texas
McDaniel Landfill, Inc.	North Dakota
McGill Landfill, Inc.	Michigan
Meadowfill Landfill, Inc.	Delaware
Michigan Environs, Inc.	Michigan
Midwest One Land Corporation	Delaware
Modesto Garbage Co., Inc.	California
Moor Refuse, Inc.	California
Mountain Indemnity Insurance Company	Texas
Mountainview Landfill, Inc.	Maryland
Mountainview Landfill, Inc.	Utah
Nassau Landfill, L.L.C.	Delaware
National Guaranty Insurance Company of Vermont	Vermont
New England CR L.L.C.	Delaware
New Milford Landfill, L.L.C.	Delaware
New Orleans Landfill, L.L.C.	Delaware
North Manatee Recycling and Disposal Facility, L.L.C.	Florida
Northwestern Landfill, Inc.	Delaware
Nu-Way Live Oak Reclamation, Inc.	Delaware
Oak Grove Disposal Co., Inc.	Oregon
Oakleaf Global Holdings, Inc.	Delaware
Oakleaf Waste Management, Inc.	Delaware
Oakleaf Waste Management, LLC	Connecticut
Oakridge Landfill, Inc.	South Carolina
Oakwood Landfill, Inc.	South Carolina
OGH Acquisition Corporation	Delaware
Okeechobee Landfill, Inc.	Florida
Ozark Ridge Landfill, Inc.	Arkansas
P & R Environmental Industries, L.L.C.	North Carolina
Pacific Waste Management L.L.C.	Delaware
Pappy, Inc.	Maryland
Peltz H.C., LLC	Wisconsin
Pen-Rob, Inc.	Arizona
People's Landfill, Inc.	Delaware
Peterson Demolition, Inc.	Minnesota
Phoenix Resources, Inc.	Pennsylvania
Pine Grove Landfill, Inc.	Pennsylvania
Pine Tree Acres, Inc.	Michigan
Prime Westport, LLC	Florida
Quail Hollow Landfill, Inc.	Delaware
Questquill Limited	England
R & B Landfill, Inc.	Georgia
RAA Colorado, L.L.C.	Colorado
RAA Trucking, LLC	Wisconsin
RCI Hudson, Inc.	Massachusetts
Recycle America Co., L.L.C.	Delaware
Recycle America Holdings, Inc.	Delaware

Entity Name	*Jurisdiction of Formation / Incorporation*
Redwood Landfill, Inc.	Delaware
Refuse Services, Inc.	Florida
Refuse, Inc.	Nevada
Reliable Landfill, L.L.C.	Delaware
Remote Landfill Services, Inc.	Tennessee
Reno Disposal Co.	Nevada
Resco Holdings L.L.C.	Delaware
Resource Control Composting, Inc.	Massachusetts
Resource Control, Inc.	Massachusetts
Richland County Landfill, Inc.	South Carolina
Riverbend Landfill Co.	Oregon
RTS Landfill, Inc.	Delaware
Rust Engineering & Construction Inc.	Delaware
Rust International Inc.	Delaware
S & J Landfill Limited Partnership	Texas
S & S Grading, Inc.	West Virginia
S&T Materials, LLC	Florida
Sanifill de Mexico (US), Inc.	Delaware
Sanifill de Mexico, S.A. de C.V.	Mexico
SC Holdings, Inc.	Pennsylvania
SF Land Acquisition, LLC	Florida
Shade Landfill, Inc.	Delaware
Shawnee Rock Company	Missouri
Sierra Estrella Landfill, Inc.	Arizona
Southern Alleghenies Landfill, Inc.	Pennsylvania
Southern One Land Corporation	Delaware
Southern Waste Services, L.L.C.	Delaware
Spruce Ridge, Inc.	Minnesota
Stony Hollow Landfill, Inc.	Delaware
Suburban Landfill, Inc.	Delaware
Swire Waste Management Limited	Hong Kong
Texarkana Landfill, L.L.C.	Delaware
Texas Pack Rat - Austin #1 LLC	Texas
Texas Pack Rat - Dallas #1 LLC	Texas
Texas Pack Rat - Houston #1 LLC	Texas
Texas Pack Rat - Houston #2 LLC	Texas
Texas Pack Rat - Houston #3 LLC	Texas
Texas Pack Rat - San Antonio #1 LLC	Texas
Texas Pack Rat Service Company LLC	Texas
The Peltz Group, LLC	Wisconsin
The Waste Management Charitable Foundation	Delaware
The Woodlands of Van Buren, Inc.	Delaware
Thermal Remediation Solutions, L.L.C.	Oregon
TN'T Sands, Inc.	South Carolina
Trail Ridge Landfill, Inc.	Delaware
Transamerican Waste Central Landfill, Inc.	Delaware
Trash Hunters, Inc.	Mississippi
Twin Bridges Golf Club, L.P.	Indiana

Entity Name	*Jurisdiction of Formation / Incorporation*
TX Newco, L.L.C.	Delaware
United Waste Systems Leasing, Inc.	Michigan
USA South Hills Landfill, Inc.	Pennsylvania
USA Valley Facility, Inc.	Delaware
USA Waste Geneva Landfill, Inc.	Delaware
USA Waste Landfill Operations and Transfer, Inc.	Texas
USA Waste of California, Inc.	Delaware
USA Waste of Texas Landfills, Inc.	Delaware
USA Waste of Virginia Landfills, Inc.	Delaware
USA Waste Services of NYC, Inc.	Delaware
USA Waste-Management Resources, LLC	New York
USA-Crinc, L.L.C.	Delaware
USB LIHTC Fund 2010-1, LLC	Delaware
UWS Barre, Inc.	Massachusetts
Valley Garbage and Rubbish Company, Inc.	California
Vern's Refuse Service, Inc.	North Dakota
Vickery Environmental, Inc.	Ohio
Vista Landfill, LLC	Florida
Voyageur Disposal Processing, Inc.	Minnesota
Warner Company	Delaware
Waste Away Group, Inc.	Alabama
Waste Management Arizona Landfills, Inc.	Delaware
Waste Management Buckeye, L.L.C.	Delaware
Waste Management China Holdings, Limited	Hong Kong
Waste Management Collection and Recycling, Inc.	California
Waste Management Disposal Services of Colorado, Inc.	Colorado
Waste Management Disposal Services of Maine, Inc.	Maine
Waste Management Disposal Services of Maryland, Inc.	Maryland
Waste Management Disposal Services of Massachusetts, Inc.	Massachusetts
Waste Management Disposal Services of Oregon, Inc.	Delaware
Waste Management Disposal Services of Pennsylvania, Inc.	Pennsylvania
Waste Management Disposal Services of Virginia, Inc.	Delaware
Waste Management Energy Services of Texas, LLC	Texas
Waste Management Holdings, Inc.	Delaware
Waste Management Inc. of Florida	Florida
Waste Management Indycoke, L.L.C.	Delaware
Waste Management International, Inc.	Delaware
Waste Management National Services, Inc.	Delaware
Waste Management National Transportation Services, Inc.	Delaware
Waste Management of Alameda County, Inc.	California
Waste Management of Alaska, Inc.	Delaware
Waste Management of Arizona, Inc.	California
Waste Management of Arkansas, Inc.	Delaware
Waste Management of California, Inc.	California
Waste Management of Canada Corporation	Nova Scotia
Waste Management of Carolinas, Inc.	North Carolina
Waste Management of Colorado, Inc.	Colorado
Waste Management of Connecticut, Inc.	Delaware

Entity Name	*Jurisdiction of Formation / Incorporation*
Waste Management of Delaware, Inc.	Delaware
Waste Management of Fairless, L.L.C.	Delaware
Waste Management of Five Oaks Recycling and Disposal Facility, Inc.	Delaware
Waste Management of Georgia, Inc.	Georgia
Waste Management of Hawaii, Inc.	Delaware
Waste Management of Idaho, Inc.	Idaho
Waste Management of Illinois, Inc.	Delaware
Waste Management of Indiana Holdings One, Inc.	Delaware
Waste Management of Indiana Holdings Two, Inc.	Delaware
Waste Management of Indiana, L.L.C.	Delaware
Waste Management of Iowa, Inc.	Iowa
Waste Management of Kansas, Inc.	Kansas
Waste Management of Kentucky Holdings, Inc.	Delaware
Waste Management of Kentucky, L.L.C.	Delaware
Waste Management of Leon County, Inc.	Florida
Waste Management of Londonderry, Inc.	Delaware
Waste Management of Louisiana Holdings One, Inc.	Delaware
Waste Management of Louisiana, L.L.C.	Delaware
Waste Management of Maine, Inc.	Maine
Waste Management of Maryland, Inc.	Maryland
Waste Management of Massachusetts, Inc.	Massachusetts
Waste Management of Metro Atlanta, Inc.	Georgia
Waste Management of Michigan, Inc.	Michigan
Waste Management of Minnesota, Inc.	Minnesota
Waste Management of Mississippi, Inc.	Mississippi
Waste Management of Missouri, Inc.	Delaware
Waste Management of Montana, Inc.	Delaware
Waste Management of Nebraska, Inc.	Delaware
Waste Management of Nevada, Inc.	Nevada
Waste Management of New Hampshire, Inc.	Connecticut
Waste Management of New Jersey, Inc.	Delaware
Waste Management of New Mexico, Inc.	New Mexico
Waste Management of New York, L.L.C.	Delaware
Waste Management of North Dakota, Inc.	Delaware
Waste Management of Ohio, Inc.	Ohio
Waste Management of Oklahoma, Inc.	Oklahoma
Waste Management of Oregon, Inc.	Oregon
Waste Management of Pennsylvania Gas Recovery, L.L.C.	Delaware
Waste Management of Pennsylvania, Inc.	Pennsylvania
Waste Management of Rhode Island, Inc.	Delaware
Waste Management of South Carolina, Inc.	South Carolina
Waste Management of South Dakota, Inc.	South Dakota
Waste Management of Texas Holdings, Inc.	Delaware
Waste Management of Texas, Inc.	Texas
Waste Management of Tunica Landfill, Inc.	Mississippi
Waste Management of Utah, Inc.	Utah
Waste Management of Virginia, Inc.	Virginia
Waste Management of Washington, Inc.	Delaware

Entity Name	*Jurisdiction of Formation / Incorporation*
Waste Management of West Virginia, Inc.	Delaware
Waste Management of Wisconsin, Inc.	Wisconsin
Waste Management of Wyoming, Inc.	Delaware
Waste Management Partners, Inc.	Delaware
Waste Management Recycling and Disposal Services of California, Inc.	California
Waste Management Recycling of New Jersey, L.L.C.	Delaware
Waste Management Service Center, Inc.	Delaware
Waste Management, Inc. of Tennessee	Tennessee
Western One Land Corporation	Delaware
Western Waste Industries	California
Western Waste of Texas, L.L.C.	Delaware
Westminster Land Acquisition, LLC	Massachusetts
Wheelabrator Technologies International Inc.	Delaware
White Lake Landfill, Inc.	Michigan
Willow Oak Landfill, LLC	Georgia
WM Avon, Inc.	Delaware
WM Bagco, LLC	Delaware
WM Billerica, Inc.	Delaware
WM Biloxi Hauling, LLC	Mississippi
WM Biloxi Transfer Station, LLC	Delaware
WM Boston CORE, Inc.	Delaware
WM CCP Solutions, LLC	Delaware
WM Conversion Fund, LLC	Delaware
WM Corporate Services, Inc.	Delaware
WM Curbside, LLC	Delaware
WM DC 1, LLC	Delaware
WM Emergency Employee Support Fund, Inc.	Delaware
WM Energy Resources, Inc.	Delaware
WM Energy Services Holdings, LLC	Delaware
WM Energy Services of Ohio, LLC	Ohio
WM Energy Solutions, Inc.	Delaware
WM Green Squad, LLC	Delaware
WM GreenOps, LLC	Delaware
WM GTL JV Holdings, LLC	Delaware
WM GTL, Inc.	Delaware
WM GTL, LLC	Delaware
WM Healthcare Solutions, Inc.	Delaware
WM Illinois Renewable Energy, L.L.C.	Delaware
WM Intellectual Property Holdings, L.L.C.	Delaware
WM International Holdings, Inc.	Delaware
WM KS Energy Resources, LLC	Delaware
WM LampTracker, Inc.	Delaware
WM Landfills of Ohio, Inc.	Delaware
WM Landfills of Tennessee, Inc.	Delaware
WM Leasing of Arizona, L.L.C.	Delaware
WM Leasing of Texas, L.P.	Delaware
WM Leasing Services of Texas, LLC	Delaware
WM LNG, Inc.	Delaware

Entity Name	*Jurisdiction of Formation / Incorporation*
WM Logistics India Private Limited	India
WM Logistics, LLC	Delaware
WM Mercury Waste, Inc.	Delaware
WM Middle Tennessee Environmental Center, L.L.C.	Delaware
WM Mobile Bay Environmental Center, Inc.	Delaware
WM ND Energy Resources II, LLC	Delaware
WM ND Energy Resources, LLC	Delaware
WM Nevada Renewable Energy, L.L.C.	Delaware
WM North Broward, Inc.	Delaware
WM of North Dakota Energy Disposal Solutions, LLC	North Dakota
WM Organic Growth, Inc.	Delaware
WM PA Holdings, LLC	Delaware
WM Pack-Rat of California, LLC	Delaware
WM Pack-Rat of Illinois, LLC	Delaware
WM Pack-Rat of Kentucky, LLC	Delaware
WM Pack-Rat of Maryland, LLC	Delaware
WM Pack-Rat of Massachusetts, LLC	Delaware
WM Pack-Rat of Michigan, LLC	Delaware
WM Pack-Rat of Nevada, LLC	Delaware
WM Pack-Rat of Ohio, LLC	Delaware
WM Pack-Rat of Rhode Island, LLC	Delaware
WM Pack-Rat, LLC	Delaware
WM Partnership Holdings, Inc.	Delaware
WM Phoenix Energy Resources, LLC	Delaware
WM PRG, L.L.C.	Colorado
WM Propane, LLC	Delaware
WM Quebec Inc.	Federally Chartered
WM RA Canada Inc.	Ontario
WM Recycle America, L.L.C.	Delaware
WM Recycle Europe, L.L.C.	Delaware
WM Recycling Latin America, LLC	Delaware
WM Refined Coal, LLC	Delaware
WM Renewable Energy, L.L.C.	Delaware
WM Resource Recovery & Recycling Center, Inc.	Delaware
WM Resources, Inc.	Pennsylvania
WM Safety Services, L.L.C.	Delaware
WM Security Services, Inc.	Delaware
WM Storage II, Inc.	Delaware
WM Storage, Inc.	Delaware
WM Texas Pack Rat, LLC	Delaware
WM Trash Monitor Plus, L.L.C.	Delaware
WM TX Energy Resources II, LLC	Delaware
WM TX Energy Resources, LLC	Delaware
WM WY Energy Resources II, LLC	Delaware
WM WY Energy Resources III, LLC	Delaware
WM WY Energy Resources, LLC	Delaware
WMI Mexico Holdings, Inc.	Delaware
WMNA Container Recycling, L.L.C.	Delaware

Entity Name	*Jurisdiction of Formation / Incorporation*
WMRE of Kentucky, LLC	Delaware
WMRE of Michigan, LLC	Delaware
WMRE of Ohio, LLC	Delaware
WMRE of Ohio-American, LLC	Texas
WMSALSA, Inc.	Texas
WTI Air Pollution Control Inc.	Delaware
WTI Rust Holdings Inc.	Delaware

Exhibit 23.1

Consent of Independent Registered Public Accounting Firm

We consent to the incorporation by reference in the following Registration Statements:

(1) Registration Statement (Form S-8 No. 333-204319) of Waste Management, Inc. pertaining to the issuance of shares of common stock pursuant to the Waste Management, Inc. Employee Stock Purchase Plan,

(2) Registration Statement (Form S-8 No. 333-195980) of Waste Management, Inc. pertaining to the issuance of shares of common stock pursuant to the 2014 Stock Incentive Plan,

(3) Registration Statement (Form S-8 No. 333-184156 and Post-Effective Amendment No. 1 thereto) of Waste Management, Inc. pertaining to the issuance of shares of common stock pursuant to the Waste Management Retirement Savings Plan,

(4) Registration Statement (Form S-4 No. 333-32805 and Post-Effective Amendment No. 1 thereto) of Waste Management, Inc., and

(5) Registration Statement (Form S-8 No. 333-159476 and Post-Effective Amendment No. 1 thereto) of Waste Management, Inc. pertaining to the issuance of shares of common stock pursuant to the 2009 Stock Incentive Plan,

of our reports dated February 14, 2019, with respect to the consolidated financial statements of Waste Management, Inc. and the effectiveness of internal control over financial reporting of Waste Management, Inc. included in this Annual Report (Form 10-K) of Waste Management, Inc. for the year ended December 31, 2018.

/s/ ERNST & YOUNG LLP

Houston, Texas
February 14, 2019

Exhibit 31.1

CERTIFICATION PURSUANT TO RULES 13a-14(a) AND 15d-14(a)
UNDER THE SECURITIES EXCHANGE ACT OF 1934,
AS ADOPTED PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

I, James C. Fish, Jr., certify that:

i. I have reviewed this report on Form 10-K of Waste Management, Inc.;

ii. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

iii. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

iv. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a — 15(e) and 15d — 15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a — 15(f) and 15d — 15(f)) for the registrant and have:

A. Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

B. Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

C. Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

D. Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

v. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of registrant's board of directors (or persons performing the equivalent functions):

A. All significant deficiencies and material weaknesses in the design or operation of internal controls over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

B. Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

By: /s/ JAMES C. FISH, JR.
James C. Fish, Jr.
President and Chief Executive Officer

Date: February 14, 2019

Exhibit 31.2

CERTIFICATION PURSUANT TO RULES 13a-14(a) AND 15d-14(a)
UNDER THE SECURITIES EXCHANGE ACT OF 1934,
AS ADOPTED PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

I, Devina A. Rankin, certify that:

i. I have reviewed this report on Form 10-K of Waste Management, Inc.;

ii. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

iii. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

iv. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a — 15(e) and 15d — 15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a — 15(f) and 15d — 15(f)) for the registrant and have:

A. Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

B. Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

C. Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

D. Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

v. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of registrant's board of directors (or persons performing the equivalent functions):

A. All significant deficiencies and material weaknesses in the design or operation of internal controls over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

B. Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

By: /s/ DEVINA A. RANKIN
Devina A. Rankin
Senior Vice President and
Chief Financial Officer

Date: February 14, 2019

Exhibit 32.1

CERTIFICATION PURSUANT TO
18 U.S.C. SECTION 1350,
AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the Annual Report of Waste Management, Inc. (the "Company") on Form 10-K for the period ended December 31, 2018 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), I, James C. Fish, Jr., Chief Executive Officer of the Company, certify, pursuant to 18 U.S.C. § 1350, as adopted pursuant to § 906 of the Sarbanes-Oxley Act of 2002, that:

(1) The Report fully complies with the requirements of section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

(2) The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

By: /s/ JAMES C. FISH, JR.
James C. Fish, Jr.
President and Chief Executive Officer

February 14, 2019

Exhibit 32.2

CERTIFICATION PURSUANT TO
18 U.S.C. SECTION 1350,
AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the Annual Report of Waste Management, Inc. (the "Company") on Form 10-K for the period ended December 31, 2018 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), I, Devina A. Rankin, Chief Financial Officer of the Company, certify, pursuant to 18 U.S.C. § 1350, as adopted pursuant to § 906 of the Sarbanes-Oxley Act of 2002, that:

(1) The Report fully complies with the requirements of section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

(2) The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

By: /s/ DEVINA A. RANKIN
Devina A. Rankin
Senior Vice President and
Chief Financial Officer

February 14, 2019

Exhibit 95

Mine Safety Disclosures

This exhibit contains certain specified disclosures regarding mine safety required by section 1503(a) of the Dodd-Frank Wall Street Reform and Consumer Protection Act and Item 104 of Regulation S-K. Certain of our subsidiaries have permits for surface mining operations that are incidental to excavation work for landfill development.

During the year ended December 31, 2018, we did not receive any of the following: (a) a citation from the U.S. Mine Safety and Health Administration ("MSHA") for a violation of mandatory health or safety standards that could significantly and substantially contribute to the cause and effect of a coal or other mine safety or health hazard under section 104 of the Federal Mine Safety and Health Act of 1977 (the "Mine Safety Act"); (b) an order issued under section 104(b) of the Mine Safety Act; (c) a citation or order for unwarrantable failure of the mine operator to comply with mandatory health or safety standards under section 104(d) of the Mine Safety Act; (d) a flagrant violation under section 110(b)(2) of the Mine Safety Act; (e) an imminent danger order under section 107(a) of the Mine Safety Act; or (f) a proposed assessment from the MSHA.

In addition, during the year ended December 31, 2018, we had no mining-related fatalities, we had no pending legal actions before the Federal Mine Safety and Health Review Commission involving a coal or other mine, and we did not receive any written notice from the MSHA involving a pattern of violations, or the potential to have such a pattern, of mandatory health or safety standards that are of such nature as could have significantly and substantially contributed to the cause and effect of coal or other mine health or safety hazards under section 104(e) of the Mine Safety Act.

APPENDIX 3B
Financial Capacity Letter

WASTE MANAGEMENT

WASTE MANAGEMENT
1001 Fannin, Suite 4000
Houston, TX 77002
(713) 512-6200

October 21, 2019

Linda J. Butler
Licensing and Compliance Specialist, Div. of Technical Services
Maine Department of Environmental Protection
17 State House Station
Augusta, ME 04333-0017

Re: WMDSM Solid Waste Application for the Phase 14 Project

Dear Ms. Butler:

Waste Management Disposal Services of Maine, Inc. ("WMDSM") is an indirect subsidiary of Waste Management, Inc. and owns and operates the Crossroads Landfill in Norridgewock, Maine. WMDSM is proposing an expansion of the Crossroads Landfill (the "Phase 14 Project") with an estimated total cost, including development, construction, operation, closure and post-closure, of $80,500,000. Waste Management, Inc. will ensure that WMDSM is adequately capitalized with financial resources as may be necessary to fund the total cost of the Phase 14 Project. As demonstrated by the referenced annual report, Waste Management, Inc. has more than sufficient financial assets to fulfill this commitment.

Waste Management, Inc. is North America's leading provider of comprehensive waste management environmental services and through its subsidiaries owns or operates more than 250 landfills, including the Crossroads Landfill in Norridgewock, Maine. As reflected in the consolidated balance sheets included in the most recent annual report filed with the SEC, as of December 31, 2018, Waste Management, Inc. had total assets of $22.65 billion and annual revenues of $14.91 billion. (http://investors.wm.com/static-files/87e1a767-1d5c-41d8-83bf-afa0ab46e133)

Thank you for consideration of this letter in support of the Phase 14 Project.

Sincerely,

David L. Reed
Vice President & Treasurer,
Waste Management, Inc.

APPENDIX 4A

Qualifications of Waste Management Disposal Services of Maine, Inc. (WMDSM)

State of Maine

Department of the Secretary of State

I, the Secretary of State of Maine, certify *that according to the provisions of the Constitution and Laws of the State of Maine, the Department of the Secretary of State is the legal custodian of the Great Seal of the State of Maine which is hereunto affixed and of the reports of organization, amendment and dissolution of corporations and annual reports filed by the same.*

I further certify *that WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC., formerly CONSOLIDATED WASTE SERVICES, INC. is a duly organized business corporation under the laws of the State of Maine and that the date of incorporation is December 22, 1983.*

I further certify *that said business corporation has filed annual reports due to this Department, and that no action is now pending by or on behalf of the State of Maine to forfeit the charter and that according to the records in the Department of the Secretary of State, said corporation is a legally existing business corporation in good standing under the laws of the State of Maine at the present time.*

In testimony whereof, I have caused the Great Seal of the State of Maine to be hereunto affixed. Given under my hand at Augusta, Maine, this sixth day of January 2016.

Matthew Dunlap
Secretary of State

JEFFREY ALLAN MCGOWN
60 Sophie May Lane
Norridgewock, Maine 04957

EDUCATION

University of Maine
Orono, Maine 04473
Bachelor of Science in Elementary Education
Concentrations in History and Physical Education

PROFESSIONAL EXPERIENCE

1982 – 1985 History-Physical Education
Teacher K-8
MSAD #23
Carmel, Maine 04419

1985 – July 1991 Project Supervisor
Tom Sawyer Inc.
Bangor, Maine 04401

Position included responsibilities for:

- Procurement of Municipal, Government and Industrial Transportation and Disposal Contracts
- Transportation Dispatch
- Acquisition Team for Tom Sawyer Inc.
- Marketing and Media Development
- Sales Marketing Manager
- Industrial Sales Development

1991 – August Marketing Manager
SLS Contracting
P.O. Box 28
Palmyra, Maine 04965

PROFESSIONAL EXPERIENCE

1992 – Present Senior District Manager
Waste Management Disposal Services of Maine
P.O. Box 629
Norridgewock, Maine 04957

PROFESSIONAL DEVELOPMENT

Dale Carnegie Public Relations
Dale Carnegie Management Course
American Management Association:

- Professional Selling
- Sales Management
- Budgeting

University of Maine

- Management Program

Landfill University, Waste Management

CIVIC

Carmel Recreation Committee
Carmel Selectman
Soccer Coach for HCL Soccer
Benevolent Lodge #87 Carmel
Norridgewock Budget Committee
President Board of Directors, SECD
Treasurer, Norridgewock Chamber of Commerce
Norridgewock Sportsman's Association
Board of Directors, Norridgewock Fairmount Housing
Board of Directors, Waterville Boys & Girls Club
Various State of Maine Governor appointed Committees for Solid Waste and Recycling
Norridgewock Water District Trustee

SHERWOOD A. MCKENNEY

335 WARD HILL ROAD • MADISON, ME 04950 • (207) 240-9787

EXPERIENCE

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC. – Crossroads Landfill
Commercial Solid Waste Facility
District Engineer, September 2000 to present

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC. – Crossroads Landfill
Commercial Solid Waste Facility
Operations Manager, March 1998 to September 2000

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC. – Crossroads Landfill
Commercial Solid Waste Facility
Staff Engineer, May 1990 to March 1998

CONSOLIDATED WASTE SERVICES
Commercial Solid Waste Facility
Survey Engineer, Summer of 1989

S.A. MCKENNEY & SONS
General Contractor
Carpenter, Part Time 1985-1988

EDUCATION

UNIVERSITY OF MAINE AT ORONO
A.S., Civil Engineering Technology, May 1987
B.S., Civil Engineering, August 1991

SKILLS

District Engineer responsibilities at Crossroads Landfill include:

- Interfacing with regulatory agencies for permitting, compliance, construction and reporting activities associated with the active secure landfills, inactive secure landfills, landfills in post closure, solid waste transfer stations, recycling facility, tire processing facility and other administrative, maintenance, and support facilities.
- Working closely with site operations personnel to continue Crossroads proactive environmental approach to ensure compliance with local, State, and Federal requirements as well as company policy.

Please note that a majority of the work tasks outlined below as part of the Operations Manager and Staff Engineer responsibilities continue to be performed in the District Engineering role for Crossroads Landfill.

Operations Manager responsibilities at Crossroads Landfill include:

- Supervised 17 employees who performed various operational work tasks consisting of:
  - Heavy equipment operation
  - Transportation fleet and landfill equipment maintenance
  - Scalehouse operation
  - Environmental monitoring
  - Site maintenance

- Manual labor

- Managed consultants and contractors associated with landfill construction and operational activities.
- Managed site activities such as:
  - Site maintenance
  - Leachate management system
  - Safety program
  - Environmental monitoring program
  - Recycling program
  - Landfill operation

Staff Engineer duties at Crossroads Landfill entail:

- Project Management of various solid waste construction projects. Completed projects include:
  - Commercial Municipal Solid Waste Transfer Station
  - Asbestos Landfill Final Closure
  - Phase IIIC Special Waste Landfill
  - Phase X, Cell B Special Waste Landfill
  - Landfill Pump Station Modifications
- Managed Geotechnical Monitoring Program. Related activities include:
  - Supervising a field technician
  - Scheduling instrumentation monitoring
  - Evaluating geotechnical results
  - Preparing reports
  - Submitting data to Maine Department of Environmental Protection (MDEP) within regulated time frames
- Managed consultants and contractors associated with landfill construction and operation activities.
- Managed Crossroads Leachate Management Program. Related activities include:
  - Managing data acquisition
  - Evaluating and reporting data to MDEP
- Conducted training sessions and performing inspections to maintain compliance with the Site Operations Manual, health and safety regulations and regulatory requirements.
- Interacted with the MDEP to comply with construction and monitoring requirements and to seek landfill related permits.
- Assisted operations personnel with technical and regulatory guidance to ensure site operations are conducted in accordance with local, state and federal requirements as well as company policies.

APPENDIX 4B
Qualifications of Geosyntec Consultants, Inc.

GEOSYNTEC CONSULTANTS

QUALIFICATIONS AND EXPERIENCE

Introduction

Geosyntec is a highly qualified landfill design / permitting firm with considerable experience in the State of Maine. This section presents Geosyntec's qualifications for providing landfill design, permitting, and construction-related services for the Phase 14 landfill at the Crossroads facility in Norridgewock.

Geosyntec's Qualifications

Geosyntec is a geotechnical, hydrogeological, and waste management consulting engineering firm with dozens of offices throughout the U.S. The firm has been involved in numerous projects involving landfill hydrogeologic explorations, geotechnical explorations, siting studies, analysis, design, permitting, construction monitoring, and closure. Geosyntec has directly relevant qualifications for the Crossroads Landfill expansion project, as summarized below:

- Geosyntec personnel have prepared the engineering designs, permit applications, and construction documents for more than 100 landfills, all of which included liner and final cover system designs.

- As a result of previous work in the State of Maine, Geosyntec has developed an excellent working relationship with the Maine Department of Environmental Protection (MEDEP).

- Geosyntec's personnel have worked for the U.S. Environmental Protection Agency (USEPA) providing technical guidance on the development of regulations for hazardous waste landfills and surface impoundments. Several of Geosyntec's technical reports have been published by the USEPA.

- Geosyntec's personnel were closely involved in developing many of the design techniques that are currently used for landfill liner and cover system design.

- Geosyntec has a highly experienced landfill construction quality assurance (CQA) group that works on landfill projects throughout the U.S. The firm has provided CQA services on numerous construction and closure projects. Geosyntec was the first engineering company in the United States to offer CQA services for landfill liner systems and cover systems. The firm's professionals are regularly summoned to address construction difficulties on challenging landfill construction projects.

Geosyntec's Relevant Experience

Overview

Geosyntec's areas of experience and expertise include a full range of professional services that typically involve all phases of the life cycle of a waste disposal facility, starting with siting and permitting, including design and site remediation, and finishing with closure and post-closure care. Geosyntec has successfully completed waste disposal facility projects in more than 40 states, many of which are located in the northeast U.S. The firm's personnel have considerable experience with the MEDEP regulations (i.e., Chapters 400 and 401) and Federal regulations, and have developed an excellent working relationship with MEDEP personnel. Also, with experience on over a dozen projects in Maine, Geosyntec has extensive local experience that applies directly to the Crossroads Landfill expansion project, as summarized below.

Design and Permitting

Geosyntec is nationally recognized for both its technical expertise and project experience in the design and permitting of waste management and disposal facilities. Geosyntec personnel have made important contributions (through more than 300 published technical papers and several books) to many of the analytical techniques used in the design of landfills and related facilities.

Geosyntec personnel have served as the engineer-of-record for hundreds of landfill design projects, including projects involving a range of different types of liner and final cover systems. Geosyntec has designed facilities to meet both federal Subtitle C and Subtitle D regulatory requirements. In addition to sites requiring complex geotechnical and liner-related analyses, these projects have involved the design of civil infrastructure, leachate storage and treatment systems, leachate recirculation systems, and passive and active gas management systems. Geosyntec is well known for the high quality of its design plans and permit applications and producing designs that are cost-effective and straightforward to construct.

Construction-Phase Services

Geosyntec was the first engineering company in the United States (in 1984) to offer CQA services for waste containment facility liner and cover systems. As the first, Geosyntec was heavily involved in developing many of the CQA methods and procedures that are standard today. Firm personnel are leaders in the development of CQA test standards, through participation in American Society of Testing and Materials (ASTM) and other standards-setting organizations.

Geosyntec has been providing CQA services in Maine since 1990 and has assisted in completing the implementation of landfill construction projects in a timely and cost-effective manner. Geosyntec's assistance on CQA projects have expedited the approval of MEDEP for waste containment facilities throughout the state.

Project Experience

Geosyntec's first-hand knowledge of the previous designs for the Crossroads disposal cells will be of considerable value in ensuring a comprehensive understanding of the effects of Phase 14. Our CQA experience at the site will be applied by infusing constructability review throughout the preliminary design process. Geosyntec's role as Construction Manager for several cells at Crossroads has provided us with first-hand knowledge and information regarding construction costs, which will be applied in the sequential development of Phase 14.

Geosyntec's Experience in Maine

Geosyntec has a long history, and an excellent track record of experience in performing waste management projects in the State of Maine, as summarized below.

- Geosyntec has provided landfill-related design and construction monitoring services in Maine continuously since 1988.

- Geosyntec's technical reputation is well regarded by the MEDEP. Several of the firm's engineers and field CQA personnel have extensive experience interacting with MEDEP personnel.

- Geosyntec's engineers have monitored and certified the construction of over a dozen landfill units in Maine.

- In 1994, Geosyntec was commissioned by the MEDEP to investigate the failure of a landfill cover system in Bridgton, Maine. As a result of this forensic work, Geosyntec was retained to prepare a detailed document for the MEDEP, titled *Final Cover system Guidance Document for Municipal Solid Waste Landfills*, which describes the state-of-practice for landfill closure design and construction. Extensive meetings were held between Geosyntec and MEDEP during the preparation of this document. As such, Geosyntec has an in-depth understanding of MEDEP's expectations (beyond those in the SWMRs) for landfill designs and closures.

Geosyntec's recent project experience in Maine includes the following projects, several of which are associated with the Crossroads facility:

- Waste Management Disposal services of Maine, Inc., Crossroads Landfill, Norridgewock, Maine: Geosyntec has been providing engineering consulting services to WMDSM since 1993 for various aspects of site's operations. The projects include siting, permitting, and designing/CQA monitoring of liner and/or closure systems of multiple special waste landfill units, the Asbestos Landfill, and municipal solid waste landfill cells.

- *Balefill*. Regional Waste Systems, Inc., South Portland Maine. CM and CQA of an approximately 40-acre area, Balefills 1 through 8, closure project.

- *Anson-Madison Sanitary District Sludge Landfill*. Madison, Maine. CQA of an approximately 6.1-acre sludge landfill closure projects in 2010 and 2016.

Geosyntec consultants

SCOTT M. LUETTICH, P.E.

landfill / waste-containment design
geotechnical engineering
construction management/ CQA

EDUCATION

M.S., Geotechnical Engineering, Georgia Institute of Technology, Atlanta, Georgia, 1987
B.S., Civil Engineering, Georgia Institute of Technology, Atlanta, Georgia, 1983

PROFESSIONAL REGISTRATION

Maine P.E. Number 7452
Ohio P.E. Number 61219
Illinois P.E. Number 062-052655
OSHA 40-hour Haz-Woper Certified
OSHA 8-hour Supervisor Certified

PROFESSIONAL HISTORY

Geosyntec Consultants, 1988-present
Soil & Material Engineers, Inc., 1985 - 1988
Georgia Institute of Technology, 1983 - 1985

REPRESENTATIVE EXPERIENCE

Mr. Luettich has been the lead designer or engineer-of-record for the design, permitting, and construction of dozens of landfills in New England and throughout North America. With over 30 years experience, he is well-versed in all landfill design analyses, and has a proven track record of achieving cost-effective closure designs and maximizing disposal capacity for sites with difficult geometric and/or subsurface conditions. Mr. Luettich has directed equivalency analyses on several projects, including successful demonstration of cost-saving containment systems that meet regulatory requirements based on performance standards rather than prescriptive standards. Mr. Luettich has special expertise in filter design to avoid clogging of drainage systems such as landfill leachate collection systems and has been the certifying professional engineer for many solid waste permit modifications at Crossroads that required slope stability analyses at multiple locations and for multiple waste configurations.

Mr. Luettich has led multi-disciplinary project teams for permit expansions of several large solid-waste (MSW and Ash Landfill) facilities, and has considerable expertise in conducting public hearings and interaction with regulatory personnel. He has established professional rapport with Maine DEP personnel, and has authored papers and guidance documents for both private and public agencies. For example, Mr. Luettich was the lead author of a guidance document for the Maine Department of Environmental Protection (MEDEP) titled *Guidance Manual for Design of Municipal Solid Waste Landfill Final Cover Systems.*

Other projects on which Mr. Luettich has provided design, permitting, and/or construction quality assurance services are include: *Bridgton Landfill Forensic, Bridgton, Maine; Saco Landfill Superfund Closure, Saco, Maine; Orrington Remediation Site – Landfills 3, 4, and 5, Orrington, Maine.*

AFFILIATIONS

American Society of Civil Engineers (ASCE); American Society for Testing and Materials (ASTM); North American Geosynthetics Society - Award of Excellence for Outstanding Contributions 1993.

TECHNICAL PUBLICATIONS – 23 technical publications – list available upon request.

Geosyntec consultants

NICHOLAS J. YAFRATE, Ph.D., P.E.

landfill / waste-containment design
geotechnical engineering and instrumentation
soft clay soil behavior and in situ testing
construction management/ CQA

EDUCATION

Ph.D., Civil and Environmental Engineering, University of California, Davis, California, 2008
M.S., Civil and Environmental Engineering, University of Massachusetts, Amherst, Massachusetts, 2004
B.S., Civil and Environmental Engineering, University of Massachusetts, Dartmouth, Massachusetts, 2002

PROFESSIONAL REGISTRATION

Maine P.E. Number 16092
Massachusetts P.E. Number 50238
Oregon P.E. Number 90470PE
OSHA 40-hour Haz-Woper Certified

PROFESSIONAL HISTORY

Geosyntec Consultants, 2008 to present

REPRESENTATIVE EXPERIENCE

Dr. Yafrate is a design engineer with over 10 years of professional experience in waste containment, geotechnical, and instrumentation projects across the United States. He has extensive experience with site investigation, laboratory testing, instrumentation, and design on sites with soft clay soils. Dr. Yafrate's landfill experience includes permitting, liner and cover system design, stability monitoring, operational support, and construction quality assurance services. His landfill design experience includes development of permit/construction drawings, specifications, quality assurance manuals, and supporting calculations including slope stability, settlement, leachate collection system capacity, etc.

Some of the landfill projects in New England on which Dr. Yafrate has provided design, permitting and /or construction quality assurance services include *Crossroads Landfill, Norridgewock, Maine; Anson Madison Landfill, Anson, Maine; Turnkey Landfill, Rochester, New Hampshire; Titcomb Pit Landfill, Amesbury Massachusetts;* and *Orrington Remediation Site, Orrington Maine.* Since 2008 he has provided extensive design, stability monitoring, and construction quality assurance support at Crossroads Landfill including liner and cover systems, slope modifications, and landfill operations support. He has managed multiple Crossroads slope modification projects that have included dozens of slope stability analyses for critical surfaces through the soft Presumpscot Clay soils. The Crossroads slope stability analyses extensively used Presumpscot Clay strength calculated with the SHANSEP method.

AFFILIATIONS

Member American Society of Civil Engineers (ASCE)
Waste360 40 under 40 Award for Solid Waste Practitioners
Member of Geo-Institute (a.k.a. International Society for Soil Mechanics and Geotechnical Engineering)

TECHNICAL PUBLICATIONS

20 technical publications – list available upon request.

APPENDIX 4C
Qualifications of Golder Associates

Statement of Qualifications

WMDSM Crossroads
Landfill Siting Permit Application

Golder Associates Inc. (Golder) is an international consulting company specializing in the application of earth sciences and engineering to environmental, natural resources, and civil engineering projects. Every day, Golder consultants are working in communities around the world providing a range of integrated services to meet local waste management needs. During our more than 45 years of providing solutions to the waste industry, Golder has successfully completed projects at over 1,000 waste management facilities in 30 countries on six continents. With more than 160 offices around the world, Golder Associates is one of the largest employee-owned waste management consultants. Local specialists leveraging our global expertise are key to successfully providing sustainable waste management solutions to our clients.

Through the years, we have held fast to the core values that have guided our growth, from pioneering the use of geomembrane liners for the containment of hazardous wastes in the 1970s to developing innovative strategies that manage waste as a resource today. Every solution we propose begins by actively listening to our clients' needs and working with regulators to achieve sustainable and compliant solutions that contribute to the quality of life of the communities involved.

Golder offers services that consider technical, social, and economic criteria from project initiation through post-closure operations and maintenance. At the forefront of the waste management field, our extensive experience helps our clients secure sustainable and community-centered solutions for market & financial studies, due diligence, waste reduction, recycling, organics management, secure disposal, landfill gas and leachate management, environmental program management, and asset management.

Golder established a New England presence in August of 1992 to address the needs of local clients. The personnel of the New England Offices include geotechnical and civil engineers, hydrogeologists, geologists, and support staff that all have significant experience in hydrogeological analysis, landfill permitting, design, and operation. The New England staff is conversant with the demands of the solid waste industry and those associated with environmental compliance. Each of the staff is dedicated to meeting stringent deadlines as required to establish and maintain the operation of an active solid waste facility or comply with Agency mandated deadlines. Golder's active involvement in the permitting, construction, and operation of landfills, and our strong technical capabilities, ensure that our designs and environmental monitoring plans are innovative, practical, and responsive to the operator's needs.

Golder Associates Inc. – Manchester

Employment History

Education

M.S. Hydrogeology, Kent State University, Kent, Ohio, 1986

B.S. Geology, Allegheny College, Meadville, Pennsylvania, 1983

Certifications

Massachusetts Licensed Site Professional No. 9380

State of Maine Registered Geologist, No. 431

State of New Hampshire, Professional Geologist, No. 90

State of Alabama, Professional Geologist, No. 1185

State of Oregon, Registered Geologist, No. G2345

OSHA 40-Hour HAZWOPER per 29 CFR 1910.120

OSHA 8-Hour Refresher

Golder Associates Inc. – Manchester, New Hampshire
Program Leader and Principal (1994 to Present)

Responsibilities include management and technical oversight of multidisciplinary projects related to site assessments, landfill design and permitting, remedial investigations/feasibility studies, remedial designs, and brownfields redevelopment. Projects include field investigations, data reduction, groundwater modeling, work plan preparation, permit application preparation, expert opinions, agency negotiations and design of soil, groundwater, and sediment remedial system at numerous Superfund/CERCLA, RCRA, and State regulated sites including extensive experience in Massachusetts (MCP), Connecticut (RSR), Maine, New Hampshire, Vermont, New Jersey, New York, Pennsylvania, Virginia, Ohio, Michigan, Alabama and Oregon. Highly experienced in the preparation of technical justification and negotiation of cost effective site investigations, remedial solutions, landfill permitting and site redevelopment.

Golder Associates Inc. – Mt. Laurel, New Jersey/Manchester, New Hampshire
Project then Senior Hydrogeologist (1988 to 1993)

Responsibilities included design, supervision, and preparation of geologic and hydrogeologic investigations for solid waste permit applications in Pennsylvania and New Jersey including long term pumping tests and packer testing, groundwater quality assessments, preparation of a Remedial Investigation report summarizing the results of a field investigation program implemented to delineate the extent of a volatile organic plume from a site in northern New Jersey, supervision and monitoring of a groundwater extraction/slurry wall remediation system in central New Jersey, assisted in negotiations with state regulatory agencies in Pennsylvania and New Jersey.

Golder Associates Inc. – Mt. Laurel, New Jersey
Staff Hydrogeologist (1986 to 1988)

Responsibilities included the installation of groundwater monitoring wells, excavation and logging of test pits, groundwater sampling, geologic mapping, completion and analysis of packer tests and slug tests, geologic and hydrogeologic interpretation and report writing, assisted in the engineering design of a municipal waste landfill.

Kent State University – Kent, Ohio
Research Assistant (1984 to 1986)

Conducted studies on the impacts of septic system discharges to groundwater resources. The objective of the study was to determine the minimum residential lot sizes for a rural community in northeastern Ohio. Responsibilities included

creation of detailed groundwater contour maps of the study area, calculation of hydraulic conductivity and storativity values from pumping test data, collection and chemical analysis of groundwater samples, and the creation of a three-dimensional groundwater flow computer model.

South Dakota Geological Survey – Vermillion, South Dakota
Assistant Geologist (1980 to 1983)

Field responsibilities included drilling and installing groundwater monitoring wells and drilling boreholes with auger drilling rig; roughnecking on rotary and hollow stem drill rigs; logging boreholes; and collecting groundwater samples. Office duties included mapping sand and gravel deposits in southeastern South Dakota.

PROJECT EXPERIENCE – SOLID WASTE/LANDFILL PERMITTING

Fairhaven Landfill Fairhaven, Massachusetts	Prepared Major Permit Modification for the construction of a separator berm for an operating landfill facility. Has also been responsible for hydrogeologic investigations completed to assess options for groundwater control at the site. Investigations include well and piezometer installations and multiple groundwater pumping test. Additional responsibilities include management of construction QA/QC team and on-going landfill design services.
Crossroads Landfill Norridgewock, Maine	Responsible for management of the site water quality monitoring program and assessment of overall site groundwater quality. Completed hydrogeologic investigation and provide expert testimony in support of major landfill expansion. Completed detail geologic investigation of marine clay thickness using statistical analytical methods.
Chicopee Landfill Chicopee, Massachusetts	Performed evaluation of groundwater dewatering system for landfill expansion. Work included design of pilot scale groundwater collection with electronic monitoring system.
Lake County Landfill Cleveland, Ohio	Completed Phase I, II, III geologic and hydrogeologic investigations to identify areas of leachate seeps and groundwater contamination. Designed leachate toe drain system for existing landfill areas and for future expansions. Prepared permit application documents for landfill expansions completed borrow area investigation and regrading plan.
Turnkey Landfill Rochester, New Hampshire	Project Director for hydrogeologic investigation completed in support of a landfill expansion permit application. Investigations included deep well installation, aquifer testing, and top of bedrock investigation.
G.R.O.W.S. Landfill Morrisville, Pennsylvania	Completed numerous investigations in support of three separate landfill expansions totalling over 120 acres. Work included geologic and hydrogeologic investigations (including 6 long-term groundwater pumping tests), borrow investigations, and design of a dewatering system for landfill construction. Additional investigations were completed to locate leachate breaks and to design and install a gas collection system.
Lake View Landfill Erie, Pennsylvania	Prepared a landfill expansion permit for an existing landfill facility. Field work included over 600 feet of bedrock coring, packer testing, pump testing, and borrow investigations.
Tullytown Landfill Tullytown, Pennsylvania	Completed field investigations and prepared permit application material for a new landfill facility in southeastern Pennsylvania. Field investigation included an extensive geologic, hydrogeologic and geotechnical drilling and sampling program.

Northwest Landfill
Butler, Pennsylvania

A number of field investigations were completed in support of permitting and design of a new landfill facility at a former strip mine/unlined landfill facility. Beyond meeting the permitting requirements investigations were successfully completed to estimate the extent and volume of existing refuse material, and to demonstrate perched groundwater levels in mine spoil material which resulted in a significant increase in landfill air space. Developed field screening program to facilitate the identification of contaminated soil during construction. Other work included the preparation of an excavation plan to depths of 120 feet through mine spoil material and a stability analysis of existing high walls and fill material.

Y & S Landfill
Scottsdale, Pennsylvania

Extensive field investigations were completed in support of a landfill expansion permit at a site underlain by a network of coal mines. These investigations included bedrock coring, packer testing, pump testing and the installation of monitoring wells and gas probes within and beneath coal workings. Preparation of permit application included a detailed evaluation of groundwater/surface water interaction.

Harrisville Landfill
Harrisville, New Hampshire

Completed series of hydrogeologic investigations to assess nature and extent of groundwater impacts. Designed groundwater cut-off and collection systems as part of overall landfill closure activities.

PROJECT EXPERIENCE – CERCLA REMEDIAL INVESTIGATION/REMEDIAL DESIGN

Coakley Landfill Remedial Design
North Hampton, New Hampshire

The Coakley Landfill Superfund Site is a closed, unlined, municipal landfill which has impacted groundwater, surface water and soil quality adjacent to the site. Mr. Macdonald managed the Pre-Design Investigations (PDI) and Remedial Design (RD) for this project which included sediment consolidation, landfill capping, gas extraction and treatment, and groundwater extraction, treatment and recharge. Mr. Macdonald was responsible for the technical management and design of the groundwater extraction, treatment and recharge system. The ROD required the installation of extraction wells and trenches around the entire perimeter of the landfill with an extraction flow rate exceeding 200 gallons per minute (GPM). Through appropriate field investigation and design, it has been successfully demonstrated that following capping, groundwater extraction will only be required on one side of the site. This reduced required groundwater extraction flow rates to less than 60 gpm. Most recently, successful negotiations to delay construction of the extraction, treatment and recharge system have been completed. An assessment of groundwater quality trends and environmental risks has demonstrated that refuse relocation, and landfill capping may prove to be sufficient to meet groundwater clean-up standards. Successful negotiations have also been completed to allow for passive gas venting in place of active gas extraction and treatment. This change was supported through air dispersion modeling which demonstrated no risk to potential receptors. 100% Design Report has been approved by EPA and NHDES. Construction of the remedy is expected to be completed in the fall of 1998.

Dover Municipal Landfill Remedial Design
Dover, New Hampshire

Mr. Macdonald served as the Project Manager for this Superfund Remedial Investigation/Remedial Design project located in Dover, New Hampshire. The Dover Municipal Landfill comprises a 55-acre municipal solid waste landfill that received some industrial wastes during its early operation. Because of its disposal history and the presence of volatile organic compounds and elevated metals concentrations in groundwater the site was listed on the National Priorities List (Superfund Sites), and a Record of Decision was developed by the USEPA and State of New Hampshire Department of Environmental Services requiring construction of a RCRA Subtitle C composite closure cap over the landfill and installation and operation of a groundwater extraction and treatment system.

Several technical initiatives were pursued with the Agencies to gain acceptance of more economical cap sections, utilize the City's wastewater treatment plant for extracted groundwater, allow passive landfill gas venting as opposed to active collection and treatment of landfill gas (based on site specific air modeling, risk analysis and demonstration of compliance with ambient air quality regulations), and reduce the frequency and type of analytical testing required during environmental monitoring. Based on strong technical arguments, Golder was able to gain approval for these modifications to the required closure design elements. These modifications are projected to result in significant cost savings to the Group both during construction and during operation and maintenance of the closed landfill.

Tabernacle Drum Dump Site
Tabernacle, New Jersey

Completed remedial investigations to locate a plume of TCA and DCE in a highly transmissive sand aquifer at a Superfund site in southern New Jersey. Field investigations included well and piezometer installation, groundwater sampling, slug testing and completion of a long-term groundwater pumping test. Analytical contaminant transport modeling was completed to assess the rate of plume migration. This information was used in conjunction with a 3-dimensional groundwater flow model to design a 200 gpm groundwater extraction, treatment and recharge system. The remedial design included preparation of design drawing, bid specifications, permit documents, O&M manuals, and environmental monitoring plans. Extensive Agency negotiations were completed to allow downgradient discharge of treated groundwater. Upgradient discharge, as required by the Record of Decision would have required pumping of discharge over one mile across a dozen properties. The successful negotiations resulted in reduced costs for wetland delineation and mitigation, reduced extraction flow rates, and significantly lower design and construction costs. The remedial design which has been approved by USEPA, and the NJDEP has been constructed, and is currently operational. Mr. Macdonald was the Project Manager for this project and was responsible for ensuring that all work was completed on schedule. Mr. Macdonald also served as the lead client and regulatory contact and was responsible for all regulatory negotiations.

Waste Disposal, Inc.
Monmouth County, New Jersey

Initial work at this closed landfill facility involved upgrading the environmental monitoring system at the site to better delineate the extent of groundwater and surface water contamination. A partial slurry wall and groundwater extraction system was already in place at the facility, however significant contamination continued to migrate from the site in both groundwater and surface water. The new monitoring program indicated that contaminated groundwater was bypassing the existing control measures. The NJDEP ordered the owner to construct a slurry wall around the entire site. This approach presented several technical difficulties and would be cost prohibitive. A 3-dimensional groundwater flow model was developed to assess alternative remedial approaches. In addition to controlling the off-site migration of contaminated groundwater, it was necessary to ensure that adjacent environmentally sensitive streams and wetlands would not be adversely impacted by the remedial measures. The modeling indicated that a series of low flow extraction wells would be capable of meeting the design goals and would have less environmental impacts on the streams and wetlands than a slurry wall.

Following presentation of technical justification to NJDEP, the alternative remedial approach was approved. A detailed design package including design drawings, bid specifications, and an O&M plan were prepared. The alternative remedial design has been constructed and is operational. A drum removal and soil sampling plan was also prepared and implemented. Mr. Macdonald was the Project Manager and lead client and regulatory contact for this project.

Olin Saltville Former Chlorine Plant Site
Saltville, Virginia

The Saltville waste disposal site comprises two settling ponds containing ammonia soda ash waste (predominately calcium chloride and calcium carbonate solids) and a former electrolytic chlorine plant (chlor alkali) site. The wastes in the ponds are up to 80 feet thick and are contained in dikes up to 100 feet high. Mr. Macdonald is currently managing supplemental site characterization studies of the Chlor Alkali site. The purpose of these investigations is to quantify the flex of mercury from groundwater discharge to the North Fork Holsten River. The project involves installation of multi-level monitoring wells in overburden, shallow bedrock and deep bedrock, remote monitoring of groundwater elevations and river levels, groundwater sampling, and development of a site water budget. This information will be used to characterize any remaining risks posed by the site on human health and the environment. Following completion of this work, a Feasibility Study will be completed.

PROJECT EXPERIENCE – MASSACHUSETTS CONTINGENCY PLAN (MCP)

Middleboro Gas and Electric Department
Middleboro, Massachusetts

Minor remodeling of the Department's distribution center offices encountered a previously unknown vault beneath the building. A preliminary survey of the vault found it to be flooded with groundwater and underlain with thick tarry sludge. Subsequent review of historical files and Sanborn maps indicated the facility was once a oil gas plant that had ceased operations in the early 1920s. Further investigations encountered contaminated groundwater and soils beneath the paved site and LNAPL accumulations up to 5 feet thick. Remedial Response Actions completed to date include Phase I and Phase II hydrogeological investigations, Immediate Response Action to collect LNAPL, and Tier Ranking. The Phase III Remedial Action alternative evaluation has recently been initiated. Mr. Macdonald has served as the lead technical reviewer and project coordinator for this site since 1996.

Westfield Gas and Electric Light Department
Westfield, Massachusetts

Phase I and Phase II investigations encountered soils and groundwater contamination and thick accumulations of DNAPL at this former coal gasification site. Contaminated groundwater and DNAPL have been detected migrating into the Westfield River causing noticeable sheens on the water surface and accumulations of DNAPL blebs within the pore spaces of the gravel streambed. An Imminent Hazard Evaluation was performed using exposure scenarios and temporary mitigation measures were developed to reduce short-term exposure. A Phase III Remedial Action Alternative Evaluation has been initiated to address the soils, groundwater and DNAPL contamination and removal of an on-site tar well containing an estimated 10,000 gallons of DNAPLs, LNAPLs and contaminated water. Mr. Macdonald has served as the lead technical reviewer and project coordinator for this site since 1996.

Former Jerguson Gage and Valve Site
Burlington, Massachusetts

During investigations completed in 1986 and subsequent investigations chlorinated volatile organic compounds and floating oil were discovered at this former machine shop. The Site was issued a Tier 1B permit under the MCP. Preliminary remedial measures completed by others included the installation of shallow bedrock groundwater interceptor trenches and groundwater treatment system. An LNAPL recovery system was also installed. Golder was retained to complete the MCP Phase II and Phase III investigations and to obtain a remedial action outcome (RAO) for the Site before the permit expired. The focus of the additional investigations was on the deep bedrock where contaminant concentrations had been observed to increase following installation of the shallow interceptor trenches. Results of the investigations indicated that significant contaminant mass removal is occurring as a result of natural attenuation. Evaluation of potential remedial alternatives indicated that monitored natural attenuation with passive LNAPL skimming was the most appropriate remedial alternative. Following submittal of the Phase IV Remedy Implementation Plan, a class C RAO was submitted. The existing groundwater extraction and treatment system has been shut down. Mr. Macdonald has served as the LSP of record for this Site since 1997.

Clean Corp Site
Natick, Massachusetts

Mr. Macdonald was retained as LSP of record for this Tier 1A located in Natick Massachusetts following the issuance of several notices of noncompliance by MassDEP. Investigations completed by others in the early 1980's indicated the presence of chlorinated volatile organic compounds (CVOCs) in Site soils and groundwater. The site is located in the Interim Well Head Protection Area of the Town of Natick water supply wells. A soil vapor extraction and groundwater recovery system has been installed as Immediate Response Action (IRA). These IRA measures have removed significant contaminant mass from Site soils and groundwater. Golder is currently completing Phase II investigations at the Site. As a Tier 1A Site, all project deliverable must be approved by MassDEP. Mr. Macdonald and Golder have been successful in greatly improving relations between the PRP and MEDEP such that a permanent solution for the Site can be quickly identified and implemented.

RiverPark 93
Wilmington, Massachusetts

During geotechnical investigations for a proposed office building, soil with a strong petroleum odor was encountered in this vacant lot. Golder was retained to investigate the suspect soil. Soil sampling and analysis indicated the presence of semi-volatile organic compounds (SVOC) at concentrations exceeding the appropriate MCP standards. To avoid construction delays, Golder prepared a Release Abatement Measure (RAM) Plan for removal of the soils. The RAM was completed within three weeks of the presumptive approval of the work plan. Following completion of the RAM a Class A-3 RAO was filed for the site. Mr. Macdonald served as project manager and the LSP of record for this project, which was completed in very short time frame.

PROJECT EXPERIENCE – STATE LEVEL AND VOLUNTARY CLEAN-UP PROGRAMS

Fayscott Site
Dexter, Maine

Served as Project Director for this in Dexter, Maine where over 100 years of industrial activity had resulted in impacts to soil sediment, groundwater and surface water. Under the State of Maine's voluntary cleanup program Golder implemented a risk-based closure strategy involving detailed risk assessment, limited removal actions and implementation of innovative remedial approaches. Through detailed assessment, Golder successfully demonstrated that many of the sediment impacts were the result of off-site sources, thus relieving the client of responsibility. Site related impacts were addressed through limited soil removal and capping and construction of two, in-situ bioreactors to treat groundwater and surface water impacted with volatile organic compound. Through the use of detailed risk assessment, innovative remedial technologies and extensive agency negotiations significant cost savings were recognized by the client.

Daisy Cleaner
Salem, New Hampshire

Served as Project Director for this dry cleaning site in Salem, New Hampshire where impacted soil and groundwater are being remediated under New Hampshire's voluntary clean-up program. Golder selected, designed and implemented an enhanced bioremediation remedy which involves the injection of amended water (sodium lactate and ethanol) into a series of recharge wells. This remedial strategy is one of the first enhanced bioremediation projects to be approved by the New Hampshire Department of Environmental Services.

Former Americold Facility
Cullman, Alabama

After a long history of industrial use, this facility has been closed and is currently being remediated under Alabama's Land Recycling and Redevelopment Act, a voluntary brownfields program. Golder has used a variety of sophisticated and innovative assessment technologies including: borehole and surface geophysics, borehole packer testing and sampling, soil gas testing, fracture trace analyses along with more conventional assessment tools. Golder also undertook a detailed analytical program to differentiate between site-related and natural petroleum impacts to groundwater. Golder is currently preparing to initiate pilot-scale testing of chemical oxidation, enhanced bioremediation and nano-scale zero valent iron to address soil and groundwater impacted with VOCs. Mr. Macdonald has served as Project Director through the duration of this project.

Former Electrolux Home Products Facility
Greenville, Michigan

Prior to closure in early 2006, this facility was the largest refrigerator manufacturing facility in the world. The property has over a 100 year history of manufacturing operations, being originally developed for manufacturing of Gibson ice boxes. Impacts to soil and groundwater are currently being assessed as part of a brownfields redevelopment program under Michigan DEQ's Part 201 program. Mr. Macdonald currently serves as Project Director for site assessment and demolition services.

Former Frigidaire Manufacturing Facility
Edison, New Jersey

This 1-million square foot air conditioner manufacturing facility was closed in 2003 and entered into NJDEP's ISRA program as a result of petroleum and VOC impacts to soil and groundwater. Under the direction of Mr. Macdonald, Golder has completed extensive investigation of 140 areas of concern, including almost 200 borings, a soil gas survey, groundwater sampling, utility surveys and indoor air sampling. Golder has also observed the removal and disposal of over 6,000 cubic yards of soil and currently operates a groundwater recovery system. Golder has completed the General Information Notice (GIN), Preliminary Assessment Report (PAR), Baseline Ecological Evaluation (BEE), and Remedial Investigation (RI).

Education

B.S., Geology, St. Lawrence University, Canton, New York, 2004

Certifications

Professional Geologist NH #834

Training

OSHA 40-hr HAZWOPER

OSHA 8-hr Supervisor

Golder Associates Inc. – Westborough

Senior Project Geologist
(2018 to Present)

Management of a hydrogeologic investigation for a landfill siting application. Complete investigations and submittals in accordance with the Massachusetts Contingency Plan (MCP), and due diligence for the acquisition or divestiture of commercial properties. Extensive field experience including subsurface exploration, aquifer tests, and sample collection of various methods and media including groundwater, soil, and soil gas/indoor air.

Employment History

Amec Foster Wheeler (now Wood E&I) – Chelmsford, MA
Project Manager (2008 to 2018)

Completed development of conceptual and numerical groundwater and watershed models to support mitigation of impairments, remedial design, construction, and data gap analyses. Provided litigation support for a Superfund/CERCLA remediation project, developing a position for the allocation process of a potentially responsible party. Managed site investigations and remediation concerns within a national banking institution, addressing issues at retail facilities nationwide and advising regional health and safety managers of concerns and path forward to address regulatory and exposure issues focused on vapor intrusion.

AMEC Environment & Infrastructure – Chelmsford, MA
Staff Geologist (2004 to 2008)

Responsibilities included development and execution of multifaceted field programs, including sample collection of various media, oversight of subcontractors and training junior staff. Completed emergency response actions for releases in Massachusetts. Report preparation in compliance with Massachusetts Contingency Plan.

PROJECT EXPERIENCE – GROUNDWATER AND WATERSHED CHARACTERIZATION

White Swan Cleaners Sun Cleaners NPL Site, Bank of America, Inc.
Sea Girt, NJ, USA

Completed the development and calibration of a numerical model of groundwater flow (MODFLOW) to support comprehensive RI/FS efforts of a chlorinated solvent groundwater plume that extends across several neighborhoods in a coastal town. Unique dimensions of the project included evaluation of municipal and commercial pumping stresses, simulating groundwater interactions with tidally influenced surface water bodies, and evaluation of hydrogeologic properties in a coastal plain aquifer system.

Mr. Lennon also modelled contaminant transport from the ground surface through the vadose zone and groundwater to downgradient receptors. Site specific data was combined in SESOIL and AT123D, used through the SEVIEW interface, to determine Site Remediation Standards (SRS) for future source soil removal activities. The PCE SRS was iteratively determined when the concentration at downgradient receptors were below applicable standards.

CSX Real Property
Savannah, GA

Assessed groundwater concerns at a former bulk storage facility on the banks of the Savannah River. Responsibilities included installation, gauging and monitoring of a piezometer network, executing a slug test program and 48-hour pump test to determine properties of a thin surficial sand aquifer unit. Information was incorporated into the development and calibration of a MODFLOW groundwater flow model. An iterative approach was used to design an extraction well network to remove ammonia-impacted groundwater, which was implemented as part of the remedial design of the property.

Camp Dawson, WVARNG
Kingwood, WV, USA

Conducted a data gap analysis which resulted in piezometer installation and aquifer tests. Results were used to construct and calibrate a MODFLOW flow model to provide insight as to the interaction between groundwater, surface water, and seepage of groundwater into the excavation of a foundation for the proposed Mountaineer Challenge Academy Building at the Camp Dawson Collective Training Center. The model was used to determine the likely effectiveness of lowering or draining an adjacent man-made pond as well as installation of a French drain system upgradient of the excavation area.

Kentucky Waterways Alliance
KY, USA

EPA Guidelines were followed to produce a Watershed Based Plan for the Bacon Creek watershed in Kentucky, which is impaired due to the presence of elevated bacteria levels. Mr. Lennon was responsible for the development of a simple watershed model using AVGWLF, which was used to prioritize sub-basins for mitigation.

Oklahoma Conservation Commission
OK, USA

The Soil and Water Assessment Tool (SWAT) was used to produce a basin-scale model of the Oklahoma portion of the Grand Lake watershed and the entire Honey Creek sub-watershed. Land cover imagery was combined with associated data layers and land management practices to produce a tool that estimates pollutant loads to identify locations where the environmental benefit of best management practice (BMP) implementation will be maximized. Findings were summarized in a report. Mr. Lennon lead data preparation, model development, and report preparation efforts.

Air National Guard
Charlotte, NC, USA

Developed a numerical model of groundwater flow using MODFLOW code and groundwater vistas interface. The objective of the modelling effort was to integrate all available geologic, hydrologic, and analytical data and assumptions into a quantitative framework to provide for assessment of subsurface conditions and groundwater flow dynamics of a debris filled aquifer. The groundwater flow model also provides the basis for future development of a contaminant fate and transport model. Model findings and documentation were included as part of the Remedial Investigation (RI) for the North Carolina Air National Guard facility.

CSX Real Property
Savannah, GA

Field lead assessing groundwater concerns at a former bulk storage facility on the banks of the Savannah River. Responsibilities included gauging and monitoring of a groundwater well network, executing a slug test program and 48-hour pump test to determine properties of a thin surficial sand aquifer unit. Information was incorporated into the development and calibration of a MODFLOW groundwater flow model. An iterative approach was used to design an extraction well network to remove ammonia-impacted groundwater, which was implemented as part of the remedial design of the property.

PROJECT EXPERIENCE – ENVIRONMENTAL INVESTIGATION AND REMEDIATION

Bank of America
Nationwide Program

Worked within an environmental remediation program at a banking institution. Addressed issues at retail facilities nationwide, advising regional health and safety managers of concerns and path forward to address regulatory and exposure issues. Prepare scope for local vendors, ensure work is completed appropriately and program norms are maintained. Update records, documents and project descriptions in a database such that information is available for stakeholders and audit processes.

Support the Bank due diligence program, assessing vapor intrusion concerns and preparing scope for phase II assessments in both new lease and disposition scenarios. Advise transaction team during negotiations of properties with environmental issues, enabling development of brownfield properties in prime locations. Work with construction managers and general contractors to remediate contaminants during construction, with a focus on installing vapor mitigation systems.

Assist the Bank legal team draft access agreements for third-party requests to investigate downgradient issues, ensure investigations are completed, regulatory and exposure concerns are addressed and documented appropriately.

Review historic environmental projects on Bank properties. Confirm appropriate actions were taken and property restoration occurred. Update documentation to meet program standards.

Passaic River Superfund
Kearny, NJ

Provided litigation support for a potentially responsible party of a CERCLA Superfund site. Assessed the contaminant distribution, remediation, and pathways for the contribution of contaminants of concern from an upland property to the river. Information was used to determine potential nexus to contaminated sediments in a tidally influenced river and develop a position during an allocation process for remediation costs.

Environmental Liability Estimating, United States Coast Guard
Various States, USA

Estimated environmental liability of USCG assets. At each property with known environmental impacts, existing reports and documents were reviewed in order to determine the tasks to necessary to achieve closure in compliance with state and federal regulations. Site information and cleanup strategy was compiled in a standardized environmental liability estimate sheet, and a cost estimating software was used to determine the liability associated with each site. Resulting product consisted of a standardized summary of USCG assets with known environmental impacts, which was required to be in compliance with federal standards.

Worcester Terminal Expansion, CSX
Worcester, MA, USA

Addressed environmental issues associated with a large $100MM construction project in an urban area. In order to facilitate expansion, work was conducted in an existing hazardous waste site with known soil contaminants regulated by MassDEP. Construction activities were conducted as a Release Abatement Measure. Mr. Lennon worked with the Licensed Site Professional to compile applicable work plans and closure documents and provided oversight of the field activities.

On a separate portion of the construction project, environmental impacts to soil and groundwater were discovered during utility placement, which was subsequently conducted as a Utility Release Abatement Measure. The impacts were investigated, and a Response Action Outcome was prepared to close the site under the Massachusetts Contingency Plan.

During construction activities, Mr. Lennon responded to two emergency response incidents for releases of hydraulic fluid and diesel fuel. All releases were reported to the MassDEP, and Mr. Lennon provided oversight of cleanup activities. If warranted, additional investigation was conducted to confirm removal of impacts. Mr. Lennon was responsible for reviewing laboratory data, and compiling documents to achieve site closure in accordance with the Massachusetts Contingency Plan.

Until - Former MGP Somersworth, NH

Managed clean-up activities implemented at a former manufactured gas plant in New Hampshire, which included remedial performance monitoring and alternatives analysis to expedite regulatory closure. Reports were compiled in accordance with NHDES standards and monitoring well sample frequency was consistently reduced. Alternative analysis included an upgradient source analysis, and assessing additional chemical injections, and the groundwater monitoring.

Phase I/II ESA, Ensign Bickford / 500 Riverside Associates
Portland, ME, USA

Completed a Phase I and Phase II ESA and navigated the Maine VRAP to support a real estate transaction. A Phase I identified historical use of chlorinated solvents and hexavalent chromium, and remedial actions were completed within a former drum storage area. A work plan was developed and implemented to investigate RECs, which included soil, groundwater and indoor air sample collection. Based on the resulting data, the site entered the Maine Voluntary Remedial Action Program (VRAP) to address low levels of TCE in groundwater, which resulted in a deed restriction on the property. With the deed restriction and Phase II ESA, the client engaged in a successful real estate transaction.

Barnes Air National Guard Base, Air National Guard
Westfield, MA, USA

Conducted investigation and remediation at a fuel distribution facility with petroleum hydrocarbons in soil and groundwater, at concentrations above MassDEP criteria. Responsibilities included O&M of a biosparge remediation system, and collection of groundwater samples. Collected soil samples, installed monitoring wells, and assisted the implementation of a large excavation to remove source material, and subsequent monitoring of groundwater chemistry.

Former Dartco Manufacturing Facility, Dartco
Neshanic Station, NJ, USA

Developed and executed multifaceted field program to determine the nature of bedrock aquifer unit. Borehole geophysics, and aquifer pump tests were conducted to determine the nature and connection between source areas and downgradient monitoring points. Data was reduced, and results were used to develop remedial strategies.

Managed a long-term monitoring program consisting of groundwater and drinking water sample collection on a quarterly basis for a site regulated by New Jersey DEP. Submersible centrifugal pumps and bladder pumps were used to collect EPA low-flow samples from shallow overburden and deep bedrock wells. Drinking water wells are sampled both prior to, and after filtration devices to ensure no contaminated water is impacting residents. Field data records are maintained, and summary reports are compiled after each event.

Implemented the excavation of sediment from a fire pond on an adjacent property that received runoff from the site, resulted in elevated metals concentrations. Responsibilities included contractor oversight and adherence to the work plan, construction permits and scientific collection permits to relocate turtles. Above average rainfall was managed in order to remove and transport 1,080 tons of sediment offsite, and restore the site within the allowable work period specified by permits.

Installed bedrock monitoring wells. Wet rotary and air rotary drill rigs were used to continuously sample bedrock cores and set monitoring wells up to 240 ft bgs. Cores were logged to record rock structure and quality. Packer tests confirmed water bearing fractures in desired intervals, prior to monitoring well installation. Responsibilities included subcontractor oversight, maintenance of bedrock logs, determination of monitoring well placement, well development, and associated reporting.

Portsmouth Septic Suitability Study, Lombardo Associates
Portsmouth Park, RI, USA

Managed the field effort of a dynamic drilling program which investigated subsurface properties to determine wastewater disposal options. Borings were advanced and monitoring wells were placed to log soil, perform aquifer tests, and collect groundwater samples. Subsurface investigation data was analysed, including laboratory results, field water quality tests, and slug tests. Interpreted results were supplied to the client to determine the suitability of two areas for individual septic systems or community-based waste treatment facilities to mitigate bacteria problems in an adjacent bay on the eastern seaboard.

Dorchester Yacht Club, National Grid
Dorchester, MA, USA

Implemented a long-term perimeter air monitoring program associated with a dredge operation that removed MGP impacted sediment from Dorchester Harbor. Sediment was dredged and placed in a dewatering facility prior to transport to an offsite disposal facility. Air monitoring stations with both real-time monitors and analytical samples were placed around the dredging area and dewatering facility to monitor transport of volatiles and dust off-site.

APPENDIX 4D
Qualifications of Normandeau Associates, Inc.

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS

Normandeau Associates Inc. (Normandeau) is an employee-owned company founded in 1970 as an environmental consulting firm. With nearly 50 years of natural resources experience, we are a national leader in fisheries and aquatic sciences, wetland and terrestrial sciences, marine science, water quality, wildlife and endangered species, permitting, and environmental regulatory compliance. Our highly qualified and credentialed staff of scientists, biologists, and regulatory specialists has expertise in both terrestrial and marine environments. We are known throughout the Northeast for our technical excellence and unparalleled client service, and have nationwide recognition as one of the foremost consulting companies dealing with natural resources issues. Normandeau is currently listed as one of the ENR Top 200 Environmental Companies in the United States.

With nearly 170 professionals, we provide environmental science, planning, and consulting services to a wide range of clients and develop strategies that address environmental needs at competitive costs while meeting regulatory requirements. Our scientists take pride in applying a service-oriented approach to our clients' projects. Project managers understand that clients deserve personalized service to address their environmental challenges, and develop solutions that ensure treatment of all critical issues. This commitment to quality is a corporate philosophy that is exemplified in all phases of our operation.

Normandeau's terrestrial and wetland scientists assist private clients with federal, state and local wetland compliance requirements, while government agencies utilize our wetland services for site investigations, wetland resources evaluations and compensatory mitigation. Our professional staff includes scientists with many years of wetland project experience in both freshwater and coastal systems throughout the US, Professional Wetland Scientists (PWS), New Hampshire Certified Wetland Scientists (CWS) and PhD-level scientists. Senior staff have published books and professional journal articles, and authored wetland functional assessment methods.

Our wetland staff capabilities are supplemented by other Normandeau specialists in disciplines such as aquatic ecology, hydrology, landscape architecture, CADD/GIS mapping, fisheries science, wildlife biology, botany, and geology, and engineering. Our professional staff are supported by a data processing center and publications department for all technical analysis and environmental reporting needs.

Normandeau has been providing natural resource services at Waste Management's Crossroads facility, a secure special waste landfill in Norridgewock, Maine since 1990. Normandeau initially performed a baseline environmental assessment on over 500 acres to aid Crossroads in selecting locations and configurations of landfill expansion areas that minimize impacts to regulated environmental resources. The baseline assessment included wetland delineation and evaluation, a Class B high intensity soil survey, an aquatic community assessment, a wildlife habitat survey, and a rare plant survey. Other services provided by Normandeau to date have included wetland impact analysis; mitigation design, construction oversight, and monitoring; long-term aquatic monitoring; assessment of several significant wildlife habitats; and preparation of State and Federal environmental permit applications. Normandeau has assisted Crossroads in their four previous expansions, Phase 7, Phase 10, Phase 9, 11 & 12, and Phase 8.

Normandeau continues to provide natural resource consulting services for Crossroads, including wetland delineation, vernal pool identification, wildlife management advice, and invasive species control. For the currently proposed Phase 14 Project, Normandeau is providing natural resource services for siting and permitting.

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS

SARAH D. ALLEN, PWS, NHCWS

Principal Scientist, Wetlands/Terrestrial

Ms. Allen has a broad background in wetland and wildlife services, gained from over 30 years in natural resource research and consulting. She has technical experience in coastal and inland wetland delineation, functional assessment, mitigation design, botanical and wildlife surveys, and rare species surveys. As her project experience indicates, she has been involved in various terrestrial aspects for a range of projects including private development, hydroelectric relicensings, transmission lines, wind projects, ski area expansion, and transportation projects. Her work has included all stages of local, state and federal permitting, including agency coordination, permit preparation and regulatory review. Ms. Allen has managed numerous projects during her long career at Normandeau; participated in NEPA EA/EIS preparation; given presentations to professional and public audiences; and provided expert testimony at regulatory hearings.

EDUCATION

M.S., Natural Resources Science, (Wetland Ecology), University of Rhode Island

BS, Wildlife Biology, University of Vermont

PROFESSIONAL EXPERIENCE

1989-Present	Normandeau Associates
1985-1986	K-V Associates, Inc.
1983-1985	Woods Hole Oceanographic Institution
1979-1985	Boston University Marine Program

PROFESSIONAL CERTIFICATIONS

- Professional Wetlands Scientist. Society of Wetlands Scientists (1995)
- Certified Wetlands Scientist. NH Association of Natural Resource Scientists (1999)

PROFESSIONAL AFFILIATIONS

- Society of Wetland Scientists
- Coastal & Estuarine Research Federation
- New Hampshire Association of Natural Resource Scientists
- Maine Association of Wetland Scientists

REPRESENTATIVE PROJECT EXPERIENCE

Crossroads Landfill, Waste Management, Inc., Norridgewock, ME (1990-Present). Normandeau has provided long-term natural resource permitting and mitigation design, construction oversight and long-term monitoring for four landfill expansions. Over 18 acres of wetland mitigation has been successfully created, restored and enhanced as compensatory mitigation for impacts related to the landfill expansions. Other site work has included vernal pool surveys, semi-quantitative surveys of state-mapped Deer Wintering Areas and an Inland Wading and Waterbird Habitat, fish and macroinvertebrate surveys in Mill Stream, state-listed upland sandpiper surveys, and surveys for rare plants. Ms. Allen provided expert testimony for two sets of hearings in front of the Maine Board of Environmental Protection and is currently leading the Phase 14 Project effort for Normandeau. Project Manager

Seacoast Reliability Project, Eversource Energy, Seacoast Region, NH (2013-Present). Normandeau is providing siting, permitting and environmental monitoring services to Eversource for a proposed 115kw, 13-mile transmission project. The project travels along existing right-of-way in 4 towns, and includes a 1-mile submarine crossing of Great Bay via jet plow. Normandeau assessed potential impacts to all freshwater and marine natural resources (wetlands, streams, vernal pools, fish, wildlife, rare species, and water quality) and has led the environmental component for stakeholder outreach. We have subcontractors providing visual, historic and archeologic analyses. Permit applications include a Certificate for Site and Facility from the NH Site Evaluation Committee, NH Department of Environmental Services Wetlands Permit, 401 Water Quality, Shoreland, and Alteration of Terrain. This project included expert testimony to the NH Site Evaluation Committee. Project Manager.

Brassua Dam Relicensing, FPL Energy Hydro Maine, Rockwood Strip, ME (2008-2011). This FERC hydropower relicensing effort on the Moose River/Brassua Lake followed the Integrated Licensing Process. Ms. Allen managed the mapping of terrestrial, aquatic and wetland vegetation, as well as mammalian, avian and

amphibian studies to support relicensing. Report preparation included agency consultation and assessment of impacts from impoundment fluctuation. Task Manager.

Balsams Ski Resort Expansion, **Dixville LLC, Dixville, NH (2014-2017)**. Dixville LLC is proposing to revive and expand the deteriorated Balsams Grand Resort and Wilderness Ski Area into a world-class, year-round resort. The project includes restoring the original resort and facilities, constructing new facilities, and increasing the ski terrain from approximately 100 acres to 1200 acres. Normandeau was retained to undertake natural resources data collection efforts and to assist with environmental State and Federal permitting. We have provided aerial photo interpretation of wetland resources on approximately 4,500 acres, and wetland delineations along an 8-mile pipeline route and portions of an existing golf course. We have assisted Dixville with State and Federal agency consultations regarding wetlands permitting, including mitigation, rare species and wildlife habitat and assembled the technical components of the NH DES Wetland Permit Application. Project Manager.

Scarborough Marsh Restoration Project, US Army Corps of Engineers, Scarborough, ME (2002-2004). The USACE was the lead agency for a feasibility study to develop a restoration plan to restore tidal flow and reduce Phragmites on 135 acres of degraded salt marsh. Normandeau provided multiple preliminary design options, hydrologic modeling, and cost estimates using the Corps MCAS method. Project Manager/Ecologist.

Wild Meadows Wind Project, Iberdrola Renewables, Danbury and Alexandria, NH (2010-2016). Normandeau provided natural resource studies and permitting for a proposed 23-turbine, 75.9 MW wind project. Field surveys included wetlands, vernal pools, and general wildlife habitat. Ms. Allen negotiated consensus with state agencies on vernal pool functional rankings and a mitigation package. Prepared a wetlands permit application for the NH Department of Environmental Services Wetlands Bureau, and compiled a 4,500-page application for a Certificate of Site and Facility to the NH Site Evaluation Committee. Project Manager.

Connecticut River Dam Relicensing, TransCanada Hydro Northeast Inc., NH-VT (2012-Present). This FERC hydropower relicensing effort on three dams on the Connecticut River followed the Integrated Licensing Process. Ms. Allen managed preparation of the terrestrial/wetlands components of the preliminary application documents, study plan preparation, study reports, and stakeholder review. She also managed the field studies for the terrestrial habitat mapping, and rare species surveys, including cobblestone tiger beetle, odonates, Fowlers toad, and approximately 250 records of rare plant species. A specialized rare plant study included detailed surveys and habitat studies for the federally endangered Jesup's milk vetch. Terrestrial/ Wetland Task Manager.

Confidential Project, Columbia Falls, ME (2011-2013). This 30-turbine project was proposed on blueberry barrens on Passamoquoddy tribal lands and a former military installation. Normandeau provided a critical issues analysis, field studies for wetlands, vernal pools, breeding birds and raptor migration, and a residence survey. Project Manager.

Moosehead Lake Water Level Fluctuation Assessment, FPL Energy Hydro Maine, Rockwood, ME (2008). Normandeau assessed the likely impact of water level fluctuations on lake trout populations and breeding success. The work included compiling bathymetry from several existing data sets and estimating the percentage of suitable lake trout spawning habitat exposed at various drawdown levels.

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS

SARAH A. BARNUM, CWB®
Senior Wildlife Ecologist

Dr. Barnum is a Senior Wildlife Ecologist at Normandeau with over 20 years of professional experience. Her background includes providing expertise to the transportation and energy sectors, as well as a variety of general development projects. She has hands-on experience with a wide range of species including forest birds, waterfowl, raptors, small mammals, large mammals, amphibians, and reptiles. Dr. Barnum's projects have emphasized examining habitat relationships, impact assessment for threatened and endangered species, mitigation planning, and Federal Endangered Species Act (ESA) compliance. Dr. Barnum also has extensive experience in project planning, project management, experimental design, and data analysis.

EDUCATION

Ph.D., Conservation Planning, University of Colorado

M.S., Wildlife Biology, Utah State University

B.S., (cum laude) Wildlife Biology, University of Vermont

PROFESSIONAL EXPERIENCE

2007-Present	Normandeau Associates
2005-2007	New Hampshire Audubon
2004-2005	Baystate Environmental Consultants
2001-2003	Environmental Planning and Policy Unit, Colorado DOT
1998-2000	Office of Environmental Services, Colorado DOT
1996-1998	Dames & Moore
1993-1994	Bio-Resources, Inc.

PROFESSIONAL CERTIFICATIONS

- Certified Wildlife Biologist
- AAE's Airport Wildlife Manager's Course and Wildlife Management Techniques Course
- Cyber Tracker Level III Tracking Certification

PROFESSIONAL AFFILIATIONS

- The Wildlife Society
- New Hampshire Association of Natural Resource Scientists
- Epsom, NH Conservation Commission
- Bear-Paw Regional Greenways Land Conservation Committee

REPRESENTATIVE PROJECT EXPERIENCE

New England Cottontail Permitting, Tidewater Landing, LLC, Wells, ME. Wrote the New England cottontail related permitting documents for the Tidewater Landing sub-division. Assessed habitat suitability and negotiated with MDIFW. Wrote the Habitat Management Plan and Incidental Take Plan required for the project permit. Project Manager and NEC Biologist.

Casco Bay Fuel Line Removal, U.S. Navy, in Brunswick and Harpswell, ME. Wildlife studies to support Corps 404 and Maine NRPA permitting. Conducted habitat survey of project area, mapped wildlife habitat, and assessed impacts, with a focus suitable habitat for and presence of species listed by the State of Maine and /or USFWS. Compiled results in a report to support all local and federal permitting efforts. Senior Wildlife Ecologist.

The Effect of Roadside Mowing Practices on Deer-Vehicle Collision Rates, Federal Highway Administration, Nationwide (2009-2012). Conducted literature review and interviews with State Department of Transportation (DOT) personnel to summarize any known effects of roadside mowing regimes on Deer-Vehicle Collision (DVC) rates, followed by a quantitative analysis of DVC rates as a function of mowing regime. Project responsibilities include acquiring data from State DOTs, data management and analysis, and report writing, as well as contracting, budget management, and project planning. Data Analysis Task Manager.

Habitat Assessment and Acoustic Northern Long-eared Bat Surveys, Various, NH, ME, RI (2015-2017). Planned and coordinated USFWS compliant acoustic surveys and habitat assessments for projects in southern NH, including gravel pit expansion, hydroelectric development, residential subdivisions, storm drain improvements, and pipeline expansion. Tasks included contracting, budget management, project planning, coordinating personnel, data QA/QC, and managing reporting efforts. Project Manager.

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS

Site-specific Biodiversity Assessments, Veolia North America, Various Locations Nationwide (2016-Present). Field assessments of existing biodiversity at Veolia-managed facilities, primarily waste water and drinking water treatment plants, paired with desktop assessments to understand the site's contribution to biodiversity in the local landscape. Findings are summarized to meet Veolia's specifications, and include site specific recommendations to maintain and improve biodiversity through habitat management and improvement. Project Manager.

Acoustic Bat Surveys, MassDOT, various locations, MA (2015 Present). Conducting U.S. Fish and Wildlife Service (USFWS) compliant acoustic surveys and habitat assessments for roadway projects throughout Massachusetts. Tasks include contracting, budget management, project planning, coordinating personnel, data QA/QC, and managing the reporting effort. Project Manager.

Linking Landscapes for Massachusetts Wildlife, MA Division of Fisheries and Wildlife, MA (2017). Processed, analyzed, and mapped existing wildlife roadway mortality data sets for a joint Massachusetts Division of Fisheries and Wildlife (MADFW)/Massachusetts Department of Transportation (MassDOT) project to identify high mortality locations in order to improve human safety and habitat connectivity. Results and maps were summarized in a report that will be available to the public. Lead Analyst and Author, Project Manager.

Power Line Reconstruction, Green Mountain Power, Town of Windsor, VT (2017). Planning and coordination of wildlife resource assessment, in compliance with Vermont's Act 250. Tasks included desktop analysis, field verification, impact assessment, and reporting. Wildlife Task Manager and Field Biologist.

Post-Construction Mortality Monitoring, First Wind, Stetson Wind Power Facility, Washington County, ME (2010-2011). Managed personnel to search turbines for bird and bat fatalities, spring through fall and estimate fatality rates. Coordinated searcher efficiency trials and scavenger trials to estimate true number of fatalities; supervised and quality-checked fatality estimation and report writing. Tasks also included contracting, budget management, and project planning. Project Manager.

Analysis of Methods to Identify Deer-Vehicle Collision Hotspot, Federal Highway Administration, Nationwide (2009-2011). Compared qualitative and quantitative methods to identify DVC hotspots, based on data needs, ease of implementation, expertise required, and relevancy to solving safety and ecological issues. Project responsibilities included review of methods through literature review and interviews with DOT staff, creating and implementing comparison protocols, report writing, contracting, budget management, and project planning. Principal Investigator and Project Manager.

The Effect of Roadside Mowing Practices on Deer-Vehicle Collision Rates, Federal Highway Administration, Nationwide (2009-2012). Conducted literature review and interviews with State Department of Transportation (DOT) personnel to summarize any known effects of roadside mowing regimes on Deer-Vehicle Collision (DVC) rates, followed by a quantitative analysis of DVC rates as a function of mowing regime. Project responsibilities include acquiring data from State DOTs, data management and analysis, and report writing, as well as contracting, budget management, and project planning. Data Analysis Task Manager.

The Balsams Grand Resort, Dixville LLC, NH (2014-2015). Planned and coordinated surveys and reporting for general wildlife issues and northern long-eared bat acoustic surveys. Wildlife Task Manager.

Loon Pond Dam Reconstruction, Town of Lincoln, Lincoln, NH (2015-2016). Conducted habitat suitability assessment for Canada lynx and forest roosting bats for project located on Forest Service Land; coordinated rare plant surveys and wrote the Biological Evaluation. Project Manager and Wildlife Biologist.

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS

WILLIAM S. MCCLOY, PWS, NHCWS

Senior Wetland Scientist

Mr. McCloy is a Professional Wetland Scientist and New Hampshire Certified Wetland Scientist with fourteen years of experience working on projects throughout New England. He has technical experience in wetland delineation, wetland function and value assessment, vernal pool ecology, riverine assessments, wetland and riparian mitigation and restoration design, and technical report writing. Mr. McCloy also has experience permitting wetland and stream impacts in compliance with regulations and policy guidance administered by the Maine Department of Environmental Protection (MEDEP), Vermont Department of Environmental Conservation (VTDEC), New Hampshire Department of Environmental Services (NHDES), and U.S. Army Corps of Engineers Section 404 program across New England. Mr. McCloy has contributed to and helped prepare submittals for projects subject to the Vermont Public Service Board Section 248 and the Act 250 Permit processes; along with projects associated with the New Hampshire Site Evaluation Committee (NH SEC) process.

Mr. McCloy is a detail oriented and adaptive team player with a diverse skill set that also includes project management, GIS mapping, modeling and analysis, construction oversight and erosion control monitoring, and regulatory coordination. He has been a part of many high-profile projects that have required precise coordination between other members of the project team, clients, municipalities, regulatory agencies, and the general public.

EDUCATION

M.E.M., Environmental Health and Security, Duke University Nicholas School of the Environmental and Earth Sciences

B.A., Biology, Colby College

PROFESSIONAL EXPERIENCE

2009-Present	Normandeau Associates
2008-2009	Vanasse Hangen Brustlin
2005-2007	Pioneer Environmental Associates
2004	Clean Water for North Carolina (Summer Intern)
2003-2004	Duke University Forest (Assistantship)

PROFESSIONAL CERTIFICATIONS

- Professional Wetland Scientist (#2225) - The Society of Wetland Scientists
- Certified Wetland Scientist (#268) – New Hampshire Joint Board of Licensure and Certification
- Maine DIFW Credentialed Vernal Pool Observer

PROFESSIONAL AFFILIATIONS

- New Hampshire Association of Natural Resource Scientists (NHANRS)

REPRESENTATIVE PROJECT EXPERIENCE

Crossroads Landfill, Waste Management, Inc., Norridgewock, ME (2017-Present). Normandeau has provided long-term natural resource permitting and mitigation design, construction oversight and long-term monitoring for four landfill expansions. Over 18 acres of wetland mitigation has been successfully created, restored and enhanced as compensatory mitigation for impacts related to the landfill expansions. Other site work has included vernal pool surveys, semi-quantitative surveys of state-mapped Deer Wintering Areas and an Inland Wading and Waterbird Habitat, fish and macroinvertebrate surveys in Mill Stream, state-listed upland sandpiper surveys, and surveys for rare plants. Mr. McCloy has provided wetland and vernal pool delineation, reporting and permitting support for the most recent Phase 14 Project. Ecologist.

Seacoast Reliability Project, Public Service of New Hampshire, NH (2013-Present). Mr. McCloy is currently assisting a multidisciplinary team of ecologists to draft technical natural resource reports and state permit applications in support of an approximately 13-mile, 115 kV transmission line project located in an existing right-of-way in southeastern New Hampshire. These reports are being prepared to support the project's anticipated State and Federal wetland permit applications and Application for a Certificate of Site and Facility from the New Hampshire Site Evaluation Committee (SEC). Technical Writer/Permitting and GIS Specialist.

Fletcher Mountain Wind Project Meteorological Tower Permitting and Compliance Monitoring, Iberdrola Renewables, Inc. (Atlantic Wind, LLC), ME (2010–2011; 2013-2014). Mr. McCloy provided field support and compliance monitoring for Atlantic Wind, LLC during site preparation and construction of four meteorological

towers and one LiDAR wind measurement device across two townships in northwestern Maine. Mr. McCloy provided project management, resource delineation, preparation of state permit applications, field construction oversight, and installation and monitoring of erosion control measures. Task Manager/Field Ecologist.

Natural Resource Delineations, Maine Department of Transportation (MaineDOT), Phillips, Madrid and Strong, ME (2012). In support of proposed road improvements, Mr. McCloy completed wetland and stream delineations with associated documentation along a 4.6 mile section of Route 4 in the Towns of Phillips and Madrid, Maine, as well as a 2.5 mile section of Route 4 in Strong, Maine. Mr. McCloy utilized a specialized MaineDOT data dictionary and wetland delineation and documentation methodology throughout the project. Field Ecologist.

Natural Resource Delineations, Maine Department of Transportation, Kingfield, ME (2012). In support of proposed improvements to 2.5 miles of roadway (Route 16/27) in Kingfield, Maine, Mr. McCloy completed wetland and stream delineations and prepared associated documentation. He also utilized a specialized Maine Department of Transportation data dictionary and wetland delineation and documentation methodology throughout the project. Field Ecologist/GIS Specialist.

Natural Resource Review, Maine Department of Environmental Protection, ME (2009). Mr. McCloy performed a peer-review of Central Maine Power's (CMP) water resource impact applications in support of the proposed Maine Power Reliability Project (MPRP). The MPRP included the upgrade or expansion of approximately 360 miles of transmission corridor and up to 19 substations. Normandeau field-reviewed the accuracy of CMP's delineation of jurisdictional water resources within the project area including wetlands, vernal pools, streams, and surface waterbodies. Field Ecologist/GPS Technician.

Kennebec River Dredge Monitoring, Bath Iron Works, ME (2011-2012). Mr. McCloy performed water quality sampling and real-time turbidity monitoring during active dredging on the Kennebec River in Maine. Samples were collected from a boat at multiple stations and at varying depths up-river and down-river from the dredge disposal site. Collected water samples were documented, preserved, and transferred to a laboratory for processing. Other duties included photo documentation of dredging operations. Field Ecologist.

SPECIAL TRAINING

2010 Cool Climate Soil, Hydrology, and Site Evaluator Soil Pit Classification Workshop - Maine Association of Professional Soil Scientists, Maine Association of Wetland Scientists, Maine Association of Site Evaluators

Jurisdictional Training Seminar – U.S. Army Corps of Engineers

Using Fluvial Geomorphology in Watershed Assessment and Stream Restoration – John Field, PhD, Field Geology Services

Innovations in the Vermont Soil Survey – Natural Resource Conservation Services

Aquatic Organism Passage (AD) Training Seminar – Vermont Department of Fish & Wildlife

Basic Wetland Delineator Training Course – Institute for Wetlands & Environmental Education & Research

OSHA Hazwoper 40-Hour Certification

American Red Cross – Basic First Aid/AED and CPR

APPENDIX 4E
Qualifications of SCS Engineers

SCS ENGINEERS

BRIEF HISTORY OF SCS

Founded in 1970, we are an employee-owned, environmental consulting and contracting company, with a current staff of over 800 engineers, geologists, scientists, constructors and technicians, positioned in over 50 offices located throughout the United States. We are a recognized leader in solid waste consulting and contracting.

Environmental consulting/engineering services associated with landfills, including landfill gas management, are fundamental services provided by SCS. We are one of only a few firms in the country that specializes in solid waste management and SCS has been a leader in landfill consulting services since 1970. Perennially, we are ranked by the McGraw-Hill's Engineering News Record as the #1 or #2 Solid Waste Firm in the United States.

The professional staff and the firm itself have been recognized for research achievements and technology innovations in the solid waste management field, and has received many awards and industry recognition through the Solid Waste Association of North America (SWANA), the National Waste & Recycling Association (NWRA), the American Society of Civil Engineers (ASCE), and the National Society of Professional Engineers. **Greg McCarron, who has worked on over 30 Crossroads assignments since 2001, serves on the Board of the Southern New England Chapter of SWANA.**

We have five operating groups: Engineering/Consulting; Field Services-Construction; Field Services-Operation, Monitoring and Maintenance (OM&M); SCS Energy; and, SCS Tracer. SCS Energy designs, builds and operates biogas energy utilization projects (e.g., landfill gas (LFG) to electricity or direct use projects), and SCS Tracer provides specialty tracer gas consulting and air pollution modeling services.

As an employee-owned company, our culture promotes communication, cooperation and sharing of resources between offices. Expertise, staff resources and specialized equipment throughout the company are available and utilized on all projects, as warranted.

MAINE PROJECTS

SCS has direct experience with providing LFG engineering services at Maine landfills, including:

- Engineering support for LFG collection and control systems, including LFG recovery projections (modeling), multi-year master plans and permitting.
- Field technical support for LFG collection and control systems, including construction quality assurance (CQA)/construction management, construction, and routine and non-routine operations and maintenance.
- Feasibility analysis of LFG-to-energy facilities.

We have provided these services at the following Maine landfills: Crossroads, Pine Tree, Presque Isle, and Rockland. For Crossroads Landfill, we have provided near-continuous LFG engineering services since 2001. A sample of the assignments for Crossroads Landfill include the following:

- Ongoing support in the areas of engineering, construction, regulatory issues, and operations of the landfill gas collection and control system.

- Preparation of semi-annual and annual reports, and the annual emission statement. Additional services included compliance assistance with the mandatory GHG emissions reporting regulation, LFG data management and support, general GCCS engineering support, and the annual update to the GCCS O&M Plan

- In 2014, 2015, 2016 and 2017, construction of the Phase 8 LFG collection system.

- Design of the LFG collection system for the Phase 8C' permit modification, which included revised drawings and design report for submittal to DEP.

- Preparation of the Title V permit application, including forms, emission estimates, manufacturer's information, BACT analysis, drawings, and other information.

- Preparation of New Source Performance Standard Tier 2 investigation and modeling.

- Design on a fast track basis the LFG header and condensate drain for incorporation into construction drawings for initial construction of Phase 8A area. Additional design elements included the blower/flare station and the collection system for Phase 8A.

- Rental of a blower/flare station and LFG system balancing.

- Preparation of model of LFG emissions from the unlined MSW landfill that is to be excavated and placed in the lined landfill. Used hydrogen sulfide as a surrogate for odor modeling estimates.

- Designed the LFG management system for Phase 9 and Phase 8 expansion, and for Phase 12 that interconnected to Phase 11 flare system. Prepared preliminary designs, reports, and permit applications to support regulatory review of landfill applications for Phases 8 and 9 expansion, and to permit an LFG system for Phase 12.

Details regarding SCS's experience at Pine Tree, Presque Isle, and Rockland landfills are provided below.

Client Name	Project Name	Fee	Project Start Date	Project Description
CES, Inc. Contact: David Hopkins Ph: 207-764-8412	LFG Design Peer Review, PILF	$1,000	April 8, 2014	Delivery of engineering peer review services to CES, Inc. for a LFG collection system expansion at the Presque Isle Landfill in Presque Isle, Maine. SCS designed the original LFG collection system in 2008. In 2014, the City will be closing the top and west sides of the Landfill, thus completing the cover on their older landfill area. The proposed LFG collection system expansion design by CES includes a series of horizontal collectors under the geomembrane cover. Scope included review of CES's LFG collection system expansion design.
Rockland, City of Contact: David St. Laurent Ph: 207-594-0322	LFG Control Support, Rockland, Maine	$2,500	May 1, 2012	Provide technical support for the purpose of LFG treatment/flare, controls, preparation, installation; update facility gas operations and management plans; other engineering support related to LFG/emissions control as required.
CES, Inc. Contact: Denis St. Peter Ph: 207-989-4824	CAR GHG Credit Support, PILF	$15,677	October 17, 2011	Delivery of pre-verification and verification support to the City of Presque Isle, ME through CES, Inc. for greenhouse gas (GHG) offset credits through the Climate Action Reserve (CAR). The City installed a LFG blower/flare station in October 2009, and has been operating it on a voluntary basis since that time. The City also registered this project with CAR to generate GHG offset credits, to be sold within the CAR program. The first round of offset credits to be generated for the City include years 2009 through 2011. Scope included: a) provision of pre-verification support for generation of the first round of offset credits, including compilation of emissions reduction data and GHG project information, preparation of emission reduction calculations and a project monitoring report, preparation of any required variances and assistance with selection of a verifier; and, b) provision of verification support, including participation in a kickoff meeting conference call, and addressing issues with data or requests for information or clarifications as identified by the verifier.

Client Name	Project Name	Fee	Project Start Date	Project Description
Casella Waste Management of N.Y., Inc. Contact: Toni King Ph: 207-286-1668	Subsurface Combustion, Pine Tree LF	$9,205	April 18, 2011	Provision of subsurface combustion assistance services for the Pine Tree Landfill in Hampden, ME. The landfill is fully capped and a LFGE facility operates at the site. Tasks included initial review of data, reports, and monitoring information; detailed review and analysis of project information; and, preparation of a report.
CMA Engineers Contact: Robert Grillo Ph: 207-985-8717	LFG Assessment and Pump Test, Rockland, ME	$16,000	April 1, 2011	SCS provided engineering, support to Rockland under subcontract with CMA engineers. Engineering assistance included site reconnaissance of conditions, preparatiion of an LFG model, evaluation of pump test options and initial design of LFG controls.
Contact: Ph:	Subsurface Combustion Assistance, Pine Tree Landfill, Hampden, Maine	$5,796	November 1, 2010	Provision of subsurface combustion assistance services for the Pine Tree Landfill in Hampden, ME. The landfill was undergoing final capping and a LFGE facility operates at the site. Tasks included initial review of monitoring information; a site visit; meeting with Maine DEP; detailed review and analysis of project information; and, preparation of a report.
City of Presque Isle Contact: Dana Fowler Ph:207-764-2507	City of PI, Engineering Support Credit, PILF	$3000	August 23, 2010	Delivery of consulting services related to proposed maintenance garage LFG heaters. Scope included preparation of design and cost estimates for a LFG heating system for a new maintenance garage.

Client Name	Project Name	Fee	Project Start Date	Project Description
CES, Inc. Contact: Denis St. Peter Ph: 207-989-4824	Operations & Maintenance Plan and Construction Quality Assurance, Presque Isle Solid Waste Landfill	$29,714	February 17, 2009	Delivery of an operation and maintenance (O&M) plan and construction quality assurance (CQA) services for work being performed on the Presque Isle Landfill (PILF). CES is the City of Presque Isle's consultant. SCS has designed a LFG management system for the landfill. The scope includes development of an O&M plan for the LFG system, and provision of CQA engineering services to review submittals and oversee key parts of construction.
City of Presque Isle Contact: Dana Fowler Ph: 207-764-2507	City of Presque Isle-LFG Mgmt Services, City of Presque Isle Solid Waste Landfill	$87,646	February 1, 2008	SCS developed a master plan to address long-term requirements for LFG collection and control. SCS prepared construction bid documents for the 2008 LFG system, which included the initial collection system and the flare station. SCS prepared and compiled an air permit application for construction of the permanent flare. SCS prepared a feasibility study for landfill gas-to-energy.
Access Energy, LLC Contact: William Behling Ph: 802-786-2425	Landfill Gas (LFG) Recovery Projections, Pine Tree Landfill, Maine	$3,500	October 23, 2003	Prepare landfill gas (LFG) recovery projections and report documenting work.

PROJECT STAFFING

Greg McCarron, Project Director, will oversee all work performed, and will assure that efforts on all individual tasks are coordinated and integrated so that the maximum benefit will be realized from related activities. Lisa Wilkinson, Project Manager, will serve as the client service manager and primary point of contact for day-to-day contract and project related activities. Greg and Lisa have worked on all Crossroads Landfill engineering assignments since 2001.

Full resumes are provided in Attachment 1.

Attachment 1

GREGORY P. MCCARRON, P.E.

Education

B.S. - Environmental Engineering, Rensselaer Polytechnic Institute, 1986

Professional Licenses

Professional Engineer - New York, Rhode Island, Maine, Massachusetts, New Hampshire, and Virginia

Professional Affiliations

U.S. Composting Council
Solid Waste Association of North America
New York State Association for Solid Waste Management

Professional Experience

Mr. McCarron has 32 years of progressively-responsible experience in solid waste management, including composting, waste composition studies, solid waste planning, recycling, transfer stations, waste-to-energy systems, and landfill systems. His experience includes operations, project management, design, permitting, regulatory support, construction oversight, system start-up, economic analysis, and technology assessment.

Crossroads Landfill, Norridgewock, ME. Project manager for landfill gas (LFG) system design, regulatory support, construction quality assurance services and LFG operations and maintenance consulting.

City of Presque Isle, Presque Isle, ME. Provision of LFGE engineering design and air regulatory support for the City of Presque Isle Landfill. Services included preparation of LFG control system design with LFG well dewatering system, assistance related to preparation of an air license application, preparation of a LFGE feasibility study and support related to GHG offset credit project setup, reporting and verification.

Rhode Island Resource Recovery Corporation. Project Director for LFG design at the RIRRC Landfill. Managed design, operations maintenance, and monitoring activities for the LFG dewatering system including preparation of an LFG collection system evaluation report.

Androscoggin Valley Regional Refuse Disposal District, Berlin, NH. Delivery of general LFG consulting services for AVRRDD. Provided regulatory support related to air permitting and reporting requirements. Provided engineering support related to the LFG collection system expansion and control system designs and modifications, and oversight of LFGE project design/build (by others).

Town of Windsor, Windsor, CT. Preparation of a pre-construction air permit application at Town of Windsor Landfill, CT. Prepared LFG collection system expansion designs and LFG blower/flare station relocation designs, and connection of condensate disposal system to municipal sewer. Provided support to Town for mitigation of Landfill-related odors.

City of New York, Closure Design for Section 1/9, Fresh Kills Landfill. Project manager for the design of the closure systems, including site investigations, wetlands studies, wetlands and solid waste

permitting, design of final cover, landfill gas, and stormwater management systems, and preparation of construction documents.

City of New York, Passive Venting Design for Section 2/8 and 3/4, Fresh Kills Landfill. Project engineer and task manager for the design of the passive venting systems, including field testing, design of LFG duct venting system, and preparation of construction documents.

Waste Connections, Inc., Colonie Landfill, NY. Project director for landfill gas management services, including emission statement, solid waste report, GHG reporting, annual and semi-annual compliance report, and LFG system expansion design to control odors.

Sussex County Municipal Utilities Authority, NJ. Project director for solid waste reporting services, including semi-annual groundwater and stormwater detection reporting, annual stormwater pollution prevention plan updates, enclosed flare inspections, annual surface emission monitoring, and other.

Islip Resource Recovery Agency, Blydenburgh Landfill, NY. Prepared bid documents for replacement of the LFG systems, including collection and flare systems. Conducted a field evaluation of the existing LFG collection and flare systems.

Town of North Hempstead, Port Washington Landfill, NY. Prepared bid documents for refurbishment of the LFG systems. Work items included burner, refractory, and paint enhancements.

Atlantic County Utilities Authority, Egg Harbor Township, NJ. Designed modifications to LFG blower/flare station, prepared LFG collection and control system (GCCS) and startup, shutdown and malfunction (SSM) plans for compliance with NSPS and MACT requirements, and performed construction quality assurance of LFG blower/flare modifications, including submission of plan review application to NJ Department of Community Affairs (NJDCA).

Sussex County Municipal Utilities Authority, Lafayette, NJ. Preparation of a Master Plan to address long-term requirements for LFG collection and control at the SCMUA Landfill. SCS prepared the design and air permit application for a permanent enclosed flare. SCS prepared a feasibility study for a landfill gas-to-energy project. Delivery of consulting assistance relative to the LFG system at the SCMUA Landfill, including issues related to air and solid waste facility permits, issues with Title V air permit applicability, LFG system design and evaluation, construction assistance, and general operations assistance.

Waste Management, Chicopee, MA. Provision of LFG engineering support related to a LFG well dewatering system and leachate recirculation master plan at Chicopee Landfill. Provided general LFG engineering support for ongoing operation and maintenance of LFG collection system.

Chester County Solid Waste Authority, Honey Brook, PA. Project director for preparation of design drawings for expansion of the existing LFG collection system in Areas C and D as filling continued in this area and for redrilling of existing wells that are no longer operational. The projects included design and preparation of bid documents for expansion of the LFG collection system including vertical extraction wells, headers, and laterals. SCS assisted with bidding and provided limited construction quality assurance oversight activities and preparation of the CQA report for submittal to the PaDEP.

Waste Management, Morrisville, PA. Project director for provision of engineering services related to LFG and condensate management at the GROWS North Landfill in Morrisville, PA. SCS performed an LFG collection system assessment.

Kruger Energy, Lachute, QC. Project director for preparation of a landfill gas collection and control system design for Kruger Energy at their Lidya Energy Facility, located at the Lachute Landfill in Lachute, Quebec, Canada. SCS performed a GCCS evaluation for Kruger in 2010, and made several recommendations relative to future expansions of the GCCS. Scope included preparing the design of a GCCS expansion for installation in 2013, including visiting Kruger office to provide review of drawings and design calculations.

Cape May County Municipal Utilities Authority, Cape May, NJ. Design and permitting of a 120kW microturbine facility. Prepared design drawings and specifications for a 1.2-mile LFG pipeline in Cape May County, New Jersey. Design elements included an innovative condensate management system, road crossings and a railroad crossing. The project was awarded a gold medal by SWANA for excellence in LFG utilization.

Burlington County Resource Conservation Department, Mansfield, NJ. Delivery of landfill gas management services for the Burlington County Resource Recovery Complex in Mansfield, New Jersey. Tasks included engineering, regulatory, construction and operation support relative to LFG management. The facility is operated under a Title V air permit. Prepared bid documents for a two-engine facility and direct LFG usage in a greenhouse and Eco-complex. Design elements included a pressure distribution system, booster blowers, electrical use on-site, and waste heat recovery.

Pollution Control Financing Authority of Warren County, Oxford, NJ. Delivery of LFG management services to the Pollution Control Financing Authority of Warren County relative to the Warren County District Landfill. Services included design for the flares and sulfur scrubbing facility.

Middlesex County, NJ. Prepared Due Diligence study on a LFG-to-Energy plant in Sayreville, NJ. Project includes landfill gas (LFG) collection from three landfills, a six mile pipeline, and a 20 megawatt combined cycle power plant. Review air permits and licenses, operation and maintenance (O&M) costs and assumptions, and performance test requirements. Also, prepared design drawings and specifications for a 6-mile LFG pipeline that interconnects three landfills in Middlesex County, New Jersey. Design elements included two major river crossings, five stream crossings, and a railroad crossing.

Lisa K. Wilkinson, P.E.

Education

Masters of Engineering, Environmental Engineering - State University of New York at Buffalo, 1995

B.S. - Civil Engineering - State University of New York at Buffalo, 1993

Professional Licenses

Registered Professional Engineer – New York, Vermont and Pennsylvania

Professional Affiliations

Solid Waste Association of North America
American Society of Civil Engineers
Chi Epsilon - National Civil Engineering Honor Society

Professional Experience

Ms. Wilkinson, a project manager in SCS' New York office, has over 22 years of experience in regulatory compliance, permitting, environmental consulting, landfill engineering design, landfill gas, civil engineering, financial feasibility evaluations, storm water design and construction quality assurance at landfills and solid waste facilities. Previously, Ms. Wilkinson has worked on foundation and structural design teams for various facilities and is proficient in the computerized analysis of engineering designs. Project experience includes:

Landfill Gas and Regulatory

Waste Management Disposal Services of Maine, Crossroads Landfill, Norridgewock, ME. Project Manager for LFG collection and control system design and regulatory compliance for landfill in Norridgewock, ME. Work included preparation of design drawings, calculations, engineering report, construction support, permit applications, and Title V regulatory compliance submittals. Also provided interim gas system design during development and filling phases of landfill operation.

Rhode Island Resource Recovery Corporation. Project Manager for regulatory compliance at the RIRRC Landfill. Prepared NSPS and SSM regulatory compliance reports, emission statements, Federal GHG emissions reports, surface emissions monitoring reports, quarterly gas sampling and analysis reports, and prepared regulatory gas models and provided Title V permit assistance. Also managed design, operations maintenance, and monitoring activities for the LFG dewatering system including preparation of an LFG collection system evaluation report.

New Jersey Sports and Exposition Authority, New Jersey, Keegan Landfill. Project Director for ambient air monitoring and odor support including ambient air monitoring study, surface emissions monitoring, gas collection and control system design, preparation of permit applications and construction quality assurance support.

Casella Waste Systems, Inc., Hakes C&D Landfill, New York. Project manager for general LFG and air emissions consulting services. Specific tasks include design and preparation of construction documents for LFG collection system expansions, preparation of LFG master plans, preparation of air

permit application and landfill expansion permitting assistance, H_2S surface emissions monitoring, and air compliance services.

Pine Avenue Landfill, Niagara Falls, NY. Project manager for landfill gas (LFG) system design, regulatory support, odor control from H_2S emissions, construction quality assurance services and LFG operations and maintenance consulting for LFG gas collection, control and sulfur removal system.

Chester County Solid Waste Authority, Pennsylvania, Lanchester Landfill. Project Manager for general LFG and air emissions consulting services at the Lanchester Landfill, PA. Specific tasks include design and preparation of construction documents for enclosed flare and expansions and enhancements to the existing LFG collection systems to address odors. Included preparation of permit application for construction of enclosed flare, preparation of Title V operating permit application and renewal application, preparation of annual emissions inventory calculations, Federal GHG emissions calculations and Title V compliance calculations.

New Jersey Sports and Exposition Authority, New Jersey, Kingsland and 1-E Landfills. Project Manager for regulatory compliance at the Kingsland and 1-E Landfills. Prepared annual Federal GHG emissions reports, semi-annual NSPS and SSM regulatory compliance reports, prepared annual and semi-annual Title V reports, emission statements using RADIUS, gas sampling and analysis reports, and Title V permit renewal and modification assistance.

Sullivan County Division of Solid Waste, New York, Sullivan County Landfill. Senior Project Engineer for permitting, regulatory compliance submittals, odor study and reporting, analysis of the LFG collection and control system operational history, design and preparation of LFG system expansions for odor control.

Islip Resource Recovery Agency, New York, Blydenburgh Road Landfill. Senior Project Engineer for landfill gas master plan, interim LFG designs and construction of facilities, assessment of odor issues associated with construction and demolition waste receipts, LFG to energy system evaluations, Title V air permit preparation, regulatory compliance submittals and assistance with regulatory issues.

PPL Renewable Energy, LLC. Project manager for permitting services for LFGTE facilities at the Lancaster Landfill, Greater Lebanon Refuse Authority Landfill, Community Refuse Landfill and the Northern Tier Landfill, PA and Moretown Landfill, Vermont. Specific tasks include preparation of Air Plan Approval applications, General Permit applications, Title V Operating Permit applications, gas sampling and analyses, Title V regulatory compliance reporting and feasibility study.

Waste Management of Pennsylvania, GROWS, GROWS North, Tullytown and Fairless Landfills. Project manager for preparation of major permit modification applications (solid waste) for new LFG enclosed flares and LFG control system expansions and improvements for the GROWS, GROWS North, Fairless, and Tullytown Landfills.

Lancaster County Solid Waste Management Authority. Project manager for design of LFG collection system expansions, LFG recovery potential model preparation, RNG feasibility study and regulatory compliance.

Waste Connections, Inc., Colonie Landfill, NY. Project manager for the numerous LFG related projects at the Town Landfill. Specific tasks include Title V permitting, Title V compliance submittals, emission statements, Federal GHG emissions reports, analysis of the LFG collection and control system operational history, design and preparation of LFG system expansions for odor control,

project management, oversight of construction quality assurance activities and preparation of the certification report.

Waste Management, Chicopee, MA. Provision of LFG engineering support related to a LFG well dewatering system and leachate recirculation master plan at Chicopee Landfill. Provided general LFG engineering support for ongoing operation and maintenance of LFG collection system.

Biogas Energy Solutions, LLC, Regulatory Compliance. Project Manager for air emissions consulting services for the LFGTE facilities in Burlington, VT, Manchester, NH, Suffolk, VA and various NY sites. Specific tasks include the preparation of permit applications, annual emissions inventory calculations, permitting compliance, preparation of stack test RFP's, stack test protocols and review and submittal of stack test reports. Additional tasks include submittal of Department of Energy reports for sites above and sites in Illinois and preparation of landfill gas generation model updates.

Republic Services, Inc., Fall River Landfill. Served as Project Manager for landfill gas monthly air compliance and recordkeeping, preparation of annual source registrations, preparation of annual MA GHG reports, data compilation and preparation of annual Federal GHG reports, preparation of Title V supplemental information application and review of draft permits. Provided regulatory support related to plan approval, Title V applications and coordination with the energy recovery facility.

Republic Services, Inc., East Bridgewater, Halifax, Randolph and Plainville Landfills, MA. Served as Project Manager for data compilation and preparation of annual Federal GHG reports and regulatory support as requested. Compiled water level data for input into database.

Waste Management of Massachusetts. Project Manager for numerous sites in Massachusetts including Barre, Chicopee, and Granby. Prepared Title V and NSPS regulatory compliance reports, Federal and State GHG emissions reports, assisted with LFG collection and leachate recirculation system design, including drawing preparation, calculations, compliance notebooks, and engineering report. Also performed LFG collection system evaluation and design, preparation of drawings, engineering report and permit applications.

PPL Energy Plus, Inc. Project Manager for permitting services for natural gas-fired engine installation at a manufacturing facility in Connecticut for combined heat and power project including emissions calculations, air modeling, BACT analysis and general permit

Landfill Engineering

Chester County Solid Waste Authority, Pennsylvania, Lanchester Landfill. Project manager for general LFG and air emissions consulting services at the Lanchester Landfill, PA. Specific tasks include design and preparation of construction documents for LFG collection system expansions, preparation of Title V operating permit application and renewal application, preparation of annual emissions inventory calculations, Federal GHG emissions calculations and Title V compliance calculations.

Pennsauken Sanitary Landfill, Pennsauken, New Jersey. Project Manager for the preparation of bidding documents for a groundwater remediation system. Specific tasks include preparation of construction drawings and specifications and construction cost estimate for a forty-three well air sparging system at the landfill perimeter.

City of New York, Closure Design for Section 1/9, Fresh Kills Landfill. Project manager for the design of the closure systems, including site investigations, wetlands studies, wetlands and solid waste

permitting, design of final cover, landfill gas, and stormwater management systems, and preparation of construction documents.

Townley Hill Road Dump Site, Catlin, New York. Project Manager for construction oversight for remediation and closure of site. Managed daily oversight of a 10-week closure project including site remediation, testing, geotextile and soil placement.

Youngs Avenue Landfill, Riverhead, New York. Project Manager for the planning, design and construction quality assurance of the 30 acre closure system of a partially reclaimed landfill. Work included analysis of alternatives including excavation of significant areas of waste to recontour the partially reclaimed areas of the landfill. Specific tasks include design and preparation of design drawings, engineering report, post closure monitoring and maintenance operations manual, construction drawings and specifications, interface with regulatory authority, preparation of cost estimates and alternatives analysis, and construction quality assurance activities for preparation of the certification report.

Irelandville Road Landfill, Schuyler County, New York. Project Manager for a feasibility study of reclamation of 18-acre closed, unlined Landfill to reduce collection and disposal costs of leachate influenced by high groundwater levels. Specific tasks included preparation of a workplan to complete a waste characterization study, field oversight during digging of the test pits and screening of excavated waste, preparation of the financial analysis for the feasibility study and review of historical leachate and groundwater monitoring quality data.

Sullivan County Phase I Landfill, Monticello, New York. Senior Project Engineer for the design of the Phase I Closure. Specific tasks include design and preparation of closure drawings and engineering report, preparation of construction bid drawings and specifications, project management, oversight of construction quality assurance activities and preparation of the certification report.

APPENDIX 5A
Traffic Impact Study

UPDATED TRAFFIC IMPACT STUDY

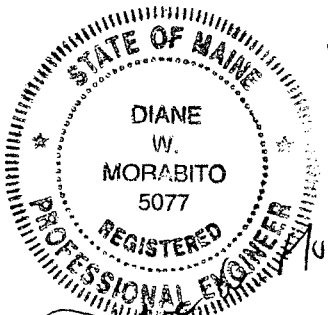
PHASE 8 CROSSROADS LANDFILL EXPANSION

NORRIDGEWOCK, MAINE

Prepared for:

Waste Management Disposal Services of Maine, Inc.

December 12, 2001



12/12/01

Prepared by:

Casey & Godfrey Engineers
263 Water Street
Gardiner, Maine 04345

INTRODUCTION

This report is an update of a traffic study that was prepared by Casey & Godfrey Engineers in December 2000 for the proposed Phase 8 Expansion of the existing Waste Management Disposal Services of Maine (WMDSM) Crossroads Landfill in Norridgewock, Maine. The December 2000 study was an update of previous 1996 and 1992 studies, also conducted by Casey & Godfrey. This update incorporates the most recent available accident data, factors additional traffic data to current and projected future conditions, and includes updated construction related traffic.

The site is served by two existing driveways. The main access drive is located directly on Route 2 while a secondary access drive is located on Airport Road. The Airport Road drive serves as a community drop-off for bringing in solid waste and was only open Thursdays through Sundays. The Route 2 drive is the primary drive, serving the remainder of the facility and all large trucks. Route 2 has been built to high standards with 12' travel lanes and paved 10' shoulders in the vicinity of the landfill and there are no weight restrictions posted on it. As a result, the maximum allowable load is the 100,000 legal load limit, applicable to six-axle vehicles.

The purpose of the expansion is to provide an area to continue operations at existing levels. Similar tonnages and transactions are expected after the Phase 8 Expansion is completed. The site location and surrounding roadways are shown on the map in Figure 1. The vast majority of traffic accesses the site via Route 2. A very limited number of local trips use Airport Road, to and from the north, without using Route 2 to access the site.

This report summarizes the review and analyses that were performed to meet the requirements for the Solid Waste Regulations of the Maine Department of Environmental Protection (MDEP), following Maine Department of Transportation (MDOT) standards and guidelines as well, since MDEP typically refers most traffic reviews to MDOT.

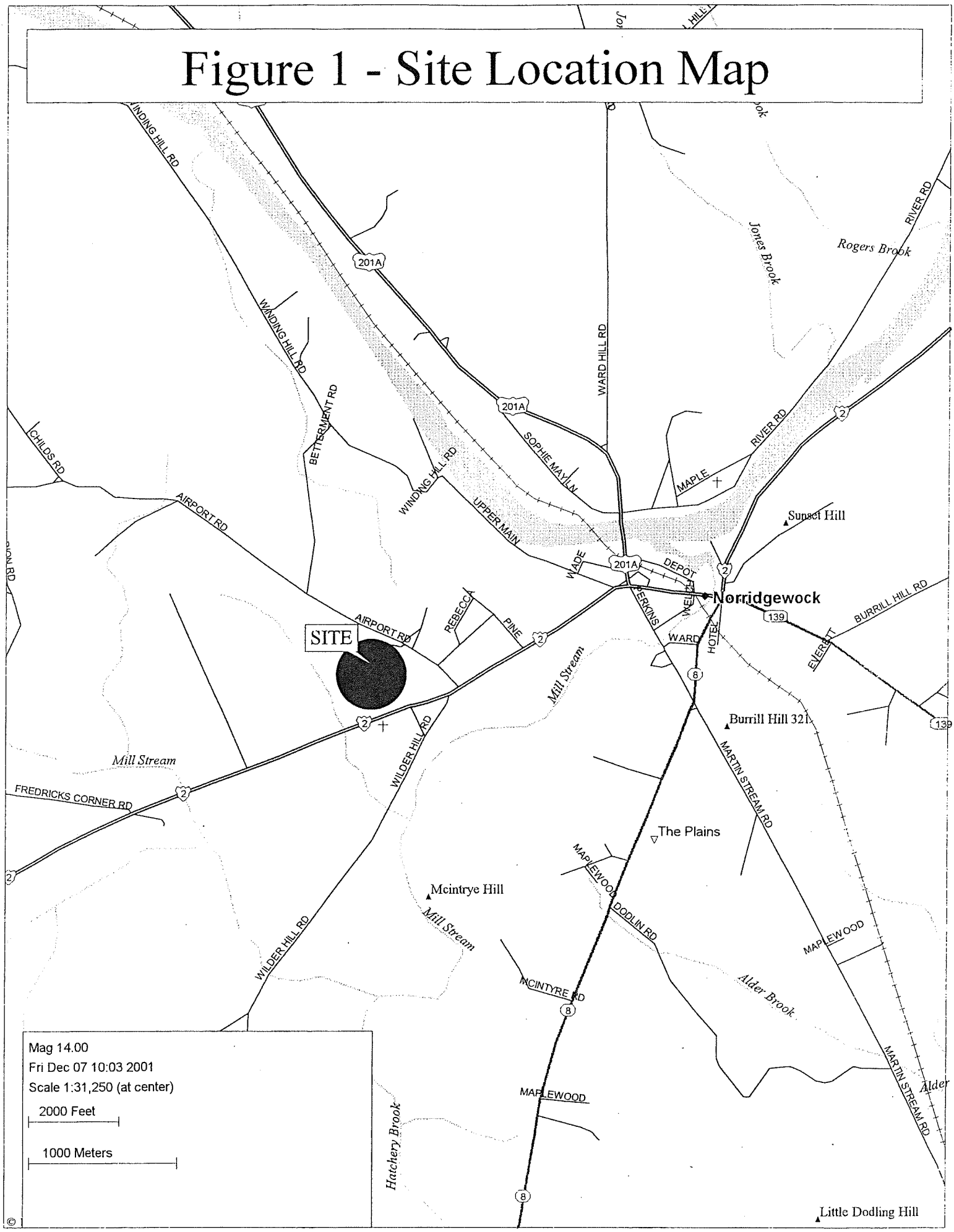
PROJECT TRIP GENERATION AND ASSIGNMENT

Trip generation counts were conducted at the Waste Management facility on Wednesday, October 11 (with secondary access closed) and on Thursday, October 12, 2000 (with secondary access open). The counts were conducted from 6:30 to 9:30 AM and from 2:30 to 5:00 PM to determine peak hour volumes. The number of trips that were measured in the AM and PM peak hours at each drive are summarized below:

TRIP GENERATION – One-Way Trip Ends

	10/11/00			10/12/00		
	Main	Secondary	Total	Main	Secondary	Total
AM Peak Hour	58	0	58	30	63	93
Entering	33	0	33	15	32	47
Exiting	25	0	25	15	31	46
PM Peak Hour	41	0	41	33	34	67
Entering	22	0	22	14	18	32
Exiting	19	0	19	19	16	35

Figure 1 - Site Location Map



As shown, the facility generated a peak of 93 one-way trips in the AM period and 67 trips in the PM peak hour, when both the main and community facilities were operating. Since many MDOT guidelines, particularly study area definitions, reference trip generation in terms of passenger car equivalents (pces), the measured trips were converted to pces using classification data collected during the counts. Each trip by a truck (defined as a minimum of two-axles with six or more tires) is equal to two pces. The AM and PM peak hours, defined in terms of pces instead of one-way trip ends, were both different by a 15-minute increment than the peak hours based upon simply volumes. The peak hours, defined in terms of pces, are summarized as follows:

TRIP GENERATION COUNTS – Pces

	10/11/00			10/12/00		
	Main	Secondary	Total	Main	Secondary	Total
AM Peak Hour	97	0	97	59	58	117
Entering	52	0	52	29	31	60
Exiting	45	0	45	30	27	57
PM Peak Hour	72	0	72	69	27	96
Entering	39	0	39	33	16	49
Exiting	33	0	33	36	11	47

As can be seen above, the primary drive generated more traffic on Wednesday than on Thursday, when the community facility was operating. As a result, to be conservative, the Wednesday volumes from the primary drive were combined with the secondary drive volumes from Thursday to obtain volumes for the purpose of this study and analysis. These results, defined in terms of both vehicle trips ends and pces, are shown below:

EXISTING TRIP GENERATION

	Vehicle Trip Ends			PCES		
	Main	Secondary	Total	Main	Secondary	Total
AM Peak Hour	19 (39)	58	77 (39)	97	58	155
Entering	14 (19)	31	45 (19)	52	31	83
Exiting	5 (20)	27	32 (20)	45	27	72
PM Peak Hour	10 (31)	27	37 (31)	72	27	99
Entering	5 (17)	16	21 (17)	39	16	55
Exiting	5 (14)	11	16 (14)	33	11	44

* ( ) truck vehicles

Daily transaction records were obtained from WMDSM for the current year. According to these records, the highest volume month was August with average weekday transactions of 156. The month of August is also the highest month for traffic volume purposes on Maine highways. As a result, all traffic analysis was performed for August volumes. Based upon the transaction records, October 11th, had daily transactions of 130. The average weekday transactions for August is 156, resulting in a factor of 1.20 to adjust October volumes to August conditions. The above pces, assuming a high Route 2 day, with the secondary drive open, were adjusted to peak August volumes using this 1.20 factor, and are summarized as follows:

PEAK SUMMER TRIP GENERATION

	Vehicle Trip Ends			PCES		
	Main	Secondary	Total	Main	Secondary	Total
AM Peak Hour	23 (47)	69	92 (47)	117	69	186
Entering	17 (23)	37	54 (23)	63	37	100
Exiting	6 (24)	32	38 (24)	54	32	86
PM Peak Hour	12 (37)	33	45 (37)	86	33	119
Entering	6 (20)	20	26 (20)	46	20	66
Exiting	6 (17)	13	16 (14)	40	13	53

* ( ) truck vehicles

As shown above, the facility currently generates approximately 92 passenger vehicle trips and 47 truck trips during the AM peak hour, with 45 passenger vehicle and 37 truck trips during the PM peak hour. In terms of pces, 186 are generated during the AM peak hour with 119 during the PM peak hour, under peak August conditions.

Previously projected traffic volumes and pces were obtained from the traffic study conducted for the Phases 9,11 and 12 expansions by Casey & Godfrey Engineers, dated March 7, 1996. The previously estimated trips and pces from that study are summarized along with the existing peak summer volumes below:

Time Period	Current Existing Peak	Previously Estimated	Difference
AM trips	121	75	46
AM pces	186	95	91
PM trips	99	68	31
PM pces	119	89	30

As shown above, the current peak trips due to operational traffic, defined in terms of pces, do not exceed the previously estimated pces by more than 100. An increase of less than 100 pces is considered insignificant by MDOT standards, and would not require a permit or a modification of an existing permit. Nonetheless, this study evaluates the impact of this traffic on the surrounding roadway system and considers such factors as level of service and turn lanes. In terms of volumes, the number of new trips over previously projected trips is expected to be a maximum of 46. The expansion project, which is expected to maintain current tonnages and transactions, should not have a significant impact off site on Route 2 beyond the site drive based upon these volumes and pces. The existing operational trip generation for the site is shown for the AM and PM peak hours in Figures 2 and 3.

In terms of specific vehicle types, the trucks that are generated by the Waste Management operations are typically 30 cubic yard roll-off trucks, 25 cubic yard packer trucks, 100-yard transfer trailers and 45 cubic yard rear end dump trailers. In terms of truck weights, the legal limits for truck weights are based upon the number of axles. The legal limits range to 100,000 pounds for a 6-axle vehicles. Trucks hauling waste to this landfill facility are expected to be within this legal gross weight limit and therefore, no alternative routing or access is necessary.

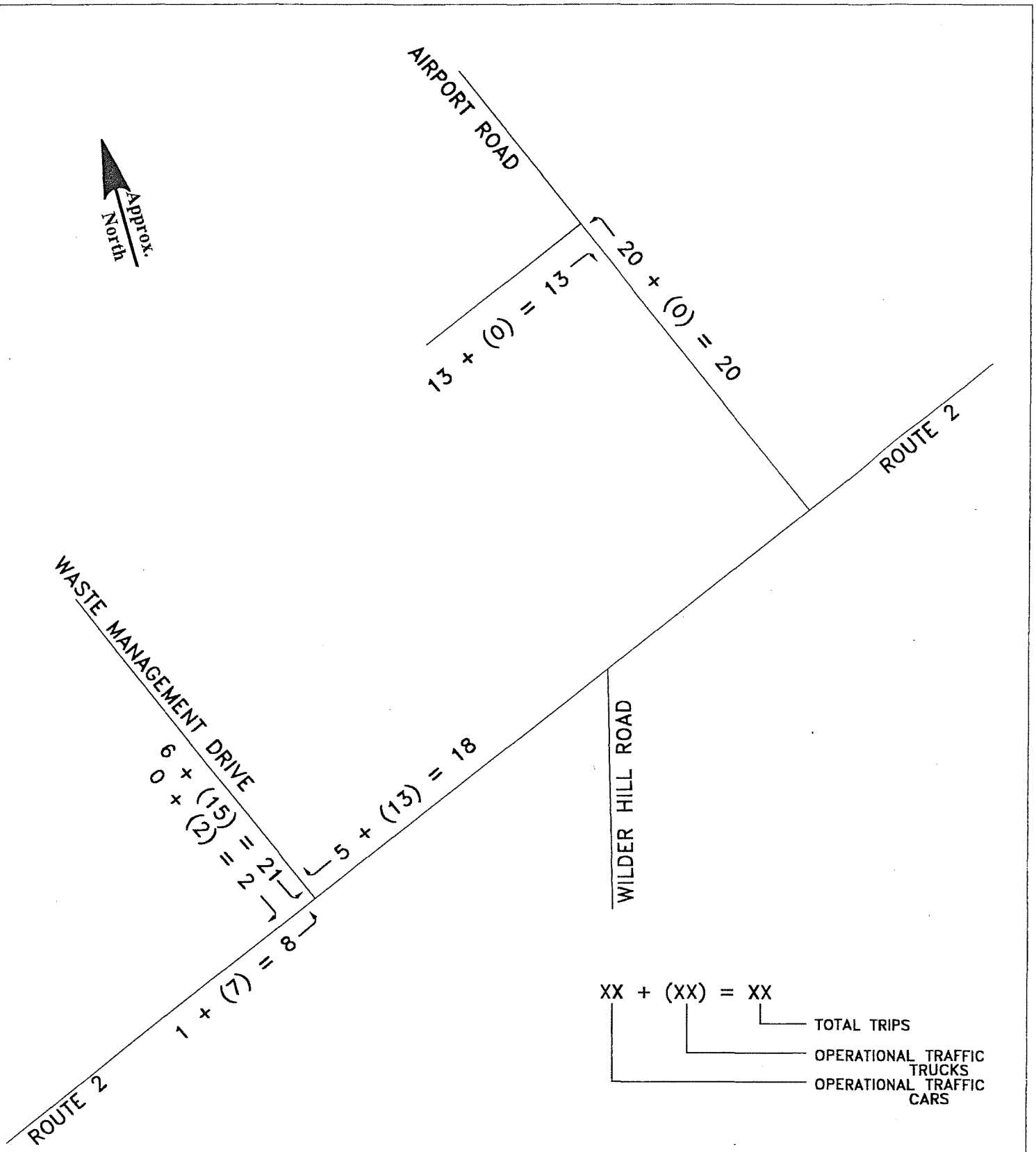


Figure 2

Norridgewock, Maine	**Casey & Godfrey**
P.M. Peak Hour	*Consulting Engineers*
Operational Trip Assignments	**263 Water Street** **Gardiner, Maine 04345** (207) 582-4526

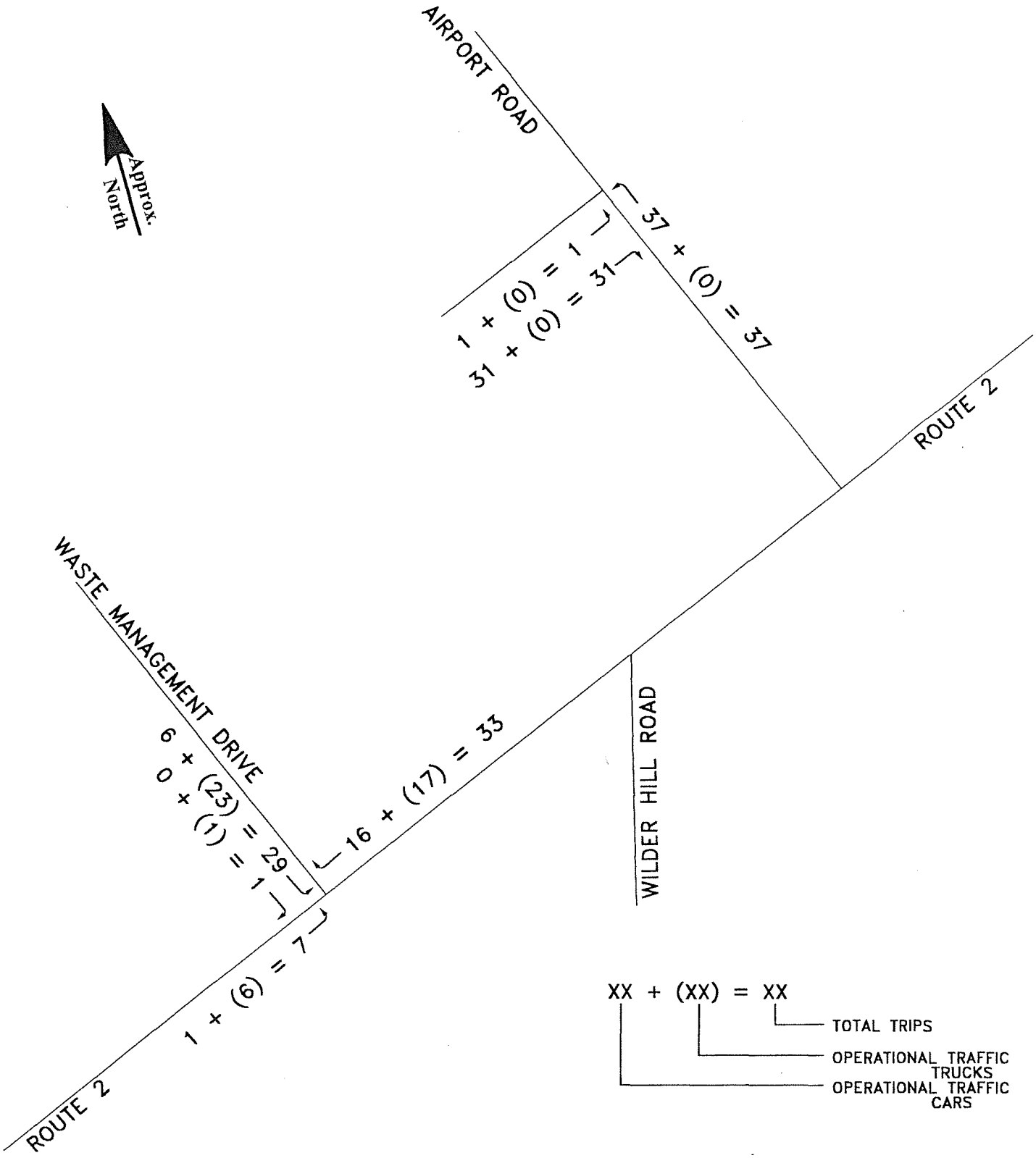


Figure 3

Norridgewock, Maine	**Casey & Godfrey**
A.M. Peak Hour	*Consulting Engineers*
Operational Trip Assignments	**263 Water Street** **Gardiner, Maine 04345** (207) 582-4526

TRAFFIC VOLUMES

A turning movement count was conducted at the intersection of Route 2, Airport Road and Wilder Hill Road on Thursday, December 6, 2001. The PM peak hour was found to occur between 3:30 and 4:30 PM. This turning movement count was factored to represent 30th highest hour volumes, the volumes used for design and traffic analysis purposes, based upon published MDOT group mean factors. These 30th highest hour volumes generally occur during the PM peak hour in late July and early August in Maine. The resulting 2001 volumes are shown in Figure 4.

Existing average annual daily traffic (AADT) data for Route 2 was obtained from "Traffic Volume Counts, 1992, 1995 and 1999 Annual Reports", published by MDOT. This data is summarized below:

	Average Annual Daily Traffic			
Location	1991	1993	1996	1998
Route 2, southwest of Winding Hill Road	—	—	—	8280
Route 2 at compact/urban line	7300	7520	7500	7710
Route 2, southwest of Inv. Road # 663	—	5780	—	5580

As can be seen above, traffic growth on Route 2 in the vicinity of the landfill has averaged less than one percent per year. To be conservative, a 2 % growth rate was used to project the 2001 volumes to 2004 conditions. These projected 2004 volumes, shown in Figure 5, represent peak August conditions during the peak PM hour with the landfill operating at current levels.

TRAFFIC ANALYSIS

Traffic operations are evaluated in terms of level of service (LOS). Level of service is a qualitative measure which describes operations by letter designation. The levels range from A - very little delay to F - extreme delays. Level of service "D" is considered generally acceptable in urban locations while LOS "E" is generally considered the capacity of a facility and the minimum tolerable level. The level of service for unsignalized intersections is based upon the average control delay for each minor movement. The criteria are defined in the following table excerpted from the 1998 "Highway Capacity Manual":

Unsignalized Intersection Level of Service

LOS	Control Delay (secs)
A	<=10.0 seconds
B	> 10.0 and <= 15.0
C	> 15.0 and <= 25.0
D	> 25.0 and <= 35.0
E	> 35.0 and <= 50.0
F	> 50.0

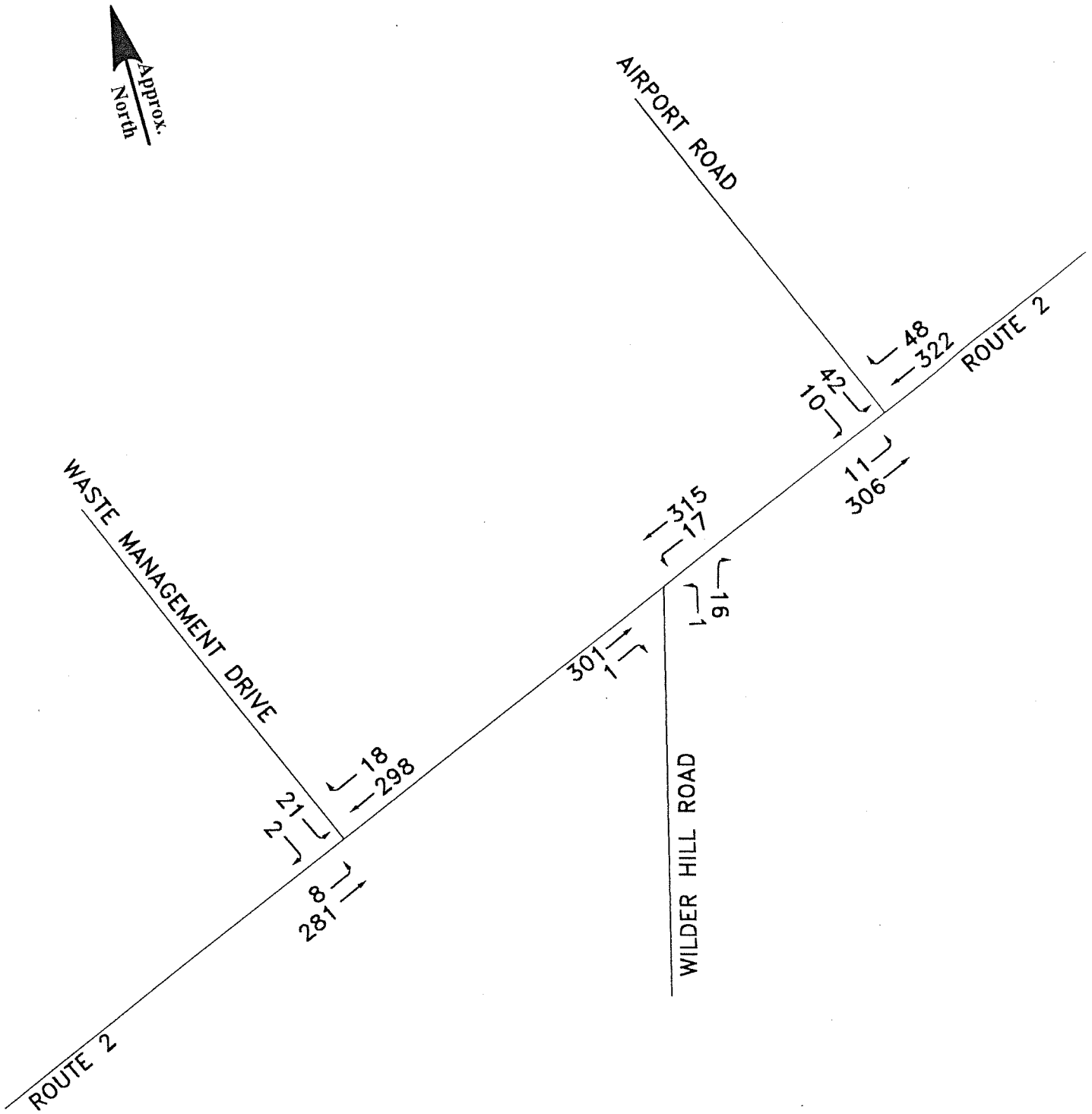


Figure 4

Norridgewock, Maine	**Casey & Godfrey**
Existing 2001 30th Highest Hour	*Consulting Engineers*
w/Existing Operational Traffic	**263 Water Street** **Gardiner, Maine 04345** (207) 582-4526

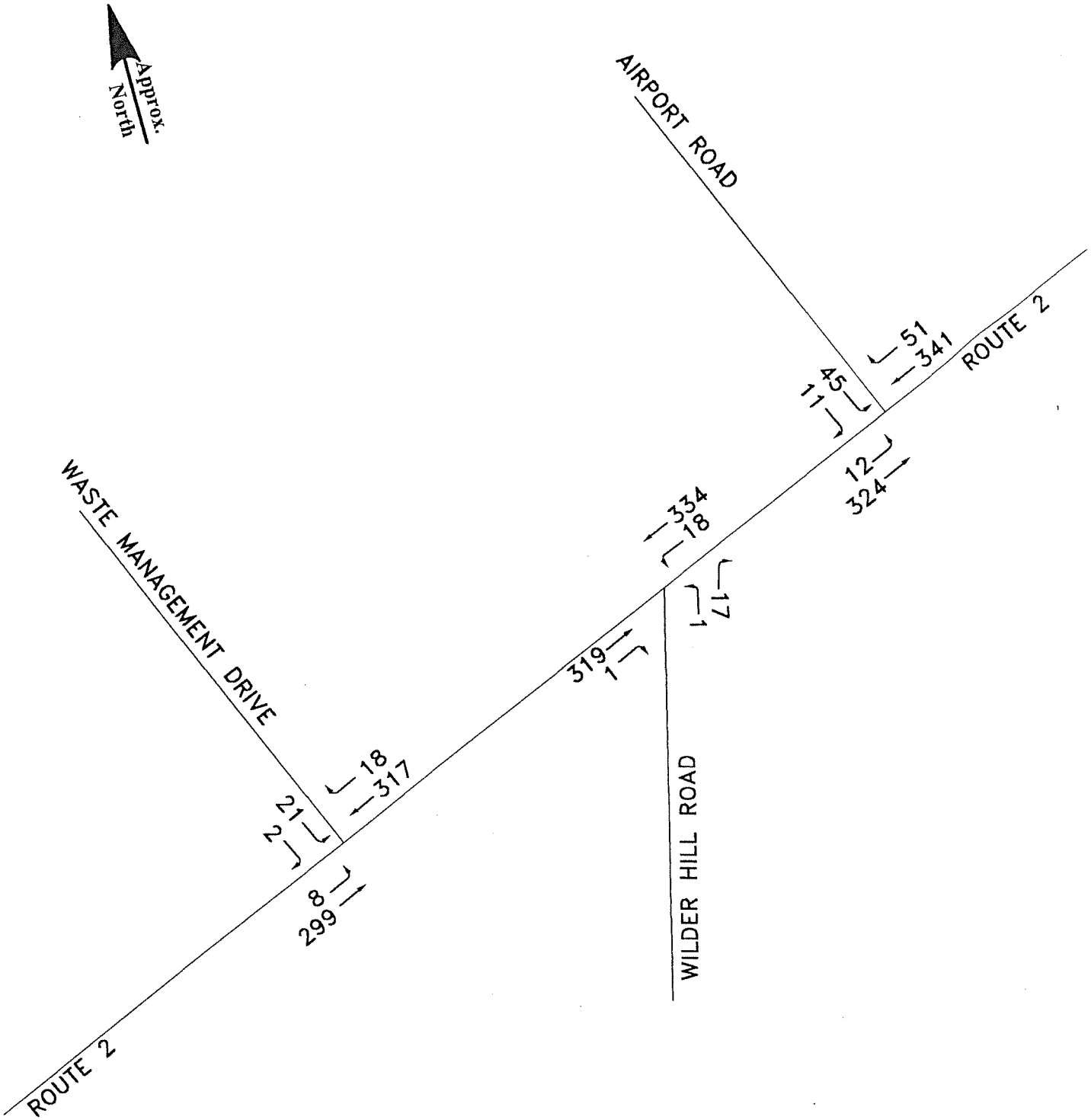


Figure 5

Norridgewock, Maine	**Casey & Godfrey**
Projected 2004 30th Highest Hour	*Consulting Engineers*
w/Existing Operational Traffic	**263 Water Street** **Gardiner, Maine 04345** (207) 582-4526

Unsignalized Intersections

The level of service for the unsignalized Route 2 intersections was calculated using "Highway Capacity Software", according to procedures of the 1998 "Highway Capacity Manual". These analyses were performed to assure that Route 2 has the capacity to continue to accept the operational landfill traffic. The LOS results, with the delay in seconds in parentheses, are summarized below:

Intersection of Route 2 and Airport Road
PM Peak Hour Level of Service

Movement	Existing 2001	Projected 2004 Exist. Operations
Airport Road	C (15.5)	C (16.5)
Left Turns onto Airport Road	A (8.2)	A (8.3)

As can be seen above, there are no capacity concerns at the intersection of Airport Road. Airport Road operates at LOS "C" during the PM peak hour period and should continue to operate at this level through 2004, allowing for background traffic growth.

Intersection of Route 2 and Wilder Hill Road
PM Peak Hour Level of Service

Movement	Existing 2001	Projected 2004 Exist. Operations
Wilder Hill Road	B (10.4)	B (10.6)
Left Turns onto Wilder Hill	A (7.9)	A (8.0)

There are no capacity concerns at the intersection of Wilder Road, which operates at LOS "B" under existing conditions. This same level of service is projected through 2004.

Intersection of Route 2 and Waste Management Drive
PM Peak Hour Level of Service

Movement	Existing 2001	Projected 2004 Exist. Operations
Exiting Right Turns	B (11.4)	B (11.6)
Exiting Left Turns	C (18.5)	C (19.6)
Drive Overall	**C (17.9)**	**C (18.9)**
Left Turns In	A (9.7)	A (9.8)

As can be seen above, there are no capacity concerns at the Waste Management drive intersection. The drive currently operates at LOS "C" and will remain at this level through 2004, allowing for Route 2 growth.

To summarize, there are no capacity constraints within the vicinity of the landfill. Route 2 has more than adequate capacity to accept the existing operational landfill traffic as shown by the analysis results. Airport Road, as shown by the analysis of its intersection with Route 2, also has excess capacity, as would be expected given its low volumes.

Auxiliary Turn Lanes

The need for auxiliary turn lanes, for Route 2 traffic entering the main drive, was evaluated using the criteria and procedures in the MDOT "Highway Design Guide". A left-turn lane warrant is based upon advancing traffic volume, the opposing volume, the posted speed limit and the percent of left-turns in the advancing volume. Based upon these factors, a left-turn lane is not warranted by either the AM or PM projected peak hour volumes.

A right-turn lane warrant is based upon the advancing volume and the number of right turns. A right-turn lane is not warranted by either the projected AM or PM peak hour volumes. To summarize, neither a left nor a right turn lane is necessary.

Traffic Signals

Traffic signal installations are controlled by the warrants in the "Manual on Uniform Traffic Control Devices" (MUTCD), Millennium Edition. One or more warrants must be met in order to justify the installation of a signal. Meeting a warrant alone doe not justify the placement of a signal. It must also be shown, through engineering studies, that the signal will either improve safety or traffic operations. The most common traffic signal warrants are based upon traffic volumes. The volume warrants are defined in terms of an average day, described as volumes that are normally and repeatedly found. The existing and projected traffic volumes do not even begin to approach the required volumes for a traffic signal nor were any capacity concerns identified that require a traffic signal evaluation.

SAFETY ANALYSIS

Accident Review

The Maine Department of Transportation uses two criteria to determine high accident locations (HALs) for safety review purposes. The first is the critical rate factor (CRF) which is a measure of the accident rate. A CRF greater than one indicates a location which has a higher than expected accident rate. The expected rate is calculated as a statewide average of similar facilities.

The second criterion, which must also be met, is based upon the number of accidents that occur at a particular location. Eight or more accidents must occur over the three-year study period for the location to be considered a HAL.

Accident data was obtained from MDOT for the three-year period 1997 to 1999 for 1.4 miles of Route 2 in the original study, more than the 0.5 mile segment required by the Maine Solid Waste Regulations. The number of accidents, their locations and the CRFs are summarized as follows:

Location	# of Acc.	CRF
Intersection of Route 2 and Fredericks Corner Road	2	0.70
Route 2 between Fredericks Corner and Wilder Hill Road	5	0.28
Intersection of Route 2 and Wilder Hill Road	2	0.65
Intersection of Route 2 and Airport Road	1	0.27

As can be seen in the preceding table, there are no high crash locations within the vicinity of the landfill that would indicate any safety deficiencies. There were five accidents along the Route 2 segment that extends from Frederick's Corner Road to Wilder Hill Road. The individual accident reports were reviewed to determine if any accidents occurred at the site drive. Based upon the individual reports, there were no accidents at the Route 2 drive intersection.

Currently, accident data is available for the more recent three-year period 1998 to 2000. Based upon the published MDOT high accident listing for this period, there are no high crash locations on Route 2 in the town of Norridgewock. There is only one high crash location in Norridgewock, which is removed from the landfill at the intersection of Route 8 and River Road. There are no high crash locations on Airport Road. In conclusion, there are no high crash locations in the area so no safety deficiencies were identified.

Sight Distance Review

No new access drives are proposed to serve the facility. Sight distance was previously measured at the existing Route 2 drive. Sight distance was evaluated to determine if it meets MDOT standards as published in "Access Management, Improving the Efficiency of Maine Arterials, A Handbook for Local Officials", as referenced in the MDEP Solid Waste Regulations. This sight distance is measured from a point ten feet back from the edge of the travel way at a driver's eye height of 3.5 feet to an object height of 4.25 feet.

Sight distance from the primary Route 2 drive is in excess of 900 feet in each direction. The speed limit is posted at 55 on Route 2. The above cited MDOT standards recommend 550 feet of sight distance for this posted speed. In addition, for drives with significant truck traffic, it is recommended that the sight distance be increased by 50 %, yielding a desired sight distance of 825 feet. The available sight distance of 900 feet exceeds this recommended standard. As a result, there are no sight distance concerns at the existing Route 2 drive. Safe sight distance was already determined and documented in the previous 1992 and 1996 traffic studies.

ON-SITE REVIEW

The Crossroads Landfill is served by an existing paved two-lane main access drive from Route 2. This road was constructed approximately 10 years ago. Assuming a typical 20-year design, this main access drive roadway is approximately halfway through its serviceable life. Waste Management will overlay the main access road when the need arises. The main access road, based upon the site map by Aerial Photography, labeled road surfaces and dated 4/17/01, is at least 26 feet in width. The roadway is fairly tangent in horizontal alignment with no geometric constraints observed, such as excessive curves. The speed limit is posted at 15 mph prior to the scales and at 10 mph beyond the scales.

In addition to the paved main access road, there are gravel roads on site. Dust control is provided by an on-site sweeper truck and by a water truck, as needed. The gravel roads are generally maintained and re-graded on an annual basis. In terms of winter maintenance, the roadways are plowed and sanded. No salt is used on the roadways for winter maintenance.

There are no pedestrian facilities on-site since there are no areas of pedestrian concentration. As a result, there are no pedestrian concerns.

RECOMMENDATIONS AND CONCLUSIONS

The Crossroads Landfill facility is generating approximately 121 one-way trips (186 pces) during the AM peak hour and 99 trips (119 pces) during the PM peak hour under peak August conditions, the high month for both the facility and Maine highways, during normal operations. Since the expansion is not expected to increase these volumes, and since there are fewer than 100 ***new*** pces being generated since previous state permits were issued, the Phase 8 Expansion project should not have a significant impact on Route 2 beyond the site drive. This level of traffic would not require a Traffic Movement Permit or a modification of an existing permit from the MDOT.

Route 2 has been built to high standards with 12' travel lanes and paved 10' shoulders in the vicinity of the landfill and there are no weight restrictions on it. Therefore, the legal load limit is 100,000 loads, applicable to six-axle vehicles. No safety deficiencies were identified in the area by the accident review. As a result, no alternative routing to reach the facility is necessary.

No deficiencies, in terms of congestion or unreasonable delay, were identified by the study. Both Route 2 and Airport Road have more than adequate capacity to accommodate the operational traffic, as shown by the capacity analysis results. No auxiliary turn-lanes are warranted on Route 2 for traffic entering the site based upon the projected operational volumes. The accident review did not identify any high accident locations in the vicinity of the facility. No on-site deficiencies were identified by the review.

Based upon this study, and the previous traffic studies conducted, the requirements of the MDEP Maine Solid Waste Regulations, as well as MDOT standards and guidelines, have been met. Casey & Godfrey also analyzed the impact of the construction traffic, at the request of Waste Management. The results of the construction traffic analyses are included in Appendix A of this report. These results demonstrate that both the temporary construction traffic and the operational traffic can be accommodated and will fall within the established traffic standards and guidelines.

APPENDIX A

CONSTRUCTION TRAFFIC STUDY

Construction Traffic Impact

Traffic studies generally do not examine the impact of construction traffic since the effect of any construction traffic will be of much shorter duration than operational traffic. However, since construction traffic will be generated while operational traffic is also being generated, additional traffic analysis to consider the impact of the construction traffic has been performed at Waste Management's request. All of the construction analyses assume that the existing operational traffic to and from the landfill remains at peak August levels.

Construction Trip Generation

Waste Management has estimated that the project will generate 107 construction trucks per day during construction of the expansion. Since construction will typically occur over a minimum of a 10-hour day, there will be an average of 10.7 trucks entering and exiting the facility per hour. For the analysis, to allow for peaking, it was assumed that 14 truck vehicles would enter and exit during the peak hours.

In terms of on-site construction employees, Waste Management has estimated that there will 50 employee cars on-site per day. Not all of these vehicles will arrive and depart in the same hour. The general split for an office building assumes that only 50 % of the employees arrive/depart in the peak hour. For the purpose of this analysis, it was assumed that 35 passenger vehicles (70 %) would arrive and depart within the peak hour.

The 28 construction truck trips, combined with the employee passenger trips, results in 63 projected construction vehicle trips in the peak hours. These 63 trips represent 91 pces for construction traffic. These temporary construction pces, when combined with the peak operational pces since the previous expansion of 91 during the AM peak hour period, total 182. This level of traffic, in the 100 to 200 pce range, would require a minor traffic study for a Traffic Movement Permit from MDOT. This study constitutes that study and includes all information routinely required by the MDOT for a permit for a 100 to 200 pce application.

Since actual construction truck patterns are not yet known, two possible alternative scenarios were evaluated. The first assumes that the 81 daily trucks associated with the delivery of granular borrow to the site are destined to and from the north on Airport Road. The remaining 26 trips, associated with clay and geosynthetic deliveries would use the Route 2 drive. The second alternative evaluated assumes that all trucks use the primary Route 2 drive. The construction trip assignments for the AM and PM peak hours are shown in Figures A-1 through A-4.

Traffic Volumes

The projected construction traffic for the two alternatives is overlayed on the 2004 volumes, as shown in Figures A-5 and A-6. These volumes assume existing operational traffic levels and allow for the projected construction traffic.

Unsignalized Intersection Analysis

The level of service analysis was repeated for two alternative construction traffic routing plans, using "Highway Capacity Software", according to procedures of the 1998 "Highway Capacity Manual". These analyses were performed to assure that both Airport Road and Route 2 has the capacity to accept the construction traffic as well as the operational landfill traffic. The LOS results, with the delay in seconds in parentheses, are summarized as follows:

Intersection of Route 2 and Airport Road
PM Peak Hour Level of Service

Movement	Proj. 2004 Exist. Oper.	Proj. 2004 Const. Alt. 1	Proj. 2004 Const. Alt.2
Airport Road	C (16.5)	C (17.1)	C (17.9)
Left Turns onto Airport Road	A (8.3)	A (8.3	A (8.3)

As can be seen above, there are no capacity concerns at the intersection of Airport Road, under either construction alternative. Airport Road operates at LOS "C" during the PM peak hour period and should continue to operate at this level through 2004, allowing for both background traffic growth and construction traffic.

Intersection of Route 2 and Wilder Hill Road
PM Peak Hour Level of Service

Movement	Proj. 2004 Exist. Oper.	Proj. 2004 Const. Alt. 1	Proj. 2004 Const. Alt. 2
Wilder Hill Road	B (10.6)	B (10.9)	B (11.0)
Left Turns onto Wilder Hill	A (8.0)	A (8.1)	A (8.1)

There are no capacity concerns at the intersection of Wilder Road, which operates at LOS "B" under existing conditions. This same level of service is projected through 2004 under both construction alternatives.

Intersection of Route 2 and Waste Management Drive
PM Peak Hour Level of Service

Movement	Proj. 2004 Exist. Oper.	Proj. 2004 Const. Alt. 1	Proj. 2004 Const. Alt. 2
Exiting Right Turns	B (11.6)	B (11.7)	B (11.9)
Exiting Left Turns	C (19.6)	C (22.8)	C (24.7)
Drive Overall	**C (18.9)**	**C (21.5)**	**C (23.4)**
Left Turns In	A (9.8)	A (9.8)	A (10.0)

As can be seen above, there are no capacity concerns at the Route 2 Waste Management drive intersection. The drive currently operates at LOS "C" and will remain at this level through 2004, allowing for both Route 2 growth and all projected construction traffic.

To summarize, there are no capacity concerns within the vicinity of the landfill. Route 2 has more than adequate capacity to accept the existing operational landfill traffic, as well as the construction traffic, as shown by the analysis results. Airport Road, as shown by the analysis of its intersection with Route 2, also has excess capacity given its low volumes.

Auxiliary Turn Lanes

Auxiliary turn lane warrants for Route 2 at the main drive were re-evaluated with all construction traffic, as well as the operational traffic, for both the AM and PM peak hour periods. Neither a left-turn lane nor a right turn is warranted by the projected peak hour volumes.

Traffic Signals

As previously noted, traffic signal installations are controlled by the warrants in the "Manual on Uniform Traffic Control Devices" (MUTCD), Millennium Edition. The existing and projected traffic volumes, even with consideration of the construction traffic volumes, do not even begin to approach the minimum volume requirements. As a result, no traffic signals are warranted at the study area intersections.

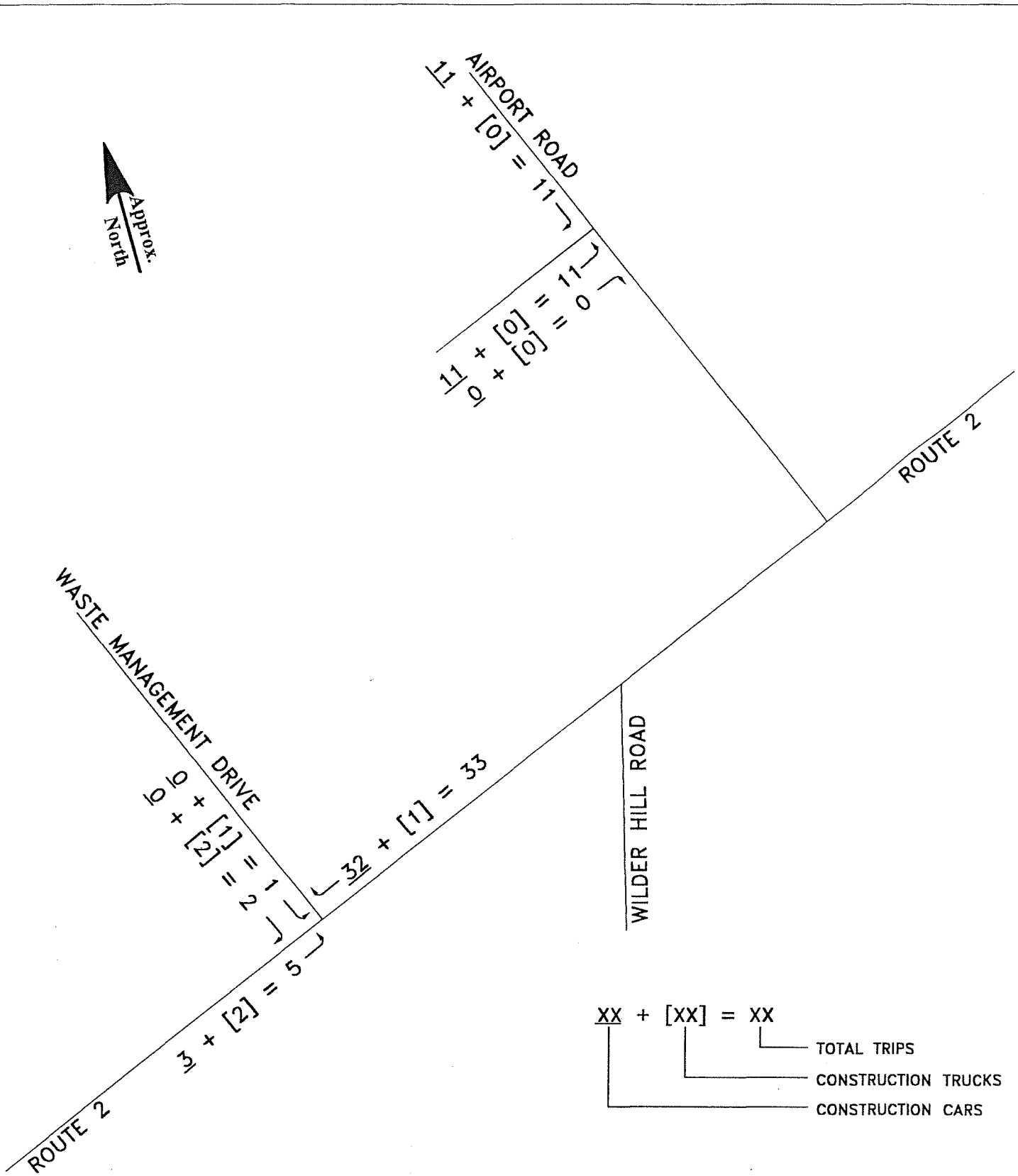


Figure A-1

Norridgewock, Maine	**Casey & Godfrey**
Alternative 1 - A.M. Peak Hour	*Consulting Engineers*
Construction Trip Assignments	**263 Water Street** **Gardiner, Maine 04345** (207) 582-4526

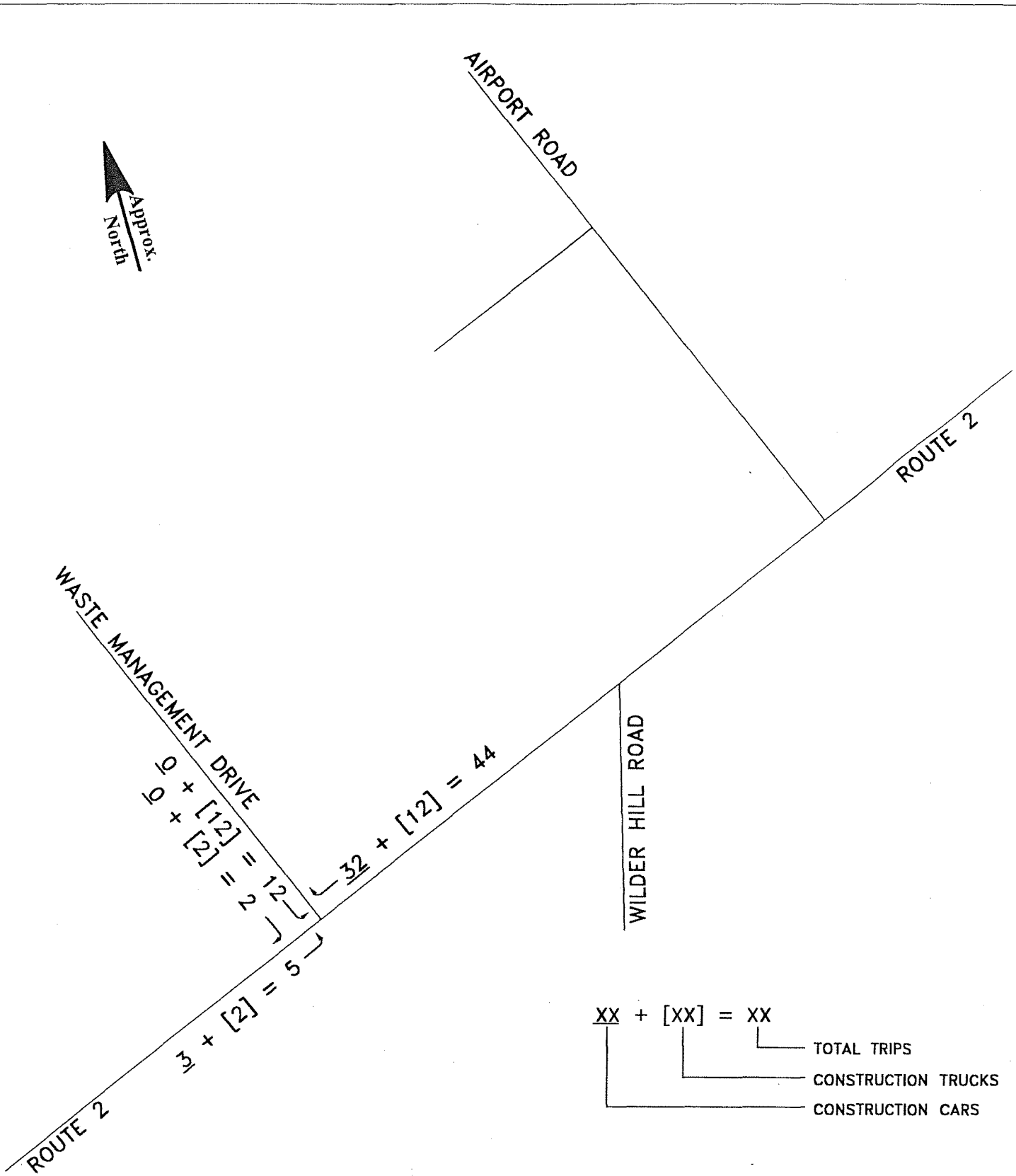


Figure A-2

Norridgewock, Maine	**Casey & Godfrey**
Alternative 2 - A.M. Peak Hour	*Consulting Engineers*
Construction Trip Assignments	**263 Water Street**
	Gardiner, Maine 04345
	(207) 582-4526

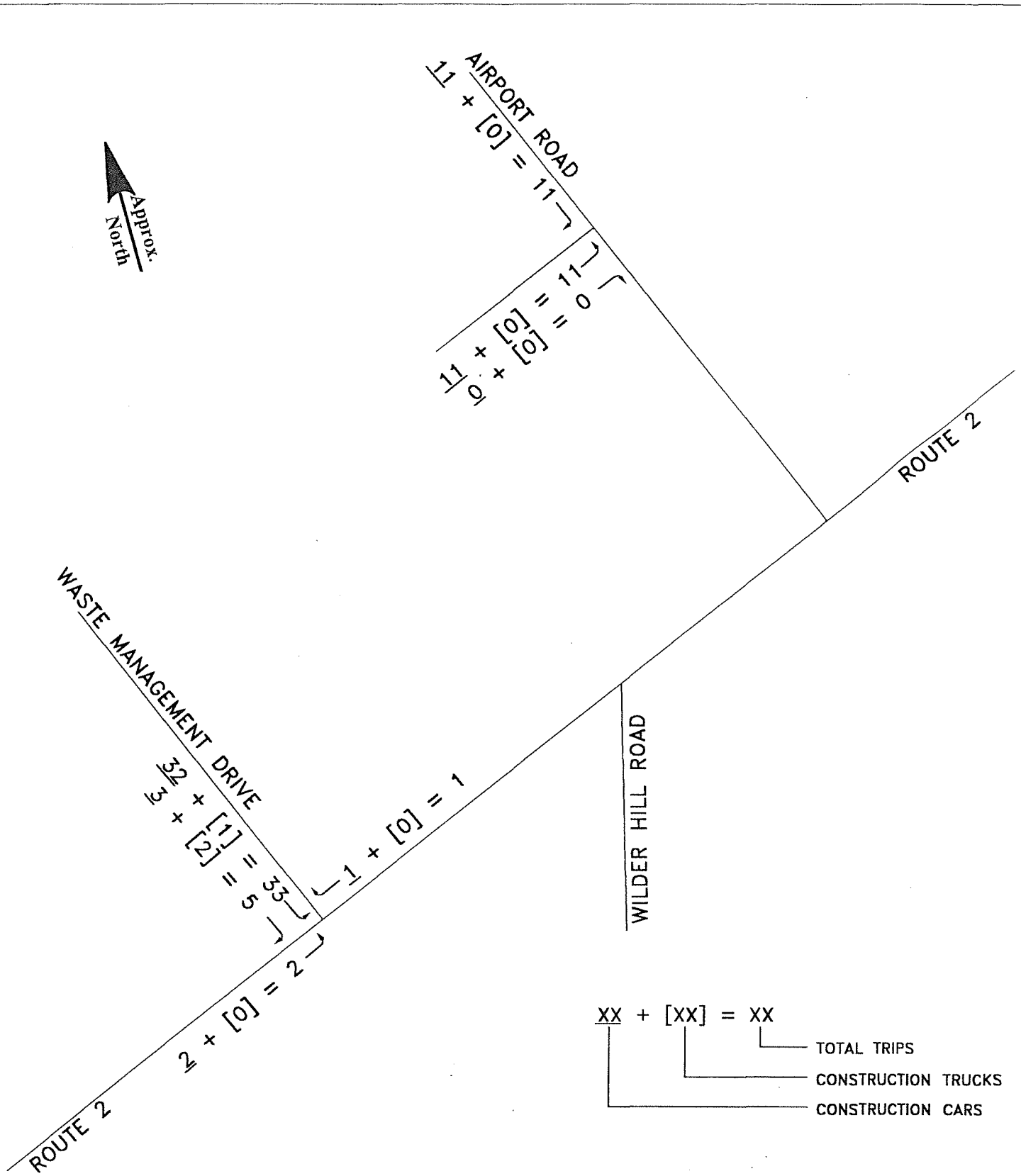


Figure A-3

Norridgewock, Maine	**Casey & Godfrey**
Alternative 1 - P.M. Peak Hour	*Consulting Engineers*
Construction Trip Assignments	**263 Water Street** **Gardiner, Maine 04345** (207) 582-4526

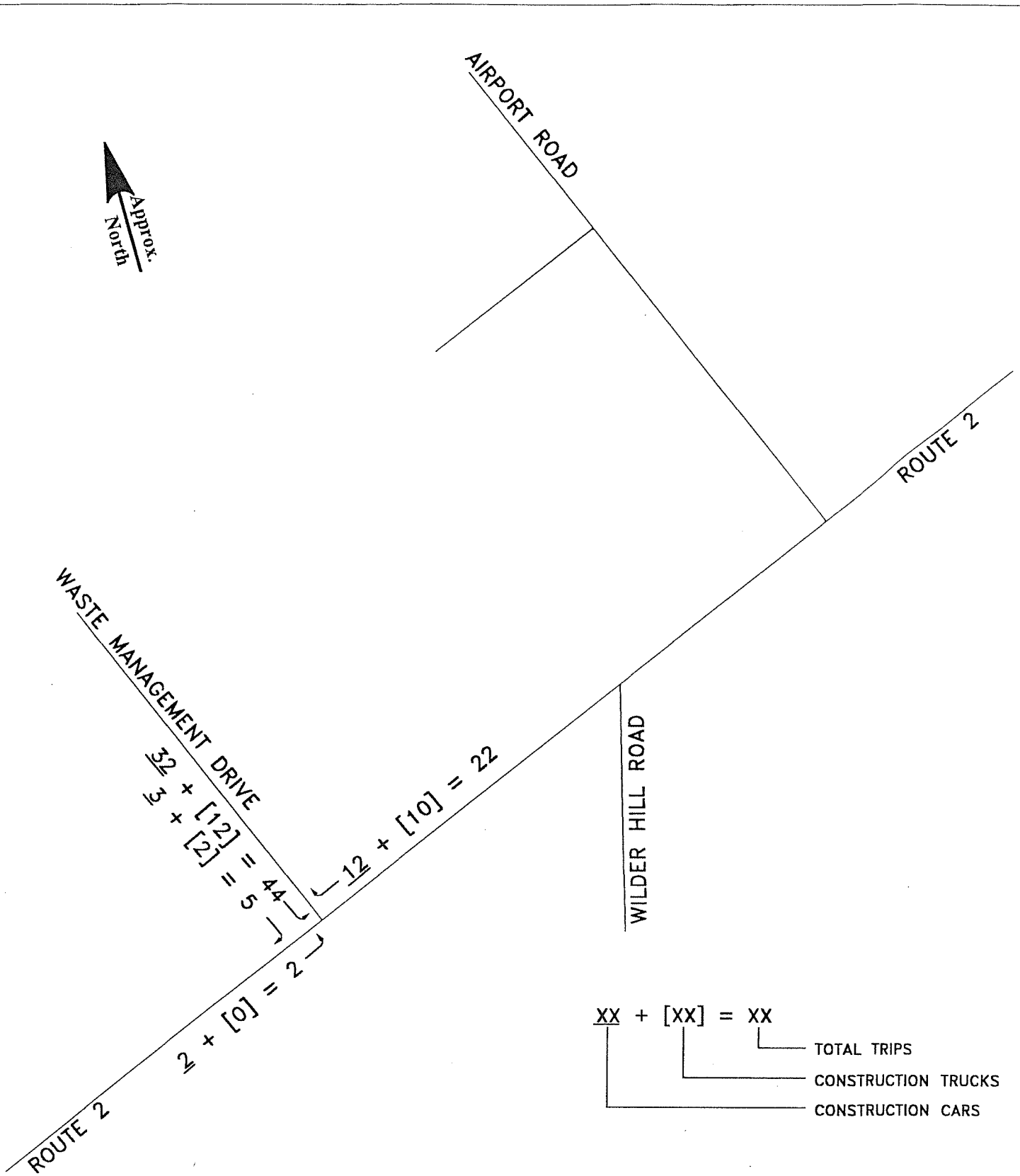


Figure A-4

Norridgewock, Maine

Alternative 2 - P.M. Peak Hour Construction Trip Assignments

Casey & Godfrey
Consulting Engineers
263 Water Street
Gardiner, Maine 04345
(207) 582-4526

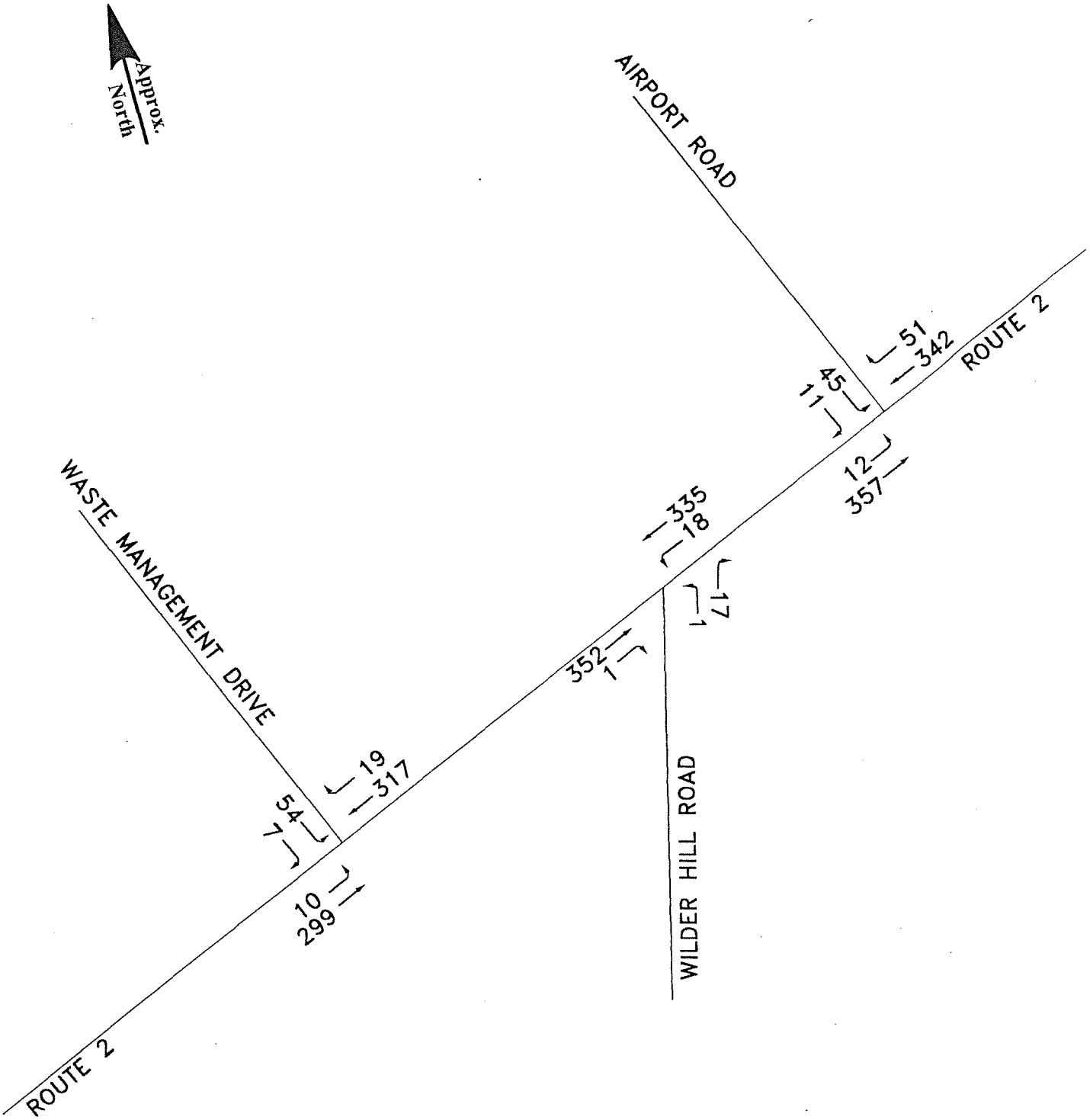


Figure A-5

Alternative 1 - P.M. Peak Hour	**Casey & Godfrey**
Projected 2004 30th Highest Hour	*Consulting Engineers*
w/Oper. & Construction Traffic	**263 Water Street** **Gardiner, Maine 04345** (207) 582-4526

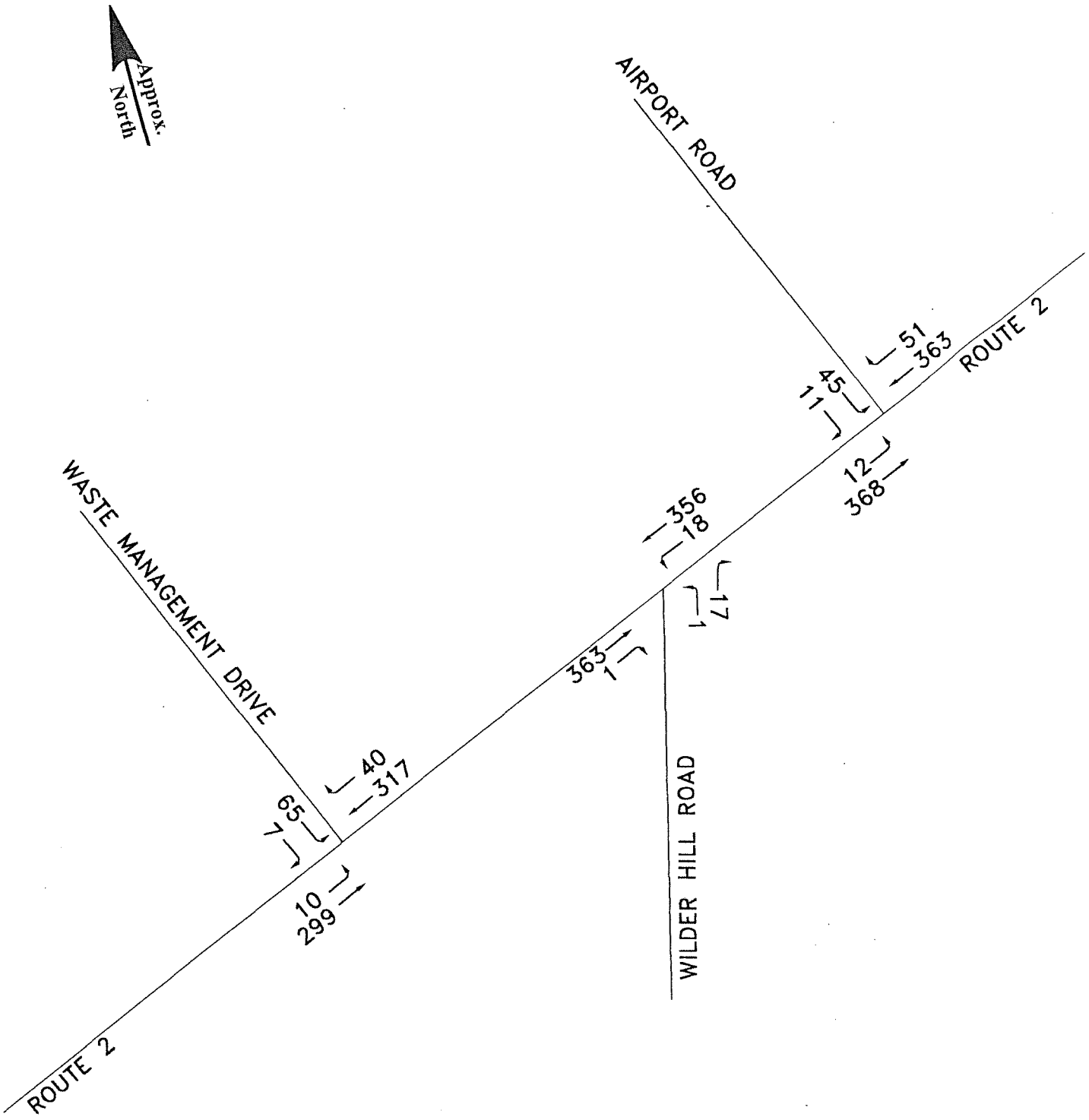


Figure A-6

Alternative 2 - P.M. Peak Hour	**Casey & Godfrey**
Projected 2004 30th Highest Hour	*Consulting Engineers*
w/Oper. & Construction Traffic	**263 Water Street** **Gardiner, Maine 04345** (207) 582-4526

APPENDIX 5B
Maine DOT High Crash Location Data (Norridgewock)

MaineDOT

Maine Public Crash Query Tool

Home | Statistics | Maps | IMPORTANT: User Notes

Advanced User Login

Set Search Criteria

Set Search Criteria

Now that you have created a query and viewed the results, simply modify the search criteria to create a new set of high crash locations.

Step 1: Select a location (i.e. state-wide, city/town, county **OR** a police dept.)

- State-Wide
- City/Town
- County
- Police Dept.

Norridgewock ×

Step 2: Select year range.

2016 ▼ 2019 ▼

Step 3: Select intersections or sections.

- Intersections
- Sections

Step 4: Submit Query. Press the button below to submit your query and view results.

Submit Query

Helpful Tips

Year: 2016 To 2019 City or Town: Norridgewock - Intersections

Print

Location	Total Crashes	Percent Injury	Fatalities	Injuries
Int of HOTEL ST MAIN ST SKOWHEGAN RD WATERVILLE RD	22	22.7	0	5

MaineDOT

Maine Public Crash Query Tool

Home | Statistics | Maps | IMPORTANT: User Notes

Advanced User Login

Set Search Criteria

Set Search Criteria

Now that you have created a query and viewed the results, simply modify the search criteria to create a new set of high crash locations.

Step 1: Select a location (i.e. state-wide, city/town, county **OR** a police dept.)

- State-Wide
- City/Town
- County
- Police Dept.

Norridgewock ×

Step 2: Select year range.

2016 ▼ 2019 ▼

Step 3: Select intersections or sections.

- Intersections
- Sections

Step 4: Submit Query. Press the button below to submit your query and view results.

Submit Query

Helpful Tips

Year: 2016 To 2019 City or Town: Norridgewock - Sections

Print

Location	Total Crashes	Percent Injury	Fatalities	Injuries
44722: Int of BETTERMENT RD UPPER MAIN ST WINDING HILL RD 44737: Non Int UPPER MAIN ST	8	50.0	0	4
46132: Int of BURRILL HILL RD WATERVILLE RD 46604: Int of HOTEL ST MAIN ST SKOWHEGAN RD WATERVILLE RD	20	10.0	0	2
46304: Int of BRIDGE ST MADISON RD RIVER RD SOPHIE MAY LN 44732: Int of MADISON RD WARD HILL RD	10	20.0	0	2

APPENDIX 7A
Bird Control Plan and FAA Notice Forms

STATE OF MAINE
DEPARTMENT OF INLAND FISHERIES AND WILDLIFE

DEPREDATION PERMIT

PERMIT#

REGION D -- 2019-1

ISSUED TO: LAST/FIRST/MI

Waste Management Disposal Services of Maine, INC.
PO Box 629
357 Mercer Road
Norridgewock, ME 04957

TELEPHONE: **207-634-2714**

DATE

EFFECTIVE	EXPIRATION
7/1/2019	**6/30/2020**

RENEWABLE	FEE
[x] **YES** [ ] **NO**	**$0.00**

TYPE OF PERMIT

Permit to kill American Crows at the Crossroads Landfill Facility when active non-lethal management strategies are not sufficiently reducing numbers of crows in the airspace for adjacent Central Maine Airport.

NAME OF PRINCIPAL OFFICER (if business)

Jeffrey A. McGown
District Manager

LOCATION WHERE AUTHORIZED ACTIVITY MAY BE CONDUCTED

Crossroads Landfill, Norridgewock – Somerset County

CONDITIONS OF PERMIT/METHOD OF CONTROL

The Permittee is authorized to kill, using a shotgun with non-toxic shot, up to 100 American Crows, which shall not exceed three (3) crows per day from July 1 – March 31. In addition, lethal control of crows during the breeding season (April 1 to June 30) must only be employed during times of increased crow density and may not exceed the killing of more than 10 crows during the three-month period.

The Permittee may possess up to 30 frozen crow carcasses for avoidance practices during the breeding season. Remaining carcasses must be buried or incinerated.

Actions of this permit are allowed on Sundays.

Only Employees of Permittee can act as agents working under this permit.

REPORTING REQUIREMENTS

Permittee must submit an annual report for animals taken under the permit at the end of the permit duration, in order for the permit to be renewed.

SIGNATURE OF PERMITTEE: (Sign after reading and understanding all requirements and conditions of permit)	TITLE	DATE

SIGNATURE OF ISSUING AGENT	TITLE	DATE
Sarah Boone	Asst. Regional Wildlife Biologist	7/15/2019

STANDARD CONDITIONS

1. This permit and a completed report of all animals taken, killed, or wounded will be presented to the issuing Agent within 10 days of the last effective date of this permit. Mail to: Maine Dept. Inland Fisheries and Wildlife, Wildlife Division, 689 Farmington Rd. Strong, ME 04983.

2. Person(s) exercising rights granted on this permit shall have a signed copy of permit on their person at the time control activities are conducted.

REPORT OF ANIMALS KILLED OR WOUNDED			
DATE	**SPECIES**	**NUMBER OF ANIMAL(S)**	**LOCATION**

DEPREDATION

Permit Number: MB724868-0

Effective: 06/01/2019 Expires: 05/31/2020

Issuing Office:

Department of the Interior
U.S. FISH AND WILDLIFE SERVICE
Migratory Bird Permit Office
300 Westgate Center Drive
Hadley, MA 01035-0779
Tel: 413-253-8643 Fax: 413-253-8424

Acting

CHIEF, MIGRATORY BIRD PERMIT OFFICE - REGION 5

Permittee:

WASTE MANAGEMENT DISPOSAL SERVIES OF MAINE INC - CROSSROADS
P.O. BOX 629
NORRIDGEWOCK, ME 04957
U.S.A.

Name and Title of Principal Officer:
JEFFREY A. MC GOWN - DISTRICT MANAGER

Authority: Statutes and Regulations: 16 USC 703-712; 50 CFR Part 13, 50 CFR 21.41.

Location where authorized activity may be conducted:
CROSSROADS LANDFILL, 357 MERCER ROAD, NORRIDGEWOCK, MAINE

Reporting requirements:
ANNUAL REPORT DUE WITH NEXT RENEWAL or IF NOT RENEWING 30 days after permit expiration even if you had no activity. Forms at: http://www.fws.gov/forms/3-202-9.pdf

Authorizations and Conditions:

A. General conditions set out in Subpart B of 50 CFR 13, and specific conditions contained in Federal regulations cited above, are hereby made a part of this permit. All activities authorized herein must be carried out in accord with and for the purposes described in the application submitted. Continued validity, or renewal of this permit is subject to complete and timely compliance with all applicable conditions, including the filing of all required information and reports.

B. The validity of this permit is also conditioned upon strict observance of all applicable foreign, state, local tribal, or other federal law.

C. Valid for use by permittee named above.

D. Authorized to kill using shotgun with non-toxic shot up to:
(a) ONE-HUNDRED (100) Herring gulls;
(b) SEVENTY-FIVE (75) Ring-billed gulls;
(c) TWENTY-FIVE (25) Turkey vultures;
(d) TWENTY (20) EACH: Great black-backed gulls, Common ravens;
and **MUST** destroy carcasses. Lethal take is not to be the primary means of control. Active hazing, harassment or other non-lethal techniques must continue in conjunction with any lethal take of migratory birds.

State restrictions: In addition to your federal permit, you must obtain a permit from the State of Maine before you take species 1) listed by Maine as endangered or threatened or 2) designated as special concern. All take must be in coordination with and have prior authorization from the Maine Department of Inland Fisheries &Wildlife (Wildlife Division 207-287-5252)

E. The following subpermittees are authorized: Any person who is (1) employed by or under contract to you for the activities specified in this permit, or (2) otherwise designated a subpermittee by you in writing to the Federal permit issuing office, may exercise the authority of this

Permit Number: MB724868-0
Effective: 06/01/2019 Expires: 05/31/2020

permit

F. You and any subpermittees must comply with the attached Standard Conditions for Migratory Bird Depredation Permits. **These standard conditions are a continuation of your permit conditions and must remain with your permit.**

G. Your permit encompasses two calendar years. You are required to report the take associated with each calendar year on separate annual reports. Annual reports can be found at <https://www.fws.gov/forms/3-202-9.pdf>.

H. A "No Feeding Policy" must be in place.

For suspected illegal activity, immediately contact USFWS Law Enforcement at: East Orland, ME 207-469-6842

WASTE MANAGEMENT

CROSSROADS LANDFILL
P.O. Box 629
357 Mercer Road
Norridgewock, ME 04957
207 634 2714
207 634 4519 Fax

April 2, 2019

U.S. Fish & Wildlife Service
Migratory Birds Permits
300 Westgate Center Drive
Hadley, MA 01035-9587

RE: Renewal of Federal Migratory Bird Depredation Permit – MB724868-0

Waste Management Disposal Services of Maine, Inc. (WMDSM) - Crossroads Landfill is seeking approval of its written renewal application for a Federal Migratory Bird Depredation Permit enclosed herein. WMDSM is submitting this written request so that it may continue bird management activities at WMDSM with support from the U.S. Fish and Wildlife Services. A check in the amount $100 is enclosed.

The responses provided below are related to Section C questions provided on the Federal Bird Depredation Permit Renewal application.

1. Species Information: A list of the species of migratory birds contributing to WMDSM's need to depredate and an estimate number of each is included within the Wildlife Services Permit Review Form (Form 37) and the attached Depredation – Annual Report.

2. Location: The location/property where the control activity is performed is at the WMDSM - Crossroads Landfill, 357 Mercer Road, Norridgewock, Maine.

3. Description of damage:

3.(a) WMDSM has not recorded any damage or injuries related to migratory bird activities.

3.(b) Not applicable.

3.(c) Not applicable.

3.(d) WMDSM owns and operates a secure landfill facility, approximately 933 acres, located near the Norridgewock Central Maine Regional Airport, a general aviation airport. WMDSM is proactive in its bird control management activities to prevent a potential bird hazard to aircraft in conjunction with minimizing site vectors.

3.(e) WMDSM has not recorded any property damage or incurred any human injuries related to migratory bird activities. WMDSM owns and operates a secure landfill facility located near

the Norridgewock Central Maine Regional Airport. To address health and safety hazards created by migratory birds, WMDSM is proactive in its bird control management practices to prevent a potential bird hazard to aircraft.

4. Economic Loss: To date, WMDSM has implemented successful bird control measures resulting in essentially negligible damage to our site and no damage to aircraft utilizing the regional airport. As such, there has not been any economic loss or cost of injury. The renewal of this permit will continue to allow us to prevent flocks of seagulls, common ravens, and turkey vultures from inhabiting the site throughout the year. Without the renewal of this permit, seagulls are more likely to roost and feed at our facility. Should this occur, local, State, and Federal authorities may have the ability to close the facility. This would result in substantial monetary loss not only to WMDSM, but also to the surrounding community and consultants/contractors who work at our facility.

5. Nonlethal deterrents tried: WMDSM uses an integrated approach all year-round to manage problematic bird species at its facility and has been doing so for almost three decades. The use of bird lines with reflective ribbon, electronic bird distress equipment, screamer siren cartridges (i.e., pyro-techniques), and effigies are nonlethal methods WMDSM practices at the landfill.

   Bird lines consist of monofilament lines with reflective ribbon spaced along the line. The monofilament line is elevated and strung in a web-like fashion over the active landfill to obstruct seagulls landing patterns and minimize bird population within the landfill.

   Screamer siren cartridges that are exempt from Alcohol, Tobacco, Firearms & Explosives (ATF) regulation are used to make loud noises to help minimize birds from flocking and loafing at our facility.

   Two electronic bird distress devices are located within the active landfilling area and outside the landfill on the perimeter road, closer to the Norridgewock Central Maine Regional Airport. Each device is intending to portray danger and has proved to be effective at deterring seagulls.

   The use of propane cannons and "evil-eye" balloons have been tried in the past as well but have been discontinued due to the noise and ineffectiveness, respectively.

   WMDSM erects and maintains a thirty-five foot tall fence made of netting used to manage wind-blown litter around its active landfills. Concurrently, this fence potentially discourages problematic birds from entering the landfill.

6. Proposed actions:
   For each species you propose to take, list the following:

6.(a) As our last measure, WMDSM proposes to take bird species identified in the license in conjunction with our non-lethal methods to minimize bird species population at WMDSM's Phase 8 landfill.

6.(b) WMDSM will not kill more than the number of birds recommended on Form 37 and as stipulated in our current permit.

6.(c) Not applicable.

6.(d) WMDSM has worked in conjunction with USDA, APHIS, Wildlife Services to trap Starlings using a wood-structure, wire mesh cage mounted on a tow-behind flat trailer. Feed and water were placed in the trap and additional feed was placed on top of the trap to lure birds. Field specialists from USDA manage the Starlings once they are captured.

7. Long-term deterrent measures: WMDSM does not plan to introduce additional long-term or new bird control measures at this time. WMDSM may consider purchasing another bird distress equipment in the future as needed. WMDSM will continue to implement non-lethal deterrents described in response 5 above.

8. Airports: Not applicable.

9. Subpermittees: Not applicable.

10. Form 37: Form 37 is attached.

11. Renewal Letter and Depredation Annual Report: Provided as instructed.

In closing, I respectfully request approval to continue to control gulls, common ravens and turkey vultures from inhabiting the site. Please renew our Federal Migratory Bird Depredation Permit to allow us to minimize the population of these birds at WMDSM.

Thank you very much for your attention to this matter. Should you have any question or concerns, please do not hesitate to contact me.

Sincerely,

John Chessa

Waste Management Disposal Services of Maine, Inc. – Crossroads
John Chessa
Landfill Operations Manager

Cc: Jeff McGown-WMDSM (w/o attachment)
Sherwood McKenney-WMDSM (w/o attachment)

File: 2019 Federal Migratory Bird Depredation Permit

Federal Aviation Administration

« OE / AAA

Project Submission Success
Project Name: WASTE-000537962-19

Project WASTE-000537962-19 has been submitted successfully to the FAA.

Your filing is assigned Aeronautical Study Number (ASN):

2019-ANE-5657-OE
2019-ANE-5658-OE
2019-ANE-5659-OE
2019-ANE-5660-OE
2019-ANE-5661-OE
2019-ANE-5662-OE
2019-ANE-5663-OE
2019-ANE-5664-OE
2019-ANE-5665-OE

Please refer to the assigned ASN on all future inquiries regarding this filing.

Please return to the system at a later date for status updates.

It is the responsibility of each e-filer to exercise due diligence to determine if coordination of the proposed construction or alteration is necessary with their state aviation department. Please use the link below to contact your state aviation department to determine their requirements:
State Aviation Contacts

To ensure e-mail notifications are delivered to your inbox please add noreply@faa.gov to your address book. Notifications sent from this address are system generated FAA e-mails and replies to this address will NOT be read or forwarded for review. Each system generated e-mail will contain specific FAA contact information in the text of the message.

Federal Aviation Administration

« OE / AAA

Notice of Proposed Construction or Alteration - Off Airport

Add a New Case Off Airport - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: WASTE-000537962-19 **Sponsor:** Waste Management Disposal Services of Maine

Details for Case : LF1

Show Project Summary

Case Status

ASN:	2019-ANE-5657-OE	**Date Accepted:**	10/04/2019
Status:	Accepted	**Date Determined:**	
		Letters:	None
		Documents:	None
Public Comments:	None		Project Documents: 10/04/2019 T:\Projects\1910 ... 08/01/2019 T:\Projects\1910 ...

Construction / Alteration Information

Notice Of:	Construction
Duration:	Permanent
if Temporary :	Months: Days:
Work Schedule - Start:	01/01/2025
Work Schedule - End:	12/31/2040

For temporary cranes-Does the permanent structure require separate notice to the FAA? To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed. If it is not filed, please state the reason in the Description of Proposal.

State Filing:	Not filed with State

Structure Summary

Structure Type:	Landfill
Structure Name:	LF1
FDC NOTAM:	
NOTAM Number:	
FCC Number:	
Prior ASN:	

Structure Details

Latitude:	44° 42' 55.79" N
Longitude:	69° 50' 5.44" W
Horizontal Datum:	NAD83
Site Elevation (SE):	296 (nearest foot) PASSED
Structure Height (AGL):	17 (nearest foot)
Current Height (AGL): ** For notice of alteration or existing provide the current AGL height of the existing structure. Include details in the Description of Proposal*	(nearest foot)
Minimum Operating Height (AGL): ** For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.*	(nearest foot)
Requested Marking/Lighting:	None
Other :	
Recommended Marking/Lighting:	
Current Marking/Lighting:	N/A Proposed Structure
Other :	
Nearest City:	Norridgewock
Nearest State:	Maine
Description of Location: *On the Project Summary page upload any certified survey.*	See the attached memo for the location and proposal descriptions
Description of Proposal:	See the attached memo for the location and proposal descriptions

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency (ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit

Previous Back to Search Result Next

Federal Aviation Administration

« OE / AAA

Notice of Proposed Construction or Alteration - Off Airport

Add a New Case Off Airport - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: WASTE-000537962-19 **Sponsor:** Waste Management Disposal Services of Maine

Details for Case : LF2

Show Project Summary

Case Status

ASN:	2019-ANE-5658-OE	**Date Accepted:**	10/04/2019
Status:	Accepted	**Date Determined:**	
		Letters:	None
		Documents:	None
Public Comments:	None		Project Documents: 10/04/2019 T:\Projects\1910 ... 08/01/2019 T:\Projects\1910 ...

Construction / Alteration Information

Notice Of:	Construction
Duration:	Permanent
if Temporary :	Months: Days:
Work Schedule - Start:	01/01/2025
Work Schedule - End:	12/31/2040

For temporary cranes-Does the permanent structure require separate notice to the FAA? To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed. If it is not filed, please state the reason in the Description of Proposal.

State Filing: Not filed with State

Structure Summary

Structure Type:	Landfill
Structure Name:	LF2
FDC NOTAM:	
NOTAM Number:	
FCC Number:	
Prior ASN:	

Structure Details

Latitude:	44° 42' 43.88" N
Longitude:	69° 49' 45.98" W
Horizontal Datum:	NAD83
Site Elevation (SE):	284 (nearest foot) PASSED
Structure Height (AGL):	29 (nearest foot)
Current Height (AGL): ** For notice of alteration or existing provide the current AGL height of the existing structure. Include details in the Description of Proposal*	(nearest foot)
Minimum Operating Height (AGL): ** For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.*	(nearest foot)
Requested Marking/Lighting:	None
Other :	
Recommended Marking/Lighting:	
Current Marking/Lighting:	N/A Proposed Structure
Other :	
Nearest City:	Norridgewock
Nearest State:	Maine
Description of Location: *On the Project Summary page upload any certified survey.*	See the attached memo for the location and proposal descriptions
Description of Proposal:	See the attached memo for the location and proposal descriptions

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency (ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit

← Previous Back to Search Result Next →

Federal Aviation Administration

« OE / AAA

Notice of Proposed Construction or Alteration - Off Airport

Add a New Case Off Airport - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: WASTE-000537962-19 **Sponsor:** Waste Management Disposal Services of Maine

Details for Case : LF3

Show Project Summary

Case Status

ASN:	2019-ANE-5659-OE	**Date Accepted:**	10/04/2019
Status:	Accepted	**Date Determined:**	
		Letters:	None
		Documents:	None
Public Comments:	None		Project Documents: 10/04/2019 T:\Projects\1910 ... 08/01/2019 T:\Projects\1910 ...

Construction / Alteration Information

Notice Of:	Construction
Duration:	Permanent
if Temporary :	Months: Days:
Work Schedule - Start:	01/01/2025
Work Schedule - End:	12/31/2040

For temporary cranes-Does the permanent structure require separate notice to the FAA? To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed. If it is not filed, please state the reason in the Description of Proposal.

State Filing: Not filed with State

Structure Summary

Structure Type:	Landfill
Structure Name:	LF3
FDC NOTAM:	
NOTAM Number:	
FCC Number:	
Prior ASN:	

Structure Details

Latitude:	44° 42' 37.37" N
Longitude:	69° 49' 54.12" W
Horizontal Datum:	NAD83
Site Elevation (SE):	282 (nearest foot) PASSED
Structure Height (AGL):	31 (nearest foot)
Current Height (AGL): ** For notice of alteration or existing provide the current AGL height of the existing structure. Include details in the Description of Proposal*	(nearest foot)
Minimum Operating Height (AGL): ** For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.*	(nearest foot)
Requested Marking/Lighting:	None
Other :	
Recommended Marking/Lighting:	
Current Marking/Lighting:	N/A Proposed Structure
Other :	
Nearest City:	Norridgewock
Nearest State:	Maine
Description of Location: *On the Project Summary page upload any certified survey.*	See the attached memo for the location and proposal descriptions
Description of Proposal:	See the attached memo for the location and proposal descriptions

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency (ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit

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Federal Aviation Administration

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Notice of Proposed Construction or Alteration - Off Airport

Add a New Case Off Airport - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: WASTE-000537962-19 **Sponsor:** Waste Management Disposal Services of Maine

Details for Case : LF4

Show Project Summary

Case Status

ASN:	2019-ANE-5660-OE	**Date Accepted:**	10/04/2019
Status:	Accepted	**Date Determined:**	
		Letters:	None
		Documents:	None
Public Comments:	None		Project Documents: 10/04/2019 T:\Projects\1910 ... 08/01/2019 T:\Projects\1910 ...

Construction / Alteration Information

Notice Of:	Construction
Duration:	Permanent
if Temporary :	Months: Days:
Work Schedule - Start:	01/01/2025
Work Schedule - End:	12/31/2040

For temporary cranes-Does the permanent structure require separate notice to the FAA? To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed. If it is not filed, please state the reason in the Description of Proposal.

State Filing: Not filed with State

Structure Summary

Structure Type:	Landfill
Structure Name:	LF4
FDC NOTAM:	
NOTAM Number:	
FCC Number:	
Prior ASN:	

Structure Details

Latitude:	44° 42' 45.79" N
Longitude:	69° 50' 14.74" W
Horizontal Datum:	NAD83
Site Elevation (SE):	282 (nearest foot) PASSED
Structure Height (AGL):	31 (nearest foot)
Current Height (AGL): ** For notice of alteration or existing provide the current AGL height of the existing structure. Include details in the Description of Proposal*	(nearest foot)
Minimum Operating Height (AGL): ** For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.*	(nearest foot)
Requested Marking/Lighting:	None
Other :	
Recommended Marking/Lighting:	
Current Marking/Lighting:	N/A Proposed Structure
Other :	
Nearest City:	Norridgewock
Nearest State:	Maine
Description of Location: *On the Project Summary page upload any certified survey.*	See the attached memo for the location and proposal descriptions
Description of Proposal:	See the attached memo for the location and proposal descriptions

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency (ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit

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Federal Aviation Administration

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Notice of Proposed Construction or Alteration - Off Airport

Add a New Case Off Airport - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: WASTE-000537962-19 **Sponsor:** Waste Management Disposal Services of Maine

Details for Case : LF5

Show Project Summary

Case Status

ASN:	2019-ANE-5661-OE	**Date Accepted:**	10/04/2019
Status:	Accepted	**Date Determined:**	
		Letters:	None
		Documents:	None
Public Comments:	None		Project Documents: 10/04/2019 T:\Projects\1910 ... 08/01/2019 T:\Projects\1910 ...

Construction / Alteration Information

Notice Of:	Construction
Duration:	Permanent
if Temporary :	Months: Days:
Work Schedule - Start:	01/01/2025
Work Schedule - End:	12/31/2040

For temporary cranes-Does the permanent structure require separate notice to the FAA? To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed. If it is not filed, please state the reason in the Description of Proposal.

State Filing: Not filed with State

Structure Summary

Structure Type:	Landfill
Structure Name:	LF5
FDC NOTAM:	
NOTAM Number:	
FCC Number:	
Prior ASN:	

Structure Details

Latitude:	44° 42' 52.04" N
Longitude:	69° 50' 13.62" W
Horizontal Datum:	NAD83
Site Elevation (SE):	285 (nearest foot) PASSED
Structure Height (AGL):	28 (nearest foot)
Current Height (AGL): ** For notice of alteration or existing provide the current AGL height of the existing structure. Include details in the Description of Proposal*	(nearest foot)
Minimum Operating Height (AGL): ** For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.*	(nearest foot)
Requested Marking/Lighting:	None
Other :	
Recommended Marking/Lighting:	
Current Marking/Lighting:	N/A Proposed Structure
Other :	
Nearest City:	Norridgewock
Nearest State:	Maine
Description of Location: *On the Project Summary page upload any certified survey.*	See the attached memo for the location and proposal descriptions
Description of Proposal:	See the attached memo for the location and proposal descriptions

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency (ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit

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Federal Aviation Administration

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Notice of Proposed Construction or Alteration - Off Airport

Add a New Case Off Airport - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: WASTE-000537962-19 **Sponsor:** Waste Management Disposal Services of Maine

Details for Case : LF6

Show Project Summary

Case Status

ASN:	2019-ANE-5662-OE	**Date Accepted:**	10/04/2019
Status:	Accepted	**Date Determined:**	
		Letters:	None
		Documents:	None
Public Comments:	None		Project Documents: 10/04/2019 T:\Projects\1910 ... 08/01/2019 T:\Projects\1910 ...

Construction / Alteration Information

Notice Of:	Construction
Duration:	Permanent
if Temporary :	Months: Days:
Work Schedule - Start:	01/01/2025
Work Schedule - End:	12/31/2040

For temporary cranes-Does the permanent structure require separate notice to the FAA? To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed. If it is not filed, please state the reason in the Description of Proposal.

State Filing: Not filed with State

Structure Summary

Structure Type:	Landfill
Structure Name:	LF6
FDC NOTAM:	
NOTAM Number:	
FCC Number:	
Prior ASN:	

Structure Details

Latitude:	44° 42' 46.56'' N
Longitude:	69° 50' 1.94'' W
Horizontal Datum:	NAD83
Site Elevation (SE):	290 (nearest foot) PASSED
Structure Height (AGL):	180 (nearest foot)
Current Height (AGL): ** For notice of alteration or existing provide the current AGL height of the existing structure. Include details in the Description of Proposal*	(nearest foot)
Minimum Operating Height (AGL): ** For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.*	(nearest foot)
Requested Marking/Lighting:	None
Other :	
Recommended Marking/Lighting:	
Current Marking/Lighting:	N/A Proposed Structure
Other :	
Nearest City:	Norridgewock
Nearest State:	Maine
Description of Location: *On the Project Summary page upload any certified survey.*	See the attached memo for the location and proposal descriptions
Description of Proposal:	See the attached memo for the location and proposal descriptions

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency (ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit

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Federal Aviation Administration

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Notice of Proposed Construction or Alteration - Off Airport

Add a New Case Off Airport - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: WASTE-000537962-19 **Sponsor:** Waste Management Disposal Services of Maine

Details for Case : LF7

Show Project Summary

Case Status

ASN:	2019-ANE-5663-OE	**Date Accepted:**	10/04/2019
Status:	Accepted	**Date Determined:**	
		Letters:	None
		Documents:	None
Public Comments:	None		Project Documents: 10/04/2019 T:\Projects\1910 ... 08/01/2019 T:\Projects\1910 ...

Construction / Alteration Information

Notice Of:	Construction
Duration:	Permanent
if Temporary :	Months: Days:
Work Schedule - Start:	01/01/2025
Work Schedule - End:	12/31/2040

For temporary cranes-Does the permanent structure require separate notice to the FAA? To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed. If it is not filed, please state the reason in the Description of Proposal.

State Filing: Not filed with State

Structure Summary

Structure Type:	Landfill
Structure Name:	LF7
FDC NOTAM:	
NOTAM Number:	
FCC Number:	
Prior ASN:	

Structure Details

Latitude:	44° 42' 49.29'' N
Longitude:	69° 50' 5.04'' W
Horizontal Datum:	NAD83
Site Elevation (SE):	291 (nearest foot) PASSED
Structure Height (AGL):	169 (nearest foot)
Current Height (AGL): ** For notice of alteration or existing provide the current AGL height of the existing structure. Include details in the Description of Proposal*	(nearest foot)
Minimum Operating Height (AGL): ** For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.*	(nearest foot)
Requested Marking/Lighting:	None
Other :	
Recommended Marking/Lighting:	
Current Marking/Lighting:	N/A Proposed Structure
Other :	
Nearest City:	Norridgewock
Nearest State:	Maine
Description of Location: *On the Project Summary page upload any certified survey.*	See the attached memo for the location and proposal descriptions
Description of Proposal:	See the attached memo for the location and proposal descriptions

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency (ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit

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Federal Aviation Administration

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Notice of Proposed Construction or Alteration - Off Airport

Add a New Case Off Airport - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: WASTE-000537962-19 **Sponsor:** Waste Management Disposal Services of Maine

Details for Case : LF8

Show Project Summary

Case Status

ASN:	2019-ANE-5664-OE	**Date Accepted:**	10/04/2019
Status:	Accepted	**Date Determined:**	
		Letters:	None
		Documents:	None
Public Comments:	None		Project Documents: 10/04/2019 T:\Projects\1910 ... 08/01/2019 T:\Projects\1910 ...

Construction / Alteration Information

Notice Of:	Construction
Duration:	Permanent
if Temporary :	Months: Days:
Work Schedule - Start:	01/01/2025
Work Schedule - End:	12/31/2040

For temporary cranes-Does the permanent structure require separate notice to the FAA? To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed. If it is not filed, please state the reason in the Description of Proposal.

State Filing: Not filed with State

Structure Summary

Structure Type:	Landfill
Structure Name:	LF8
FDC NOTAM:	
NOTAM Number:	
FCC Number:	
Prior ASN:	

Structure Details

Latitude:	44° 42' 43.30" N
Longitude:	69° 49' 54.75" W
Horizontal Datum:	NAD83
Site Elevation (SE):	292 (nearest foot) PASSED
Structure Height (AGL):	168 (nearest foot)
Current Height (AGL): ** For notice of alteration or existing provide the current AGL height of the existing structure. Include details in the Description of Proposal*	(nearest foot)
Minimum Operating Height (AGL): ** For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.*	(nearest foot)
Requested Marking/Lighting:	None
Other :	
Recommended Marking/Lighting:	
Current Marking/Lighting:	N/A Proposed Structure
Other :	
Nearest City:	Norridgewock
Nearest State:	Maine
Description of Location: *On the Project Summary page upload any certified survey.*	See the attached memo for the location and proposal descriptions
Description of Proposal:	See the attached memo for the location and proposal descriptions

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency (ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit

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Federal Aviation Administration

« OE / AAA

Notice of Proposed Construction or Alteration - Off Airport

Add a New Case Off Airport - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: WASTE-000537962-19 **Sponsor:** Waste Management Disposal Services of Maine

Details for Case : LF9

Show Project Summary

Case Status

ASN:	2019-ANE-5665-OE	**Date Accepted:**	10/04/2019
Status:	Accepted	**Date Determined:**	
		Letters:	None
		Documents:	None
Public Comments:	None		Project Documents: 10/04/2019 T:\Projects\1910 ... 08/01/2019 T:\Projects\1910 ...

Construction / Alteration Information

Notice Of:	Construction
Duration:	Permanent
if Temporary :	Months: Days:
Work Schedule - Start:	01/01/2025
Work Schedule - End:	12/31/2040

For temporary cranes-Does the permanent structure require separate notice to the FAA? To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed. If it is not filed, please state the reason in the Description of Proposal.

State Filing:	Not filed with State

Structure Summary

Structure Type:	Landfill
Structure Name:	LF9
FDC NOTAM:	
NOTAM Number:	
FCC Number:	
Prior ASN:	

Structure Details

Latitude:	44° 42' 47.64" N
Longitude:	69° 50' 6.92" W
Horizontal Datum:	NAD83
Site Elevation (SE):	286 (nearest foot) PASSED
Structure Height (AGL):	174 (nearest foot)
Current Height (AGL): **** For notice of alteration or existing provide the current AGL height of the existing structure. Include details in the Description of Proposal***	(nearest foot)
Minimum Operating Height (AGL): **** For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.***	(nearest foot)
Requested Marking / Lighting:	None
Other :	
Recommended Marking / Lighting:	
Current Marking / Lighting:	N/A Proposed Structure
Other :	
Nearest City:	Norridgewock
Nearest State:	Maine
Description of Location: ***On the Project Summary page upload any certified survey.***	See the attached memo for the location and proposal descriptions
Description of Proposal:	See the attached memo for the location and proposal descriptions

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency (ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit

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APPENDIX 7B
Preservation of Historical Sites

MAINE HISTORIC PRESERVATION COMMISSION
55 CAPITOL STREET
65 STATE HOUSE STATION
AUGUSTA, MAINE
04333

JANET T. MILLS
GOVERNOR

KIRK F. MOHNEY
DIRECTOR

June 18, 2019

Ms. Jamie O'Brien
Normandeau Associates
25 Nashua Road
Bedford, NH 03110

Project: MHPC #0822-19 Crossroads Landfill Phase 14 Expansion
Proposed Landfill Expansion

Town: Norridgewock, ME

Dear Ms. O'Brien:

In response to your recent request, I have reviewed the information received June 13, 2019 to initiate consultation on the above referenced project in accordance with the requirements of the Maine Department of Environmental Protection.

Based on the information submitted, I have concluded that there will be no historic properties (archaeological or architectural) affected by the proposed undertaking, as defined by Section 106 of the National Historic Preservation Act.

Please contact Megan Rideout at (207) 287-2992 or megan.m.rideout@maine.gov if we can be of further assistance in this matter.

Sincerely,

Kirk F. Mohney
State Historic Preservation Officer

PHONE: (207) 287-2132 FAX: (207) 287-2335

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS

Memorandum

Friday, September 06, 2019

TO: Youngmin Cho, PhD, PE, Geosyntec Consultants, Inc.
FROM: William McCloy, Normandeau Associates, Inc.
SUBJECT: Summary of Maine Tribal Communications for Phase 14 Project

---

Normandeau Associates, Inc. (Normandeau) mailed "Requests for Project Review and Comment" letters with an accompanying site location map to Tribal Historic Preservation Officers (THPOs) via the United States Postal Service (USPS) in April 2019. Contact information for each of the five THPOs within Maine was obtained from Appendix E of the Department of the Army General Permit for the State of Maine[1]. Table 1 summarizes the notifications and responses that Normandeau has received to date. Note that not all of the THPOs have responded; however none have lands in close proximity to the Project site based on available information. See Attachment 1 for a copy of correspondence to date.

Table 1. Summary of Tribal Correspondence

THPO Contact Information	**Response Details**
THPO & Environmental Planner *Houlton Band of Maliseet Indians* 88 Bell Road Littleton, Maine 04730 (207) 532-4273, x215 (phone) (207) 532-6883 (fax) envplanner@maliseets.com ogs1@maliseets.com	Susan Young Responded via Email on April 8, 2019 THPO "…does not have an immediate concern with project or project site…"
THPO *Aroostook Band of Micmacs* 7 Northern Road Presque Isle, Maine 04769 (207) 764-1972 (phone); (207) 764-7667 (fax) jpictou@micmac-nsn.gov	No response to date

[1] Department of the Army General Permit for the State of Maine. Valid October 13, 2015 through October 13, 2020. Accessed online at: https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/Maine-General-Permit/. Date accessed: September 6, 2019.

THPO Contact Information	Response Details
THPO *Passamaquoddy Tribe of Indians* Indian Township Reservation P.O. Box 301 Princeton, Maine 04668 (207) 796-2301 (phone) (207) 796-5256 (fax); soctomah@gmail.com	No response to date
THPO *Passamaquoddy Tribe of Indians* Pleasant Point Reservation P.O. Box 343 Perry, Maine 04667 (207) 853-2600 (phone); (207) 853-6039 (fax) *soctomah@gmail.com*	No response to date
THPO *Penobscot Nation* Cultural and Historic Preservation Dept. 12 Wabanaki Way Indian Island, Maine 04468 (207) 817-7471 (phone) chris.sockalexis@penobscotnation.org	Chris Sockalexis responded "This project appears to have no impact on a structure or site of historic, architectural or archaeological significance to the Penobscot Nation as defined by the National Historic Preservation Act of 1966, as amended."

Attachment 1.

Tribal Correspondence Letters and Responses To Date

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS

April 1, 2019

Susan Young, THPO
Natural Resources Director
Houlton Band of Maliseets
88 Bell Road
Littleton, ME 04730

Re: Request for Project Review and Comment
Waste Management Disposal Services of Maine, Inc. – Crossroads Landfill (WMDSM)
Proposed Landfill Expansion
Norridgewock, Maine

Dear Ms. Young:

Normandeau Associated, Inc. (Normandeau), on behalf of Waste Management Disposal Services of Maine, Inc. (WMDSM), is respectfully requesting your review and comment, as necessary, regarding WMDSM's proposed landfill expansion at their existing Crossroads Landfill in the Town of Norridgewock, Somerset County, Maine. A site location map is attached to depict the location of the proposed project.

WMDSM is proposing to construct Phase 14 on approximately 50 acres to expand the capacity at the existing landfill. Phase 14 will be located east of the current landfill facilities on land that is contiguous to the existing facility. It will be bordered by WMDSM property and Clark's property to the north, Airport Road to the east, WMDSM property to the south, and Frederick Property to the west.

Please review and comment regarding potential effects to your tribal lands and interests.

It would be appreciated if you would respond within 10 business days. If it would be easier for you to reply via e-mail, I can be reached at sallen@normandeau.com. Thank you for your time and consideration.

Sincerely,

Sarah Allen

Sarah Allen
Normandeau Associates, Inc.
25 Nashua Road
Bedford, NH 03110

Attach. 1: Site Location Map

From: Sue Young
To: Sarah Allen
Subject: Crossroads Landfill, Norridgewock, ME
Date: Monday, April 8, 2019 2:51:23 PM
Attachments: image001.jpg

Ms. Allen,

We do not have an immediate concern with your project or project site, and do not currently have the resources to fully investigate same. Should any human remains, archaelogical properties or other items of historical importance be unearthed while working on this project, we recommend that you stop your project and report your findings to the appropriate authorities including the Houlton Band of Maliseet Indians.

Please submit all future requests/permit applications to my attention via fax or email to the number or email address below. Thank you.

<><><><><><><><><><><>

Susan Young

Tribal Historic Preservation Officer
Natural Resources Director
Houlton Band of Maliseet Indians
88 Bell Road
Littleton, ME 04730
207-532-4273 ext. 202
fax 207-532-6883

ogs1@maliseets.com
www.maliseets.com

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS

April 1, 2019

Jennifer Pictou, THPO
Aroostook Band of Micmac Indians
7 Northern Road
Presque Isle, ME 04769

Re: Request for Project Review and Comment
Waste Management Disposal Services of Maine, Inc. – Crossroads Landfill (WMDSM)
Proposed Landfill Expansion
Norridgewock, Maine

Dear Ms. Pictou:

Normandeau Associated, Inc. (Normandeau), on behalf of Waste Management Disposal Services of Maine, Inc. (WMDSM), is respectfully requesting your review and comment, as necessary, regarding WMDSM's proposed landfill expansion at their existing Crossroads Landfill in the Town of Norridgewock, Somerset County, Maine. A site location map is attached to depict the location of the proposed project.

WMDSM is proposing to construct Phase 14 on approximately 50 acres to expand the capacity at the existing landfill. Phase 14 will be located east of the current landfill facilities on land that is contiguous to the existing facility. It will be bordered by WMDSM property and Clark's property to the north, Airport Road to the east, WMDSM property to the south, and Frederick Property to the west.

Please review and comment regarding potential effects to your tribal lands and interests.

It would be appreciated if you would respond within 10 business days. If it would be easier for you to reply via e-mail, I can be reached at sallen@normandeau.com. Thank you for your time and consideration.

Sincerely,

Sarah Allen

Sarah Allen
Normandeau Associates, Inc.
25 Nashua Road
Bedford, NH 03110

Attach. 1: Site Location Map

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS

April 1, 2019

Donald Soctomah, THPO
Passamaquoddy Tribe of Indians
Indian Township Reservation
PO Box 301
Princeton, ME 04668

Re: Request for Project Review and Comment
Waste Management Disposal Services of Maine, Inc. – Crossroads Landfill (WMDSM)
Proposed Landfill Expansion
Norridgewock, Maine

Dear Mr. Soctomah:

Normandeau Associated, Inc. (Normandeau), on behalf of Waste Management Disposal Services of Maine, Inc. (WMDSM), is respectfully requesting your review and comment, as necessary, regarding WMDSM's proposed landfill expansion at their existing Crossroads Landfill in the Town of Norridgewock, Somerset County, Maine. A site location map is attached to depict the location of the proposed project.

WMDSM is proposing to construct Phase 14 on approximately 50 acres to expand the capacity at the existing landfill. Phase 14 will be located east of the current landfill facilities on land that is contiguous to the existing facility. It will be bordered by WMDSM property and Clark's property to the north, Airport Road to the east, WMDSM property to the south, and Frederick Property to the west.

Please review and comment regarding potential effects to your tribal lands and interests.

It would be appreciated if you would respond within 10 business days. If it would be easier for you to reply via e-mail, I can be reached at sallen@normandeau.com. Thank you for your time and consideration.

Sincerely,

Sarah Allen

Sarah Allen
Normandeau Associates, Inc.
25 Nashua Road
Bedford, NH 03110

Attach. 1: Site Location Map

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS

April 1, 2019

Donald Soctomah, THPO
Passamaquoddy Tribe of Indians
Pleasant Point Reservation
PO Box 343
Perry, ME 04667

Re: Request for Project Review and Comment
Waste Management Disposal Services of Maine, Inc. – Crossroads Landfill (WMDSM)
Proposed Landfill Expansion
Norridgewock, Maine

Dear Mr. Soctomah:

Normandeau Associated, Inc. (Normandeau), on behalf of Waste Management Disposal Services of Maine, Inc. (WMDSM), is respectfully requesting your review and comment, as necessary, regarding WMDSM's proposed landfill expansion at their existing Crossroads Landfill in the Town of Norridgewock, Somerset County, Maine. A site location map is attached to depict the location of the proposed project.

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Please review and comment regarding potential effects to your tribal lands and interests.

It would be appreciated if you would respond within 10 business days. If it would be easier for you to reply via e-mail, I can be reached at sallen@normandeau.com. Thank you for your time and consideration.

Sincerely,

Sarah Allen

Sarah Allen
Normandeau Associates, Inc.
25 Nashua Road
Bedford, NH 03110

Attach. 1: Site Location Map

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS

April 1, 2019

Christopher Sockalexis, THPO
Cultural & Historic Preservation Department
12 Wabanaki Way
Indian Island, ME 04468

Re: Request for Project Review and Comment
Waste Management Disposal Services of Maine, Inc. – Crossroads Landfill (WMDSM)
Proposed Landfill Expansion
Norridgewock, Maine

Dear Mr. Sockalexis:

Normandeau Associated, Inc. (Normandeau), on behalf of Waste Management Disposal Services of Maine, Inc. (WMDSM), is respectfully requesting your review and comment, as necessary, regarding WMDSM's proposed landfill expansion at their existing Crossroads Landfill in the Town of Norridgewock, Somerset County, Maine. A site location map is attached to depict the location of the proposed project.

WMDSM is proposing to construct Phase 14 on approximately 50 acres to expand the capacity at the existing landfill. Phase 14 will be located east of the current landfill facilities on land that is contiguous to the existing facility. It will be bordered by WMDSM property and Clark's property to the north, Airport Road to the east, WMDSM property to the south, and Frederick Property to the west.

Please review and comment regarding potential effects to your tribal lands and interests.

It would be appreciated if you would respond within 10 business days. If it would be easier for you to reply via e-mail, I can be reached at sallen@normandeau.com. Thank you for your time and consideration.

Sincerely,

Sarah Allen

Sarah Allen
Normandeau Associates, Inc.
25 Nashua Road
Bedford, NH 03110

Attach. 1: Site Location Map

PENOBSCOT NATION
CULTURAL & HISTORIC PRESERVATION
12 WABANAKI WAY, INDIAN ISLAND, ME 04468

CHRIS SOCKALEXIS – TRIBAL HISTORIC PRESERVATION OFFICER
E-MAIL: chris.sockalexis@penobscotnation.org

NAME	Sarah Allen
ADDRESS	Normandeau Associates, Inc. 25 Nashua Road Bedford, NH 03110
OWNER'S NAME	Waste Management Disposal Services of Maine, Inc.
TELEPHONE	(603) 472-5191
EMAIL	sallen@narmandeau.com
PROJECT NAME	Crossroads Landfill Expansion Project
PROJECT SITE	Norridgewock, ME
DATE OF REQUEST	April 1, 2019
DATE REVIEWED	April 18, 2019

Thank you for the opportunity to comment on the above referenced project. This project appears to have no impact on a structure or site of historic, architectural or archaeological significance to the Penobscot Nation as defined by the National Historic Preservation Act of 1966, as amended.

If Native American cultural materials are encountered during the course of the project, please contact my office at (207) 817-7471. Thank you for consulting with the Penobscot Nation Tribal Historic Preservation Office with this project.

Chris Sockalexis, THPO
Penobscot Nation

APPENDIX 7C
Phase 14 Visual Impact Assessment Report

Geosyntec consultants

engineers | scientists | innovators

WASTE MANAGEMENT

PHASE 14 SOLID WASTE PERMIT APPLICATION

VISUAL IMPACT ASSESSMENT REPORT

Crossroads Landfill

Norridgewock, Maine

Prepared for

Waste Management Disposal Services of Maine, Inc.

357 Mercer Road
Norridgewock, Maine

Prepared by

Geosyntec Consultants, Inc.
125 Community Drive, Suite 202
Augusta, Maine 04330

Project BE0232

October 2019

TABLE OF CONTENTS

LIST OF FIGURES

1. INTRODUCTION

This assessment on the visual impact of the proposed Phase 14 landfill at the Crossroads Landfill (Crossroads) was prepared for WMDSM by Geosyntec Consultants (Geosyntec). The assessment is submitted as part of the Phase 14 Solid Waste Permit Application in partial fulfillment of the requirements of Chapter 400, Section 4.F(1)(c) of the Maine Solid Waste Management Rules (Maine SWMR, revisions effective 6 April 2015) which states "*the landfill facility may not unreasonably interfere with views from established public viewing areas*" and Chapter 400, Section 4.F(3) of the Maine SWMR states "*Application must include evidence that affirmatively demonstrates that the proposed solid waste facility will not unreasonably adversely affect existing uses and scenic character, including the following information: (a) the nature, location, design, and site of all buffers and visual screens within those buffers to be established or retained*" Previous visual impact studies for Crossroads (Mitchell, 1996[1] and Geosyntec, 2001[2]) are referenced for general site data, with specific information from the previous reports used herein that as it is directly relevant to the proposed location and elevations of the Phase 14 landfill.

As shown in Figure 1, the Crossroads facility is located on approximately 721 acres of land adjacent to, and northwest of, Route 2 (aka Mercer Road) in the Town of Norridgewock, Somerset County, Maine. The northeast and north portions of the Crossroads property abut Airport Road, the western portion abuts property owned by the Central Maine Regional Airport, and the property extends south to Fredericks Corner Road. Access to the facility is provided by a paved access road extending northward from Route 2.

Development of Phase 14 will include construction of approximately 48.6 acres of new liner system, placement of waste over a period of approximately 17 years to a final elevation of approximately 470 ft North American Vertical Datum of 1988 (NAVD88). Daily cover and intermediate cover soil, and a vegetated final cover system will be placed incrementally over the waste as final grades of the landfill are achieved in accordance with the Maine Solid Waste Management Regulations (SWMRs). As shown in Figure 1, the elevation of the surrounding roads and properties adjacent to the site ranges from approximately 220 to 320 ft NAVD88. The final height of the landfill will therefore be approximately 150 to 250 ft relative to the surrounding areas.

The visual assessment of the Phase 14 development consists of: (i) a regional study area to address distant views from hills in or near Norridgewock, and (ii) a local study area to address views from roads surrounding the site. The remainder of this report is organized as follows:

- Section 2 describes the regional visual assessment of the proposed Phase 14 landfill, including regional site study area, regional landforms, vegetation, and land use;

[1] Mitchell and Associates, "Special Waste Landfill Expansion, Phases 9, 11, 12, Visual Impact Assessment", prepared for Waste Management Disposal Services of Maine, Inc., Crossroads Landfill, Norridgewock, Maine, April 1996.
[2] Geosyntec, "Visual Impact Simulation, Phase 8 Expansion Project, Crossroads Landfill," prepared for Waste Management Disposal Services of Maine, Inc., Norridgewock, Maine, January 2001.

- Section 3 describes the local visual assessment of the proposed Phase 14 landfill, including visual characteristics of landfills, a visual simulation, and the projected visibility of the landfill; and
- Section 4 presents conclusions of this study.

2. REGIONAL VISUAL ASSESSMENT

2.1 Study Area

A regional study area with a radius of three miles from the site was used by Mitchell (1996) and Geosyntec (2001) and is likewise used in this study (Figure 2). Although the theoretical limit of visibility of a 25-foot high black object on white background is 33 miles, actual field conditions do not have such a stark contrast in shape, color, and texture. Actual field conditions incorporate various landforms, colors, vegetation, and textures. As reported by Mitchell (1996) and Geosyntec (2001), based on field observations performed on a moderately clear day for the previous visual impact study by Mitchell (1996), houses and barns that were approximately two miles away were not recognizable. As a result, it is concluded that a three-mile radius study area is conservatively appropriate for a comprehensive regional visual assessment.

2.2 Study Area Characteristics

The characteristics of the regional study area may be considered in terms of landform, vegetation, and land use. Each of these features contribute to the regional visual characteristics of the site. For example, in order to interfere with views from an established public viewing area, a location must have a combination of landform (i.e., height to see the site), lack of vegetation (i.e., sightlines are not blocked by existing or future vegetation), and established land use (i.e., the location is sensitive to visual changes). These criteria are discussed below.

Landform

The study area for the landfill facility consists of a rural landscape that is dominated by rolling topography. The Kennebec River, which passes through the town of Norridgewock, is the regional topographic low at approximately elevation 180 ft msl, and Mt. Tom, which is located to the south approximately 3.5 miles is the regional topographic high at elevation 740 ft msl. The study area contains a variety of landform features, such as hills and valleys that affect viewpoints, fields of vision, and recognition of objects in the landscape. These regional features are identified on Figure 2.

Vegetation

Vegetation is a key element that affects the visual impact of landfill development. In particular, current or future vegetation may serve to block or screen sightlines to the site from potential viewing areas (based on landform). The region has a mix of deciduous and evergreen tress that create a landscape pattern of open and forested land areas. Information on current site and regional vegetation was obtained based on field observations and aerial photographs that were taken in 2015 and 2018 (Figures 3 and 4).

As indicated on the figures, open landscape occurs in limited areas primarily along roads, and forested areas occur over a majority of the site. These forested areas that surround the perimeter of the site offer varied mix of vegetative types and maturity of trees and provide both an effective screen and a buffer for the landfill. In general, open fields represent areas where distant views are

possible; wooded areas block or screen distant views. Note that distant views must be considered in terms of landform (i.e., areas with distant views do not necessarily correspond to areas from which the site is visible).

Land Use

The final criterion for visual impact is the current land use from locations where the site is visible both from a landform and vegetation perspective. The sensitivity of visual change with respect to land use is dependent on the current uses of the land. Of highest sensitivity are views from existing residences because of the duration of the views. Of secondary sensitivity are views from current public roadways and viewing areas because although views are short in duration, the number of viewers over a period of time could be large. Finally, of least sensitivity are views from open agricultural land because both the number of viewers and the duration of the views are minimal.

The location of open landscape and forested areas in the study area can be identified on Figure 3 or Figure 4. Also identified on Figure 3 are residences in the study area, which form a random pattern along the regional roads. Land is generally cleared in the close proximity to some of the residences and is wooded in many other areas. Other land uses in the area are open agricultural land and woodlots.

2.3 Regional Visual Assessment

The regional setting around the Norridgewock area has not changed appreciably for many years, and as such, the methods and results of the regional study performed and approved by the Maine Department of Environmental Protection (MEDEP) during the permitting of Phases 9, 11, and 12, and Phase 8 at the Crossroads facility (Mitchell, 1996 and Geosyntec, 2001) are still valid for and directly applicable to the Phase 14 development. As reported by Mitchell (1996), predominant high points within four miles of the site (i.e., up to one mile beyond the regional study area) include Oak Hill, Wilder Hill, Mt. Tom, Ross Hill, Dodling Hill, and Burrill Hill (Figure 2). Of these regional topographic high points, public access (i.e., roads) is only available on Oak Hill, Wilder Hill, and Burrill Hill. However, as reported by Mitchell (1996), views of the landfill from these locations were consistently blocked by vegetation. This is still the case, and as such, the Phase 14 landfill is not expected to adversely impact regional views.

3. LOCAL VISUAL ASSESSMENT

3.1 Study Area

The local visual assessment is described in this section. The extent of the local visual assessment area was based on an analysis of the Phase 14 development sequence, current site topography, current site vegetation, and current views from surrounding roads.

As shown in Figure 1, the distance from the Phase 14 boundary is approximately 3000 ft (0.57 miles) south to Route 2; 880 ft (0.17 miles) east to Airport Road; 5720 ft (1.08 miles) west to the nearest runway of the Central Maine Regional Airport; and 4200 ft (0.80 miles) southwest to Fredricks Corner Road. The Phase 14 landfill will be filled to a final elevation of approximately 470 ft NAVD88, followed promptly by construction of a vegetated final cover system in accordance with the Maine SWMRs. As shown on Figure 1, the elevation of the surrounding roads and properties adjacent to the site ranges from approximately 220 to 320 ft NAVD88. The final height of the landfill will therefore be approximately 150 to 250 ft relative to the surrounding areas.

3.2 Visual Characteristics of Phase 14 Development

Development of Phase 14 will include construction of approximately 48.6 acres of new liner system, placement of waste over a period of approximately 17 years to approximately elevation 470 feet, and final closure of the site. Phase 14 will be developed incrementally in five cells (Phase 14A through Phase 14E) during which time portions of the site will be under construction, or being filled with waste, or covered with a final cover system. Accordingly, development of the site can be organized into three periods: (i) construction period; (ii) operations period; and (iii) post-closure period. Although these periods will overlap incrementally for the Phase 14A through 14E cells, the visual characteristics during these periods will be different, as described below.

Construction Period

The first phase of operations will include construction of the landfill cells. Activity associated with construction of landfill cells will be at or below the current ground-level and therefore will be completely screened by surrounding vegetation. As a result, the cell construction activities will not unreasonably interfere with views from surrounding roads.

Operations Period

The active operations period of the landfill will involve filling and compaction of the waste in Phase 14, during which time the elevation of the landfill will gradually increase as waste is placed. At the end of each operational day, the waste placed during that day will be covered with daily cover materials consisting of soils or alternate daily cover materials (i.e., tarps, etc.). Areas that are inactive for periods generally longer than 3 months will be covered with an interim geomembrane cover (temporary tarp).

Since waste placement in Phase 14 will begin at the liner elevation (approximately elevation 275 to 295 ft NAVD88), the majority of the waste-filling operations will be at or below the existing

level of trees and vegetation that occupy the large setbacks from surrounding areas. Therefore, during much of the time required to fill the landfill, visibility of the landfill from surrounding locations will not be possible. As the elevation of the landfill increases, the top of the landfill above the surrounding tree line may become more visible from some locations; however, this will occur only during the final approximately five years of filling, and the visible area of active operations will decrease as the peak elevation of the landfill is reached.

Post-Closure Period

The landfill cover system will be seeded and fully vegetated to resemble the character of an open field or grassy hill such that, although the landfill may be potentially visible from discrete vantage points, it will be visually compatible in terms of texture and color with the open landscape areas that surround the facility. The method and findings of visual simulations of the landfill at the final peak elevation are described below.

Geosyntec used a 3-dimentional (3D) modeling software AutoDesk® InfraWorks® in combination with photographs obtained at several roadside locations around the facility and aerial images using Google Maps and the National Agriculture Imagery Program (NAIP) to perform the visual simulation of Phase 14. The locations of photographs obtained from the modeled vantage points are shown on Figure 4. After traversing the perimeter roads several times, these locations were selected as the vantage points from which Phase 14 is most likely to be visible based on the combination of ground elevation, setback distance, and vegetation. Then, 3D modeling graphics were developed from these locations to simulate views of Phase 14 once it is filled to the peak elevation. The 3D simulation models and comparison to the existing views from the five vantage points are presented in Figures 5 through 9. Inspection of these figures reveals that Phase 14 will be largely obscured or completely concealed from the surrounding boundaries because of the combination of setback distances, ground elevations, and vegetation. Notwithstanding, the Phase 14 landfill may be visible from discrete vantage points during the final period of operation (specifically, Vantage Points 1, 2, and 5 as it is approaching its final height during the last 5± years of filling). A vegetated final cover system will be placed incrementally over the waste, such that shortly after reaching the peak, the landfill will be closed and completely vegetated in accordance with the Maine SWMRs.

It should be noted that much of the vegetation surrounding Phase 14 is expected to continue growing and providing additional visual screening over the many years during which Phase 14 is filled and eventually closed. (It is noted that future vegetation growth has not been illustrated in the 3D visual modeling conducted and shown in Figures 5 through 9.) In areas where additional or supplemental visual screening will be beneficial, WMDSM has the ability to construct and maintain visual barrier berms with planted trees on top, similar to the nearly 900 linear feet of visual barrier berms WMDSM has constructed along Route 2 to the east of the site main entrance (see Figure 10).

4. CONCLUSIONS

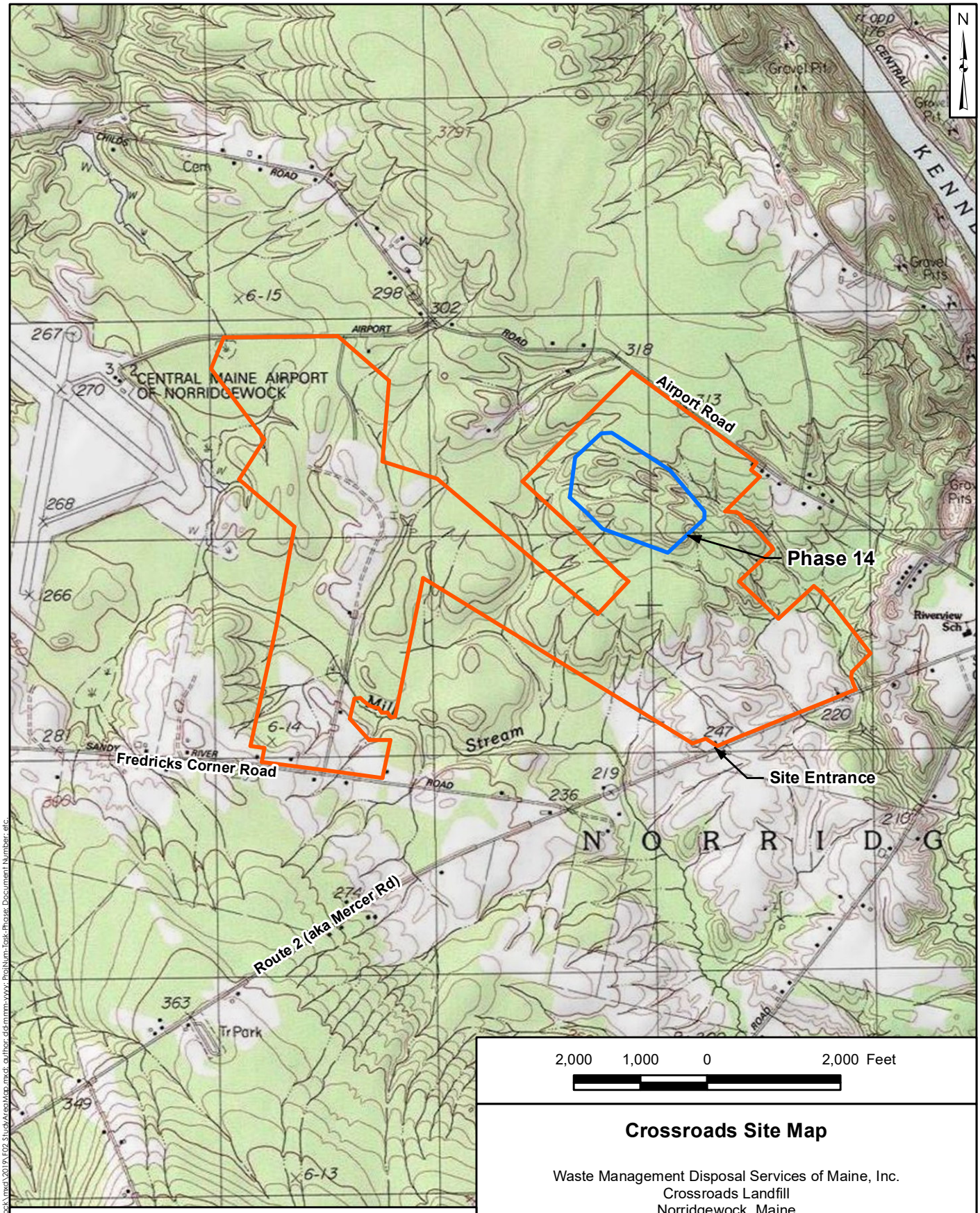
Based on the analyses and visual simulations presented in this report, the Phase 14 landfill will not have an adverse effect on current scenic character of the Norridgewock area. During the majority of filling operations of the landfill, the color and texture of the landfill will be either black or dark earth cover, which will be effectively screened by surrounding vegetation. The potential visual impact of the Phase 14 landfill will be limited to a relatively short duration as the landfill reaches its final stage of filling. Incrementally, during this period, the landfill will be covered with a vegetated final cover system, which will be compatible with the surrounding areas and will look like a natural landform. As a result, the Phase 14 landfill will not unreasonably interfere with views from surrounding areas and established public viewing vantage points. Visibility of the landfill from nearby vantage points will be largely obscured by the large setback distances and existing vegetation, much of which will continue to grow in height and fill out as the site is developed.

5. REFERENCES

Geosyntec, "Visual Impact Simulation, Phase 8 Expansion Project, Crossroads Landfill," prepared for Waste Management Disposal Services of Maine, Inc., Norridgewock, Maine, January 2001.

Mitchell and Associates, "Special Waste Landfill Expansion, Phases 9, 11, 12, Visual Impact Assessment", prepared for Waste Management Disposal Services of Maine, Inc., Crossroads Landfill, Norridgewock, Maine, April 1996.

FIGURES



Legend

WMDSM Facility Site Boundary

Source: USGS Norridgewock 7.5 Minute Quadrangle, 2018.

Crossroads Site Map

Waste Management Disposal Services of Maine, Inc.
Crossroads Landfill
Norridgewock, Maine

Geosyntec consultants

Acton, Massachusetts | October 2019

Figure 1

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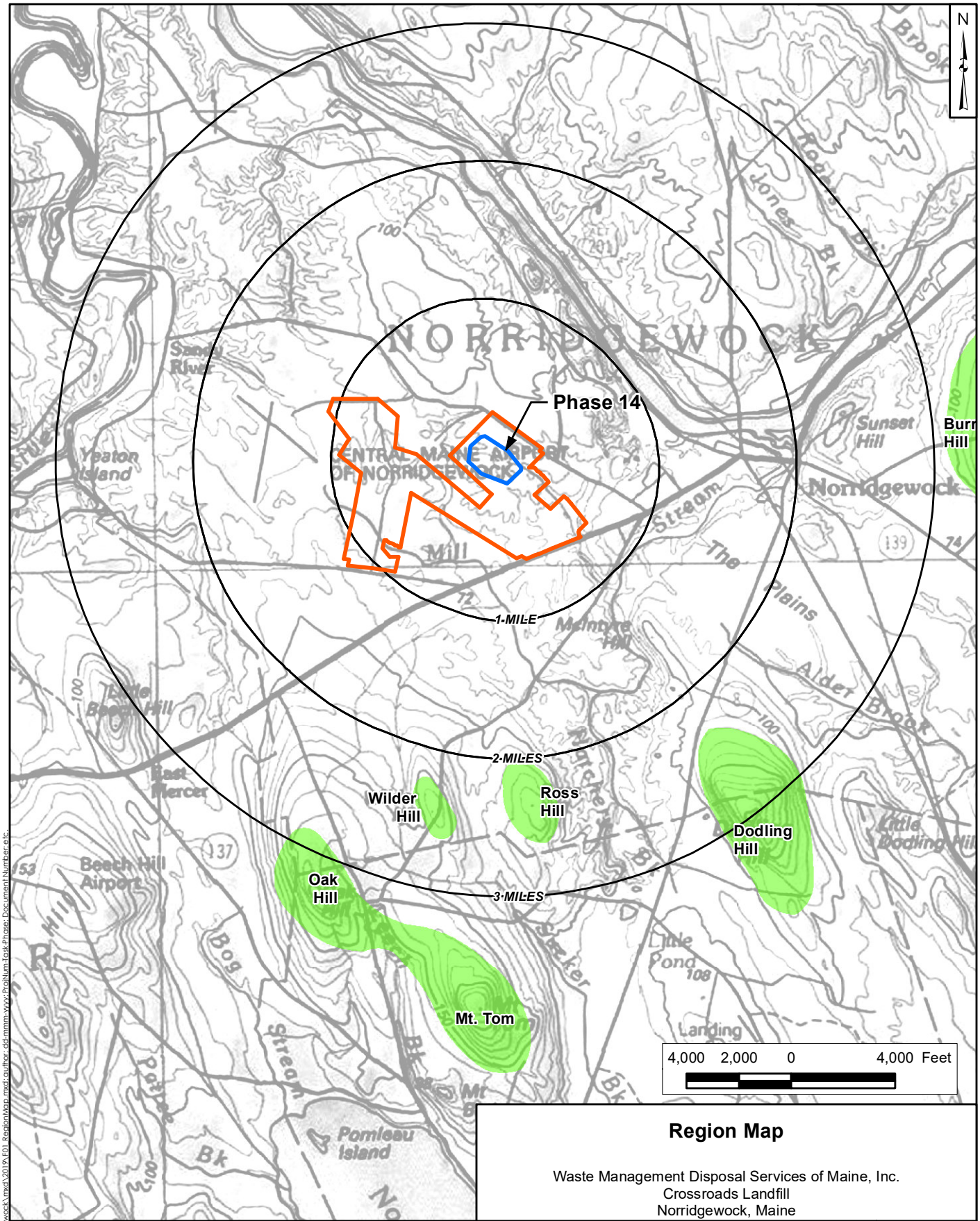

Region Map

Waste Management Disposal Services of Maine, Inc.
Crossroads Landfill
Norridgewock, Maine

Legend

WMDSM Facility Site Boundary

Source: USGS Norridgewock 7.5 Minute Quadrangle, 2018.

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Figure 2

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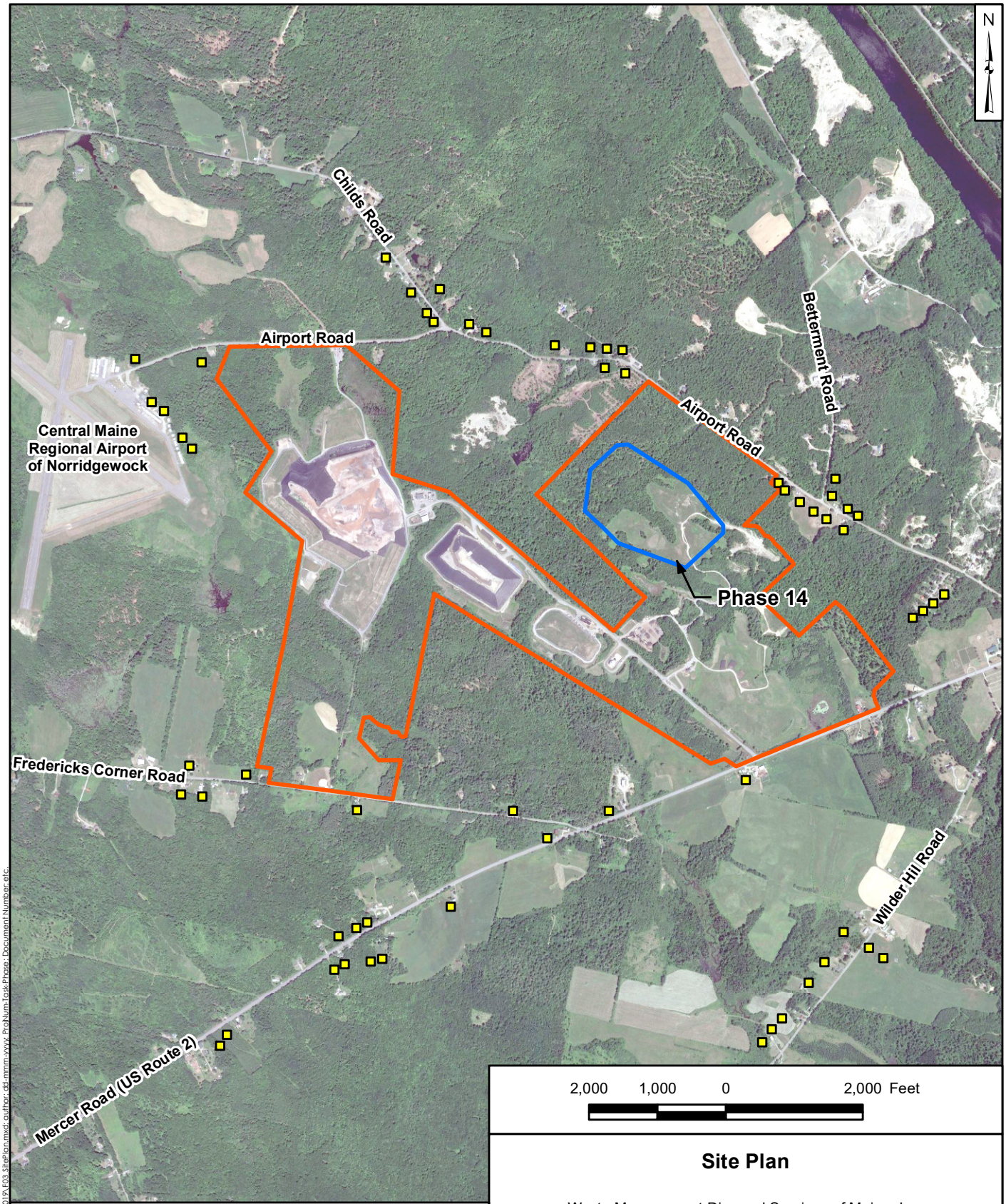

2,000 1,000 0 2,000 Feet

Legend

- Residential/Structures
- WMDSM Facility Site Boundary

Aerial Image Source: Google, 2018.

Site Plan

Waste Management Disposal Services of Maine, Inc.
Crossroads Landfill
Norridgewock, Maine

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Acton, Massachusetts | October 2019

Figure 3

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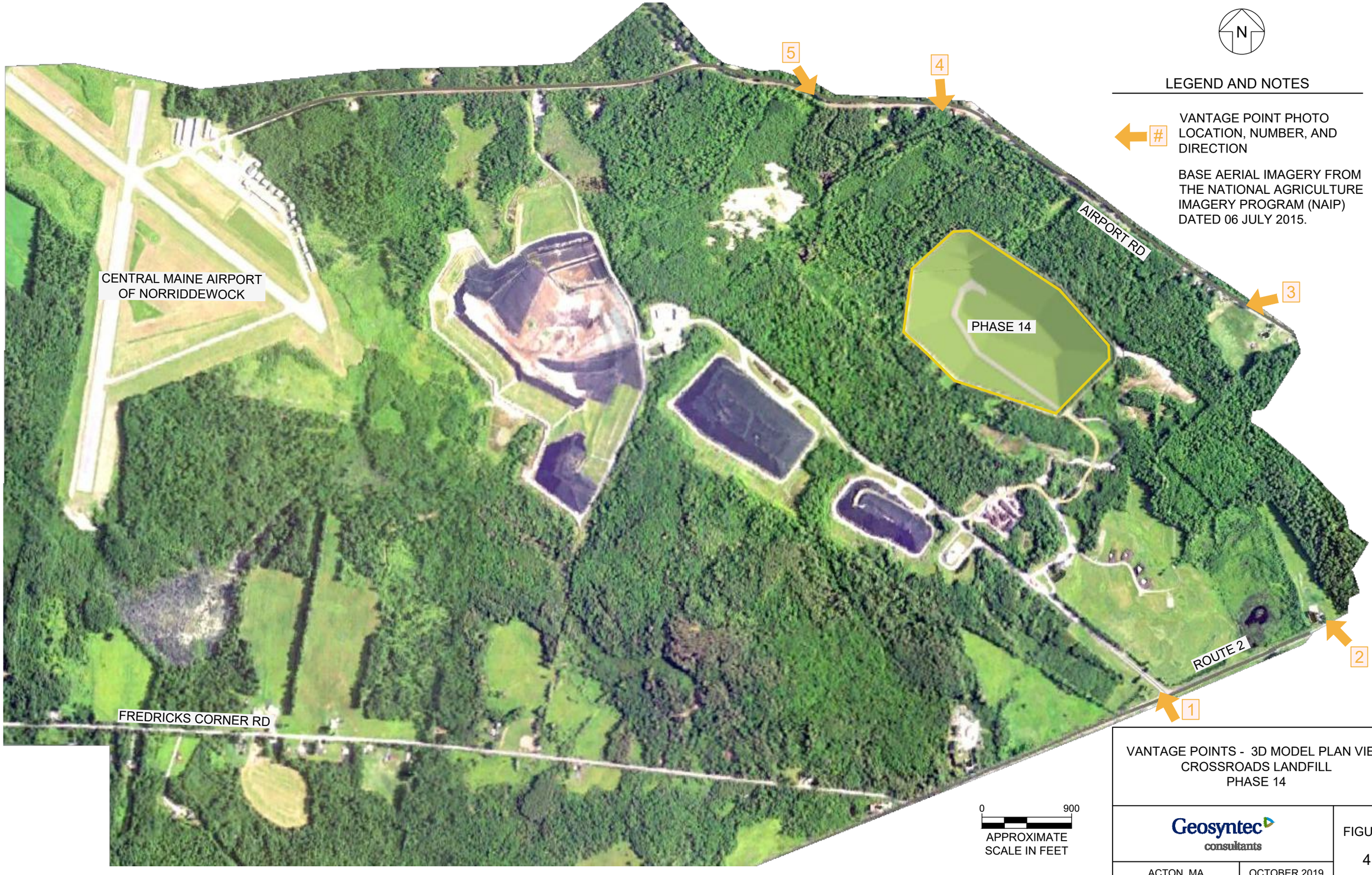


N

LEGEND AND NOTES

VANTAGE POINT PHOTO LOCATION, NUMBER, AND DIRECTION

BASE AERIAL IMAGERY FROM THE NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) DATED 06 JULY 2015.

0 900

APPROXIMATE SCALE IN FEET

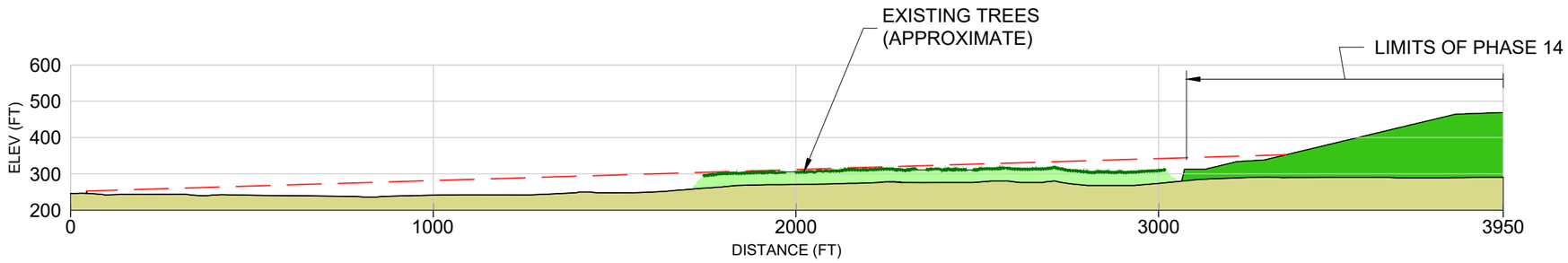
VANTAGE POINTS - 3D MODEL PLAN VIEW
CROSSROADS LANDFILL
PHASE 14

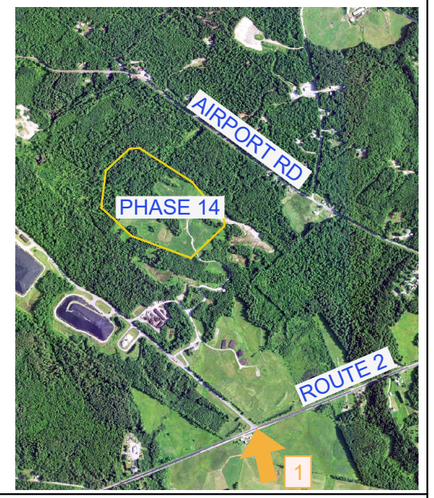
Geosyntec consultants

ACTON, MA | OCTOBER 2019

FIGURE 4

P:\CAD\PROJECTS\CROSSROADS LANDFILL\PERMIT\PHASE 14 (ME1752A.02)\FIGURES\ME1752AF05 - Last Saved by: JJVail on 10/17/19





LEGEND AND NOTES

1 VANTAGE POINT LOCATION, NUMBER, AND VIEWING DIRECTION

AERIAL PHOTO FROM THE NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) DATED 06 JULY 2015.

PHOTOGRAPH OF EXISTING CONDITIONS FROM GOOGLE MAPS -STREET VIEW

3D MODEL VIEW FROM
VANTAGE POINT LOCATION #1
CROSSROADS LANDFILL
PHASE 14

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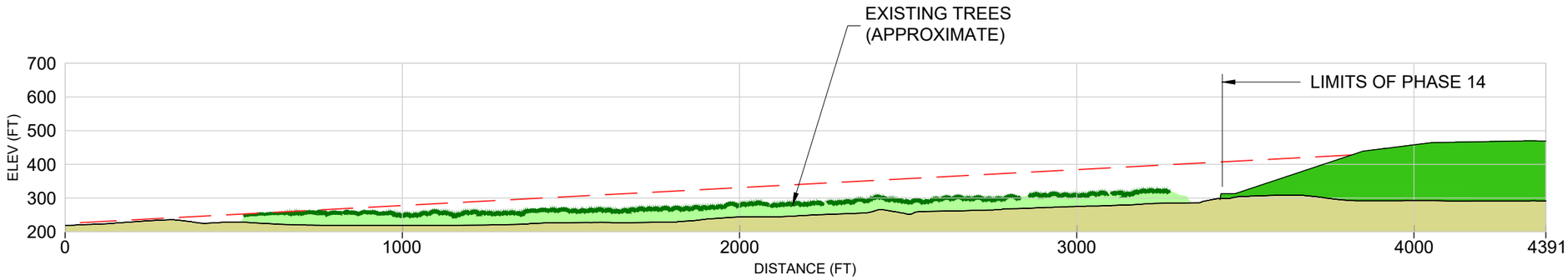
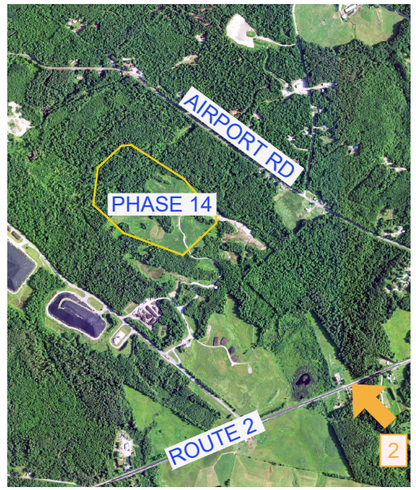
FIGURE 5

P:\CAD\PROJECTS\CROSSROADS LANDFILL\PERMIT\PHASE 14 (ME1752A.02)\FIGURES\ME1752AF06 - Last Saved by: JJVail on 10/17/19





LEGEND AND NOTES

2 VANTAGE POINT LOCATION, NUMBER, AND VIEWING DIRECTION

AERIAL PHOTO FROM THE NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) DATED 06 JULY 2015.

PHOTOGRAPH OF EXISTING CONDITIONS FROM GOOGLE MAPS -STREET VIEW

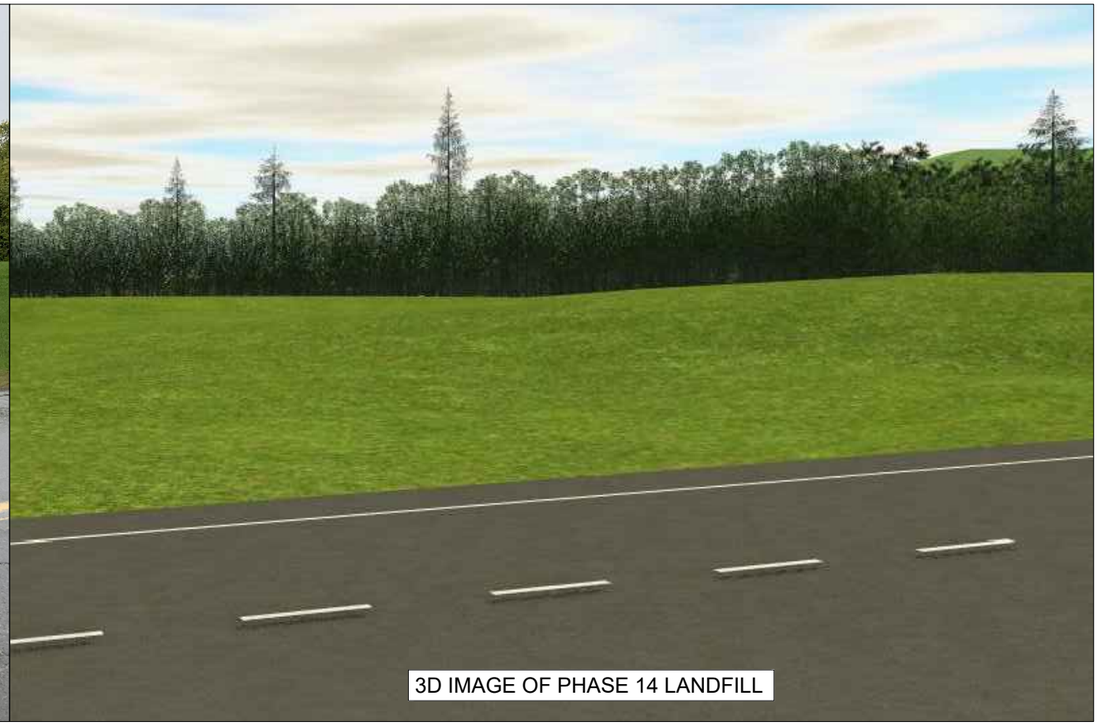
3D MODEL VIEW FROM
VANTAGE POINT LOCATION #2
CROSSROADS LANDFILL
PHASE 14

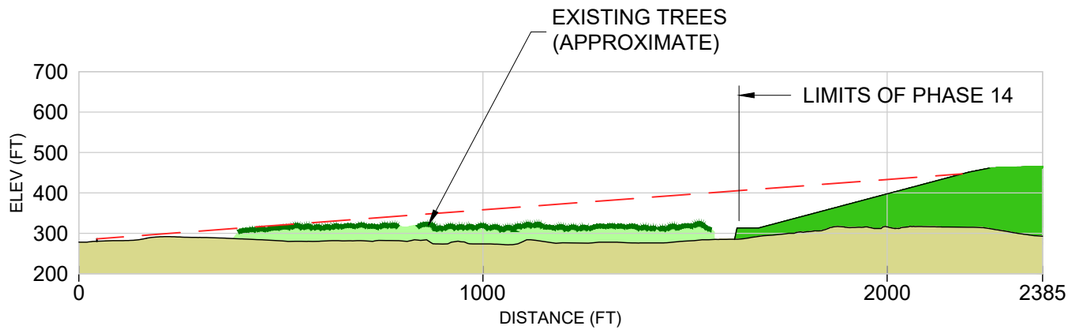
Geosyntec consultants

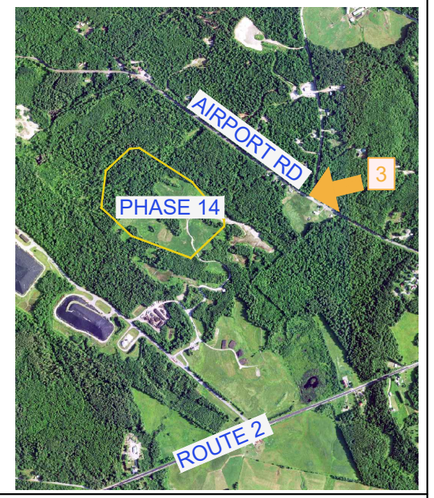
ACTON, MA | OCTOBER 2019

FIGURE
6

P:\CAD\PROJECTS\CROSSROADS LANDFILL\PERMIT\PHASE 14 (ME1732A.02)\FIGURES\ME1752AF07 - Last Saved by: JJVail on 10/17/19







LEGEND AND NOTES

3 VANTAGE POINT LOCATION, NUMBER, AND VIEWING DIRECTION

AERIAL PHOTO FROM THE NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) DATED 06 JULY 2015.

PHOTOGRAPH OF EXISTING CONDITIONS FROM GOOGLE MAPS -STREET VIEW

3D MODEL VIEW FROM
VANTAGE POINT LOCATION #3
CROSSROADS LANDFILL
PHASE 14

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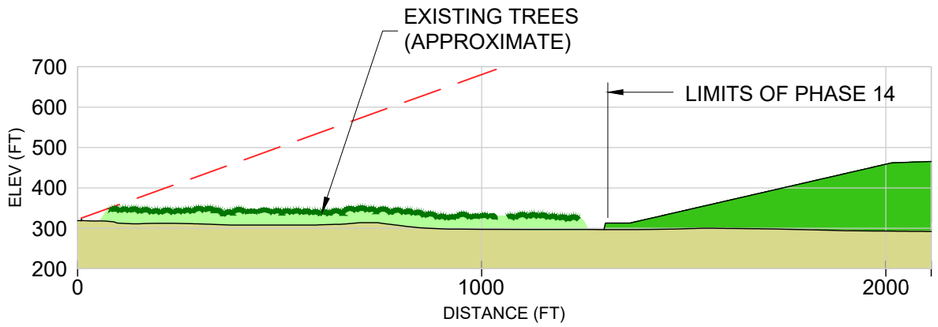
ACTON, MA | OCTOBER 2019

FIGURE 7

P:\CAD\PROJECTS\CROSSROADS LANDFILL\PERMIT PHASE 14 (ME1752A.02)\FIGURES\ME1752AF08 - Last Saved by: JJVail on 10/17/19

PHOTOGRAPH OF EXISTING CONDITIONS

3D IMAGE OF PHASE 14 LANDFILL



LEGEND AND NOTES

4 VANTAGE POINT LOCATION, NUMBER, AND VIEWING DIRECTION

AERIAL PHOTO FROM THE NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) DATED 06 JULY 2015.

PHOTOGRAPH OF EXISTING CONDITIONS FROM GOOGLE MAPS -STREET VIEW

3D MODEL VIEW FROM
VANTAGE POINT LOCATION #4
CROSSROADS LANDFILL
PHASE 14

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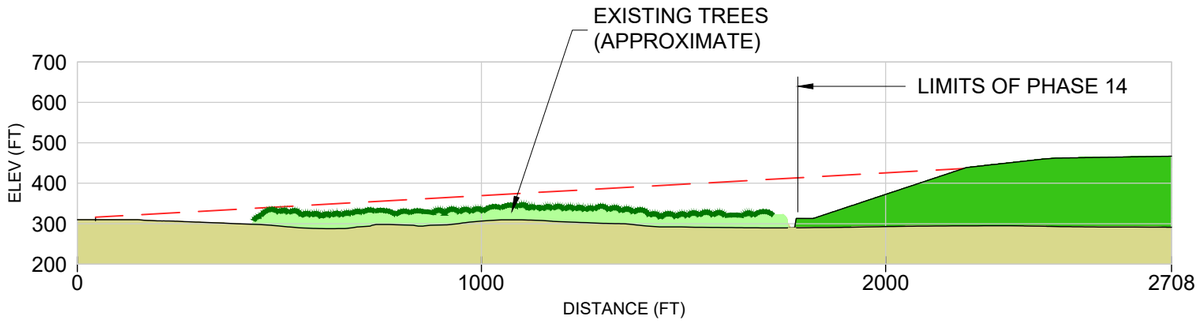
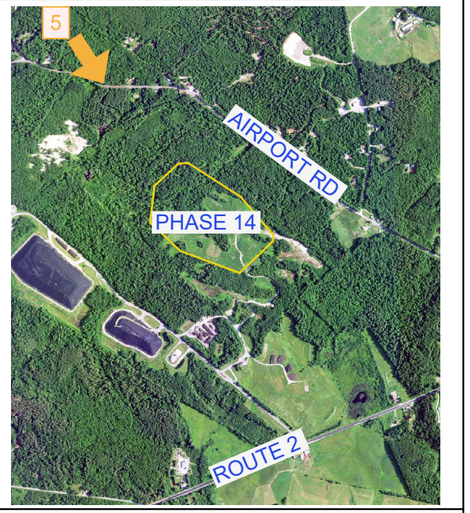
FIGURE
8

PHOTOGRAPH OF EXISTING CONDITIONS

3D IMAGE OF PHASE 14 LANDFILL





LEGEND AND NOTES

5 VANTAGE POINT LOCATION, NUMBER, AND VIEWING DIRECTION

AERIAL PHOTO FROM THE NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) DATED 06 JULY 2015.

PHOTOGRAPH OF EXISTING CONDITIONS FROM GOOGLE MAPS -STREET VIEW

3D MODEL VIEW FROM
VANTAGE POINT LOCATION #5
CROSSROADS LANDFILL
PHASE 14

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FIGURE 9

P:\CAD\PROJECTS\CROSSROADS LANDFILL\PERMIT\PHASE 14 (ME1752A.02)\FIGURES\ME1752AF10 - Last Saved by: JJVail on 10/17/19

(A) Looking East

(B) Looking West

Note:
1. Image Source: Google Earth

Photographs of Existing Visual Barrier Berm along Route 2

Waste Management Disposal Services of Maine, Inc.
Crossroads Landfill
Norridgewock, Maine

Geosyntec consultants

FIGURE 10

PROJECT NO: BE0232C

October 2019

DRAWING1

APPENDIX 7D

Phase 9, 11, and 12 Visual Impact Assessment Report

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.

CROSSROADS LANDFILL

Norridgewock, Maine

SPECIAL WASTE LANDFILL EXPANSION

Phases 9, 11 and 12

VISUAL IMPACT ASSESSMENT

April 18, 1996

Prepared by:

Mitchell & Associates
Landscape Architects
70 Center Street
Portland, Maine 04101

CONTENTS

VISUAL IMPACT ASSESSMENT

Purpose

The purpose of this study is to assess the potential visual impact of the proposed special waste landfill expansion of Phases 9, 11 and 12.

Project Description

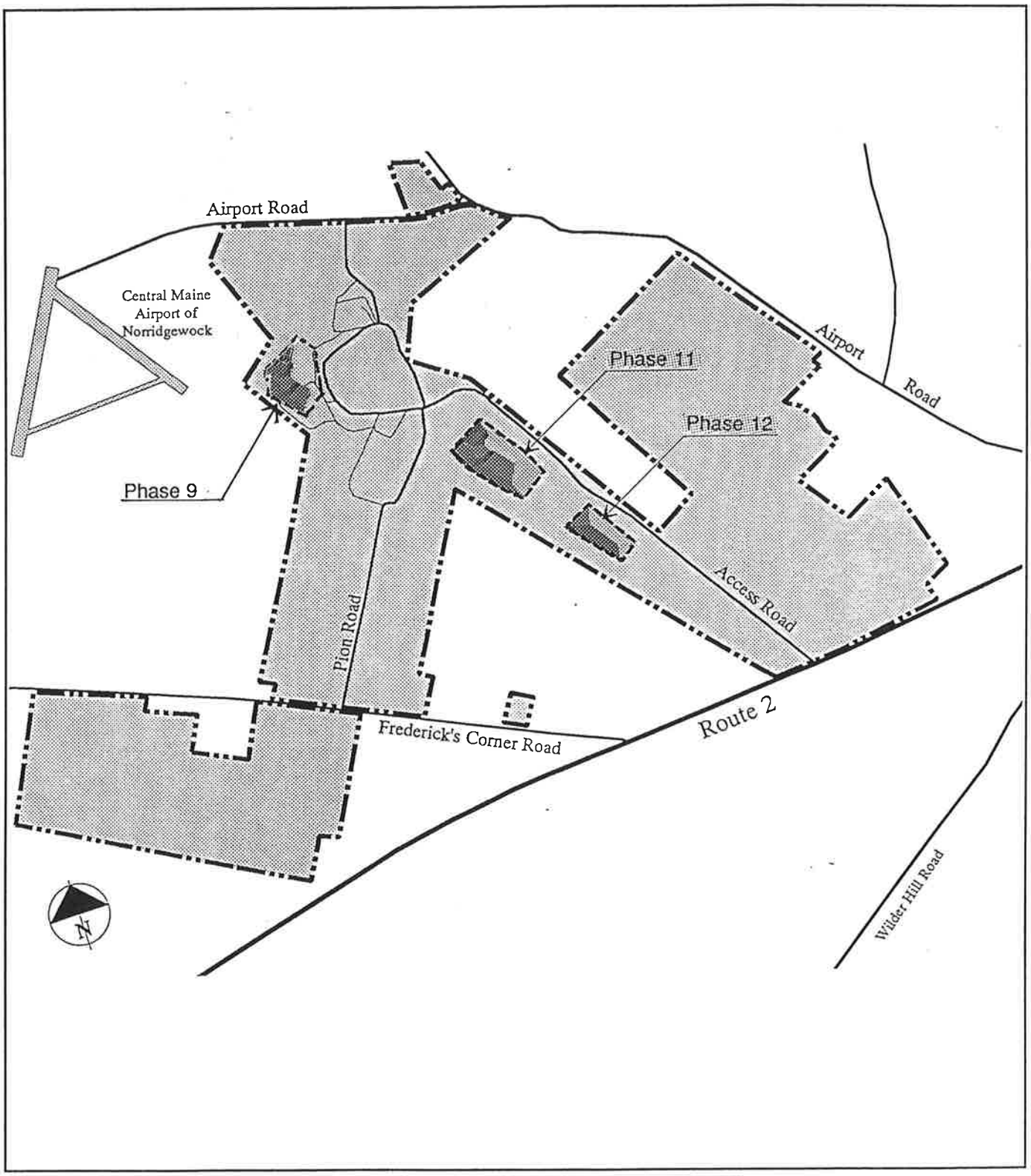
Crossroads Landfill is proposing to expand an existing special waste landfill in Norridgewock, Maine. The Crossroads Landfill has been in operation since 1977 and was purchased by Waste Management of North America, Inc. on October 15, 1990. This facility is located on an 800 ± acre site off U.S. Route 2, approximately two miles west of the Norridgewock town center, and currently consist of a closed 4 acre asbestos landfill, a 4.5 acre and 12.5 acre inactive special waste landfills, a 5.8 acre active special waste landfill, and a closed inactive 25 acre municipal solid waste landfill.

Landfill Expansion

The phases of the landfill expansion are the Phase 9, 11 and 12 areas shown on the following Site Map. Phase 9 is located near the western property boundary and will consist of a landfill footprint of approximately 12 acres. Phases 11 and 12 are located on the southwest side of the access road leading from Route 2, and will have a combined landfill footprint of approximately 23 acres.

Development of Phases 9, 11, and 12 is scheduled to be staged over a 14 year period. The following chart summarizes the landfill development sequence:

Phase	Duration	Start Date	Completion Date
Phase 11 (A,B,C)	7 years	July, 1997	Dec., 2004
Phase 12	3 years	June, 2003	Sept., 2007
Phase 9	5 years	June, 2005	Sept., 2010
Phase 11 (Final)	1 year	Feb., 2010	Sept., 2011



SITE MAP Scale: 1" = 2,000'

VISUAL IMPACT ASSESSMENT

Visual Characteristics

Each proposed landfill phase will go through a life cycle spanning several years with very different visual characteristics through different periods. The life cycle will begin with an initial construction period in which infrastructure like roads, liners, leachate management systems and sediment ponds would be built. The potential visual impact of this period is minimal since the height of the landfill is at its lowest elevation.

The active operation period of each landfill involves the placement of special waste with trucks, bulldozers and other heavy equipment. The elevation of each landfill would change daily as it gradually increases. A temporary cover of soil or synthetic cover is kept over the landfill, and is opened only for each day's operations. This period of each landfill's life cycle has the greatest potential for adverse visual impact due to the typical dark color of the temporary cover and the activity of the heavy equipment. This potential impact is somewhat minimized, however, by the fact that as each landfill grows taller (and potentially more visible), it grows closer to the closure period of its life cycle.

Landfill closure involves placing a permanent cap of an impervious membrane and soil layer over each landfill. The soil layer is seeded with grass and achieves much of the character of an open field or grassy hill. Of course, this grass cover is visually compatible with the nearby fields and pasture land in terms of color and texture. Scale, form and visibility remain to be addressed in the conclusion of this report.

VISUAL IMPACT ASSESSMENT

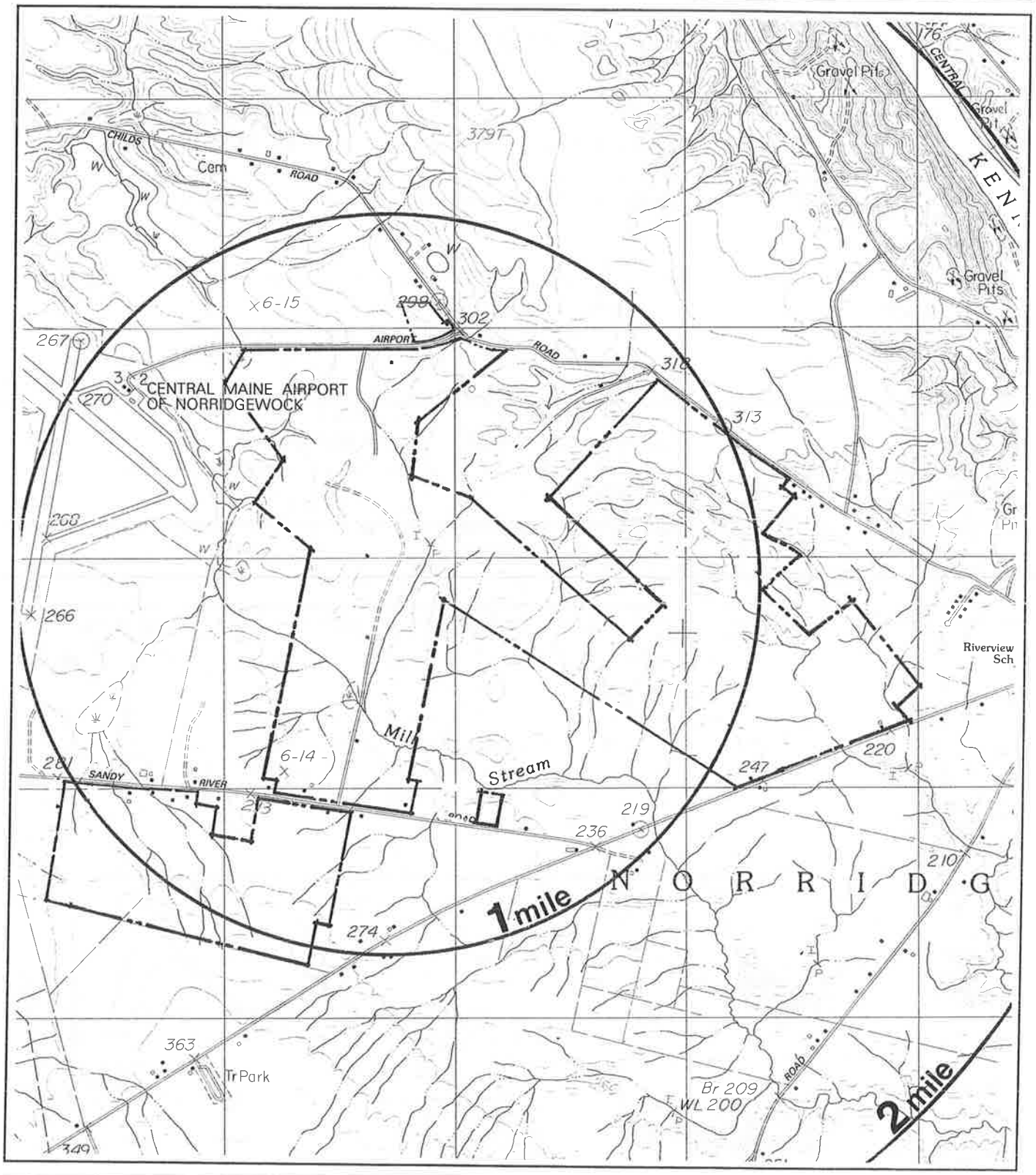
Study Area

The first step in assessing the potential visual impact of each proposed landfill expansion involved studying maps of topography, vegetation, circulation patterns and settlement patterns. The overall area included in this study has a diameter of approximately six miles.

In determining the extent of this study area, we researched the *physiological limit to normal vision.* In Fellman, J.P., 1986, *Foundations for Visual Project Analysis*. New York: Wiley, 45, we found that under ideal conditions, one can identify a target in a field for objects intercepting 30 seconds of arc. The familiar eye chart tests the extreme limits of this phenomena. If a landfill was black, on a field of white (as an eye chart), we calculate one could recognize a 25 foot high landfill on a theoretical eye chart at 33 miles. Of course, actual field conditions are far from those presented on an eye chart. The landfills after closure will not be black, and the background has intricate and varied textures, colors and forms from surrounding trees and landforms. Just barely being able to identify a tiny object is somewhat beyond reasonable limits for consideration of potential visual impact. Our field observations from Route 8 near Dodling Hill concluded that houses and barns, which are a similar height to some of the proposed landfills, were not recognizable two miles away on a moderately clear sunny day. We believe our six mile study area is more than adequate to ensure a comprehensive visual assessment.

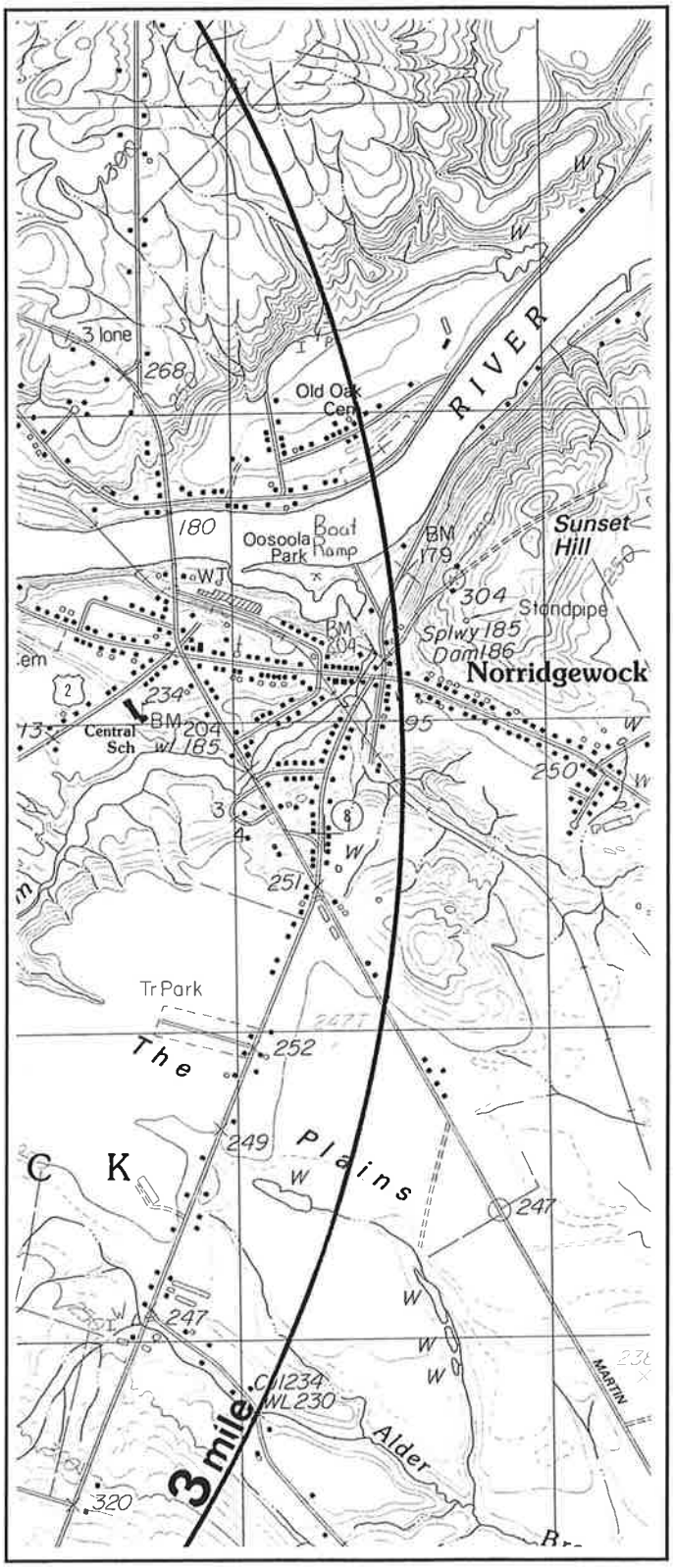
A smaller study area was selected for use in the field observation portion of the study. The extent of this area was based on an analysis of the topography, vegetation, roads and the probable viewshed the map data indicated.

Using topographic map data, we can determine with a good deal of certainty, from where the proposed landfills can not be seen. Also, the study of topography and identification of high points determines the areas from were the landfill may be seen.



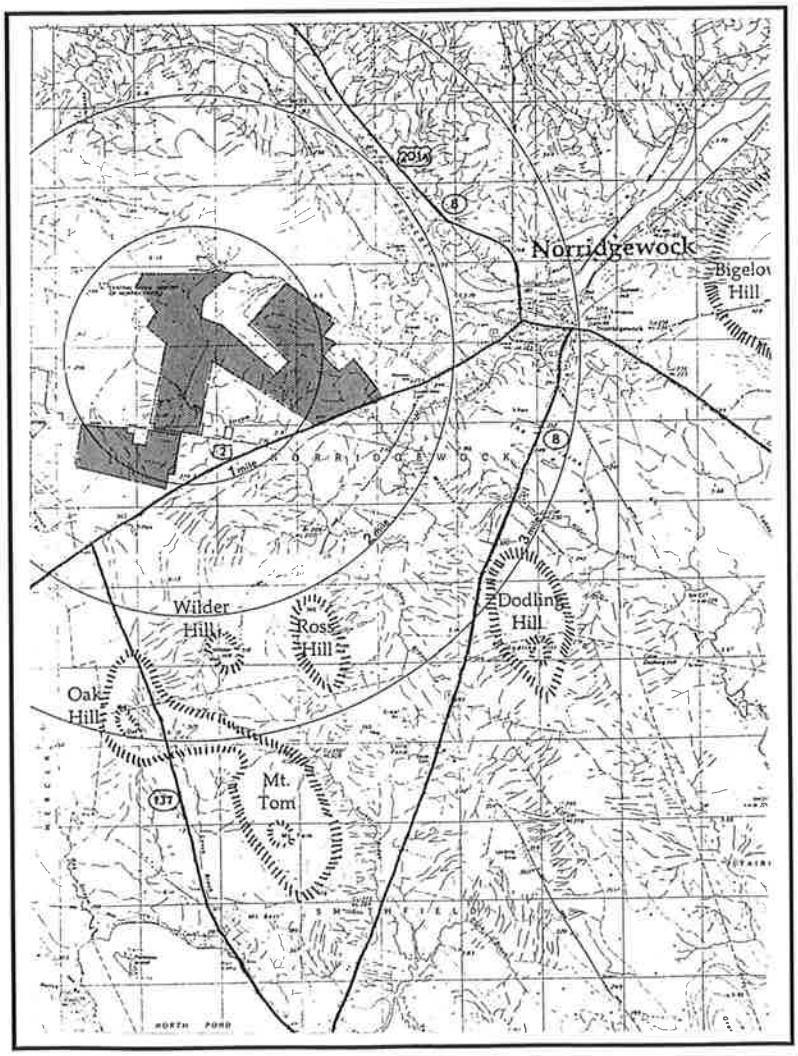
STUDY AREA MAP - USGS Norridgewock quadrangle

Scale: 1" = 2000'


3 lane
268
Old Oak Cem
RIVER
180
Oosoola Park
Boat Ramp
BM 179
Sunset Hill
WJ
304
Standpipe
Splwy 185
Dam 186
Norridgewock
BM 204
Central Sch
WL 185
234°
13
95
250
251
Tr Park
247
The
252
249
Plains
C K
247
CL 234
WL 230
3 mile
Alder
320
MARTIN

VISUAL IMPACT ASSESSMENT

Predominant high points within four miles of the site include; Oak Hill, Wilder Hill, Mt. Tom and Ross Hill to the south, Dodling Hill to the southeast, and Burrill Hill to the east. Public roads cross Oak Hill, Wilder Hill and Burrill Hill. The combination of public access and topography made us suspect distant views of the landfills might be possible. However, field observations at these hills consistently showed vegetation screening the view of the landfill site.



REGION MAP Scale: 1" = 1.5 miles

Source: U.S.G.S. 7.5 Minute Series, Norridgewock Quad, 1982

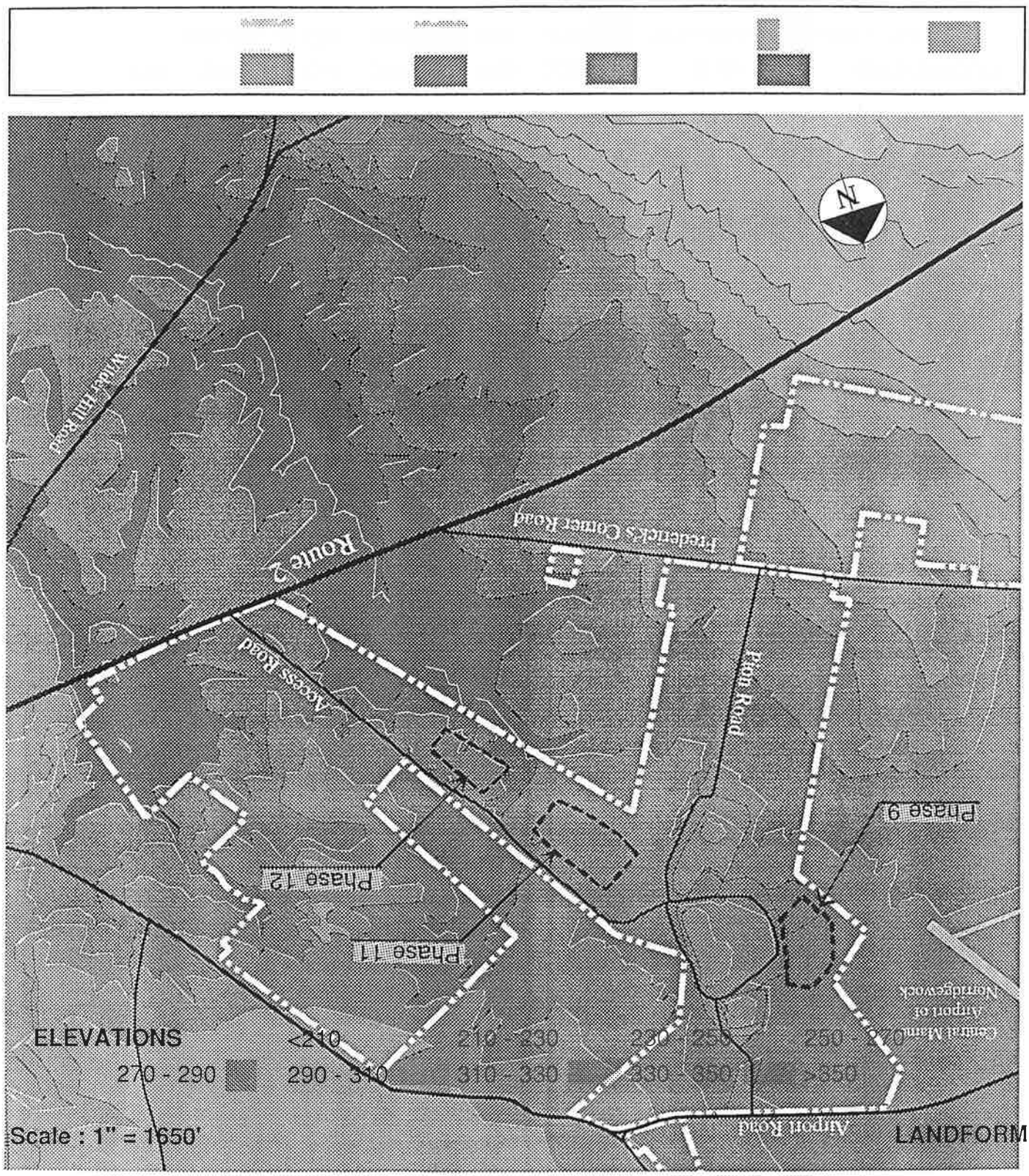
VISUAL IMPACT ASSESSMENT

Study Area Characteristics

Landform

The area surrounding the landfill facility is a rural landscape dominated by rolling topography with elevation changes varying from 200 to 300 feet. The nearby Kennebec River, which passes just north of the Norridgewock town center, is approximately elevation 180, while Mt. Tom, three and one-half miles to the south, has a peak elevation of 742. There are numerous small streams throughout the area. The varying terrain creates a variety of landform features, such as hills and valleys that affect one's viewpoint, field of vision, and recognition of objects in the landscape.

The proposed landfills will be at an elevation that could be seen from certain areas if land form alone were the only criteria involved.


Wade Hall Road
Route 2
Frederick's Corner Road
Access Road
Plain Road
Phase 9
Phase 12
Phase 11
Central Maine Airport of Northridgewock
ELEVATIONS
<210
210 - 230
230 - 250
250 - 270
270 - 290
290 - 310
310 - 330
330 - 350
>350
Scale : 1" = 1650'
Airport Road
LANDFORM

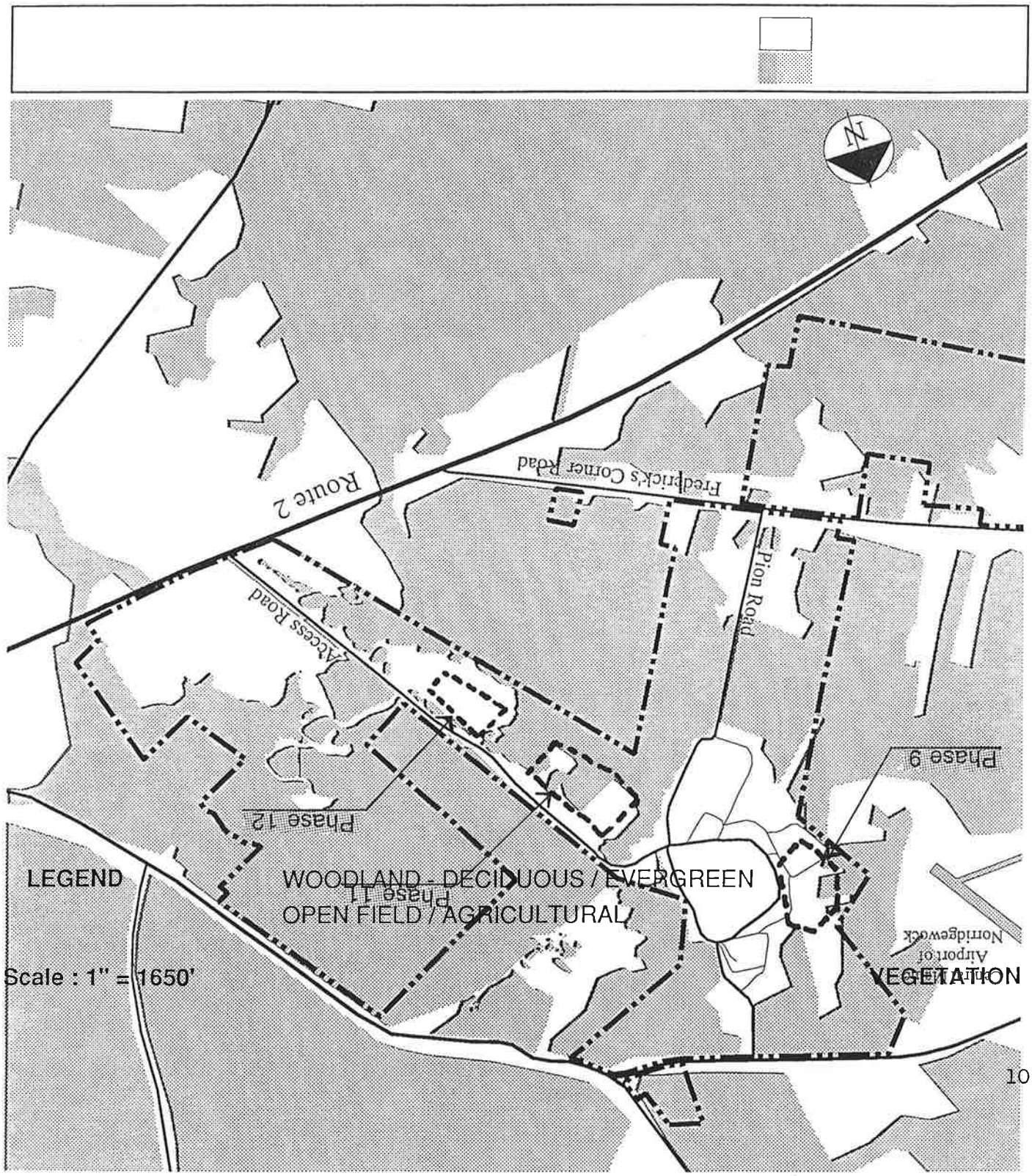
VISUAL IMPACT ASSESSMENT

Vegetation

Vegetation is another key landscape element that affects one's ability to view the proposed landfills. Data on vegetation came from several sources: field observation, a recent series of aerial photographs, survey data, and a USGS 15 minute quadrangle map. Open fields indicate areas where the landfills may be visible from. Wooded areas block or screen views to the landfill.

The region has a mix of deciduous and evergreen trees that create a landscape pattern of open and forested land areas. Open landscape areas occur predominantly along the roads, while the more heavily forested areas occur in the interior. As a result of a varied mix of vegetative types and maturity, the landscape can screen, buffer, absorb, or accent other features placed in the landscape. Color and texture also play a major role in integrating diverse aspects into the landscape.

Airport Road



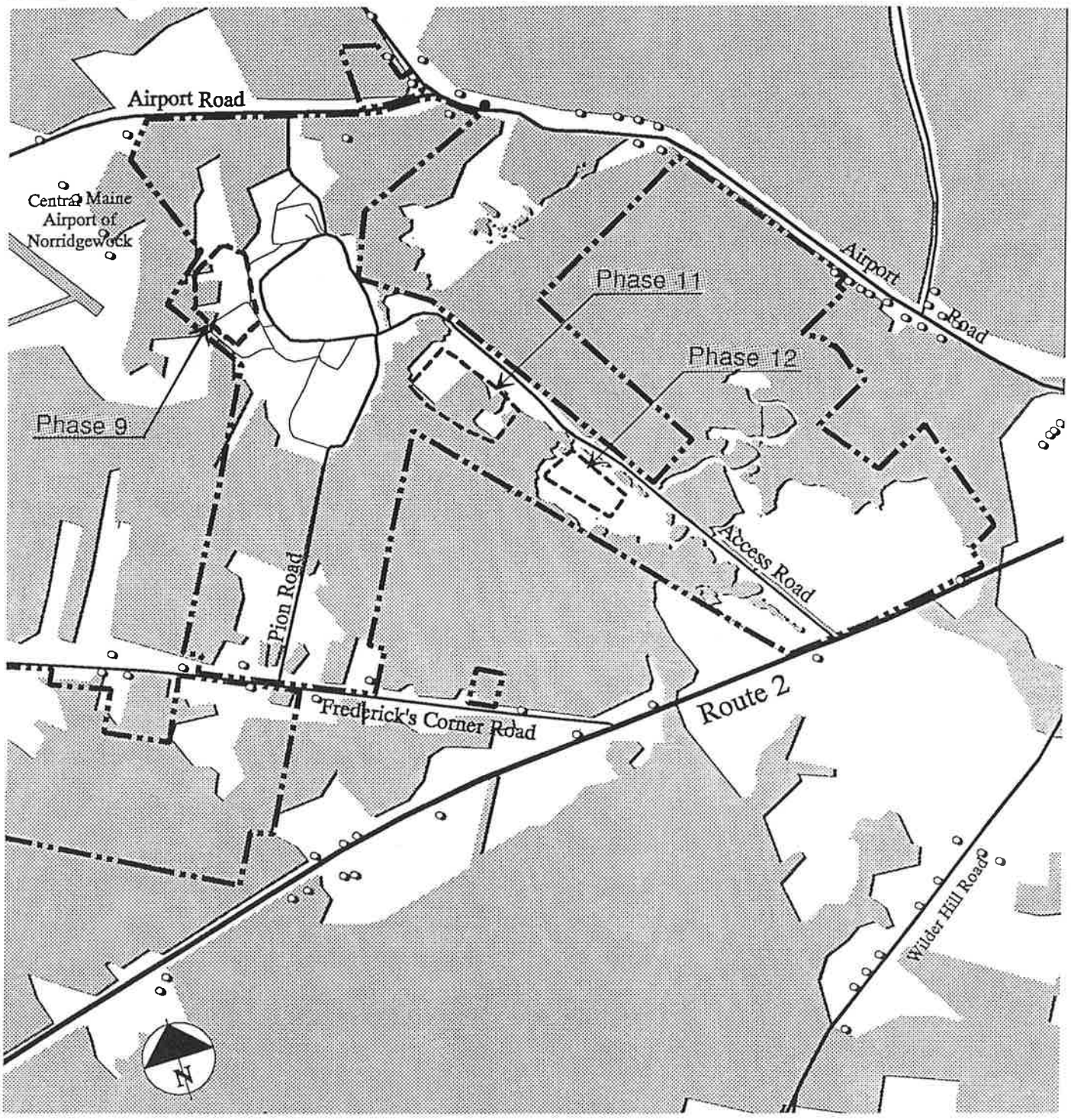
VISUAL IMPACT ASSESSMENT

Land Use

Typical of a rural area, the location of residences form a random pattern along the roads that occur within the study area. Other land uses appear to be open agricultural land and woodlots.

Some land uses are more sensitive to visual change than others. Residential use is highly sensitive due to the long duration of views possible, and emotional ties between viewer and their residence. Roads are also highly sensitive because of the large number of viewers over a length of time. Open agricultural land is less sensitive because the number of viewers over time is minimal and the view duration is likely to be short.

Norridgewock currently has no land zoning ordinance, although a shoreland zoning ordinance has been adopted.



LEGEND		
	RESIDENTIAL / STRUCTURES	FORESTED AREAS
	OPEN TERRAIN	

Scale : 1" = 1650'

LAND USE

VISUAL IMPACT ASSESSMENT

Visual Simulation Method Phase 9

In order to develop a comprehensive understanding of visibility, we have used a method for the proposed Phase 9 landfill involving field observation of helium filled balloons placed as markers.

A surveyor located the center of the proposed landfill along with points at each corner. On two separate days, helium filled balloons in high visibility colors, were flown at these points using surveyed elevations to mark the top center and top edges of the proposed landfills. Using our study of the map data to plan our field observations, all probable viewpoints were visited and photographs taken to document the degree of visibility and conditions screening the balloons.

Visibility Phase 9

The aerial photograph on the following page shows the limit of clearing for the Phase 9 landfill as a white line. The marker balloon locations are shown as white circles. The property line is shown as a double dash line.

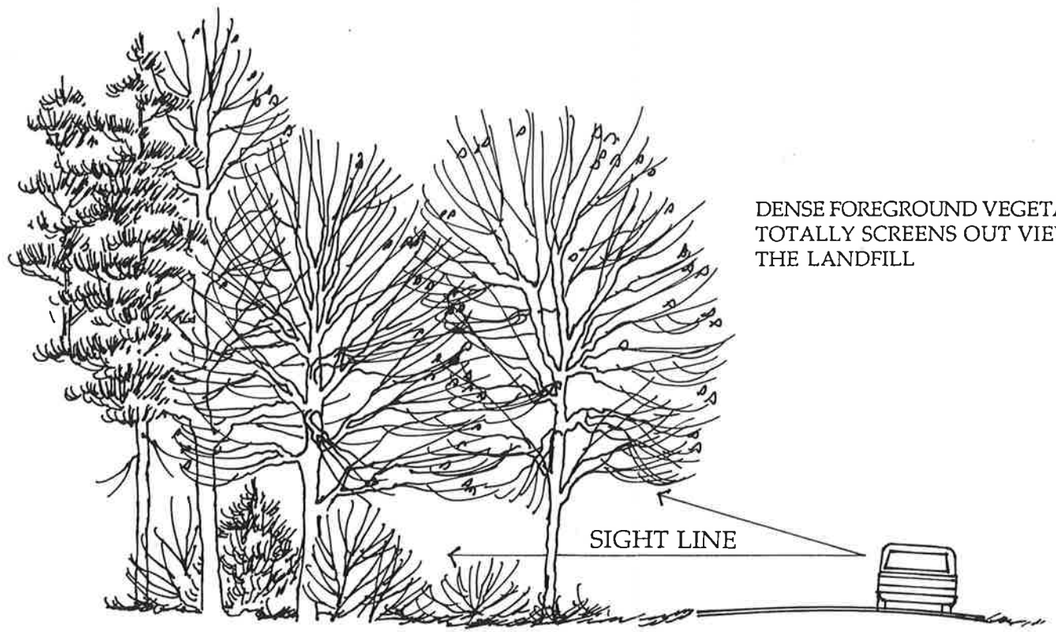
During field observations from surrounding roads and properties, we were unable to see any of the marker balloons set on the Phase 9 landfill site. The aerial photograph, as well as the cross section A-A' shown on the following pages, clearly illustrate the density of vegetation screening views from the north. West of the Phase 9 landfill is the Norridgewock Regional Airport which is buffered by a wetland and dense tree cover on their own property. It is partly open, but mostly wooded, blocking views from that direction. Southeast and east of the Phase 9 landfill site is Crossroads property.

Date of Photo: 1992

AERIAL PHOTO - PHASE 9

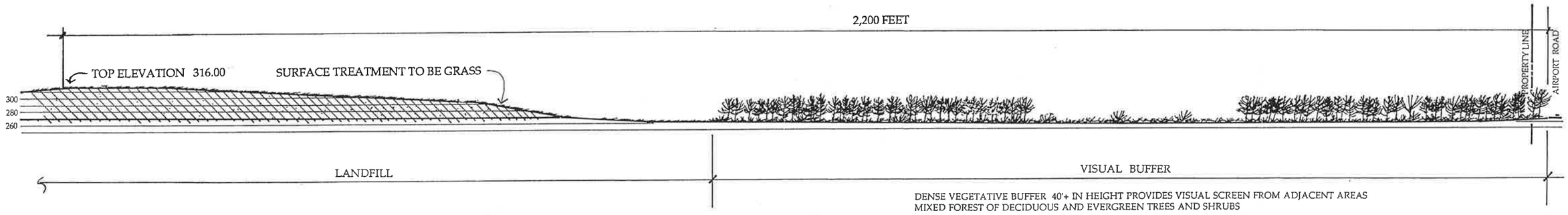
SITE PLAN - PHASE 9

Scale : 1" = 400'



SECTION THRU AIRPORT ROAD TOWARD LANDFILL SITE

HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" =10'



HORIZONTAL SCALE: 1" = 150' VERTICAL SCALE: 1" = 150'

CROSS SECTION A-A' FROM AIRPORT ROAD TO LANDFILL PHASE 9

VISUAL IMPACT ASSESSMENT

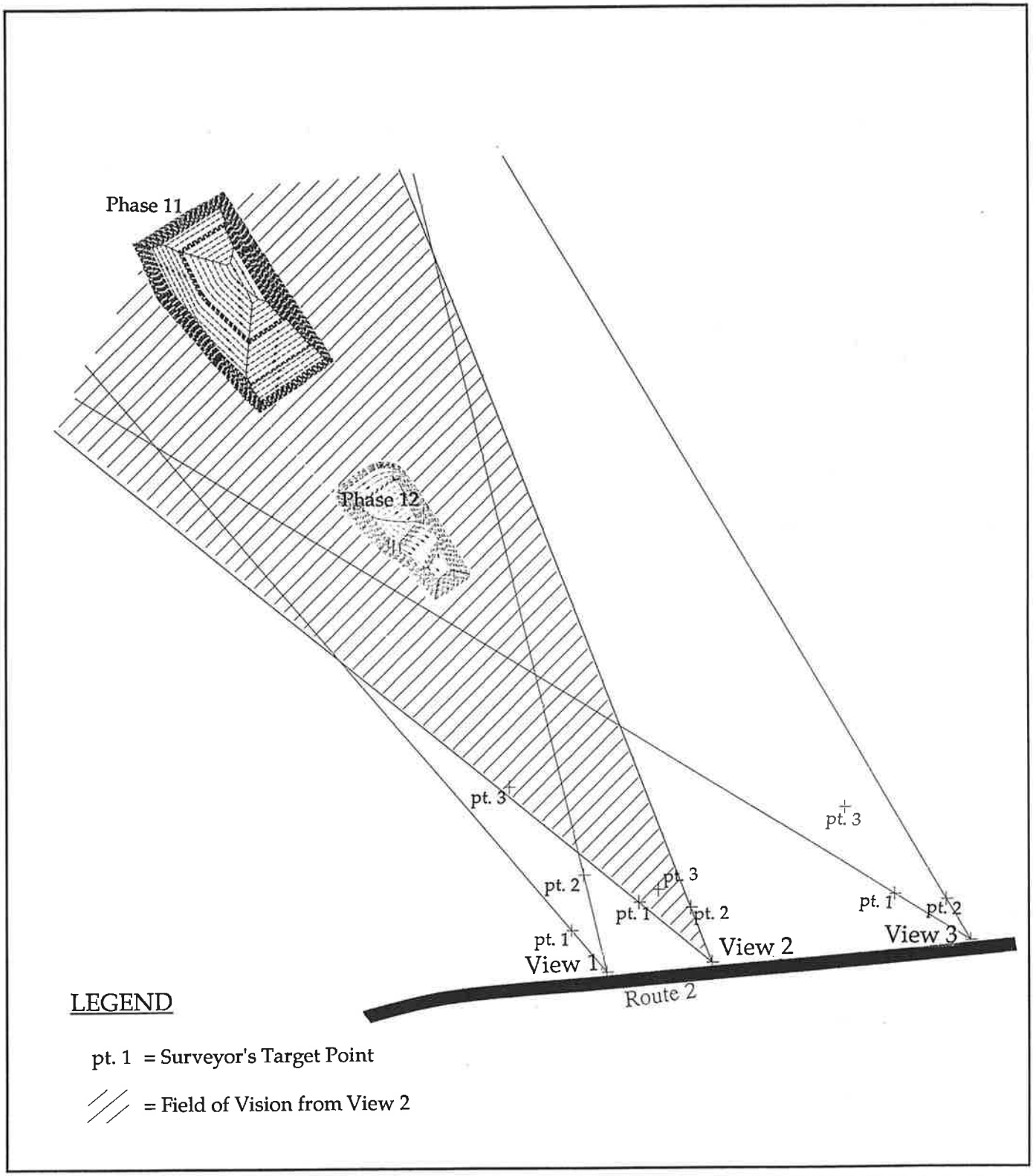
Visual Simulation Method Phases 11 & 12

For Phases 11 and 12, we have used a method involving survey instrument accuracy, photography and computer assisted graphics to predict and present what the future landfills will look like in operation and after closure.

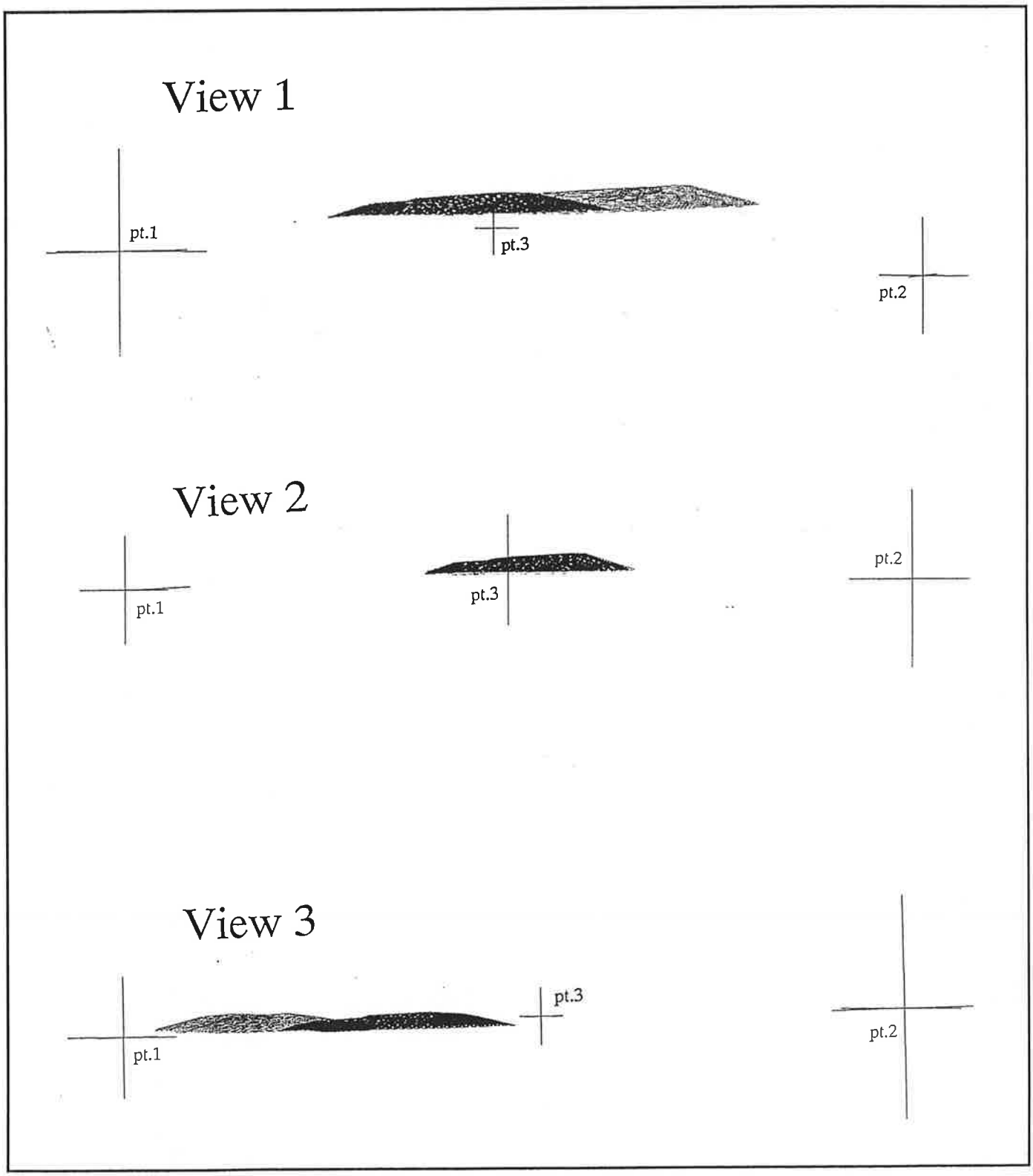
Once the three key viewpoints were selected, a series of four photographs were taken at each viewpoint with the camera mounted on a tripod and oriented toward the future landfills. The series of photos were comprised of three photos with surveyor targets and one without. The surveyor targets were positioned on the far left, on the far right, and exactly at the center of the camera frame.

The surveyor targets' position, as well as the camera position, was recorded using a total station type survey instrument. The same coordinate system was used as that used in the Crossroads field survey and in the design development drawings of the proposed landfills. Using this coordinate system, a three dimensional computer model of the landfill Phases 11 and 12 was developed from final grading plans. Perspective views of this computer model were generated using the actual surveyed camera coordinates as the virtual camera coordinates in the models which are shown on the following pages.

The three survey targets' coordinates for each key viewpoint were shown at X's. All settings for the computers virtual camera (such as focal length) were matched to the settings of the real camera used to take the photographs.



THREE DIMENSIONAL MODELS - BASE PLAN



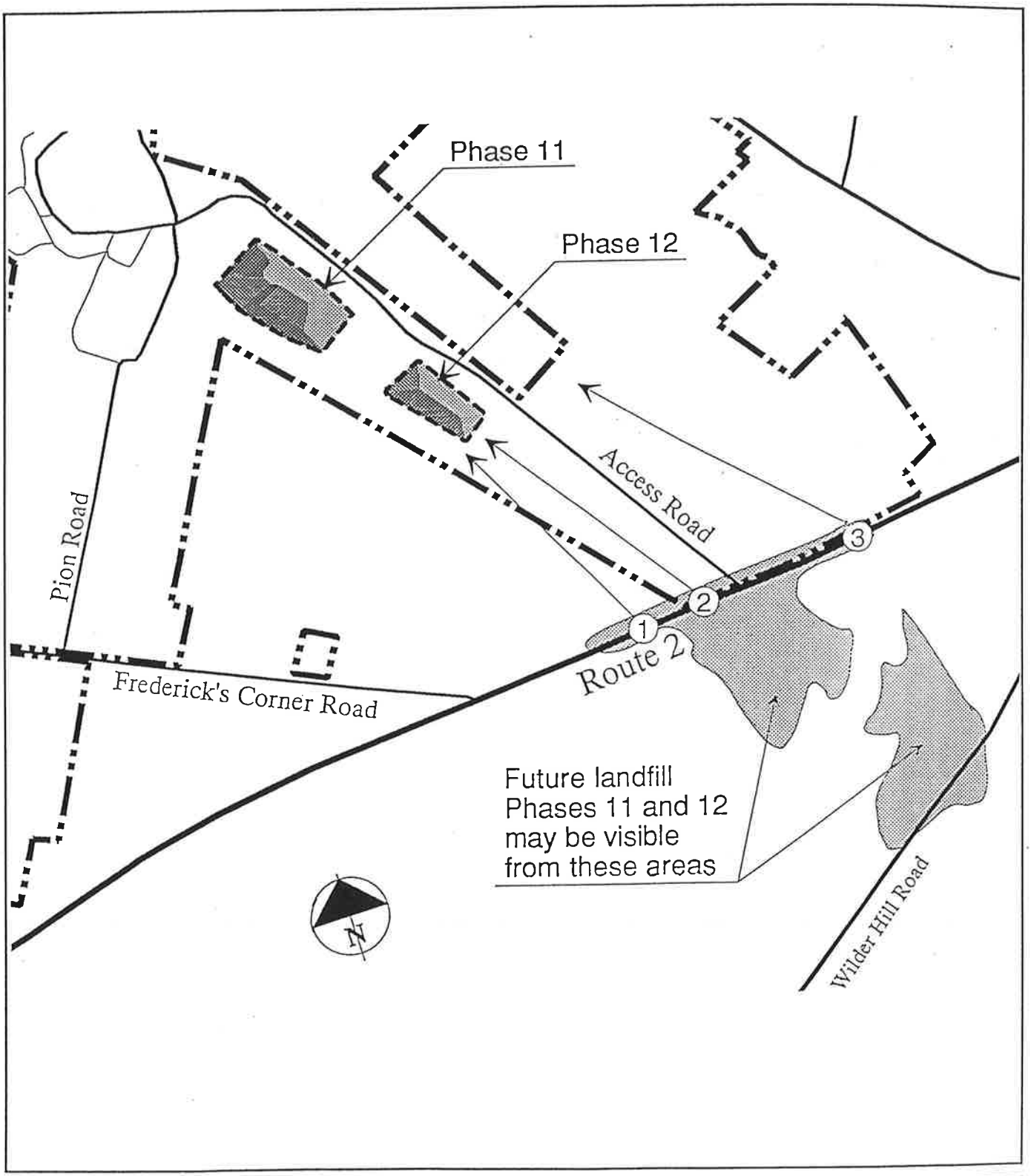
THREE DIMENSIONAL MODELS - PHASE 11 AND 12

VISUAL IMPACT ASSESSMENT

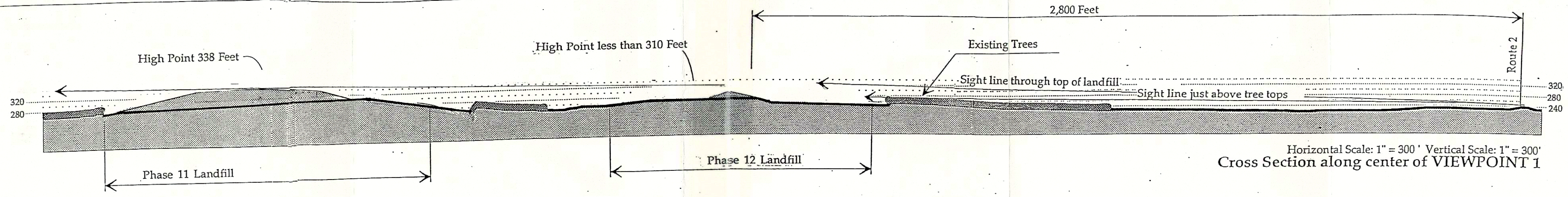
Visibility
Phase 11 & 12

In order to develop a comprehensive understanding of potential visibility, we have used a combination of field observation and analysis of aerial photographs, cross sections and other mapped data.

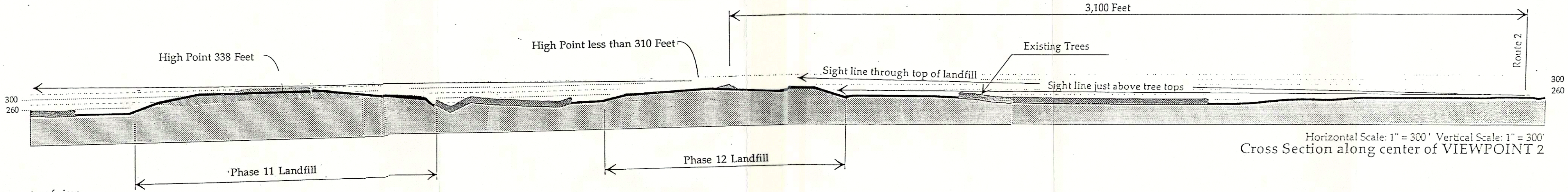
The visibility potential map shows areas where one or both of future landfill Phases 11 & 12 may be seen from. Within that area, the three viewpoints that had the greatest degree of visibility were selected to represent the whole area. Visual simulations of these three key viewpoints have been prepared to show their visual characteristics as accurately as possible.



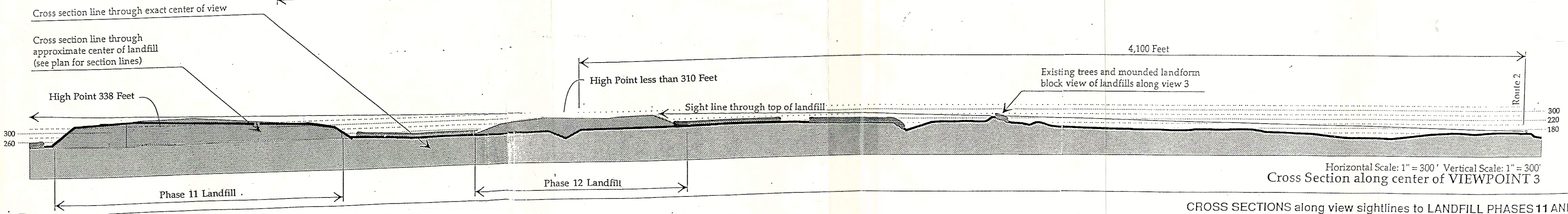
VISIBILITY POTENTIAL MAP - PHASE 11 AND 12



Horizontal Scale: 1" = 300 ' Vertical Scale: 1" = 300'
Cross Section along center of VIEWPOINT 1



Horizontal Scale: 1" = 300 ' Vertical Scale: 1" = 300'
Cross Section along center of VIEWPOINT 2



Horizontal Scale: 1" = 300 ' Vertical Scale: 1" = 300'
Cross Section along center of VIEWPOINT 3

CROSS SECTIONS along view sightlines to LANDFILL PHASES **11** AND **12**

VISUAL IMPACT ASSESSMENT

View One

The visual simulation of View 1 illustrates that the Phase 11 landfill will be completely hidden and that the Phase 12 landfill will be partially hidden by several large pine trees. Portions of the upper part of Phase 12 can be seen between the trees.

The grass color and texture of the proposed closure condition of the landfill looks like a natural landform. The visible portion is only seven percent of the width of the picture, or typical cone of vision, and appears in scale with the overall scene.

During filling operations of the landfill, the color and texture will be either a black or a dark earth color. While the black would not be compatible with the surrounding scene and dark earth slightly better, the overall impact would be very small and of relatively short duration (the final year or two of operation). We feel no mitigation efforts are warranted at this viewpoint.

VIEWPOINT 1 PHOTOGRAPH

COMPOSITE PHOTO 1 AND 3D MODEL

VISUAL SIMULATION VIEW 1 OPERATION

VISUAL SIMULATION VIEW 1 CLOSURE - PHASE 11 AND 12

VISUAL IMPACT ASSESSMENT

View Two

In View 2 the upper portion of the Phase 12 landfill can be seen above the middle ground tree line. As in View 1, the grass color and texture of the proposed closure conditions of the landfill looks like the natural part of the scene.

The form of the Phase 12 landfill calls for a three-on-one side slope on the lower two-thirds of the landform. The form of the top of the landform calls for a more subtle six percent slope.

The visible portion of the landfill in View 2 is only seven percent of the width of the picture. This modest proportional scale, along with natural color and texture of the closure condition, has the effect of minimizing any adverse visual impact of the triangular form.

As in View 1, during operation of the landfill, the color and texture will be either a black or a dark earth color which would not be compatible with the surrounding scene. This impact is minimized by its relatively short duration (the final year or two of operation). We feel no mitigation efforts are warranted at this viewpoint.

VIEWPOINT 2 PHOTOGRAPH

COMPOSITE PHOTO 2 AND 3D MODEL

VISUAL SIMULATION VIEW 2 CLOSURE CONDITION - PHASE 11 AND 12

VISUAL IMPACT ASSESSMENT

View Three

The View 3 composite photo and 3D model shows that both Phase 11 and Phase 12 landfills will be completely hidden by a tree covered ridge along the landfill access road. Even though some of the deciduous trees which will screen the landfill may permit a careful observer to see and identify the landfill, it is clear there could be no adverse visual impact from this view.

VIEWPOINT 3 PHOTOGRAPH

COMPOSITE PHOTO 3 AND 3D MODEL

VISUAL IMPACT ASSESSMENT

Conclusion Phase 9

During all periods of operation and after closure, the Phase 9 landfill expansion will not have any adverse visual impact on the Airport Road area or other properties to the north, due to existing vegetation screening potential views.

During the **construction period** and the **active operation period** of the Phase 9 landfill expansion there will be no undue adverse impact to views from the regional airport or from the property just south of the airport. The landfill may be visible to a viewer standing on the property line of those adjacent properties, and the color and texture of the active landfill may be incompatible with the surrounding landscape. However, the remoteness of those viewpoints leads us to conclude that no further buffering or other mitigating efforts are warranted. We do recommend maintaining at least a 50 foot wide forested buffer along Airport Road during construction and during the active operation of Phase 9.

After the **closure** of the Phase 9 landfill expansion there will be no adverse visual impact to views from the regional airport or from the properties just south of the airport. The landfill may be visible to a viewer on the property line of those adjacent properties but the color, texture and form of the grassed landfill will be substantially compatible with the surrounding landscape.

VISUAL IMPACT ASSESSMENT

Conclusion Phase 11 and 12

During all periods of operation and after closure, the Phase 11 and 12 landfill expansion areas will not have any undue adverse visual impact on the Route 2 area or other properties to the south, due to existing vegetation and landform screening potential views.

During the **construction period** of the Phase 11 and 12 landfill expansion, there will be no adverse visual impact to the surrounding areas as the base elevations of the landfills will not be visible.

As discussed in the introduction, the **active operation period** of Phases 11 and 12 will be phased over a fourteen year period. The active operation period of Phase 11 will begin in 1997 and temporarily stops in 2004. During this initial sequence of Phase 11 expansion, there will be no adverse impact to views from Route 2 and from the residence just south of the Crossroads access road on Route 2. The final sequence of Phase 11 development will take place between 2010 and 2011. The visual images presented in this report indicate there will be a nominal impact on views from Route 2 resulting from this sequence of development. However, it must be noted that fifteen years of existing vegetative growth will have occurred by this time.

The following list outlines the trees found in the vegetative buffer zone between the Phase 11 and 12 landfill expansion and Route 2:

Tree	Growth Rate
White Pine	Fast, 50 to 75' tall in 25 to 40 years
Eastern Hemlock	Medium, 25 to 50' in 15 to 30 years
Red Maples	Medium to fast, 10 and 12' in 5 to 7 yrs.
Basalm Fir	Slow
White Ash	Medium, 1 to 2' per year over 10 to 15 year period
White Birch	Medium to fast, 2' per year over a 10 to 15 year period
Yellow Birch	Medium, 20 feet over 20 year period
Trembling Aspen	Fast, 3 to 4' per year
Northern White Cedar	Slow to medium

VISUAL IMPACT ASSESSMENT

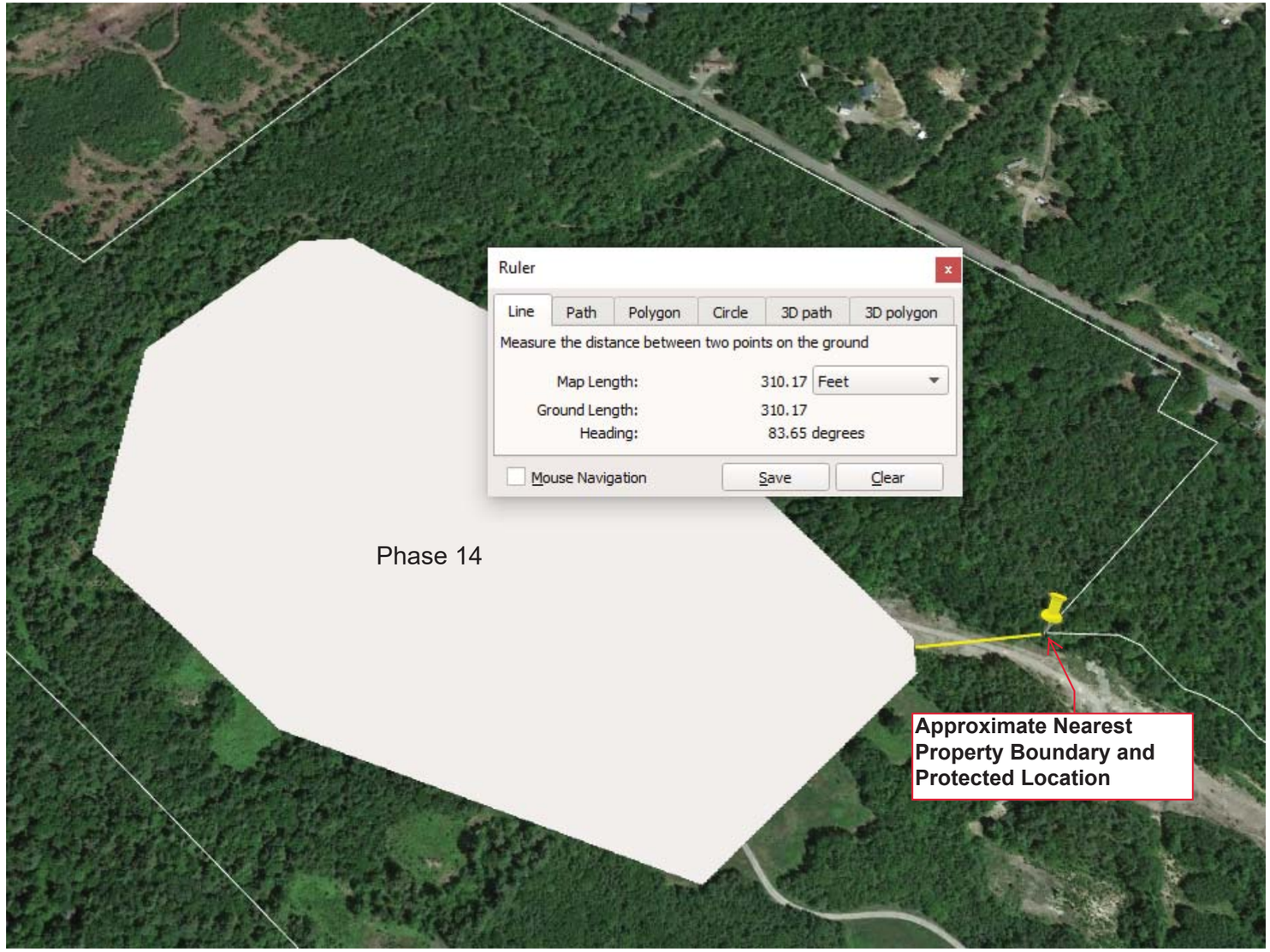
The medium and fast growth rate of many of the existing trees indicate that in fifteen years the trees will have grown, on average, between fifteen to thirty feet. This growth will provide the necessary buffering of the final sequence of Phase 11 expansion. Therefore, we conclude that no further buffering or other mitigating efforts are warranted for Phase 11.

The **active operation period** of the Phase 12 landfill expansion, occurring between 2003 and 2007, will not impact views from Route 2 and will not require buffering or mitigation.

After the **closure,** in 2011 of the Phase 11 and 12 landfill expansion, there will not be any adverse visual impact to views from the Route 2 area. The texture and scale of the grassed landfill will be substantially compatible with the surrounding landscape. Also, as aforementioned, future growth of existing trees will contribute to the buffering of adverse views.

We recommend maintaining the 50 foot wide forested buffer along the access road from Route 2 which currently screens views of the proposed landfills.

APPENDIX 7E
Noise Study Figures



Phase 14

Notes:
1. Aerial Image Source: Google Earth
2. The distance to the nearest property boundary / protected location is approximate.

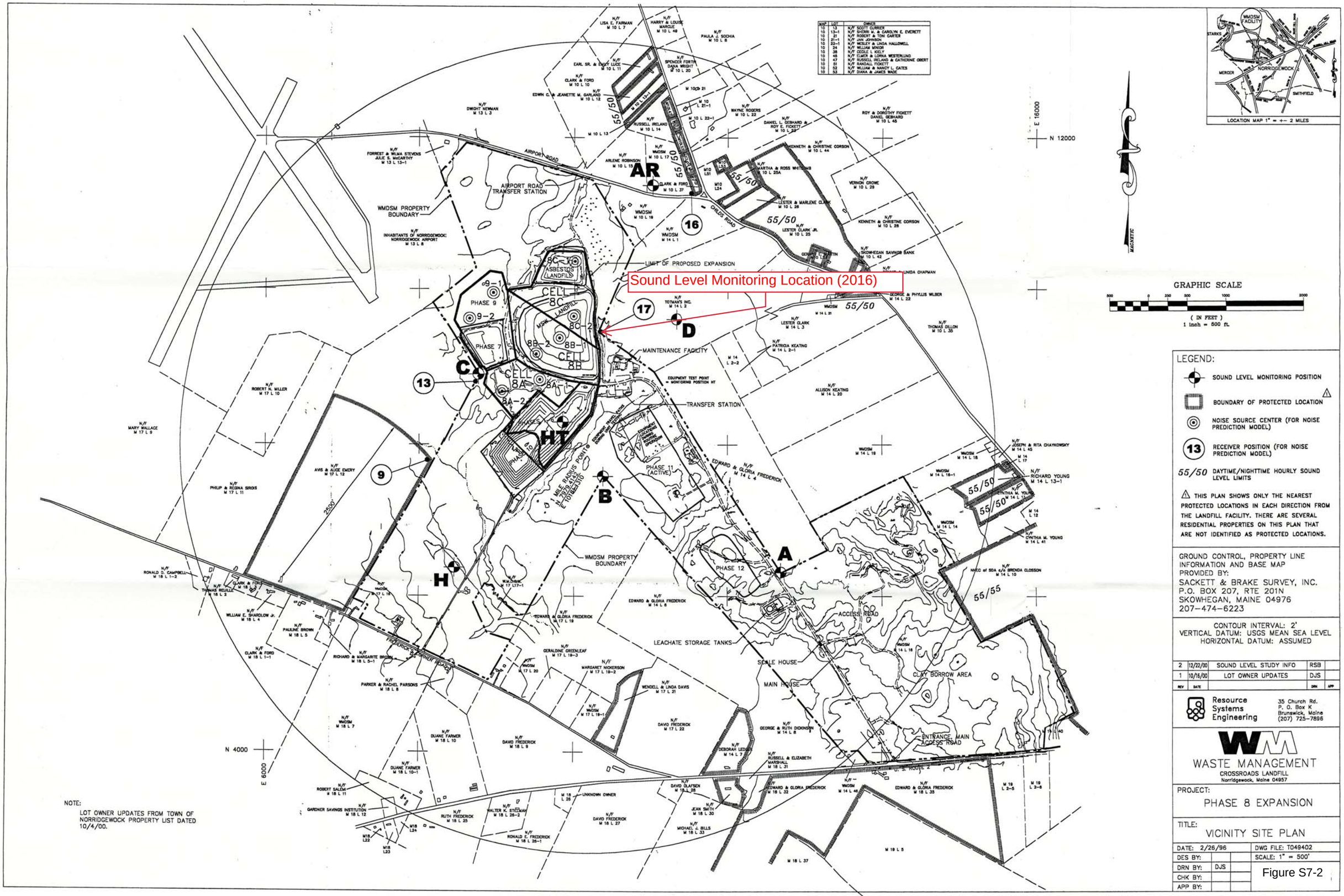
Nearest Property Boundary and Protected Location for Phase 14
Crossroads Landfill
Norridgewock, Maine

Geosyntec consultants

FIGURE S7-1

PROJECT NO: BE0232C | October 2019

DRAWING1



GROUND CONTROL, PROPERTY LINE INFORMATION AND BASE MAP PROVIDED BY:
SACKETT & BRAKE SURVEY, INC.
P.O. BOX 207, RTE 201N
SKOWHEGAN, MAINE 04976
207-474-6223

CONTOUR INTERVAL: 2'
VERTICAL DATUM: USGS MEAN SEA LEVEL
HORIZONTAL DATUM: ASSUMED

REV	DATE		DRN	APP
2	12/22/00	SOUND LEVEL STUDY INFO	RSB	
1	10/16/00	LOT OWNER UPDATES	DJS	

Resource Systems Engineering
35 Church Rd.
P. O. Box K
Brunswick, Maine
(207) 725-7896

WASTE MANAGEMENT
CROSSROADS LANDFILL
Norridgewock, Maine 04957

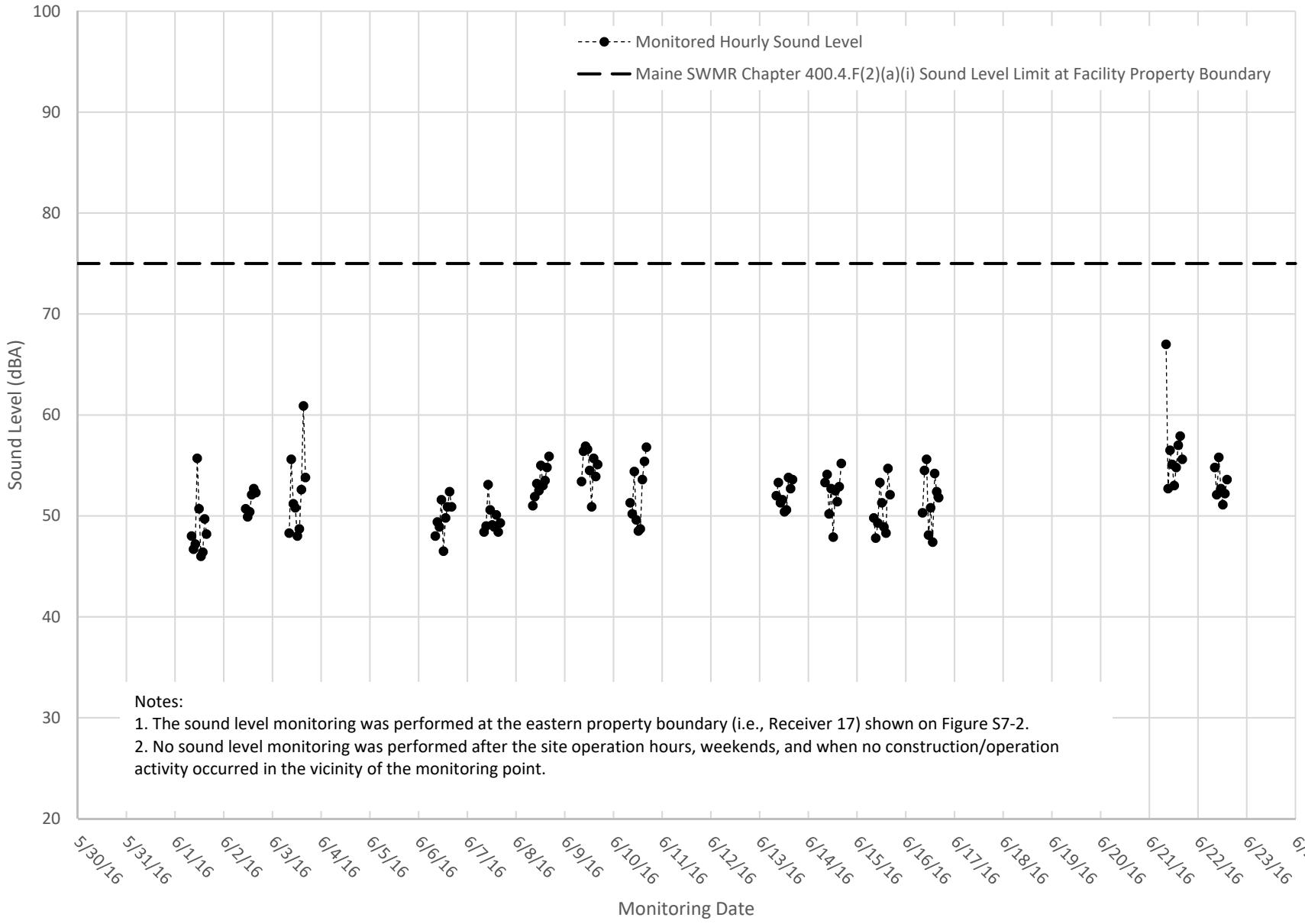
PROJECT:
PHASE 8 EXPANSION

TITLE:
VICINITY SITE PLAN

DATE: 2/26/96			DWG FILE: T049402
DES BY:			SCALE: 1" = 500'
DRN BY:	DJS		
CHK BY:			
APP BY:			

Figure S7-2

Figure S7-3: Hourly Sound Levels Measured during Phase 8C' Operation



Notes:
1. The sound level monitoring was performed at the eastern property boundary (i.e., Receiver 17) shown on Figure S7-2.
2. No sound level monitoring was performed after the site operation hours, weekends, and when no construction/operation activity occurred in the vicinity of the monitoring point.

APPENDIX 7F
Phase 8 Sound Level Study Report

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE
CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

PHASE 8 LANDFILL EXPANSION
SOUND LEVEL STUDY - SUPPLEMENTAL REPORT

Prepared by:

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File No. 920403

December 14, 2001

Resource Systems Engineering
Brunswick, Maine

Exhibit WM-57

ACKNOWLEDGMENTS

Resource Systems Engineering (RSE) wishes to thank Waste Management Disposal Service of Maine and GeoSyntec Consultants for their assistance and cooperation during conduct of the Sound Level Study.

RSE personnel responsible for this investigation and report are Charles F. Wallace, Jr., P.E., R. Scott Bodwell, P.E., Ann M. Vedock and Ronald H. Mattson.

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE
CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

SOUND LEVEL STUDY - SUPPLEMENTAL REPORT

CONTENTS

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE
CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

SOUND LEVEL STUDY - SUPPLEMENTAL REPORT

1.0 INTRODUCTION

Waste Management Disposal Services of Maine (WMDSM) proposes to construct and operate an expansion of its existing solid waste disposal facility at the Crossroads Landfill in Norridgewock, Maine.

The facility has operated since 1976 when the Maine Board of Environmental Protection granted initial permits for a sanitary landfill at the site. WMDSM acquired the facility in October 1990 and for the past 10 years has conducted site operations in accordance with solid waste permits issued by the Maine Department of Environmental Protection (MDEP). Since 1990, WMDSM has constructed several landfill expansion phases, two vertical side slope modification projects, and three closure projects.

RSE prepared a Sound Level Study for this Phase 8 expansion dated December 22, 2000. The Phase 8 Study followed 1992 and 1996 Sound Level Studies by RSE of previous facility expansions. The previous studies were based on noise control regulations developed under authority of the Site Location of Development Law (38 M.R.S.A 481-490). These Site Law regulations were promulgated in 1989 as Chapter 375.10, Control of Noise.

Under Solid Waste Management Regulations adopted by the Board of Environmental Protection in 1989, solid waste facilities were required to obtain approval under both the Site Location and Maine Solid Waste Laws[1]. Noise standards applicable to a solid waste facility remained under the Site Law regulations as Chapter 375.10. On August 12, 1998, the Board adopted new Solid Waste Management Regulations, which provided full facility licensing and established specific noise standards for solid waste facilities. These standards are contained in Chapter 400, General Provisions, Section 4 General Licensing Criteria, Subsection F, No Unreasonable Adverse Affect on Existing Uses and Scenic Character. The noise standards contained in the Solid Waste regulations are similar to those adopted under the Site Law, but there are some important differences, which are discussed in this Supplemental Report.

[1] "Maine Solid Waste Laws" means all the laws of the State of Maine relating to the management of solid waste. It includes the "Maine Hazardous Waste, Septage and Solid Waste Management Act," Subchapters I and IA (38 MRSA section 1301 *et seq.*); 38 MRSA sections 417 and 420; the Waste Discharge Law (38 MRSA section 413); 38 MRSA section 590-E; the Maine Refuse Disposal District Enabling Act (38 MRSA section 1701 *et seq.*); and the Solid Waste Management and Recycling Law (38 MRSA section 2101 *et seq.*).

The purpose of this supplemental report is to apply the noise standards that are part of the Solid Waste regulations to the Phase 8 Landfill Expansion. Because the noise reports for prior landfill expansion as well as the initial Phase 8 sound level study addressed the Site Law noise regulation, this supplemental report discusses both the Solid Waste and Site Law noise regulations.

As part of the Sound Level Study for the Phase 8 expansion RSE monitored sound levels of existing site operations and updated mapping of protected locations in the vicinity of the landfill facility. In addition, RSE reviewed information about construction and operation of the proposed expansion in order to quantify future sound levels for comparison with Site Law and Solid Waste noise regulations.

2.0 SOUND AND DECIBELS

Sound is a rapid fluctuation in pressure that the human ear has the potential to detect. The decibel or dB is the unit of measurement for sound. The decibel scale is logarithmic to avoid large unmanageable numbers normally associated with pressure change. Figure 1 shows a comparison of sound pressure and decibel level for some typical sound environments.

Undesirable sound is generally referred to as *noise*. The effects of noise depend both on its frequency (or pitch), decibel level, and duration, particularly in relationship to changes in existing sound levels. The frequency of a sound generally refers to the number of vibrations per second, measured in hertz (Hz). The frequency of sounds audible to humans range from about 20 Hz to 20,000 Hz, with greater sensitivity to frequencies above 1,000 Hz.

Sound may consist of a single frequency known as a pure tone, but is generally a disorderly mixture of many frequencies. When measuring sound, A-weighted sound levels are typically used in order to resemble the hearing response of the human ear to varying sound level frequencies. A-weighted sound levels are expressed as dBA.

For constant sounds, a single measurement can generally quantify the level of sound for both long and short periods. However, if a sound varies, longer sampling periods are needed to quantify the sound level. Integrating sound level meters are commonly used to measure fluctuating sound levels. These meters have the capability to record the sound level every 1/8 of a second. This provides 480 sound level readings every minute and over 28,000 readings every hour. Instead of producing measurement reports showing every sound level reading, statistical parameters are used to summarize the data for comparison and analysis. In this form, sound level measurements provide definite quantities that rate various sounds and permit scientific analysis of new or modified sources of sound. Sound level measurements also provide clear evidence of when noise controls will be needed to prevent adverse impact to the existing sound environment of a community.

The most common parameter is the equivalent sound level or Leq. The Leq is used to represent the sound energy during a given sampling period as a constant decibel level. The Leq takes all the sound level fluctuations into account similar to an averaging technique; however, it is accomplished in a mathematically correct manner to deal with decibels as logarithmic expressions. For example, at a site influenced by variable sounds from vehicle traffic, the Leq

takes the sound energy of the traffic and distributes it over the entire measurement period as a single value. If the measurement period was 1 hour and the sound level was 30 dBA except for 5 minutes when traffic noise occurred at 60 dBA, the Leq would be 49 dBA.

The Maine DEP uses a one-hour Leq as the basis for determining existing sound levels and establishing sound level limits. Other common statistical parameters include L(10), L(50) and L(90), which represent the sound level exceeded 10%, 50%, and 90% of the time during the measurement, respectively. The L(90) is commonly used to determine the value of constant or "background" sound during a measurement period. The L(10), L(50) and L(90) parameters are not relevant when applying Maine DEP sound level limits.

In order to calculate the sound level resulting from multiple noise sources, such as the processing equipment at the landfill facility, it is necessary to combine decibel levels from several sources. Decibel levels must be added properly to reflect the mathematics of the logarithmic scale. For example, when two sounds of the same decibel level are combined, the resulting combined sound level is just 3 dB higher than the individual sound levels (50 dB + 50 dB = 53 dB). The analysis contained in this report addresses both individual and combined sources associated with expansion of the solid waste facility.

Sound propagation in air can be compared to ripples on a pond. The ripples spread out uniformly in all directions decreasing in amplitude as they move further from the source. For every doubling of distance from a noise source, the sound level drops by 6 dB. With an obstacle in the sound path, part of the sound is reflected, part absorbed and the remainder transmitted through the object. How much sound is reflected, absorbed or transmitted depends on the properties of the object, its size, and the frequency of the sound. The properties of an object and its effect on sound propagation are primary considerations in the design of noise control measures.

3.0 SITE DESCRIPTION

The Crossroads Landfill is located in Somerset County in the Town of Norridgewock, Maine. The site consists of approximately 430 acres of land adjacent to, and north of Route 2. The property extends to the southwest to Frederick's Corner Road and abuts property to the northwest owned by the Central Maine Regional Airport. Access to the facility primarily occurs on a paved access road, which extends from Route 2. A site locus map is shown as Figure 2.

WMDSM recently completed construction of Phase 9, which is currently operating to receive and dispose of solid waste, along with Phase 11. WMDSM has an approved license and plans to proceed with development of Phase 12 next year. Construction of the proposed Phase 8 expansion will begin during operation of Phases 9 and 12. The landfill phases are shown on Figure 3, Vicinity Site Plan.

The new Phase 8 expansion will occupy the footprint shown on Figure 3 and overlie a significant portion of previously developed areas of the site. Specifically, the footprint

proposed for Phase 8 will include areas of Phases 1-6, Phase 7, Phase 9, the Asbestos Landfill, and the Municipal Solid Waste Landfill (MSW Landfill). One area of new development for the expansion is between the Phases 1-6 and the Phase 7 Landfill. A portion of this area had previously been delineated as Phase 8 in earlier site planning documents. The current designation of Phase 8 is as shown on Figure 3, Vicinity Site Plan.

A major component of the proposed expansion will be excavation and relocation of waste material from the former MSW and Asbestos Landfills to the new Phase 8 Landfill. To accomplish this, development of the Phase 8 expansion will be done sequentially as Cells A, B, and C. Cell A is outside the footprint of the former landfills and will be the first cell constructed in Phase 8. Eventually, all the waste currently residing in the former MSW and Asbestos Landfills will be moved to the new cells constructed as part of the Phase 8 expansion.

Other aspects of the Phase 8 landfill expansion project will include: (a) installation of wick drains and working mat/underdrain beneath portions of the expansion area; (b) construction of mechanically stabilized earth (MSE) berms along designated sides of the proposed expansion area; (c) developing the area currently occupied by erosion control structures between existing landfill phases; (d) placing additional waste in (i.e. overfilling) the Phase 1-6, Phase 7, and Phase 9 areas; (e) modifying the stormwater management system for the site; and (f) modifying the leachate collection/transfer system for this portion of the site.

4.0 NOISE CONTROL STANDARDS

Noise control standards applicable to the Crossroads Landfill consist of regulations established by the Maine DEP. The Maine DEP has established noise regulations as part of its Site Law and Solid Waste Management Regulations. Prior to Phase 8, the Crossroads Landfill was licensed pursuant to Site Law noise regulations, MDEP Chapter 375.10, *Control of Noise*. RSE understands that noise standards of the Solid Waste regulations, MDEP Chapter 400.4.F.(2) *Noise Standards*, will be applied to the Phase 8 expansion. The following describes both the Solid Waste and Site Law noise control regulations, and highlights differences between them.

4.1 Site Law and Solid Waste Noise Control Regulations

Both the Site Law and Solid Waste noise regulations establish hourly sound level limits at facility property boundaries and at nearby *protected locations*. Under Site Law regulations protected locations are defined as:

> "Any location, accessible by foot, on a parcel of land containing a residence or planned residence or approved residential subdivision, house of worship, academic school, college, library, duly licensed hospital or nursing home near the development at the time a Site Location of Development application is submitted. . ."
>
> Protected locations also include state parks, and designated wilderness and passive recreation areas. In addition, at protected locations more than 500 feet from living and sleeping quarters, the daytime hourly sound level limits shall apply regardless of the time of day. (ref. MDEP Chapter 375.10.G.16)

Under the Solid Waste regulations, the definition of a protected location is similar and as follows:

(1) Any location within a parcel of land which, at the time a solid waste facility application is submitted, either contains or has local approval for the construction of a residence, residential subdivision, house of worship, academic school, college, library, hospital or nursing home;

(2) Any location within:
  (a) A state park;
  (b) Baxter State Park;
  (c) A National park;
  (d) A historic site;
  (e) A nature preserve owned by the Maine or National Audubon Society or the Maine Chapter of the Nature Conservancy;
  (f) The Appalachian Trail;
  (g) A National Wildlife Refuge;
  (h) A federally-designated wilderness area; or
  (i) State wilderness area designated by state statute, such as the Allagash Wilderness Waterway; or

(3) Any location within consolidated public reserve lands designated as a protected location by rule of the Bureau of Public Lands.

State and National Parks that do not have camping areas, houses of worship, schools, libraries, and historic sites are considered protected locations only during their regular hours of operation. (ref. MDEP Chapter 400.1.Hh.)

There are two significant differences between these definitions that are important to the Phase 8 Landfill Expansion. Under the Site Law, protected locations must be accessible by foot, which would generally exclude surface water and some wetland areas. The Solid Waste rule does not contain the accessible by foot provision. Also under the Site Law, daytime limits apply regardless of the time of day at locations over 500 feet from living and sleeping quarters. The Solid Waste rule does not contain this provision, but considers State and National Parks to be protected locations only during their regular hours of operation.

Under both the Site Law and Solid Waste regulations, the hourly sound level resulting from routine operation of the development is limited to 75 dBA at any facility property boundary. Also, the hourly sound level limits at protected locations vary depending on local zoning or surrounding land uses and existing (pre-development) ambient sound levels.

Note: The hourly sound level in both regulations means the equivalent sound level (Leq) as measured over a one-hour period. The language in the Solid Waste and Site Law regulations establishing sound level limits at protected locations is identical, except that the Solid Waste regulations omit the phrase "at a protected location" from the paragraph establishing the daytime and nighttime limits in commercial/industrial areas. This appears to have been a clerical error and is treated as such in this report.

At protected locations in an area for which the zoning, or, if unzoned, the existing use or use contemplated under a comprehensive plan, is predominantly commercial or industrial, the hourly sound level limits under both regulations for routine operation of the facility are:

70 dBA daytime (7 a.m. through 7 p.m. or 700 through 1900 on a 24-hour basis)
60 dBA nighttime (7 p.m. through 7 a.m. or 1900 through 700)

At protected locations in an area for which the zoning, or, if unzoned, the existing use or use contemplated under a comprehensive plan, is not predominantly commercial or industrial, the hourly sound level limits under both regulations for routine operation of the facility are:

60 dBA daytime; 50 dBA nighttime

The Site Law regulations include a provision for lower hourly limits (55 dBA daytime/45 dBA nighttime) in quiet areas. These lower limits apply where the daytime pre-development ambient hourly sound level at a protected location is equal to or less than 45 dBA and/or the nighttime hourly sound level is equal to or less than 35 dBA. The Solid Waste regulations do not include a provision for quiet areas.

Under the Site Law regulations, sound from routine, ongoing maintenance activities are considered part of routine operations and subject to the specified hourly limits. The Site Law regulations also establish sound level limits for blasting operations, and tonal and short duration repetitive sounds. Under the Solid Waste regulation, sound level limits are not specified for these types of sounds.

Under the Site Law, sound from nighttime construction activities is subject to the same nighttime sound level limits as routine operation. However, construction during daylight hours or from 7 a.m. to 7 p.m., whichever is longer, is exempt from Site Law regulation by 38 M.R.S.A. Section 484. There are no sound level limits for construction under the Solid Waste regulations. However, both regulations require that equipment used in construction comply with applicable federal noise regulations and must include environmental noise control devices in proper working condition as originally provided by its manufacturer.

Sounds associated with certain activities are exempt from regulation under both the Site Law and Solid Waste regulations. Exempt activities associated with the proposed expansion may include:

- Registered and inspected vehicles while operating on public ways or that enter the facility to make a delivery or pickup and that are moving, starting or stopping, but not when they are parked with the engine running for over 60 minutes in the facility.
- The unamplified human voice and other sounds of natural origin.
- Facility and vehicle warning signals and alarms so long as used in appropriate circumstances;
- Emergency maintenance and repairs;
- Safety and protective devices installed in accordance with the devices' installation instructions;

- Snow removal, landscaping and street sweeping activities;
- Test operations of emergency equipment occurring in the daytime and no more frequently than once per week; and
- Sound from a regulated development received at a protected location when the generator of the sound has been conveyed a noise easement for that location. This exemption shall only be for the specific noise, land and term covered by the easement.

4.2 Local Standards

RSE understands that the Town of Norridgewock has not enacted noise control standards or an ordinance that designates industrial, commercial or residential zoning districts.

5.0 PROTECTED LOCATIONS

The sound level limits established by Site Law and Solid Waste regulations apply to parcels of land found to be protected locations and to property lines of the facility or contiguous property under common ownership.

Protected locations near the WMDSM facility were identified from site maps provided by Sackett & Brake Survey, Inc. and verification by RSE field personnel. The site maps were compiled based on site boundary surveys, local property tax maps and records, and aerial photography. Figure 3 presents a Vicinity Site Plan of the WMDSM facility showing the nearest protected locations and residential structures in each direction from the landfill facility. Findings and assumptions concerning the identification of protected locations are as follows.

1. There is a mobile home at the Central Maine Airport of Norridgewock (Map 13, Lot 8), which may be used as a residence. However, the Town of Norridgewock owns the property and the primary use is as an airport. Therefore, RSE has determined that the airport property is not a protected location.

2. The Emery property (Map 17, Lot 12) and Sirois property (Map 17, Lot 11) consist of large parcels located off the Sandy River Road (Frederick's Corner Road). There is a residence on each property located less than 150 feet from the Sandy River Road. Both properties extend more than 3,000 feet north of the Sandy River Road with Mill Stream crossing the properties approximately 2,500 feet north of the road. The areas of the properties adjacent to and north of the Mill Stream are primarily forested wetland. Field observations indicate that these areas are not typically accessible by foot. Therefore, RSE has determined that under Site Law noise regulations only land within 2,500 feet of each residence meets the definition of a protected location. However, under Solid Waste noise regulations there is no accessible by foot provision, therefore, all points on both parcels are protected locations as shown on Figure 3.

3. The Totman property (Map 14, Lot 2) formerly contained an abandoned residence, which has now been removed. Because the property does not contain a residence, it is not considered a protected location under Site Law or Solid Waste regulations.

4. Since 1996, WMDSM acquired additional properties around the site that were formerly private residences. Because these properties are now under WMDSM ownership, they no longer meet the definition of a protected location.

6.0 EXISTING SOUND LEVELS

RSE monitored existing sound levels at nearby protected locations in the vicinity of the proposed Phase 8 expansion. Monitoring was conducted on October 24, 2000 prior to and during weekday operation of the facility.

RSE monitored ambient sound levels at six positions A, B, C, D, H, and AR as shown on Figure 3. The monitoring positions were selected based on site maps and field observations of existing noise sources to quantify sound levels from existing operations and at nearby protected locations.

Descriptions of the monitoring positions are as follows:

Position	***Description and Purpose***
A	*WMDSM property line along the main access road 2,900 feet from Route 2. Provides sound level readings of access road traffic noise and at facility property line.*
B	*WMDSM property line 400 feet west of active landfill Phase 11. Provides sound level readings at facility property line.*
C	*WMDSM property line 100 feet west of the Phase 8 expansion. Provides sound level readings at facility property line near Phase 8.*
D	*Abutting property 1,400 feet northeast of Phase 11 and 1,200 east of the Phase 8 expansion. Provides baseline operating sound level readings for projection to nearby protected locations.*
H	*WMDSM property 2,000 feet southeast of the Phase 8 expansion. Provides baseline operating sound level readings for nearby protected locations.*
AR	*WMDSM property along Airport Road 1,400 feet northeast of the Phase 8 expansion. Provides baseline operating sound level readings for nearby protected locations.*

RSE used Type 1 integrating sound level meters (per ANSI S1.4 – Specification for Sound Level Meters) to measure the sound level every 1/8 of a second, to monitor ambient sound levels. Sound level instrumentation consisted of Larson Davis 812 Integrating Sound Level

Meters. Each instrument was fitted with a standard windscreen and mounted on a tripod to put the microphone at a height of 4-5 feet above the ground.

Instrumentation was calibrated before and after the measurements using a B&K 4231 Sound Level Calibrator. The instrumentation has also been calibrated to manufacturer's specifications and applicable national standards by a certified calibration laboratory within the past 12 months. Certificates of instrument calibration can be found in Appendix I.

The hourly Leq results for each monitoring position are presented in Figure 4 along with the daytime average sound levels. Figure 4 presents the Leq readings at the monitoring positions in both tabular and graphical form. The Leq or *equivalent sound level* represents the average energy level of all sounds present during the measurement period. The one-hour Leq is the parameter specified for use by the Maine DEP for establishing existing ambient sound levels.

During sound monitoring temperatures ranged from 23 to 60 degrees F, skies were mostly clear and there was no precipitation. Except for the afternoon, winds were light (0-2 mph) and from the north. During the afternoon, the wind shifted from the south and was typically 2 to 5 mph, with wind speeds as high as 10 mph. Meteorological conditions were satisfactory for pre-development sound level monitoring as set forth in Maine DEP Chapter 375.10.H.2.4.

Hourly sound levels at position A ranged from 56 to 60 dBA with a daytime arithmetic average of 58 dBA. Noise sources at position A were traffic on the main access road and Route 2, and landfill operations.

Hourly sound levels at position B ranged from 49 to 63 dBA with a daytime arithmetic average of 58 dBA. Noise sources at position B were equipment operating in Phase 11 and traffic on Route 2.

Hourly sound levels at position C ranged from 33 to 46 dBA with a daytime arithmetic average of 40 dBA. Noise sources at position C were traffic Route 2, and aircraft. Noise from landfill operations was difficult to discern at position C.

Hourly sound levels at position D ranged from 39 to 50 dBA with a daytime arithmetic average of 45 dBA. Noise sources at position D were landfill operations, site traffic, and traffic on Route 2.

Hourly sound levels at position H ranged from 37 to 51 dBA with a daytime arithmetic average of 43 dBA. Noise sources at position H were traffic on Route 2, and landfill operations.

Hourly sound levels at position AR ranged from 42 to 47 dBA with a daytime arithmetic average of 44 dBA. Noise sources at position AR were traffic on Airport Road, and occasional landfill operations.

7.0 SOUND LEVEL LIMITS

In accordance with Site Law and Solid Waste noise regulations, the sound level limits at protected locations in the vicinity of the Phase 8 expansion are based on existing sound levels

and land uses in the vicinity of the landfill site. The only *nighttime* hour that the Crossroads Landfill routinely operates is from 6:00 a.m. to 7:00 a.m. on weekdays.

Under the Site Law regulations, monitoring positions D, H, and AR represent protected locations. Sound level readings taken by RSE during October 2000 showed that the average daytime sound level at these positions was 45 dBA or less, and the nighttime sound level was above 35 dBA. The hourly sound level limit at nearby protected locations for the Phase 8 expansion is 55 dBA during daytime hours and 50 dBA for the *nighttime* hour beginning at 6:00 a.m. At distances (within a protected location) more than 500 feet from sleeping quarters, the daytime limit of 55 dBA also applies during nighttime hours.

Under the Solid Waste noise regulations, monitoring position C also represents a protected location. Sound level limits are based on the predominant surrounding land use. The predominant surrounding land use for most of the protected locations shown on Figure 3 is residential or undeveloped. The daytime hourly sound level limit at these protected locations is 60 dBA and the nighttime hourly sound level limit is 50 dBA. An exception occurs at the Emery property (Map 17, Lot 12), where surrounding properties include WMDSM property and the Norridgewock Airport, making the predominant surrounding land use commercial or industrial. The daytime hourly sound level limit at the Emery property is 70 dBA and the nighttime sound level limit is 60 dBA. The nighttime limits apply at all points within a protected location containing a residence.

Under both regulations, a 75 dBA limit also applies at the property boundary of the facility, However, where that property line is also a protected location, the lower limits for protected locations apply. The Vicinity Site Plan, Figure 3, has been modified to depict both the Site Law and Solid Waste sound level limits for nearby protected locations.

Under the Site Law, during construction of the Phase 8 expansion, nighttime limits apply from 7 p.m. (1900) to 7 a.m. (700) or during non-daylight hours, whichever is shorter. Noise from construction activity during daytime or daylight hours is not subject to regulation by the Maine DEP (ref. 38 M.R.S.A. Section 484). The Solid Waste regulations do not establish hourly sound level limits for construction activity.

8.0 FUTURE SOUND LEVELS

Future noise sources associated with the proposed landfill expansion consist of landfill cell construction, waste excavation and placement, routine operation, and maintenance activity.

8.1 Landfill Cell Construction

A variety of equipment will be used to construct the Phase 8 expansion including heavy mobile equipment such as bulldozers, excavators, loaders, compactors/rollers and dump trucks. Construction activity consists of land clearing, liner installation, and site grading. When operating at or near full load, most earth moving equipment generates sound levels of 75-85 dBA at a distance of 50 feet.

Typical construction noise is extremely variable as most construction equipment operates intermittently. Noise from construction equipment is not subject to Maine DEP regulation during daylight hours or daytime hours (7:00 a.m. to 7:00 p.m.), whichever is longer. However, noise from construction during other hours is subject to nighttime sound level limits established by Site Law Regulation Chapter 375.10. Construction of Phase 8 will occur only during daylight or daytime hours, and therefore will not be subject to any Maine DEP sound level limits (ref. 38 M.R.S.A. 484).

The mobility and sound levels inherent to construction equipment make complete control of construction noise infeasible. However, several measures will be taken to limit noise from construction activities. These measures include compliance with federal regulations that limit noise from trucks and compressors, and ensuring that equipment and sound muffling devices are kept in good operating condition.

8.2 Waste Excavation and Placement

A major component of the proposed Phase 8 expansion will be excavation of waste material from the former MSW and Asbestos Landfills, and placement of this material into the new Phase 8 Landfill. This activity will be an integral part of Phase 8 construction. As shown on the Vicinity Site Plan (Figure 3), Cells B and C of the Phase 8 expansion will occupy the entire footprint of the former MSW and Asbestos Landfills. Cell A is outside this footprint and will be the first cell constructed as part of Phase 8.

Mechanically stabilized earth (MSE) berms will be constructed around the perimeter of the landfill expansion area. These berms will range from 15 to 20 feet high and will be approximately 40 feet wide along the crest. The berms will have a 3 to 1 (horizontal to vertical) inner slope (into the landfill) and nearly vertical outer slopes. RSE understands that the MSE berms will limit wetland disturbance and maintain current setback requirements while increasing slope stability and landfill volume.

Waste will be placed behind the MSE berms in lifts, starting with the first lift 5 to 8 feet high. The second and subsequent lifts will be 12 to 14 feet high and built from the perimeter berm toward the center of the landfill. The MSE berm will provide a visual and noise barrier to the landfill operation during the first and second lifts. For subsequent lifts extending above the MSE berms, a berm will be constructed of waste and cover material along the perimeter of each cell in areas where the active operation is within 250 feet of abutting parcels to the west of Phase 8 and within 400 feet of abutting parcels to the east of Phase 8. The perimeter berms will provide a visual and noise barrier to landfill operation associated with each subsequent lift in these areas. A schematic diagram showing the arrangement of the MSE and perimeter noise control berms is shown as Figure 6.

Once construction of Phase 8 - Cell A is complete, WMDSM will begin excavating and trucking waste material from the former MSW landfill of Cell B and placing it into Cell A for final disposal. Excavation and placement of waste from the Cell B area is expected to take approximately 106 days. This will occur simultaneously with the routine operation of receiving and placing incoming waste into Phase 9, as well as Phase 12 once Phase 9 is full (see Figure 3).

After the existing waste material is removed from Phase 8 - Cell B, WMDSM will begin construction of the MSE berms, final grading, and installation of the new liner and leachate collection systems in Cell B. When construction of Phase 8 Cell B is complete, WMDSM will begin excavating and trucking waste material from the former landfills of Cell C and placing it in Cell B for final disposal. Excavation and placement of waste from Cell C is expected to take approximately 118 days and will occur simultaneously with routine operation of Cell B.

Construction of the MSE berms, final grading, and installation of the new liner and leachate collection systems for Cell C will begin when all the waste currently residing in the former MSW and Asbestos Landfills has been moved to Cells A and B.

Waste excavation and placement will be performed with equipment similar to that used for landfill cell construction and routine operation of the landfill. Specifically, excavation and transport of the waste will be performed using two or more excavators, one or more front-end loaders, and three or more articulating dump trucks. WMDSM expects to perform final spreading and placement of the excavated waste material into Cells A and B using two bulldozers and two compactors.

WMDSM plans to excavate and place waste during the same hours as routine operation as described in Section 8.3.

8.3 Routine Operation

The operating hours for the Phase 8 expansion will be the same as the existing operating hours. Routine operating hours established for the Crossroads Landfill are from 6 a.m. to 6 p.m. Monday through Friday, and 7 a.m. to 5 p.m. on Saturday. Actual daily operations may often be shorter than the established operating hours depending upon the volume of waste received at the site.

Routine landfill operations include moving, placement, mixing, and covering of the waste material. This is accomplished using equipment similar to that used for landfill construction such as bulldozers, waste compactors, front-end loaders, and excavators. Bulldozers and waste compactors will operate nearly full time to spread and compact waste material. At current levels, full operation of the landfill consists of two bulldozers and two compactors operating simultaneously to spread and compact waste. A front-end loader and excavator are used intermittently to move and spread cover material. Equipment operators substitute the loader or excavator for a bulldozer or compactor so that the number of operating units does not increase.

Landfill operations are generally reduced during the first and last hour of daily operations. In the first hour, landfill mobile equipment is generally in the checkout, fueling and startup process, and the active area of the landfill is being prepared for receiving waste. This daily site preparation may involve removing daily synthetic cover or preparing waste unloading areas. If landfill operations occur during the nighttime hour (6 a.m. to 7 a.m.) when sound level limits are lower, they are generally at the reduced level associated with daily startup. During the last hour of daily operations, equipment shutdown/checkout occurs and daily cover such as soil, ash or synthetic material is applied.

Vehicles used to transport material to and from the landfill include haul trucks to deliver waste to the landfill, dump trucks to deliver gravel and cover material, and tank trucks to remove leachate from the leachate storage facility. Nearly all traffic enters and exits the site during routine operating hours. However, waste may be accepted during other hours to accommodate special customer needs. Because transport vehicles do not remain on site for more than one hour, these vehicles are exempt from the Site Law and Solid Waste noise regulations. In addition, noise generated by truck and equipment warning signals and backup alarms is exempt from these noise regulations.

8.4 Sound Level Estimates

In order to estimate sound levels from operation of the proposed Phase 8 expansion at nearby protected locations and property lines, RSE developed a sound level prediction model for the facility. The model predicts the sound levels resulting from each major noise source by calculating attenuation due to distance, atmospheric absorption and, as appropriate, noise control berms. Site distances were taken from plans and aerial photographs provided by consultants for WMDSM.

Estimates were prepared for five receiver positions representing the nearest protected locations and property lines where the sound level limits of Site Law and/or Solid Waste regulations apply. The receivers positions include two points (9 and 13) from previous sound level studies and three new points (16, 17, and 18) north and east of the Phase 8 expansion as shown on Figure 3, Vicinity Site Plan. Under the Site Law regulation, receivers 13 and 18 are not protected locations so that the property line limit of 75 dBA applies. However, under the Solid Waste regulation, these receivers are protected locations and the sound level limits are 70 dBA daytime and 60 dBA nighttime at receiver 13 and 60 dBA daytime/50 dBA nighttime at receiver 18. RSE expects hourly sound levels at nearby protected locations to be equal to or less than the estimated sound levels at receiver points 9, 13, 16 and 18. Similarly, sound levels at other property lines should be equal or less than estimated sound levels at positions 13 and 17.

The noise prediction model is based on standard-day meteorological conditions (59 degrees F and 70% relative humidity), which represent the lower range of attenuation values found in relevant literature.

Wind and temperature gradients can affect outdoor sound propagation. When sound travels with the wind, the "downwind effect" will erase any sound attenuation due to vegetation or distant barriers that might otherwise occur. Strong temperature gradients can also affect sound waves in a similar fashion. With a temperature inversion, warm air above the ground surface acts to bend sound waves down similar to a downwind effect. A temperature inversion can diminish the effects of vegetation along the sound path to the receiver. For sound traveling against the wind, there can be significant sound level reduction as sound waves are bent upward.

Although trees and other vegetation could potentially reduce sound levels significantly, these factors are not considered in the model due to potential contrasting effects of wind and temperature gradients.

The MSE and perimeter berms will act as sound barriers during placement of waste into the landfill cells. This includes periods when simultaneous disposal of new waste and placement of waste excavated from the MSW and Asbestos Landfills will occur. Sound level reduction will vary depending upon the location of the MSE berms in relation to landfill equipment, property lines and nearby protected locations. The perimeter berms will be maintained a minimum of 12 feet above the top of the previous lift and will extend to either side of the active landfill operating area.

Barrier insertion loss is calculated for receivers 13 and 17 located at the facility property boundary. Due to the topography, the barriers will be effective for these receivers under a variety of meteorological conditions. The barriers will also act to reduce sound levels at other receivers, however, due to the large distances from the barriers, the sound insertion loss will vary and therefore has not been calculated.

Noise source data for use in the model was obtained from measurements by RSE of landfill operations at the WMDSM facility on October 24, 2000. These measurements were conducted from monitoring position HT established on the side of the partially completed Phase 1-6 landfill as shown on Figure 5. This position is approximately 800 feet from the northwest corner of Phase 11 and chosen to isolate noise from landfill equipment operating in Phase 11.

At position HT, RSE measured octave band sound levels from both individual and simultaneous operation of primary landfill equipment, i.e. bulldozers and compactors. Sound level readings and observations of simultaneous operation were taken between 7:00 a.m. and 9:00 a.m. on October 24, 2000. Subsequently, sound level readings of individual equipment were taken by moving one unit at a time to the northwest corner of Phase 11 while the other units operated in a low area closer to the center of Phase 11. This allowed each piece of equipment to be isolated for purposes of measuring sound levels during typical operation. A summary of sound level readings for routine operation and landfill equipment is presented in Table 1.

From the equipment sound level readings, the model predicts sound levels from landfill operation at each receiver position, and as appropriate, the combined sound level of equipment in different phases operating simultaneously. The model calculations can be found in Appendix II. Table 2 presents a summary of the model results and a comparison to Site Law and Solid Waste sound level limits. Table 2 provides the estimated sound level at each receiver from operation of each landfill cell, and as appropriate, the combined sound level of landfill cells and phases that are expected to operate simultaneously. The equipment locations for the noise model were selected near the perimeter of the landfill in the direction of each receiver. The location of each landfill phase and cell, and receiver is shown on Figure 3, Vicinity Site Plan.

At receiver 9, the estimated hourly sound levels during operation of each Phase 8 landfill cell range from 47 dBA for Cell C to 57 dBA for Cell A. The estimated combined sound levels at receiver 9 from simultaneous operation of cells and phases range from 56 to 59 dBA. The Site Law daytime limit at receiver 9 is 55 dBA, whereas the Solid Waste daytime limit is 70 dBA. Operation of Cell 8A and combined operation of cells and phases has the potential to exceed the Site Law limit of 55 dBA but will be 11 to 14 dBA below the Solid Waste limit of 70 dBA.

At receiver 13, the highest hourly sound levels are expected to occur during placement of waste into Phase 8A with equipment operating within 50 feet of the edge of the landfill. The estimated hourly sound level at receiver 13 is 68 dBA, which is 7 dBA below the 75 dBA limit under the Site Law regulation and 2 dBA below the 70 dBA limit under the Solid Waste regulation.

At receiver 16, the estimated hourly sound levels during operation of each Phase 8 landfill cell range from 45 dBA for Cell A to 53 dBA for Cell C. The estimated combined sound levels at receiver 16 from simultaneous operation of cells and phases range from 51 to 55 dBA. Sound levels from landfill operations are expected to be at or below daytime limits under both Site Law and Solid Waste regulations.

At receiver 17, the highest hourly sound levels are expected to occur during operation of Phase 8C with equipment operating within 50 feet of the edge of the landfill. The estimated hourly sound level at receiver 17 is 68 dBA, which is 7 dBA below the 75 dBA limit under both the Site Law and Solid Waste regulations.

At receiver 18, the estimated hourly sound levels during operation of each Phase 8 landfill cell range from 49 dBA for Cell B to 52 dBA for Cell B. The estimated combined sound level at receiver 18 from simultaneous operation of selected cells and phases is 57 dBA. Under the Site Law regulation, there is no daytime limit at receiver 18. The daytime limit at receiver 18 under the Solid Waste regulation is 60 dBA. Sound levels from landfill operations are expected to below the daytime limit under the Solid Waste regulation.

The first hour of landfill operation (6:00 a.m. to 7:00 a.m.) occurs during a nighttime hour as defined by the Maine DEP. Based on sound monitoring results of October 24, 2000, sound levels from Phase 8 during this hour are expected to be 5 to 10 dBA below sound levels produced by routine operation during daytime hours. Consequently, sound levels produced by operation of the Phase 8 expansion during nighttime operation (6:00 a.m. to 7:00 a.m.) should be at or below the nighttime limits of 60 and 50 dBA at nearby protected locations, and below the 75 dBA limit at the facility property line.

9.0 SUMMARY AND CONCLUSIONS

The primary objectives of the Sound Level Study were: 1) to establish sound level limits at the nearby protected locations and 2) estimate future sound levels for comparison with Maine DEP Site Law and Solid Waste noise regulations.

Protected locations were identified using previous sound level studies, current site maps, and field observations. Existing sound levels and regulatory limits were established based on results of sound level monitoring and existing land uses. Future noise sources associated with the Phase 8 expansion consist of mobile equipment, truck traffic, and miscellaneous smaller sources. Sound levels associated with regulated noise sources were established from measurements during routine operation at the Crossroads Landfill.

A noise model was developed to estimate sound levels during construction and operation of the Phase 8 expansion. The results indicate that future noise sources at the landfill and sound

levels at nearby protected locations will be similar to existing and previous site conditions. In addition, sound levels from the facility will be at or below the Site Law regulation limits during most operations, and below the Solid Waste regulation limits during all operations. During limited periods, the placement of waste into the landfill may generate sound levels up to 4 dBA above the Site Law limit in the vicinity of receiver 9, which is more than 2,000 feet from the nearest residence. Noise reduction due to existing vegetation will likely reduce landfill sound levels to at or below the Site Law limits at receiver 9.

The purpose of noise modeling is to predict future sound levels during operation of the Phase 8 landfill expansion. However, in order to confirm the modeling results, RSE recommends that WMDSM periodically monitor sound levels generated by routine operation of the Phase 8 landfill, particularly during periods of simultaneous Phase/Cell operation and operation in close proximity to the limits of the landfill.

FIGURE 1
RELATION BETWEEN SOUND PRESSURE IN PASCALS AND SOUND PRESSURE LEVEL IN DECIBELS

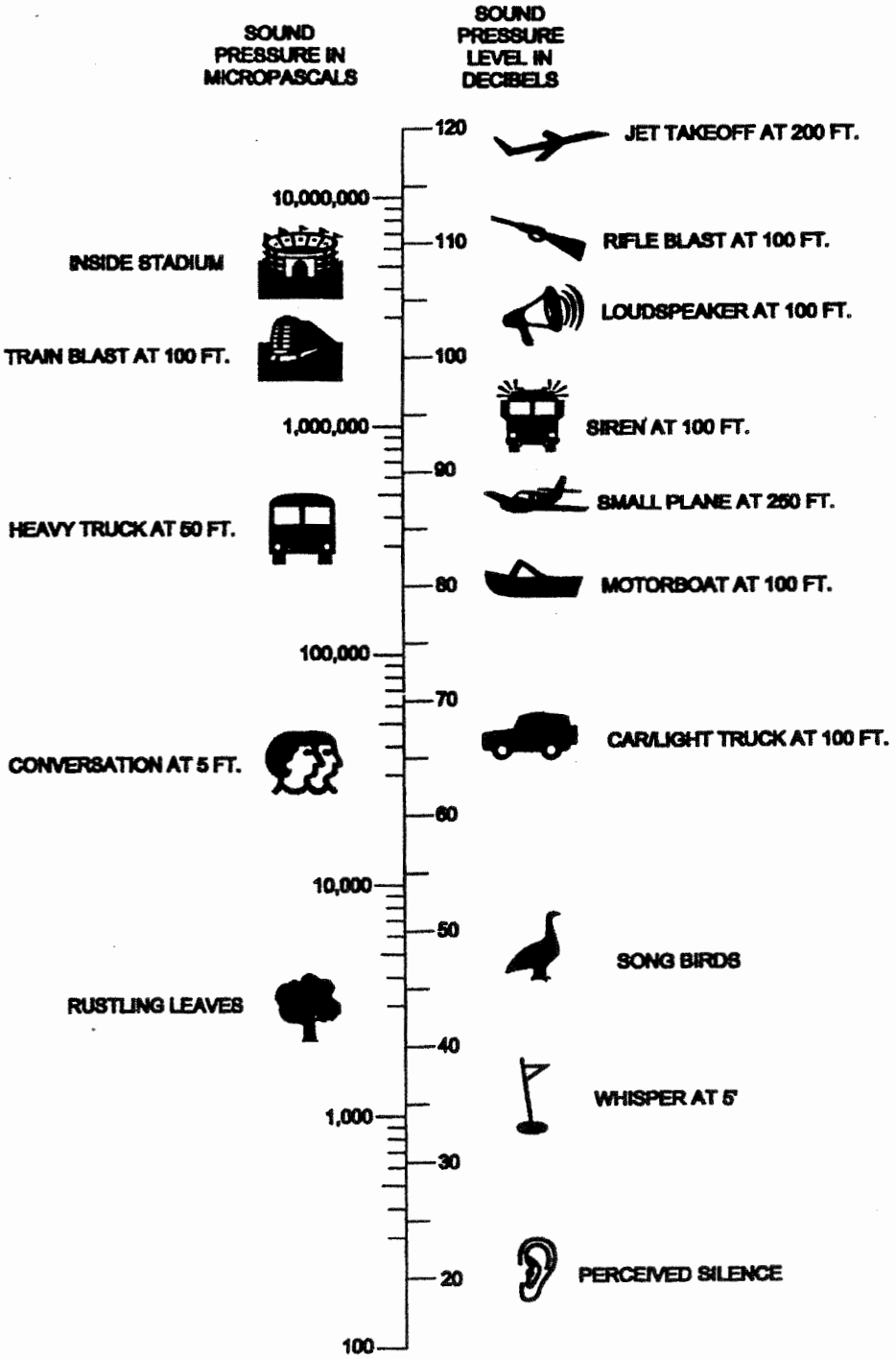
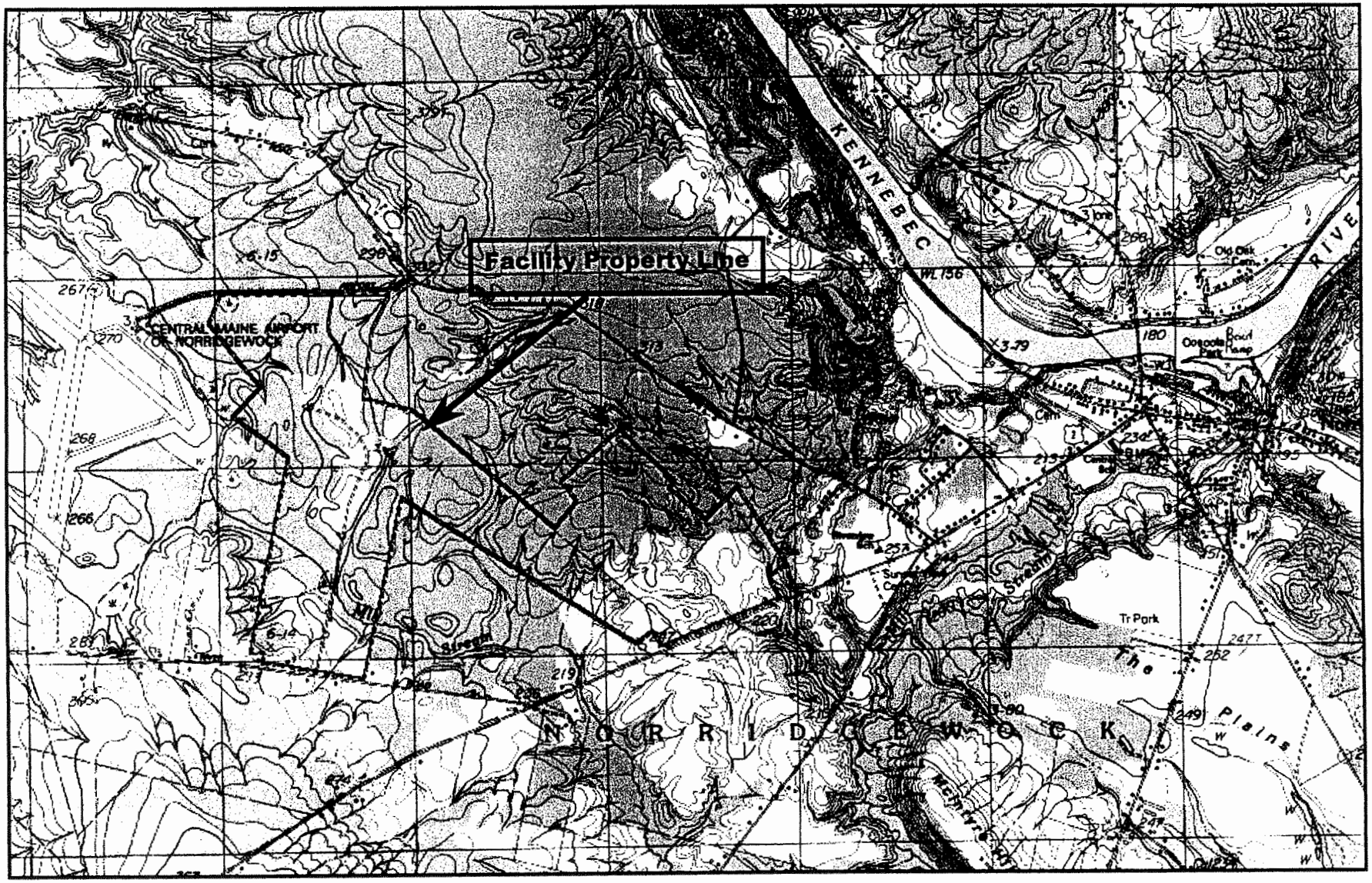
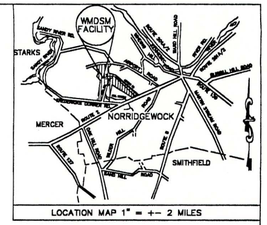


FIGURE 2
SITE LOCUS MAP - CROSSROADS LANDFILL



Source: U.S.G.S. Topographic 7.5 Minute Series

MAP	LOT	OWNER
10	13	N/F SCOTT GURNER
10	13-1	N/F SHERRI M. & CAROLYN E. EVERETT
10	21	N/F ROBERT & TONI CARTER
10	21-1	N/F JAN JOHNSON
10	22-1	N/F WESLEY & LINDA HALLOWELL
10	24	N/F WILLIAM MINOR
10	38	N/F CECILE L KIELY
10	46	N/F ELMER & LORNA WESTERLUND
10	47	N/F RUSSELL IRELAND & CATHERINE OBERT
10	51	N/F RANDALL FICKETT
10	52	N/F WILLIAM & NANCY L. CATES
10	53	N/F DIANA & JAMES WADE



LOCATION MAP 1" = +- 2 MILES

E 16000
N 12000

MAGNETIC

GRAPHIC SCALE
500 0 250 500 1000 2000
(IN FEET)
1 inch = 500 ft.

LEGEND:
- SOUND LEVEL MONITORING POSITION
- BOUNDARY OF PROTECTED LOCATION ⚠
- NOISE SOURCE CENTER (FOR NOISE PREDICTION MODEL)
- 13 RECEIVER POSITION (FOR NOISE PREDICTION MODEL)
- 55/50 DAYTIME/NIGHTTIME HOURLY SOUND LEVEL LIMITS

⚠ THIS PLAN SHOWS ONLY THE NEAREST PROTECTED LOCATIONS IN EACH DIRECTION FROM THE LANDFILL FACILITY. THERE ARE SEVERAL RESIDENTIAL PROPERTIES ON THIS PLAN THAT ARE NOT IDENTIFIED AS PROTECTED LOCATIONS.

NOTE:
LOT OWNER UPDATES FROM TOWN OF NORRIDGEWOCK PROPERTY LIST DATED 10/4/00.

GROUND CONTROL, PROPERTY LINE INFORMATION AND BASE MAP PROVIDED BY:
SACKETT & BRAKE SURVEY, INC.
P.O. BOX 207, RTE 201N
SKOWHEGAN, MAINE 04976
207-474-6223

CONTOUR INTERVAL: 2'
VERTICAL DATUM: USGS MEAN SEA LEVEL
HORIZONTAL DATUM: ASSUMED

REV	DATE		DRN	APP
2	12/22/00	SOUND LEVEL STUDY INFO	RSB	
1	10/16/00	LOT OWNER UPDATES	DJS	

Resource Systems Engineering
35 Church Rd.
P. O. Box K
Brunswick, Maine
(207) 725-7896

WASTE MANAGEMENT
CROSSROADS LANDFILL
Norridgewock, Maine 04957

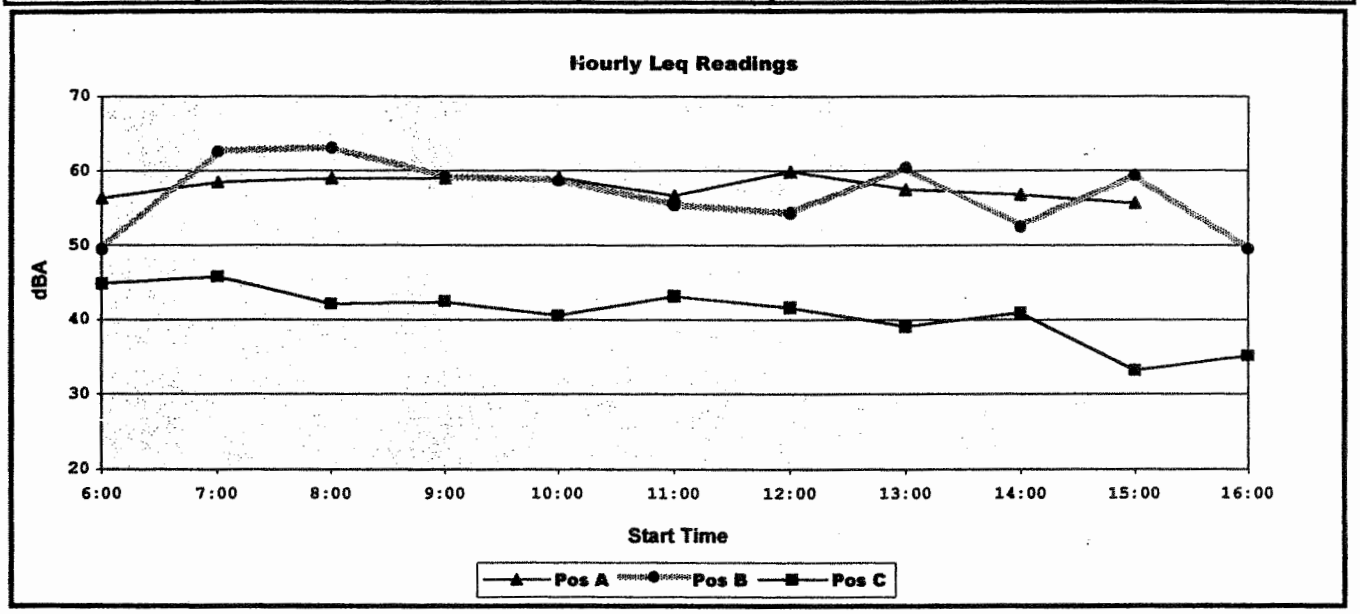
PROJECT:
PHASE 8 EXPANSION

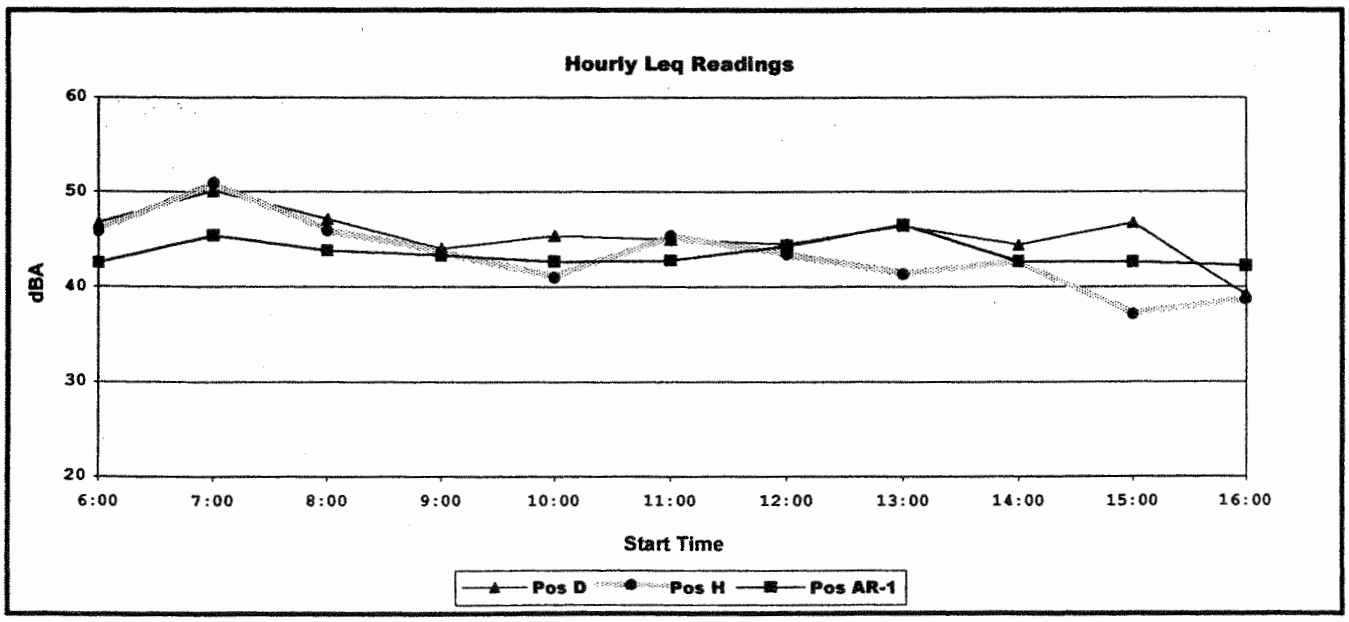
TITLE:
VICINITY SITE PLAN

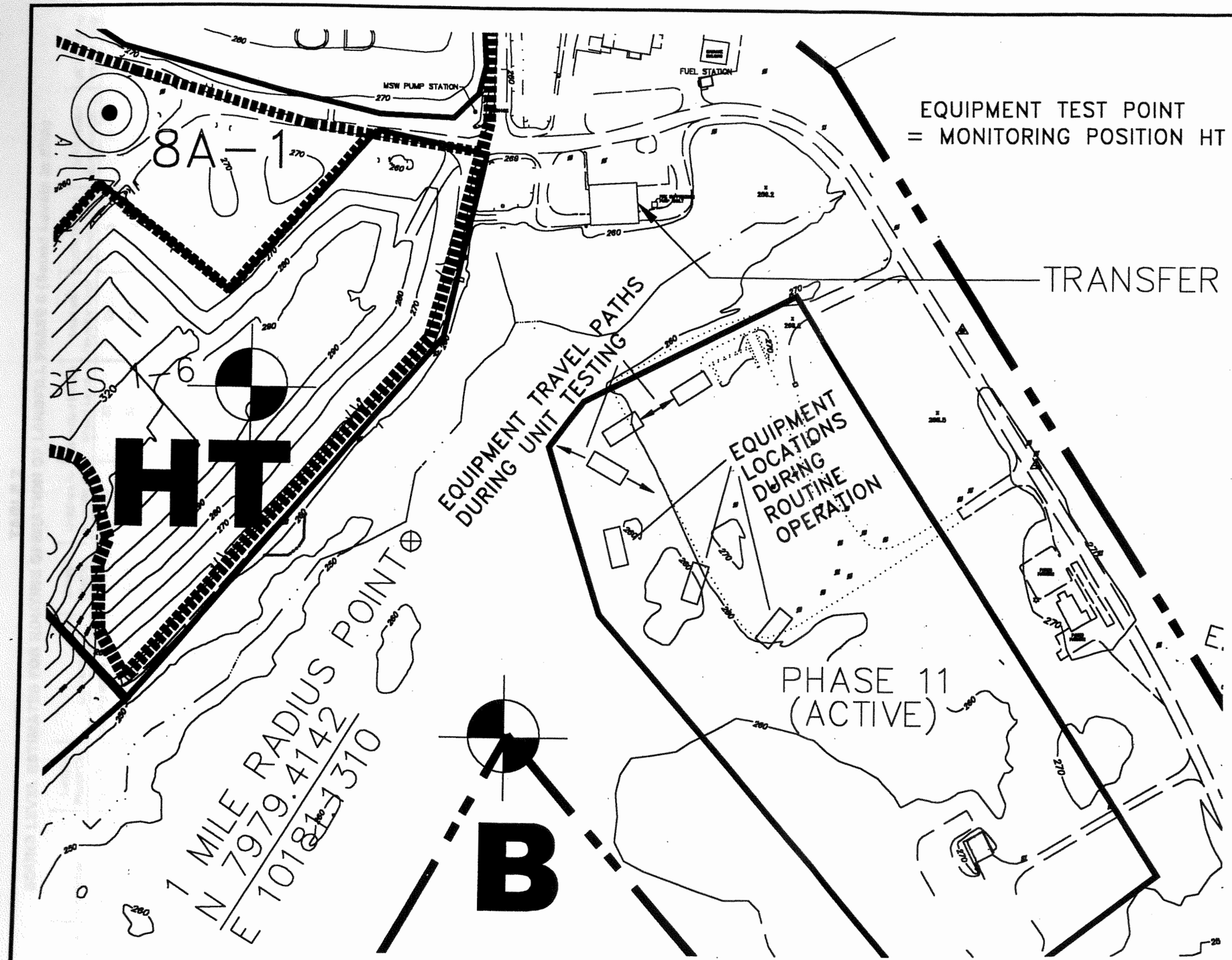
DATE: 2/26/96			DWG FILE: T049402
DES BY:			SCALE: 1" = 500'
DRN BY:	DJS		**FIGURE 3**
CHK BY:			
APP BY:			

FIGURE 4. SOUND LEVEL READINGS DURING ROUTINE OPERATION ON OCTOBER 24, 2000

Start Time	Pos A	Pos B	Pos C	Pos D	Pos H	Pos AR-1
6:00	56	49	45	47	46	43
7:00	59	63	46	50	51	45
8:00	59	63	42	47	46	44
9:00	59	59	42	44	44	43
10:00	59	59	41	45	41	43
11:00	57	55	43	45	45	43
12:00	60	54	42	45	43	44
13:00	58	60	39	46	41	47
14:00	57	53	41	44	43	43
15:00	56	59	33	47	37	43
16:00		50	35	39	39	42
Average Daytime	**58**	**58**	**40**	**45**	**43**	**44**







LEGEND:

- SOUND LEVEL MONITORING POSITION
- BOUNDARY OF PROTECTED LOCATION
- NOISE SOURCE CENTER (FOR NOISE PREDICTION MODEL)
- (13) RECEIVER POSITION (FOR NOISE PREDICTION MODEL)
- *55/50* DAYTIME/NIGHTTIME HOURLY SOUND LEVEL LIMITS

GROUND CONTROL, PROPERTY LINE INFORMATION AND BASE MAP PROVIDED BY:
SACKETT & BRAKE SURVEY, INC.
P.O. BOX 207, RTE 201N
SKOWHEGAN, MAINE 04976
207-474-6223

CONTOUR INTERVAL: 2'
VERTICAL DATUM: USGS MEAN SEA LEVEL
HORIZONTAL DATUM: ASSUMED

REV	DATE		BY	APP
2	12/22/00	SOUND LEVEL STUDY INFO	RSB	
1	10/18/00	LOT OWNER UPDATES	DJS	

Resource Systems Engineering
35 Church Rd.
P. O. Box K
Brunswick, Maine
(207) 725-7896

WASTE MANAGEMENT
CROSSROADS LANDFILL
Norridgewock, Maine 04957

PHASE 8 EXPANSION

EQUIPMENT SOUND LEVEL MEASUREMENT AND OPERATING LOCATIONS

DATE: 2/26/96			DWG FILE: T049402
DES BY:			SCALE: 1" = 200'
DRN BY:	DJS		
CHK BY:			
APP BY:			

FIGURE 5

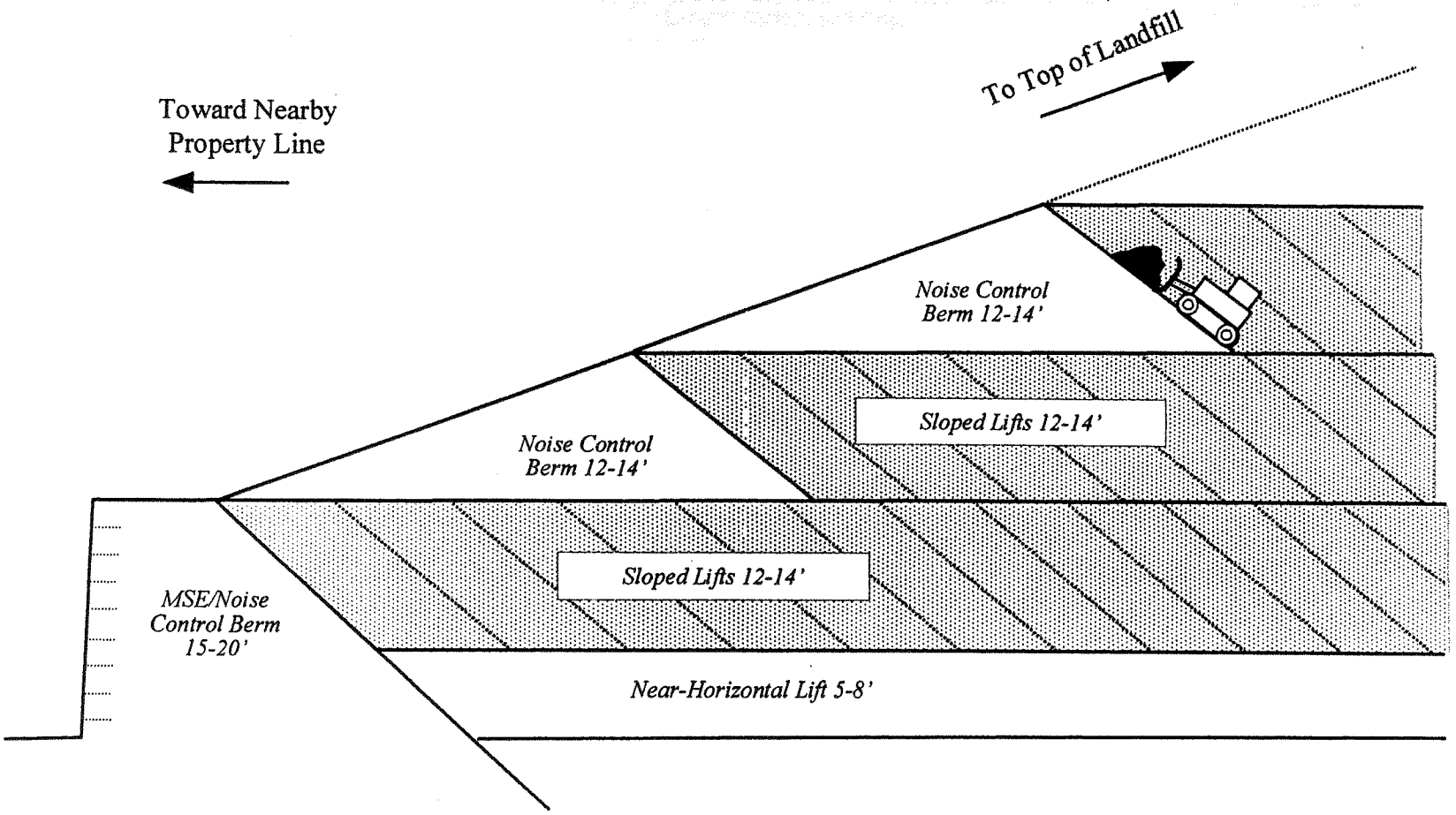
TABLE 2

SOUND LEVEL ESTIMATES FOR ROUTINE OPERATION OF LANDFILL PHASE 8 (Sound Levels in dBA)

Receiver	Description	Landfill Phase/Cell	Operation	Source Position	Distance to Receiver (ft)	Estmated Hourly Sound Level	Site Law Daytime Limit	dBA Over or Under Limit	Solid Waste Daytime Limit	dBA Over or Under Limit
9	Protected location	Phase 9	Incoming waste	9-2	1900	52	55	-3	70	-18
	southwest of	Phase 8A	Place excavated waste	8A-2	1300	57	55	+2	70	-13
	Phase 8	Phase 8B	Excavate waste	8B-2	1900	52	55	-3	70	-18
		Combined				**59**	**55**	**+4**	**70**	**-11**
9	Protected location	Phase 8B	Incoming waste	8B-2	1900	52	55	-3	70	-18
	southwest of	Phase 8B	Place excavated waste	8B-2	1900	52	55	-3	70	-18
	Phase 8	Phase 8C	Excavate waste	8C-2	2600	47	55	-8	70	-23
		Combined				**56**	**55**	**+1**	**70**	**-14**
16	Protected location	Phase 9	Incoming waste	9-1	2900	46	55	-9	60	-14
	northeast of	Phase 8A	Place excavated waste	8A-1	3200	45	55	-10	60	-15
	Phase 8	Phase 8B	Excavate waste	8B-1	2500	48	55	-7	60	-12
		Combined				**51**	**55**	**-4**	**60**	**-9**
16	Protected location	Phase 8B	Incoming waste	8B-1	2500	48	55	-7	60	-12
	northeast of	Phase 8B	Place excavated waste	8B-1	2500	48	55	-7	60	-12
	Phase 8	Phase 8C	Excavate waste	8C-1	1800	53	55	-2	60	-7
		Combined				**55**	**55**	**+0**	**60**	**-5**
18	Protected location	Phase 9	Incoming waste	9-2	1600	54	n/a	n/a	60	-6
	southwest of	Phase 8A	Place excavated waste	8A-3	1900	52	n/a	n/a	60	-8
	Phase 8	Phase 8B	Excavate waste	8B-2	2400	49	n/a	n/a	60	-11
		Combined				**57**	**n/a**	**n/a**	**60**	**-3**
13	Property line west of Phase 8	Phase 8A	Incoming waste	50 feet from landfill limit	120	68	75	-7	70	-2
17	Property line east of Phase 8	Phase 8C	Incoming waste	50 feet from landfill limit	105	68	75	-7	75	-7

Note: See Figure 3 for phase and source positions.

FIGURE 6. LANDFILL NOISE CONTROL BERMS



Not to Scale

TABLE 1. LANDFILL EQUIPMENT SOUND LEVEL READINGS (OCTOBER 24, 2000)

Start Time	Duration (hh:mm:ss)	Broadband, dBA			Linear Sound Levels by Octave Band, dB							Observations
		Leq	L1	L10	63	125	250	500	1K	2K	4K	
Landfill Startup and Operation												
6:00:00	1:00:00	51	56	53	58	51	48	49	46	39	31	Phase 11 startup; truck activity at MRF and container storage area; Route 2 traffic
7:00:00	1:00:00	57	63	60	60	58	56	57	53	47	35	Phase 11 operation - dozers and compactors; scale now open and facility receiving waste
8:00:00	1:00:00	58	62	60	59	59	56	57	53	48	37	Phase 11 operation - receiving and placing waste
9:00:00	1:00:00	55	63	59	60	58	55	54	51	45	35	Phase 11 operation - receiving and placing waste
CAT D6 Bulldozer												
10:41:43	0:01:43	54	59	56	61	57	51	53	51	44	34	Spreading waste - level terrain
10:43:44	0:02:30	56	59	57	56	59	53	55	51	47	36	Moving up and down side slope - backing down
10:46:40	0:01:22	55	58	56	55	57	54	54	50	45	35	Moving up and down side slope - backing up
CAT 836 Compactor												
10:51:17	0:01:42	58	61	60	57	66	54	58	52	47	35	Pushing waste over slide slope
10:53:50	0:02:27	61	65	64	58	66	57	62	57	52	40	Pushing waste over slide slope and level terrain
10:56:37	0:00:31	61	65	63	58	59	52	61	58	53	41	Traveling to center of Phase 11
CAT D5 Bulldozer												
11:04:09	0:00:47	54	58	57	56	58	52	54	49	44	33	Spreading waste - level terrain
11:05:59	0:02:14	54	59	57	59	56	50	53	50	44	33	Spreading waste - level terrain
11:08:36	0:02:04	56	63	58	58	56	52	56	51	47	36	Moving up and down side slope - backing down
11:11:11	0:01:12	54	58	56	59	55	53	54	49	44	34	Moving up and down side slope - backing up
11:12:37	0:00:27	55	60	57	56	54	51	53	52	47	33	Backing across Phase 11
CAT 826 Compactor												
11:21:38	0:02:25	60	65	62	54	59	57	59	57	51	40	Spreading waste on level terrain
11:24:34	0:01:11	53	56	55	54	55	52	53	48	43	32	Spreading waste on level terrain
11:26:49	0:01:10	61	65	63	56	60	59	60	57	51	40	Pushing waste up side slope
11:28:56	0:00:21	60	62	61	52	55	58	58	56	50	39	Traveling to center of Phase 11

NOTE: Sound Level Readings taken at Position HT (Phase 1-6)

APPENDIX I
INSTRUMENT CALIBRATION CERTIFICATES

West Caldwell Calibration Laboratories Inc.

Certificate of Calibration

for

ACOUSTICAL CALIBRATOR

Manufactured by:	BRUEL & KJAER
Model No:	4231
Serial No:	2241033
Calibration Recall No:	8274

Submitted By:

Customer:	CHARLIE WALLACE
Company:	RESOURCE SYSTEMS ENGINEERING

The subject instrument was calibrated to the indicated specification using standards traceable to the National Institute of Standards and Technology or to accepted values of natural physical constants. This document certifies that the instrument met the following specification upon its return to the submitter.

West Caldwell Calibration Laboratories Specification No. 4231 BRUE

Upon receipt for Calibration, the instrument was found to be:

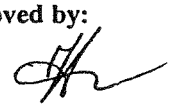
Within (X) see attached report.

the tolerance of the indicated specification.

West Caldwell Calibration Laboratories' calibration control system meets the requirements, MIL-STD-45662A, ANSI/NCSL Z540-1, IEC Guide 25 and ISO 9002

Calibration Date:	13-Jul-00
Calibration Due:	13-Jul-01
Certificate No:	8274 - 2

Approved by:



Felix Christopher

West Caldwell Calibration Laboratories, Inc.
uncompromised calibration

1086 Bloomfield Avenue
West Caldwell
New Jersey
07006

Telephone
(973) 882-4900
Fax
(973) 808-9297

Certificate of Calibration and Conformance

Certificate Number 2000-28213

Instrument Model 812, Serial Number 0473, was calibrated on 07-26-2000. The instrument meets factory specifications according to Larson • Davis Test Procedure TP-1023, ISO 10012, ANSI S1.4 1983, IEC 651-Type 1 1979, and IEC 804-Type 1 1985.

New Instrument
Date Calibrated: 07-26-2000
Calibration due: 09-26-2001

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson • Davis	LDSigGn/2209	0508/0110	12 Months	03/16/2001	2000-25728

Certified Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 22 ° Centigrade

Relative Humidity: 34 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Larson • Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

This calibration complies with ISO 10012. The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

Due to state-of-the-art limitations, 4:1 calibration ratios are not possible on pressure measurement standards, microphones and acoustic calibrators. Calibration ratios for these types of devices are limited to 1:1.

The results documented in this certificate relate only to the item(s) calibrated or tested. Calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of Larson • Davis Laboratories.

Technician: Ron Harris
Service Center: Larson • Davis Laboratories, Utah

Signed: Ron Harris

LARSON • DAVIS LABORATORIES
1681 West 820 North · Provo, Utah 84601 · Phone (801) 375-0177

Certificate of Calibration and Conformance

Certificate Number 2000-25177

Instrument Model 824, Serial Number 0646, was calibrated on 02-15-2000. The instrument meets factory specifications according to Larson • Davis Test Procedure TP-1039, ISO 10012, ANSI S1.4 1983, IEC 651-1979 Type 1, IEC 804-1985 Type 1, IEC 1260-1995 Class 1, and ANSI S1.11-1986 Type 1D.

New Instrument
Date Calibrated: 02-15-2000
Calibration due: 04-15-2001

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson • Davis	LDSigGn/2209	0445 / 0111	12 Months	01/12/2001	2000-24585

Certified Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 23 ° Centigrade

Relative Humidity: 23 %

Affirmations

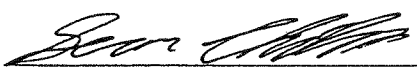
This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Larson • Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

This calibration complies with ISO 10012. The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

Due to state-of-the-art limitations, 4:1 calibration ratios are not possible on pressure measurement standards, microphones and acoustic calibrators. Calibration ratios for these types of devices are limited to 1:1.

The results documented in this certificate relate only to the item(s) calibrated or tested. Calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of Larson • Davis Laboratories.

Technician: Sean Childs
Service Center: Larson • Davis Laboratories, Utah

Signed: 

LARSON • DAVIS LABORATORIES
1681 West 820 North Provo, Utah 84601 Phone (801) 375-0177

West Caldwell Calibration Laboratories Inc.

Certificate of Calibration

for

SOUND LEVEL METER

Manufactured by:	LARSON DAVIS
Model No:	812
Serial No:	A0544
Calibration Recall No:	7561

Submitted By:

Customer:	CHARLIE WALLACE
Company:	RESOURCE SYSTEMS ENGINEERING

The subject instrument was calibrated to the indicated specification using standards traceable to the National Institute of Standards and Technology or to accepted values of natural physical constants. This document certifies that the instrument met the following specification upon its return to the submitter.

West Caldwell Calibration Laboratories Specification No. 812 LARS

Upon receipt for Calibration, the instrument was found to be:

Within (X) see attached report.

the tolerance of the indicated specification.

West Caldwell Calibration Laboratories' calibration control system meets the requirements, MIL-STD-45662A, ANSI/NCSL Z540-1, IEC Guide 25 and ISO 9002

Calibration Date:	28-Jan-00
Calibration Due:	28-Jan-01
Certificate No:	7561 - 1

Approved by:

Felix Christopher

uncompromised calibration
West Caldwell Calibration Laboratories, Inc.

1086 Bloomfield Avenue
West Caldwell
New Jersey
07006

Telephone
(973) 882-4900
Fax
(973) 808-9297

Certificate of Calibration and Conformance

Certificate Number 1999-21767

Instrument Model 812, Serial Number 0528, was calibrated on 08-25-1999. The instrument meets factory specifications according to Larson • Davis Test Procedure TP-1023, ISO 10012, ANSI S1.4 1983, IEC 651-Type 1 1979, and IEC 804-Type 1 1985.

New Instrument
Date Calibrated: 08-25-1999
Calibration due: 10-25-2000

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson • Davis	LDSigGn/2209	0612 / 0102	12 Months	02/01/2000	1999-18374

Certified Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 22 ° Centigrade

Relative Humidity: 33 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Larson • Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

This calibration complies with ISO 10012. The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

Due to state-of-the-art limitations, 4:1 calibration ratios are not possible on pressure measurement standards, microphones and acoustic calibrators. Calibration ratios for these types of devices are limited to 1:1.

The results documented in this certificate relate only to the item(s) calibrated or tested. Calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of Larson • Davis Laboratories.

Technician: Ron Birrell
Service Center: Larson • Davis Laboratories, Utah

Signed:

LARSON • DAVIS LABORATORIES
1681 West 820 North Provo, Utah 84601 Phone (801) 375-0177

Certificate of Calibration and Conformance

Certificate Number 1999-21769

Instrument Model 812, Serial Number 0526, was calibrated on 08-24-1999. The instrument meets factory specifications according to Larson • Davis Test Procedure TP-1023, ISO 10012, ANSI S1.4 1983, IEC 651-Type 1 1979, and IEC 804-Type 1 1985.

New Instrument
Date Calibrated: 08-24-1999
Calibration due: 10-24-2000

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson • Davis	LDSigGn/2209	0612 / 0102	12 Months	02/01/2000	1999-18374

Certified Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 23 ° Centigrade **Relative Humidity: 31 %**

Affirmations

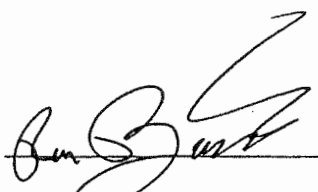
This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Larson • Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

This calibration complies with ISO 10012. The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

Due to state-of-the-art limitations, 4:1 calibration ratios are not possible on pressure measurement standards, microphones and acoustic calibrators. Calibration ratios for these types of devices are limited to 1:1.

The results documented in this certificate relate only to the item(s) calibrated or tested. Calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of Larson • Davis Laboratories.

Technician: Ron Birrell
Service Center: Larson • Davis Laboratories, Utah

Signed: 

LARSON • DAVIS LABORATORIES
1681 West 820 North Provo, Utah 84601 Phone (801) 375-0177

West Caldwell Calibration Laboratories Inc.

Certificate of Calibration

for

INTEGRATING SOUND LEVEL METER

Manufactured by:	LARSON DAVIS
Model No:	812
Serial No:	0308
Calibration Recall No:	8572

Submitted By:

Customer:	CHARLIE WALLACE
Company:	RESOURCE SYSTEMS ENGINEERING

The subject instrument was calibrated to the indicated specification using standards traceable to the National Institute of Standards and Technology or to accepted values of natural physical constants. This document certifies that the instrument met the following specification upon its return to the submitter.

West Caldwell Calibration Laboratories Specification No. 812 LARS

Upon receipt for Calibration, the instrument was found to be:

Within (X) **see attached report.**

the tolerance of the indicated specification.

West Caldwell Calibration Laboratories' calibration control system meets the requirements, MIL-STD-45662A, ANSI/NCSL Z540-1, IEC Guide 25 and ISO 9002

Calibration Date:	02-Oct-00
Calibration Due:	02-Oct-01
Certificate No:	8572 - 1

Approved by:

Felix Christopher
Quality Manager

uncompromised calibration
West Caldwell Calibration Laboratories, Inc.

1086 Bloomfield Avenue
West Caldwell
New Jersey
07006

Telephone
(973) 882-4900
Fax
(973) 808-9297

Certificate of Calibration and Conformance

Certificate Number 1999-24210

Instrument Model 812, Serial Number 0549, was calibrated on 12-21-1999. The instrument meets factory specifications according to Larson • Davis Test Procedure TP-1023, ISO 10012, ANSI S1.4 1983, IEC 651-Type 1 1979, and IEC 804-Type 1 1985.

New Instrument
Date Calibrated: 12-21-1999
Calibration due: 02-21-2001

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson • Davis	LDSigGn/2209	0612 / 0102	12 Months	02/01/2000	1999-18374

Certified Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 22 ° Centigrade **Relative Humidity: 28 %**

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Larson • Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

This calibration complies with ISO 10012. The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

Due to state-of-the-art limitations, 4:1 calibration ratios are not possible on pressure measurement standards, microphones and acoustic calibrators. Calibration ratios for these types of devices are limited to 1:1.

The results documented in this certificate relate only to the item(s) calibrated or tested. Calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of Larson • Davis Laboratories.

Technician: Ron Harris
Service Center: Larson • Davis Laboratories, Utah

Signed: Ron Harris

LARSON • DAVIS LABORATORIES
1681 West 820 North Provo, Utah 84601 Phone (801) 375-0177

APPENDIX II
SOUND LEVEL PREDICTION MODEL

SOUND LEVEL PREDICTION MODEL

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE - CROSSROADS LANDFILL

NORRIDGEWOCK, MAINE

Routine Operation Phase 9, Excavate Waste Phase 8B, Place Waste Phase 8A
Estimated Sound Level at Receiver 9
(distances & elevations in feet)

PHASE 11 OPERATION	Overall (dBA)	SounD Level (dBA) by Octave Band Center Frequency (Hz)								
		31.5	63	125	250	500	1000	2000	4000	8000
Measurement Distance = 900	61	27	36	46	50	57	56	52	41	33

Source 9-2	elevations:	receiver = 0			source = 0			top of barrier = 0		
to	horizontal distances:	receiver to barrier = 0			source to barrier = 1900			source to receiver = 1900		
Receiver 9	total distances:	receiver to barrier = 0.00			source to barrier = 1900.00			source to receiver = 1900.00		
Attenuation to Receiver:	barrier width = 0	path length difference = 0.00					barrier loss factor = 1.00			
distance loss, dB		-6.5	-6.5	-6.5	-6.5	-6.5	-6.5	-6.5	-6.5	-6.5
standard day absorption factor, dB/100 m		-0.10	-0.14	-0.23	-0.36	-0.60	-0.93	-1.60	-3.49	-10.08
molecular absorption, dB		-0.3	-0.4	-0.7	-1.1	-1.8	-2.8	-4.9	-10.6	-30.7
barrier insertion loss, dB		0	0	0	0	0	0	0	0	0
transmission loss, dB		0	0	0	0	0	0	0	0	0
sheilding, dB		0	0	0	0	0	0	0	0	0
directivity, dB		0	0	0	0	0	0	0	0	0
other, dB		0	0	0	0	0	0	0	0	0
SOUND LEVEL @ REC	52	20	29	39	43	48	47	41	24	-4

Source 8A-2	elevations:	receiver = 0			source = 0			top of barrier = 0		
to	horizontal distances:	receiver to barrier = 0			source to barrier = 1300			source to receiver = 1300		
Receiver 9	total distances:	receiver to barrier = 0.00			source to barrier = 1300.00			source to receiver = 1300.00		
Attenuation to Receiver:	barrier width = 0	path length difference = 0.00					barrier loss factor = 1.00			
distance loss, dB		-3.2	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2
standard day absorption factor, dB/100 m		-0.10	-0.14	-0.23	-0.36	-0.60	-0.93	-1.60	-3.49	-10.08
molecular absorption, dB		-0.1	-0.2	-0.3	-0.4	-0.7	-1.1	-2.0	-4.3	-12.3
barrier insertion loss, dB		0	0	0	0	0	0	0	0	0
transmission loss, dB		0	0	0	0	0	0	0	0	0
sheilding, dB		0	0	0	0	0	0	0	0	0
directivity, dB		0	0	0	0	0	0	0	0	0
other, dB		0	0	0	0	0	0	0	0	0
SOUND LEVEL @ REC	57	23	33	42	47	53	52	47	33	18

Source 8B-2	elevations:	receiver = 0			source = 0			top of barrier = 0		
to	horizontal distances:	receiver to barrier = 0			source to barrier = 1900			source to receiver = 1900		
Receiver 9	total distances:	receiver to barrier = 0.00			source to barrier = 1900.00			source to receiver = 1900.00		
Attenuation to Receiver:	barrier width = 0	path length difference = 0.00					barrier loss factor = 1.00			
distance loss, dB		-6.5	-6.5	-6.5	-6.5	-6.5	-6.5	-6.5	-6.5	-6.5
standard day absorption factor, dB/100 m		-0.10	-0.14	-0.23	-0.36	-0.60	-0.93	-1.60	-3.49	-10.08
molecular absorption, dB		-0.3	-0.4	-0.7	-1.1	-1.8	-2.8	-4.9	-10.6	-30.7
barrier insertion loss, dB		0	0	0	0	0	0	0	0	0
transmission loss, dB		0	0	0	0	0	0	0	0	0
sheilding, dB		0	0	0	0	0	0	0	0	0
directivity, dB		0	0	0	0	0	0	0	0	0
other, dB		0	0	0	0	0	0	0	0	0
SOUND LEVEL @ REC	52	20	29	39	43	48	47	41	24	-4

Combined Sound Level at Rec 9	59	26	36	45	50	55	54	49	34	18

SOUND LEVEL PREDICTION MODEL

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE - CROSSROADS LANDFILL

NORRIDGEWOCK, MAINE

Routine Operation Phase 9, Excavate Waste Phase 8B, Place Waste Phase 8A
Estimated Sound Level at Receiver 16
(distances & elevations in feet)

PHASE 11 OPERATION	Overall (dBA)	SounD Level (dBA) by Octave Band Center Frequency (Hz)								
		31.5	63	125	250	500	1000	2000	4000	8000
Measurement Distance = 900	61	27	36	46	50	57	56	52	41	33

Source 9-1	elevations:	receiver = 0			source = 0			top of barrier = 0		
to	horizontal distances:	receiver to barrier = 0			source to barrier = 2900			source to receiver = 2900		
Receiver 16	total distances:	receiver to barrier = 0.00			source to barrier = 2900.00			source to receiver = 2900.00		
Attenuation to Receiver:	barrier width = 0	path length difference = 0.00					barrier loss factor = 1.00			
distance loss, dB		-10.2	-10.2	-10.2	-10.2	-10.2	-10.2	-10.2	-10.2	-10.2
standard day absorption factor, dB/100 m		-0.10	-0.14	-0.23	-0.36	-0.60	-0.93	-1.60	-3.49	-10.08
molecular absorption, dB		-0.6	-0.9	-1.4	-2.2	-3.7	-5.7	-9.8	-21.3	-61.5
barrier insertion loss, dB		0	0	0	0	0	0	0	0	0
transmission loss, dB		0	0	0	0	0	0	0	0	0
sheilding, dB		0	0	0	0	0	0	0	0	0
directivity, dB		0	0	0	0	0	0	0	0	0
other, dB		0	0	0	0	0	0	0	0	0
SOUND LEVEL @ REC	46	16	25	34	38	43	41	32	9	-39

Source 8A-1	elevations:	receiver = 0			source = 0			top of barrier = 0		
to	horizontal distances:	receiver to barrier = 0			source to barrier = 3200			source to receiver = 3200		
Receiver 16	total distances:	receiver to barrier = 0.00			source to barrier = 3200.00			source to receiver = 3200.00		
Attenuation to Receiver:	barrier width = 0	path length difference = 0.00					barrier loss factor = 1.00			
distance loss, dB		-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0
standard day absorption factor, dB/100 m		-0.10	-0.14	-0.23	-0.36	-0.60	-0.93	-1.60	-3.49	-10.08
molecular absorption, dB		-0.7	-1.0	-1.6	-2.5	-4.2	-6.5	-11.2	-24.5	-70.7
barrier insertion loss, dB		0	0	0	0	0	0	0	0	0
transmission loss, dB		0	0	0	0	0	0	0	0	0
sheilding, dB		0	0	0	0	0	0	0	0	0
directivity, dB		0	0	0	0	0	0	0	0	0
other, dB		0	0	0	0	0	0	0	0	0
SOUND LEVEL @ REC	45	15	24	33	37	41	39	30	5	-49

Source 8B-1	elevations:	receiver = 0			source = 0			top of barrier = 0		
to	horizontal distances:	receiver to barrier = 0			source to barrier = 2500			source to receiver = 2500		
Receiver 16	total distances:	receiver to barrier = 0.00			source to barrier = 2500.00			source to receiver = 2500.00		
Attenuation to Receiver:	barrier width = 0	path length difference = 0.00					barrier loss factor = 1.00			
distance loss, dB		-8.9	-8.9	-8.9	-8.9	-8.9	-8.9	-8.9	-8.9	-8.9
standard day absorption factor, dB/100 m		-0.10	-0.14	-0.23	-0.36	-0.60	-0.93	-1.60	-3.49	-10.08
molecular absorption, dB		-0.5	-0.7	-1.1	-1.8	-2.9	-4.5	-7.8	-17.0	-49.2
barrier insertion loss, dB		0	0	0	0	0	0	0	0	0
transmission loss, dB		0	0	0	0	0	0	0	0	0
sheilding, dB		0	0	0	0	0	0	0	0	0
directivity, dB		0	0	0	0	0	0	0	0	0
other, dB		0	0	0	0	0	0	0	0	0
SOUND LEVEL @ REC	48	17	27	36	39	45	43	35	15	-25

Combined Sound Level at Rec 16	51	21	30	39	43	48	46	38	16	-25

SOUND LEVEL PREDICTION MODEL

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE - CROSSROADS LANDFILL

NORRIDGEWOCK, MAINE

Routine Operation Phase 8B, Excavate Waste Phase 8C, Place Waste Phase 8B
Estimated Sound Level at Receiver 16
(distances & elevations in feet)

PHASE 11 OPERATION	Overall (dBA)	SounD Level (dBA) by Octave Band Center Frequency (Hz)								
		31.5	63	125	250	500	1000	2000	4000	8000
Measurement Distance = 900	61	27	36	46	50	57	56	52	41	33

Source 8B-1	elevations:	receiver = 0			source = 0			top of barrier = 0		
to	horizontal distances:	receiver to barrier = 0			source to barrier = 2500			source to receiver = 2500		
Receiver 16	total distances:	receiver to barrier = 0.00			source to barrier = 2500.00			source to receiver = 2500.00		
Attenuation to Receiver:	barrier width = 0	path length difference = 0.00					barrier loss factor = 1.00			
distance loss, dB		-8.9	-8.9	-8.9	-8.9	-8.9	-8.9	-8.9	-8.9	-8.9
standard day absorption factor, dB/100 m		-0.10	-0.14	-0.23	-0.36	-0.60	-0.93	-1.60	-3.49	-10.08
molecular absorption, dB		-0.5	-0.7	-1.1	-1.8	-2.9	-4.5	-7.8	-17.0	-49.2
barrier insertion loss, dB		0	0	0	0	0	0	0	0	0
transmission loss, dB		0	0	0	0	0	0	0	0	0
sheilding, dB		0	0	0	0	0	0	0	0	0
directivity, dB		0	0	0	0	0	0	0	0	0
other, dB		0	0	0	0	0	0	0	0	0
SOUND LEVEL @ REC	48	17	27	36	39	45	43	35	15	-25

Source 8B-1	elevations:	receiver = 0			source = 0			top of barrier = 0		
to	horizontal distances:	receiver to barrier = 0			source to barrier = 2500			source to receiver = 2500		
Receiver 16	total distances:	receiver to barrier = 0.00			source to barrier = 2500.00			source to receiver = 2500.00		
Attenuation to Receiver:	barrier width = 0	path length difference = 0.00					barrier loss factor = 1.00			
distance loss, dB		-8.9	-8.9	-8.9	-8.9	-8.9	-8.9	-8.9	-8.9	-8.9
standard day absorption factor, dB/100 m		-0.10	-0.14	-0.23	-0.36	-0.60	-0.93	-1.60	-3.49	-10.08
molecular absorption, dB		-0.5	-0.7	-1.1	-1.8	-2.9	-4.5	-7.8	-17.0	-49.2
barrier insertion loss, dB		0	0	0	0	0	0	0	0	0
transmission loss, dB		0	0	0	0	0	0	0	0	0
sheilding, dB		0	0	0	0	0	0	0	0	0
directivity, dB		0	0	0	0	0	0	0	0	0
other, dB		0	0	0	0	0	0	0	0	0
SOUND LEVEL @ REC	48	17	27	36	39	45	43	35	15	-25

Source 8C-1	elevations:	receiver = 0			source = 0			top of barrier = 0		
to	horizontal distances:	receiver to barrier = 0			source to barrier = 1800			source to receiver = 1800		
Receiver 16	total distances:	receiver to barrier = 0.00			source to barrier = 1800.00			source to receiver = 1800.00		
Attenuation to Receiver:	barrier width = 0	path length difference = 0.00					barrier loss factor = 1.00			
distance loss, dB		-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0
standard day absorption factor, dB/100 m		-0.10	-0.14	-0.23	-0.36	-0.60	-0.93	-1.60	-3.49	-10.08
molecular absorption, dB		-0.3	-0.4	-0.6	-1.0	-1.6	-2.6	-4.4	-9.6	-27.7
barrier insertion loss, dB		0	0	0	0	0	0	0	0	0
transmission loss, dB		0	0	0	0	0	0	0	0	0
sheilding, dB		0	0	0	0	0	0	0	0	0
directivity, dB		0	0	0	0	0	0	0	0	0
other, dB		0	0	0	0	0	0	0	0	0
SOUND LEVEL @ REC	53	20	30	39	43	49	48	42	25	-1

Combined Sound Level at Rec 16	55	23	33	42	46	52	50	43	26	-1

SOUND LEVEL PREDICTION MODEL

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE - CROSSROADS LANDFILL

NORRIDGEWOCK, MAINE

Routine Operation Phase 9, Excavate Waste Phase 8B, Place Waste Phase 8A
Estimated Sound Level at Receiver 18
(distances & elevations in feet)

PHASE 11 OPERATION	Overall (dBA)	SounD Level (dBA) by Octave Band Center Frequency (Hz)								
		31.5	63	125	250	500	1000	2000	4000	8000
Measurement Distance = 900	61	27	36	46	50	57	56	52	41	33

Source 9-2	elevations:	receiver = 0			source = 0			top of barrier = 0		
to	horizontal distances:	receiver to barrier = 0			source to barrier = 1600			source to receiver = 1600		
Receiver 18	total distances:	receiver to barrier = 0.00			source to barrier = 1600.00			source to receiver = 1600.00		
Attenuation to Receiver:	barrier width = 0	path length difference = 0.00					barrier loss factor = 1.00			
distance loss, dB		-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0
standard day absorption factor, dB/100 m		-0.10	-0.14	-0.23	-0.36	-0.60	-0.93	-1.60	-3.49	-10.08
molecular absorption, dB		-0.2	-0.3	-0.5	-0.8	-1.3	-2.0	-3.4	-7.5	-21.5
barrier insertion loss, dB		0	0	0	0	0	0	0	0	0
transmission loss, dB		0	0	0	0	0	0	0	0	0
sheilding, dB		0	0	0	0	0	0	0	0	0
directivity, dB		0	0	0	0	0	0	0	0	0
other, dB		0	0	0	0	0	0	0	0	0
SOUND LEVEL @ REC	54	22	31	40	44	50	49	44	28	7

Source 8A-3	elevations:	receiver = 0			source = 0			top of barrier = 0		
to	horizontal distances:	receiver to barrier = 0			source to barrier = 1900			source to receiver = 1900		
Receiver 18	total distances:	receiver to barrier = 0.00			source to barrier = 1900.00			source to receiver = 1900.00		
Attenuation to Receiver:	barrier width = 0	path length difference = 0.00					barrier loss factor = 1.00			
distance loss, dB		-6.5	-6.5	-6.5	-6.5	-6.5	-6.5	-6.5	-6.5	-6.5
standard day absorption factor, dB/100 m		-0.10	-0.14	-0.23	-0.36	-0.60	-0.93	-1.60	-3.49	-10.08
molecular absorption, dB		-0.3	-0.4	-0.7	-1.1	-1.8	-2.8	-4.9	-10.6	-30.7
barrier insertion loss, dB		0	0	0	0	0	0	0	0	0
transmission loss, dB		0	0	0	0	0	0	0	0	0
sheilding, dB		0	0	0	0	0	0	0	0	0
directivity, dB		0	0	0	0	0	0	0	0	0
other, dB		0	0	0	0	0	0	0	0	0
SOUND LEVEL @ REC	52	20	29	39	43	48	47	41	24	-4

Source 8B-2	elevations:	receiver = 0			source = 0			top of barrier = 0		
to	horizontal distances:	receiver to barrier = 0			source to barrier = 2400			source to receiver = 2400		
Receiver 18	total distances:	receiver to barrier = 0.00			source to barrier = 2400.00			source to receiver = 2400.00		
Attenuation to Receiver:	barrier width = 0	path length difference = 0.00					barrier loss factor = 1.00			
distance loss, dB		-8.5	-8.5	-8.5	-8.5	-8.5	-8.5	-8.5	-8.5	-8.5
standard day absorption factor, dB/100 m		-0.10	-0.14	-0.23	-0.36	-0.60	-0.93	-1.60	-3.49	-10.08
molecular absorption, dB		-0.5	-0.6	-1.1	-1.6	-2.7	-4.3	-7.3	-16.0	-46.1
barrier insertion loss, dB		0	0	0	0	0	0	0	0	0
transmission loss, dB		0	0	0	0	0	0	0	0	0
sheilding, dB		0	0	0	0	0	0	0	0	0
directivity, dB		0	0	0	0	0	0	0	0	0
other, dB		0	0	0	0	0	0	0	0	0
SOUND LEVEL @ REC	49	18	27	36	40	45	44	36	16	-22

Combined Sound Level at Rec 18	57	25	34	43	47	53	52	46	30	7

SOUND LEVEL PREDICTION MODEL

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE - CROSSROADS LANDFILL

NORRIDGEWOCK, MAINE

Routine Operation at Closest Point to WMDSM Property Line
Estimated Sound Level at Property Line
(distances & elevations in feet)

PHASE 11 OPERATION	Overall (dBA)	SounD Level (dBA) by Octave Band Center Frequency (Hz)								
		31.5	63	125	250	500	1000	2000	4000	8000
Measurement Distance = 900	58	24	33	43	47	54	53	49	38	30

Pos D	elevations:	receiver = 0			source = 0			top of barrier = 0		
Verification	horizontal distances:	receiver to barrier = 0			source to barrier = 1600			source to receiver = 1600		
	total distances:	receiver to barrier = 0.00			source to barrier = 1600.00			source to receiver = 1600.00		
Attenuation to Receiver:	barrier width = 0	path length difference = 0.00					barrier loss factor = 1.00			
distance loss, dB		-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0
standard day absorption factor, dB/100 m		-0.10	-0.14	-0.23	-0.36	-0.60	-0.93	-1.60	-3.49	-10.08
molecular absorption, dB		-0.2	-0.3	-0.5	-0.8	-1.3	-2.0	-3.4	-7.5	-21.5
barrier insertion loss, dB		0	0	0	0	0	0	0	0	0
transmission loss, dB		0	0	0	0	0	0	0	0	0
sheilding, dB		0	0	0	0	0	0	0	0	0
directivity, dB		0	0	0	0	0	0	0	0	0
other, dB		0	0	0	0	0	0	0	0	0
SOUND LEVEL @ REC	51	19	28	37	41	47	46	41	25	4

Rec 17	elevations:	receiver = 5			source = 26			top of barrier = 20		
Property Line	horizontal distances:	receiver to barrier = 45			source to barrier = 60			source to receiver = 105		
60 Feet	total distances:	receiver to barrier = 47.43			source to barrier = 60.30			source to receiver = 107.08		
Attenuation to Receiver:	barrier width = 0	path length difference = 0.65					barrier loss factor = 1.00			
distance loss, dB		18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5
standard day absorption factor, dB/100 m		-0.10	-0.14	-0.23	-0.36	-0.60	-0.93	-1.60	-3.49	-10.08
molecular absorption, dB		0.2	0.3	0.6	0.9	1.5	2.2	3.9	8.4	24.4
barrier insertion loss, dB		-5	-6	-7	-8	-10	-12	-15	-18	-21
transmission loss, dB		0	0	0	0	0	0	0	0	0
sheilding, dB		0	0	0	0	0	0	0	0	0
directivity, dB		0	0	0	0	0	0	0	0	0
other, dB		0	0	0	0	0	0	0	0	0
SOUND LEVEL @ REC	68	37	46	55	59	64	62	56	47	52

Rec 13	elevations:	receiver = 5			source = 26			top of barrier = 20		
Property Line	horizontal distances:	receiver to barrier = 60			source to barrier = 60			source to receiver = 120		
140 Feet	total distances:	receiver to barrier = 61.85			source to barrier = 60.30			source to receiver = 121.82		
Attenuation to Receiver:	barrier width = 0	path length difference = 0.32					barrier loss factor = 1.00			
distance loss, dB		17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4
standard day absorption factor, dB/100 m		-0.10	-0.14	-0.23	-0.36	-0.60	-0.93	-1.60	-3.49	-10.08
molecular absorption, dB		0.2	0.3	0.5	0.9	1.4	2.2	3.8	8.3	23.9
barrier insertion loss, dB		-4	-5	-6	-7	-8	-10	-12	-15	-18
transmission loss, dB		0	0	0	0	0	0	0	0	0
sheilding, dB		0	0	0	0	0	0	0	0	0
directivity, dB		0	0	0	0	0	0	0	0	0
other, dB		0	0	0	0	0	0	0	0	0
SOUND LEVEL @ REC	68	37	46	55	58	64	63	58	49	53

SOUND LEVEL PREDICTION MODEL

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE - CROSSROADS LANDFILL

NORRIDGEWOCK, MAINE

Routine Operation at Closest Point to WMDSM Property Line
Estimated Sound Level at Property Line
(distances & elevations in feet)

PHASE 11 OPERATION	Overall	SounD Level (dBA) by Octave Band Center Frequency (Hz)								
	(dBA)	31.5	63	125	250	500	1000	2000	4000	8000
Measurement Distance = 900	58	24	33	43	47	54	53	49	38	30

Pos D	elevations:	receiver = 0			source = 0			top of barrier = 0		
Verification	horizontal distances:	receiver to barrier = 0			source to barrier = 1600			source to receiver = 1600		
	total distances:	receiver to barrier = 0.00			source to barrier = 1600.00			source to receiver = 1600.00		
Attenuation to Receiver:	barrier width = 0	path length difference = 0.00					barrier loss factor = 1.00			
distance loss, dB		-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0
standard day absorption factor, dB/100 m		-0.10	-0.14	-0.23	-0.36	-0.60	-0.93	-1.60	-3.49	-10.08
molecular absorption, dB		-0.2	-0.3	-0.5	-0.8	-1.3	-2.0	-3.4	-7.5	-21.5
barrier insertion loss, dB		0	0	0	0	0	0	0	0	0
transmission loss, dB		0	0	0	0	0	0	0	0	0
sheilding, dB		0	0	0	0	0	0	0	0	0
directivity, dB		0	0	0	0	0	0	0	0	0
other, dB		0	0	0	0	0	0	0	0	0
SOUND LEVEL @ REC	51	19	28	37	41	47	46	41	25	4

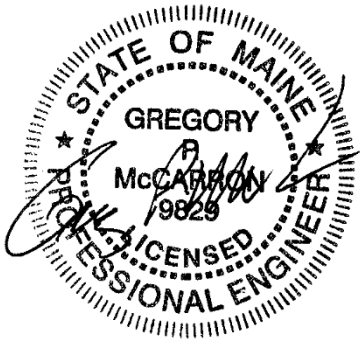
Rec 17	elevations:	receiver = 5			source = 35			top of barrier = 34		
Property Line	horizontal distances:	receiver to barrier = 160			source to barrier = 20			source to receiver = 180		
60 Feet	total distances:	receiver to barrier = 162.61			source to barrier = 20.02			source to receiver = 182.48		
Attenuation to Receiver:	barrier width = 0	path length difference = 0.15					barrier loss factor = 1.00			
distance loss, dB		13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
standard day absorption factor, dB/100 m		-0.10	-0.14	-0.23	-0.36	-0.60	-0.93	-1.60	-3.49	-10.08
molecular absorption, dB		0.2	0.3	0.5	0.8	1.3	2.0	3.5	7.6	22.1
barrier insertion loss, dB		-3	-4	-5	-6	-7	-8	-10	-12	-15
transmission loss, dB		0	0	0	0	0	0	0	0	0
sheilding, dB		0	0	0	0	0	0	0	0	0
directivity, dB		0	0	0	0	0	0	0	0	0
other, dB		0	0	0	0	0	0	0	0	0
SOUND LEVEL @ REC	66	35	43	52	56	62	61	56	47	51

Rec 13	elevations:	receiver = 5			source = 35			top of barrier = 34		
Property Line	horizontal distances:	receiver to barrier = 175			source to barrier = 20			source to receiver = 195		
140 Feet	total distances:	receiver to barrier = 177.39			source to barrier = 20.02			source to receiver = 197.29		
Attenuation to Receiver:	barrier width = 0	path length difference = 0.12					barrier loss factor = 1.00			
distance loss, dB		13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2
standard day absorption factor, dB/100 m		-0.10	-0.14	-0.23	-0.36	-0.60	-0.93	-1.60	-3.49	-10.08
molecular absorption, dB		0.2	0.3	0.5	0.8	1.3	2.0	3.4	7.5	21.6
barrier insertion loss, dB		-3	-4	-5	-6	-7	-8	-10	-12	-15
transmission loss, dB		0	0	0	0	0	0	0	0	0
sheilding, dB		0	0	0	0	0	0	0	0	0
directivity, dB		0	0	0	0	0	0	0	0	0
other, dB		0	0	0	0	0	0	0	0	0
SOUND LEVEL @ REC	65	34	43	51	55	61	61	56	47	50

APPENDIX 8A
Fugitive Particulate Matter Control Plan

Fugitive Particulate Matter Control Plan For Crossroads Landfill Permit # A-816-70-C-R/A

Waste Management Disposal Services of Maine, Inc.
357 Mercer Road
Norridgewock, Maine 04957
(207) 634-2714



SCS ENGINEERS

File No. 13201002.30 | October 2019

4 Executive Boulevard
Suite 303
Suffern, New York 10901
(845) 357-1510

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Figures

1.0 INTRODUCTION

Waste Management Disposal Services of Maine, Inc. (WMDSM) owns and operates the Crossroads Landfill located in Norridgewock, Maine. Currently, the WMDSM facility consists of eight landfill units; the Asbestos Landfill (final closure construction completed 1994) and seven secure landfill units (Phase 1-6, Phase 7, Phase 8, Phase 9, Phase 10, Phase 11, and Phase 12). WMDSM is also seeking a permit to construct and operate a future secure landfill, Phase 14, at the Crossroads Facility. The secure landfills at Crossroads are geosynthetic-lined facilities, with leachate collection and removal systems.

This Fugitive Particulate Matter Control Plan is required by the landfill's Part 70 Air Emission License Renewal, in compliance with the Federal Clean Air Act and the Maine Department of Environmental Protection regulations. This plan has been successfully implemented to minimize dust emissions associated with construction and operation of Phase 8 and closure of Phases 10, 11 and 12.

2.0 SOURCES AND PREVENTION OF DUST EMISSIONS

Dust (i.e., particulate matter) is defined as tiny particles of earth or waste matter lying on the ground surface that can become airborne.

Sources that potentially create dust at the WMDSM facility consist of the following activities: (i) transporting and placing earthen materials from soil borrow sources for landfill cell and final closure projects; (ii) placement and compaction of waste; (iii) placement of operational daily/intermediate cover and stockpiles; and (iv) traveling on paved and unpaved access roads.

Starting in Section 2.1, WMDSM describes dust control measures it performs, as necessary, to minimize the amount of particulate matter produced from the identified sources or activities. It should be noted that the surrounding facility buffer zones consists of trees and shrubs which create windbreaks that serve as a natural dust control measure. These windbreaks reduce airborne particles by minimizing wind velocities (slower winds do not suspend particles).

2.1 LANDFILL CELL & FINAL CLOSURE CONSTRUCTION

During the construction of new landfill cells and final closures, earthen materials are transported by truck from on-site and off-site soil borrow sources to the construction site within the facility. For instance, clay material is used to construct part of the landfill cell floor. When the clay is spread (placed) and compacted, this activity potentially creates dust, depending upon the clay moisture content. With that said, if the clay is dry, it must be watered to achieve the specified moisture content during placement, to achieve the required density. Watering of the clay prohibits dust emissions. This is similar for other soil and stone materials placed to construct final caps and landfill cells.

Watering soil materials is an effective dust control measure when placing soil during landfill cell and final cap construction.

2.2 WASTE PLACEMENT & COMPACTION

Heavy equipment at the active face of the landfill is used to spread and compact waste. Similar to placement of construction soils, the activity of spreading and compacting waste potentially creates

dust. WMDSM best management practices to control dust during waste placement and compaction are as follows:

- Watering the dry and dusty loads of waste.
- Pushing small quantities of waste with the equipment at a slower pace.
- Creating a bowl or barrier within the waste to act as a wind buffer to minimize dust and contain dust in the active area.

2.3 COVER MATERIAL & STOCKPILE APPLICATION

WMDSM uses Alternate Daily Cover (ADC) materials, which are approved special waste streams, to spread over in-place waste to minimize vectors, odors, and litter. Approved ADC includes, but is not limited to reinforced synthetic tarps, unsaleable wood waste fines (tailings) from the Wood Waste Facility, ground utility poles, ground Construction/Demolition Debris (C&D), Pioneer Plastics by-product, approved fly-ash and bottom-ash, approved auto shredder residues, mill felt, and urban fill soils. In addition, intermediate soil (silty sand) material is spread over final waste grades during or before final closure construction activities. Heavy equipment is used to spread ADC materials and intermediate soil. The activity of spreading these cover materials can potentially create dust.

Some ADC materials have little potential to create fugitive dust emissions during application due to the initial moisture content and/or non-particulate structure of the ADC materials. WMDSM uses these types of ADCs as much as practical in an effort to minimize dust. Where necessary, watering is conducted to control excess fugitive dust emissions that potentially occur during the spreading of these cover materials.

To complement the cover material described above, WMDSM places temporary tarps over portions of the landfill surface that have reached interim or final waste grades and is awaiting future waste placement or final closure. The temporary tarps replace or reduce the need for spreading ADC and essentially eliminates dust creation. Therefore, placement of temporary tarps is another effective dust control measure.

Additionally, WMDSM maintains temporary stockpiles of special waste streams used for ADC purposes and for use as base material for future access roads within the landfill. WMDSM also temporarily stockpiles purchased soil used for backfilling around landfill gas wells and for leachate collection services within the landfill.

Excess soil materials excavated from on-site borrow sources during construction projects are maintained by hay mulching and seeding to minimize dust emissions. These stockpiles typically consist of topsoil and clay. Watering temporary topsoil and clay stockpiles is an additional effective dust control measure performed as necessary.

2.4 HAUL ROADS AND OTHER UNPAVED ROADS

Operations and construction trucks that travel on unpaved roads at the WMDSM facility potentially create dust (see attached Site Location Maps - Figures 1, 2, and 3). Unpaved roads are located around a portion of the perimeter of Phases 11 and 12 (currently closed, resulting in minimal roadway travel), access ways to on-site borrow sources, along the south and west side of the closed Asbestos Landfill, and the haul roads within the active areas of Phase 8 and the future Phase 14.

WMDSM minimizes dust by paving many of the heavily traveled roads at the Crossroads facility. The main access road is paved from Route 2 all the way to the entrance of the active Phase 8 Secure

Landfill. The future access road from the main access road to Phase 14 will also be paved (see Figure 3). The perimeter access road around Phase 8 is paved, as will be the future perimeter road around Phase 14. Additional paved areas exist at the Residential Transfer Station, the Maintenance Facility, the Material Recovery Facility (MRF), the Landfill Gas to Energy Facility, along the east sides of Phases 11 and 12, around the Leachate Storage Tank Facility, and at the Main Office access/parking area. Operation of vehicle and equipment on these paved roads generates substantially less dust that on unpaved roads.

As necessary, WMDSM uses a water truck to water unpaved access roads and an industrial sweeper to clean paved roads. In addition, WMDSM requires that, as much as practical, our customers use the pressure washer (i.e., truck wash) currently located in Phase 8 before exiting the active landfill. The truck wash cleans soil from the wheels and undercarriage of the truck preventing tracking of soil onto the landfill roads and/or public roads.

3.0 PERSONNEL

Personnel responsible for implementing and overseeing this Fugitive Particulate Matter Plan for WMDSM are:

- Project Manager;
- Operations Manager; and the
- Lead Operator

The Fugitive Particulate Matter Control Plan is maintained on-site at WMDSM's Main Office. All employees have access to this plan and are familiar with dust control procedures identified herein. Training is provided to ensure WMDSM employees understand the importance of preventing excess dust emissions at the Crossroads Landfill.

Figure 1. Phase 11 & 12 Landfills and Additional Facility Feature

Figure 2. Phase 8 Secure Landfill and Supporting Facilities

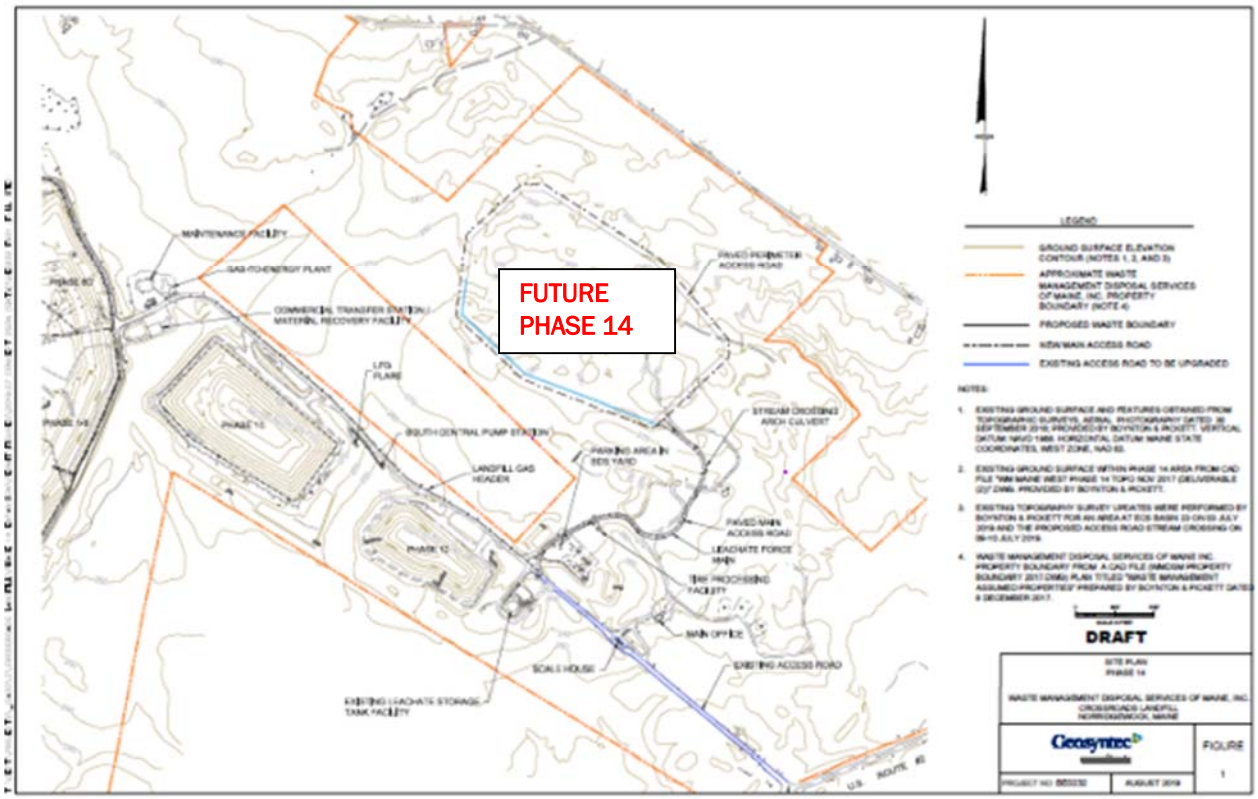


Figure 3. Future Phase 14 Disposal Unit Area

APPENDIX 13A
WMDSM Leachate Disposal Agreements

Article 4. Meters and Records
The transportation contractor of landfill leachate or Waste Management will provide the District with hauling records for each load delivered to the WWTP. The District shall have the right to check the accuracy of any and all loads delivered to the WWTP.

Article 5. Charges (within the meaning of M.R.S.A. Title 38 Sec. 1202)

Charges will be assessed at a flat rate of Three Thousand Dollars and zero cents ($3.000.00) per calendar month for volumes up to 440.000 gallons in that calendar month. Volumes greater than this will be assessed a fee of $0.00688 per gallon. Waste Management will additionally be charged for any and all laboratory analyses required for regulatory compliance.

The District shall invoice Waste Management monthly for treatment of landfill leachate based on this agreement. Payments more than FORTY-FIVE (45) days delinquent from the date of receipt will be increased by a penalty charge of one and one half percent (1-1/2%) thereof per month computed from the date of billing.

Article 6. Term
The term of this Agreement shall commence on January 1st, 2019 and shall continue for a term of one (1) year, provided that both parties reserve the right to terminate this agreement at any time for any reason with ten days written notification to the addresses referenced above.

IN WITNESS WHEREOF, the parties have caused this Agreement to be executed at Madison, Maine, this 12 day of December, 2018

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.

By _____

Title Sr District Manager

ANSON-MADISON SANITARY DISTRICT

By _____

Title Chairman, Board of Trustees

ANSON-MADISON SANITARY DISTRICT
INDUSTRIAL WASTEWATER DISCHARGE PERMIT

Issued to Waste Management Disposal Services of Maine, Inc. ("WM") (the "Permittee") owner and operator of Crossroads Landfill ("Facility") , located at 357 Mercer Road, Norridgewock, ME.. The Permittee is hereby authorized to discharge leachate from the Facility into the Anson-Madison Sanitary District ("AMSD") Wastewater Treatment Plant ("WWTP") in accordance with the effluent limitations, monitoring requirements, and other conditions set forth in this permit. All Discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of this permit.

This permit shall be effective for a one (1)-year period beginning on _1/1/2019_ and expiring at midnight on _12/31/2019_.

By: Robert P Roy Sr
Robert Roy
Chairman, Board of Trustees
Anson-Madison Sanitary District

Issued this 12 day of December, 2018

PART I – APPLICABLE EFFLUENT LIMITATIONS

A. During the effective period of this permit the Permittee is authorized to discharge leachate to the AMSD WWTP from WM Crossroads Landfill in Norridgewock. Any other discharge is prohibited.

B. During the effective period of this permit, the discharge from Permittee's Facilities shall not exceed the following effluent limitations.

Daily Maximum Flow (gallons)	56,000
Average BOD (mg/L) for any 3 consecutive monitoring events	100
Average TSS (mg/L) for any 3 consecutive monitoring events	500

C. The Permittee shall not discharge wastewater to the WWTP:

Having a pH lower than 5.5 or higher than 9.5;

Containing any gasoline, benzene, naphtha, fuel oil or other flammable or explosive liquids, solids or gases, and any material having a flash point of less than 140 F;

Containing any grease or oils of petroleum origin, whether emulsified or not, in excess of 100 mg/l or containing substances which may solidify or become viscous between 32 and 140 F;

Containing any grease or oils that cause a visible sheen on any process tank, basin, or final effluent from the WWTP. The Permittee shall be responsible for all costs associated with any oil or grease cleanup caused by the Permittee;

Containing any sand, shavings, metal, glass, rags, plastics, woods, or any other substance capable of causing obstructions or interference with the operation of the treatment facility which, alone or in conjunction with a discharge or discharges from other sources, both inhibits or disrupts the WWTP, its treatment processes or operations, or its sludge processes, use or disposal, and therefore is a cause of, or contribution to, a violation of any requirement of the WWTP's MEPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with applicable statutory provisions and regulations or permits issued thereunder, or, which exits the WWTP into waters of the United States in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of, or contribution to, a violation of any requirement of the WWTP's MEPDES permit (including an increase in the magnitude or duration of a violation);

That is a cause of, or contribution to, a violation of any requirement of the WWTP's MEPDES permit (including an increase in the magnitude or duration of a violation).

D. The Permittee shall not discharge wastewater to the WWTP that does not comply with the requirements of 40 C.F.R. 403.5 (1998), the State of Maine Rule 06-096 CMR DEP Chapter 528, and/or the Bylaws and Rules and Regulations of AMSD.

E. AMSD reserves the right to refuse acceptance of wastewater delivery from the Permittee for due cause including but not limited to wastewater parameter non-compliance or AMSD WWTP system status.

F. Wastewater deliveries will be suspended during high-flow events if combined influent flow levels exceed a 6.0 MGD. Wastewater delivery acceptance will be resumed when levels recede below

6.0 MGD and high influent flow conditions have passed, provided approval is received from AMSD staff.

PART II – MONITORING REQUIREMENTS

A. At the time of this Permit, discharge monitoring as described in this Section shall apply to the leachate from Permittee's existing facilities that is delivered to AMSD. Expansion of Permittee's facilities shall be cause for re-opening of this permit as defined in Part IV, Section 8.

B. Except as otherwise provided in this Section, for the effective period of this permit Permittee shall reimburse AMSD for monitoring of the Permittee's wastewater from wastewater hauling trucks and/or holding tanks at Permittee's facility for the parameters listed in Table II-B on the following page. AMSD will provide at least 48 hour prior notification of any testing or monitoring to be conducted by AMSD and Permittee shall be entitled to be present for such testing or monitoring event. At Permittee's request and expense, AMSD shall provide split samples of testing or monitoring to Permittee for any testing or monitoring event conducted by AMSD under this Permit.

C. If necessary, for the effective period of this permit, Permittee shall reimburse AMSD for monitoring of the Permittee's wastewater from wastewater hauling trucks and/or holding tanks at Permittee's facility for screening level testing including: Whole Effluent Toxicity (WET) Testing, Analytical Chemistry Testing, and/or Priority Pollutant Testing. If necessary, such testing will be performed concurrently with AMSD's Waste Discharge License required testing at the Permittee's expense.

D. AMSD reserves the right to change monitoring requirements, locations, frequency, parameters, and add parameters if the District experiences stricter or different regulatory requirements, process upsets, toxicity analysis failures, or indication in the process or by lab result that a certain pollutant or constituent may be present in the discharge from Permittee. Any and all additional monitoring shall be at the Permittee's expense. AMSD shall provide at least thirty (30) day prior written notification of any such changes listed above to Permittee.

E. For any individual parameter listed above, after eight (8) consecutive analyses that show none of the parameters in question present in the wastewater from Permittee, Permittee may petition AMSD to reduce or suspend further analysis.

F. All handling and preservation of collected samples and laboratory analyses of samples shall be performed in accordance with 40 CFR, Part 136 and amendments thereto unless specified otherwise in the monitoring conditions of this permit.

G. All sample collection, handling, and preservation and analysis shall be performed by AMSD or AMSD-contracted laboratory at the expense of the Permittee unless specified otherwise in the monitoring conditions of this permit.

TABLE II-B

Parameter	Units	Note	Frequency	Type
Flow	(gallons)	(2)	per haul	8,000 gallon truck
pH	(SU)	(3)	1x/haul day	Grab
Temperature	(degrees F)	(3)	1x/haul day	Grab
Total Dissolved Solids	(mg/l)	(1)	three times/yr	Grab
Total Phosphorous	(mg/l)	(1)	three times/yr	Grab
Nitrite	(mg/l)	(1)	three times/yr	Grab
Nitrate	(mg/l)	(1)	three times/yr	Grab
Heptachlor	(µg/l)	(1)	three times/yr	Grab
Total Residual Chlorine	(mg/l)	(1)	three times/yr	Grab
Aluminum	(mg/l)	(1)	three times/yr	Grab
Cyanide	(mg/l)	(1)	three times/yr	Grab
Hardness	(mg/l)	(1)	three times/yr	Grab
Oil & Grease	(mg/l)	(5)	three times/yr	Grab
Total Suspended Solids	(mg/l)	(5)	three times/yr	Grab
Biochemical Oxygen Demand	(mg/l)	(5)	three times/yr	Grab
Ammonia Nitrogen	(mg/l)	(5)	three times/yr	Grab
Cadmium	(mg/l)	(5)	three times/yr	Grab
Chromium	(mg/l)	(5)	three times/yr	Grab
Copper	(mg/l)	(5)	three times/yr	Grab
Lead	(mg/l)	(5)	three times/yr	Grab
Nickel	(mg/l)	(5)	three times/yr	Grab
Zinc	(mg/l)	(5)	three times/yr	Grab
Arsenic	(mg/l)	(5)	three times/yr	Grab
Barium	(mg/l)	(5)	three times/yr	Grab
Selenium	(mg/l)	(5)	three times/yr	Grab
Silver	(mg/l)	(5)	three times/yr	Grab
Cobalt	(mg/l)	(5)	three times/yr	Grab
Chemical Oxygen Demand	(mg/l)	(5)	three times/yr	Grab
E. Coli	(cfu/0.1L)	(5)	three times/yr	Grab
Thallium	(mg/l)	(5)	three times/yr	Grab
Low-Level Mercury	(ng/l)	(4,5)	one time/yr	Grab
Acetone	(mg/l)	(5)	three times/yr	Grab
Benzene	(mg/l)	(5)	three times/yr	Grab
2-Hexanone	(mg/l)	(5)	three times/yr	Grab
Methyl Ethyl Ketone	(mg/l)	(5)	three times/yr	Grab
Methyl Isobutyl Ketone	(mg/l)	(5)	three times/yr	Grab
Methylene Chloride	(mg/l)	(5)	three times/yr	Grab
Toluene	(mg/l)	(5)	three times/yr	Grab
Total Xylenes	(mg/l)	(5)	three times/yr	Grab
a-Terpineol	(mg/l)	(5)	three times/yr	Grab
Benzoic Acid	(mg/l)	(5)	three times/yr	Grab
Benzyl Alcohol	(mg/l)	(5)	three times/yr	Grab
2-Methylphenol	(mg/l)	(5)	three times/yr	Grab
4-Methylphenol	(mg/l)	(5)	three times/yr	Grab
Fluoranthene	(mg/l)	(5)	three times/yr	Grab
2-Methylnaphthalene	(mg/l)	(5)	three times/yr	Grab
Naphthalene	(mg/l)	(5)	three times/yr	Grab
Phenanthrene	(mg/l)	(5)	three times/yr	Grab
Phenol	(mg/l)	(5)	three times/yr	Grab
Pyrene	(mg/l)	(5)	three times/yr	Grab

Numbers listed in Table II-B are defined as follows:

(1) Samples are collected from the wastewater (leachate) delivery trucks or from the Permittee's leachate tank or tanks, located at the Permittee's facilities, as determined by AMSD each monitoring period.

(2) Flows are totalized by counting the number of 8,000 gallon truckloads hauled. Daily flow shall be reported to AMSD by Permittee on a monthly basis, at the address listed in Part III-C of this permit.

(3) AMSD staff will test Permittee wastewater for pH range compliance prior to accepting discharge. Temperature will also be noted.

(4) Mercury samples are collected from the wastewater (leachate) delivery trucks or from the Permittee's leachate tank or tanks, located at the Permittee's facilities, as determined by AMSD each monitoring period. Mercury will be analyzed using EPA Method 1631: Measurement of Mercury in Water.

(5) These parameters may be submitted by the Permittee to AMSD provided the testing is performed using approved wastewater methods.

Definitions of sample types can be found in Part IV, Section 1 of this permit.

PART III – ADDITIONAL/SPECIAL MONITORING REQUIREMENTS

A. Accidental Discharge:

The Permittee shall notify AMSD at 207-696-3246 immediately upon the occurrence (or suspected occurrence) of an accidental discharge of substances that may cause pass through, interference, or upset as defined in Part IV, Section 1 of this permit. After normal business hours, AMSD's on-call individual shall be called at 207-851-4745. The notification shall include location of discharge, date and time thereof, type of waste, including the concentration and volume, and corrective action taken. Within five days following an accidental discharge, the Permittee shall submit to AMSD a detailed written report. The report shall specify:

(1) Description and cause of the upset, slug load, or accidental discharge. The report shall also include location of discharge, type, concentration, and volume of discharged material.

(2) Duration of upset or accidental discharge, including exact dates and times and the time by which normal operations are reasonably expected to resume.

(3) All steps taken to reduce, eliminate, and prevent recurrence of an upset, slug load, accidental discharge, or other conditions of concern.

B. AMSD reserves the right to repeat sampling and analysis of any constituent at any time it deems necessary to ensure validity of results and/or avoid potential upset conditions.

C. All reports required by the permit shall be submitted to AMSD at the following address, or such other person and address as AMSD may designate.

AMSD
52 Main Street, Suite 1
Madison, ME 04950

PART IV – STANDARD CONDITIONS

SECTION 1 – DEFINITIONS

Terms used in this permit shall be as defined herein; terms not defined herein shall have their customary dictionary meaning.

A. Grab sample, for monitoring requirements, is defined as an individual sample, which is taken from a waste stream on a one-time basis.

B. Discharge means the introduction of pollutants into the WWTP from any non-domestic source regulated under Section 357(b), (c) or (d) of the Federal Water Pollution Control Act. 33 U.S.C. § 1251 et seq.

C. Pass-Through means a discharge which exits the WWTP into waters of the United States in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the WWTP MEPDES permit (including an increase in the magnitude or duration of a violation).

D. Interference means a discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

(1) Inhibits or disrupts the WWTP, its treatment processes or operation, or its sludge processes, use or disposal; and

(2) Therefore is a cause of a violation of any requirement of the WWTP's MEPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued there under (or more stringent State or local regulations) Section 405 of the Clean Water Act, the Solid Waste Disposal Act (including State regulations contained in any State sludge management plan prepared pursuant to subtitle D of said Act), the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act.

E. Upset means an exceptional incident in which there is temporary discharge outside of typical, reasonable, or licensed parameter limits.

SECTION 2 – GENERAL CONDITIONS

A. Duty to Comply:

The Permittee must comply with all conditions of this permit. Failure to comply with the requirements of these regulations may be grounds for administrative action, or judicial enforcement proceedings including civil or criminal penalties, injunctive relief, termination of sewer service, or summary abatements.

B. Permit Action:

This permit may be modified, revoked, reissued or terminated by AMSD Board of Trustees with at least thirty (30) working days' written notice to Permittee for any of the following reasons:

(1) Violation of any terms or conditions of this permit;

(2) Obtaining this permit by misrepresentation;

(3) A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge;

(4) Reliable information indicating that the permitted discharge poses a threat to human health or welfare;

C. Property and Contract Rights:

The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights.

D. Severability:

The provisions of this permit are severable, and if any provision or provisions of this permit are held invalid, the remainder of the permit shall not be affected.

E. Limitation on Transfer:

This permit is not transferable to any other owner without the prior written approval of AMSD. Request for discharge permit must be submitted by the new owner within thirty (30) days prior to transfer of ownership.

F. Dilution:

The Permittee shall not in any way attempt to dilute a discharge as a means of misrepresentation of discharge parameters, or to achieve compliance with the limitations contained in this permit.

SECTION 3 – OPERATION & MAINTENANCE OF POLLUTION CONTROLS

A. Proper Operation & Maintenance:

The Permittee shall at all times properly operate and maintain all systems of treatment and control which are used by the Permittee to achieve compliance with the conditions of this permit.

SECTION 4 – MONITORING AND RECORDS

A. Representative Sampling:

Samples and measurements shall be representative of the volume and nature of the monitored discharge. The sampling shall be done on a day of representative process operations. "Three times/year" sampling shall occur on a trimester basis in order to collect data representative of each third of a 1-year period.

All samples shall be taken at the monitoring point or points specified in this permit.

B. Inspection and Entry:

The Permittee shall allow AMSD Staff, or an authorized representative bearing proper credentials and identification, timely access to enter the Permittee's premises where a regulated facility or activity is located or where records must be kept under the conditions of this permit. The AMSD representative shall be given access at reasonable times to:

(1) Inspect and photocopy any records that must be kept under the conditions of this permit;

(2) Inspect facilities, equipment, practices, or operations regulated or required under this permit;

(3) Sample or monitor, for the purpose of assuring permit compliance, any waste streams entering the sewer system or that could be discharged to AMSD's WWTP; and/or

(4) Inspect any production, manufacturing, fabricating, or storage area where pollutants, regulated under this permit, could be discharged to the sewer system or AMSD's WWTP.

C. Retention of Records:

The Permittee shall retain the records of all monitoring information, including copies of all reports required by this permit, for a period of at least five (5) years from the date of the sample, measurement, or report.

D. Record Contents:

Records of sampling information shall include:

(1) The date, exact place, time and methods of sampling or measurement, and sample preservation;

(2) Who performed the sampling or measurements;

(3) The date(s) analyses were performed;

(4) Who performed the analyses;

(5) The analytical techniques or methods used; and

(6) The results of such analyses.

E. Signatory Requirements:

All reports and information submitted to AMSD shall be signed and certified as indicated below.

(1) All permit applications or correspondence, reports and self-monitoring reports required by this license shall be signed by a principal executive officer or duly authorized employee responsible for overall operation of the Permittee.

(2) Certification. Any person signing a document required by this permit shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

F. Falsifying Information:

Knowingly making any false statement on any report or other document required by this permit or knowingly rendering any monitoring device or method inaccurate, may result in punishment under

criminal law proceedings as well as being subjected to civil penalties and injunctive relief, as the same may be permitted by law. Falsifying information may result in termination of this agreement.

SECTION 5 – ADDITIONAL REPORTING REQUIREMENTS

A. Planned Changes:

The Permittee shall give written notice to AMSD ninety (90) days prior to any planned facility expansion, production increase, or process equipment modifications which result in a new or substantially increased discharge or a change in the nature of the discharge, together with an estimate of the extent of the increase or change.

B. Duty to Provide Information:

The Permittee shall furnish to AMSD within a reasonable time, any information requested by AMSD to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit.

SECTION 6 – ENFORCEMENT

A. AMSD has all enforcement authority available to it under State statute, its Bylaws and its Rules and Regulations.

B. AMSD may halt the Permittee's discharge at any time of noncompliance with any items of Part I of this permit.

C. In addition or as an alternative to Sections 6A and B above, AMSD may halt the Permittee's discharge under the following circumstances:

(1) The person in responsible charge of the AMSD's WWTP becomes aware that the Permittee's discharge has the potential to cause loss of life, personal injury and/or severe property damage;

(2) The person in responsible charge of the AMSD's WWTP communicates with the Chairman of the Board of Trustees of AMSD or the Chairman's designee and the person in responsible charge of Permittee's operations, whose name(s) Permittee shall provide to AMSD upon issuance of this permit; and

(3) During said communication, at least two of the three persons – the person in responsible charge of the AMSD's WWTP, the Chairman of the Board of Trustees of AMSD or designee, and the person in responsible charge of Permittee's operations – agree that Permittee's discharge has the potential to cause loss of life, personal injury and/or severe property damage.

D. All reasonable expenses incurred by AMSD including fines assessed by State or federal regulatory agencies, as a result of and caused by the Permittee's noncompliance with the Effluent Discharge Limits in Part I hereunder shall be reimbursed by the Permittee. Such expenses may include operation and maintenance, engineering and legal costs incurred by AMSD in the processing, treatment, discharge and/or disposal of wastewater or residual solids resulting from exceedance of the Effluent Discharge Limits hereunder (the "event necessitating the expenses"). AMSD shall provide the Permittee with a preliminary itemization of time and materials and other costs proposed to be incurred thereby by AMSD within ten (10) days of the event necessitating the expenses. Surcharges shall be invoiced to the Permittee within sixty (60) days following AMSD's receipt of all invoices for

expenses associated with the event necessitating the expenses. Except as otherwise provided in this permit, the amount of a surcharge shall not exceed the actual cost incurred by AMSD for handling the additional flow and loadings resulting from the Permit exceedance. The filing of a request by the Permittee for a permit modification, revocation and re-issuance, or termination or a notification of planned changes or anticipated noncompliance does not automatically stay any permit condition.

E. Nothing in this permit shall be construed to relieve the Permittee or any person, partnership, corporation or any other legal entity from civil and/or criminal penalties for noncompliance under local, State or federal laws unless specifically allowed for in any compliance schedule that may be established under Section 7 and/or 8 below.

SECTION 7 – PERMIT RENEWAL

If the Permittee wishes to continue to discharge after the expiration date of this permit, it must file written request for re-issuance of this permit at least thirty (30) days prior to the expiration date. If the Permittee makes timely request for re-issuance of the permit, but AMSD does not reissue a permit prior to the expiration date, the Permittee shall have the right to continue to discharge to AMSD under the terms and conditions of the expired permit until the effective date of a new final permit. If the new final permit contains any modified terms and conditions, the permittee shall have a reasonable time schedule for compliance with any changes or new conditions in the reissued permit, so long as said reasonable time for compliance does not result in Interference or Pass-Through, or cause the AMSD's WWTP to violate its MEPDES permit.

SECTION 8 – PERMIT REOPENER

If, during the permit term, a modification or change in the permit terms or conditions is necessary in order to enable AMSD to comply with its permit conditions, or to avoid Pass-Through or Interference with AMSD operations, AMSD may reopen and amend the terms and conditions of this permit. AMSD shall provide Permittee at least thirty (30) working days written notice prior to the effective date of any proposed changes in the permit, offering the Permittee an opportunity for comment on the proposed changes. Any changes or new conditions in the reissued permit shall include a reasonable time schedule for compliance, so long as said reasonable time for compliance does not result in Interference or Pass-Through, or cause AMSD's WWTP to violate its MEPDES permit or solids disposal regulations. Permit may be reopened for reasons including but not limited to:

(1) Upon the request of the Permittee, provided such request does not create a violation of any existing applicable requirements, standards, laws or rules or regulations;

(2) Any new or substantially increased discharge or change in the nature of the discharge, which is not covered in this permit, including any facility expansion; and

(3) To incorporate any existing, new or revised federal, State or local pretreatment standards or requirements which AMSD is required to incorporate into this permit by any federal or State agency.

END OF PERMIT

AMENDMENT TO
LEACHATE TREATMENT AGREEMENT

This AMENDMENT (this "Amendment"), dated as of November 1, 2016 ("Effective Date"), by and between **Waste Management Disposal Services of Maine, Inc.** ("Company"), and **S.D. Warren Company d/b/a Sappi North America** ("Sappi") amends the Leachate Treatment Agreement ("Agreement") with an Effective Date of November 1, 2013.

W I T N E S S E T H:

WHEREAS, Company is is engaged in the business of managing a municipal solid waste landfill in Norridgewock, Maine ("Landfill") which produces landfill leachate ("Leachate");

WHEREAS, Company desires to supply Sappi, and Sappi is willing to receive, Leachate produced at the Landfill for treatment in Sappi's wastewater treatment facility, under the terms and conditions of the Agreement and this Amendment; and

NOW, THEREFORE, in consideration of the mutual covenants set forth below and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto hereby agree that the Agreement shall be amended as follows:

1. The parties covenant and agree that this Amendment shall apply to all deliveries of Leachate by Company to Sappi from the Effective Date of this Amendment forward.

2. Capitalized terms used herein without definition shall have the meanings ascribed to such terms in the Agreement.

3. The parties agree that the Term of the Agreement as defined in Section 1 of the Agreement shall be extended for a period of three (3) years, expiring October 31, 2019.

4. The parties agree that all other terms and conditions of the Agreement remain unchanged, and shall continue to be in effect and binding upon the parties.

[Signature page follows]

IN WITNESS WHEREOF, intending to be legally bound, the parties have executed this Amendment as of the date first set forth above.

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.

By:_____
Name: CHRISTOPHER P. DESANTIS
Title: AVP

S.D. WARREN COMPANY
d/b/a SAPPI NORTH AMERICA

By:_____
Name: John Donahue
Title: VP Procurement

APPENDIX 15A
Public Benefit Determination Application

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
CROSSROADS FACILITY
PHASE 14 SECURE LANDFILL
DETERMINATION OF PUBLIC BENEFIT APPLICATION
JULY 3, 2018

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The Crossroads Facility ("Crossroads" or the "Facility"), owned and operated by Waste Management Disposal Services of Maine, Inc. ("WMDSM"), currently provides disposal capacity for municipalities and businesses throughout the State of Maine. The vast majority of waste accepted at the Facility is special waste, construction and demolition debris and materials or waste used as alternative daily cover. These wastes cannot be incinerated and have been processed, recycled or reduced to the maximum extent practicable. The Crossroads Facility provides a critical outlet for these wastes, which would otherwise have to be transported at significant economic and environmental cost to more distant locations.

The Crossroads Facility also complements other disposal options on the State's Waste Management Hierarchy, including incinerators and processing facilities. For example, WMDSM has worked collaboratively with the Mid-Maine Waste Action Corp. ("MMWAC") to provide waste material to that facility when it experiences downturns in volume and to accept waste material from MMWAC during its periods of limited capacity. WMDSM has also partnered with the Fiberight Facility, which will serve the needs of more than 115 municipalities. The Fiberight Facility will process municipal solid waste ("MSW") into renewable fuels or material for recycling and generate a by-product that requires landfilling. WMDSM will take all of the facility's residuals and bypass, which is critical to the viability of the Fiberight Facility and the many communities it will serve.

Although it constitutes less than 25% by volume, Crossroads also provides essential and cost-effective MSW disposal capacity for approximately 55 communities in western and central Maine. Crossroads is critical to providing needed capacity for a portion of the MSW generated in Maine and, importantly, many of the communities that utilize Crossroads for MSW disposal are distant from alternative sites and existing incinerators. For these communities, Crossroads provides a critical and cost-effective disposal option not provided by other facilities in the State.

Existing capacity provided by the previously permitted Phase 8 expansion will be fully utilized by 2024. To ensure that the Facility can continue to serve the needs of Maine communities and businesses, WMDSM is proposing development of an additional 7 million cubic yards of capacity (the "Phase 14 Project" or "Project"). Like Phase 8 before it, the Phase 14 Project will provide a substantial public benefit to the State of Maine by providing disposal capacity and ancillary waste management services through 2040. Without the Project, there will be a significant shortage of landfill capacity in the State.

The Crossroads Facility is also critical to ensuring solid waste disposal services remain competitive within Maine. By 2026, more than 80% of the landfill capacity will be limited to three landfills, two of which are located in Aroostook County and none of which provide practicable options for the vast majority of customers served by the Crossroads Facility. Phase 14 will ensure competitive landfill disposal options exist within the State beyond 2024. The Phase 14 Project will benefit customers serviced by the Crossroads Facility along with consumers of all disposal services such as waste collection and transportation throughout the State.

The Phase 14 Project is also consistent with the State's Solid Waste Management Plan and Recycling Plan and promotes the State's Waste Management Hierarchy. WMDSM's parent company is also North America's largest residential recycler. WMDSM has the resources, expertise and commitment to assist the State in its recycling efforts. The Crossroads Facility provides recycling services to 23 communities and in 2010 instituted a single-sort recycling program that has increased overall recycling in these communities. WMDSM collects recyclables and manages and consolidates the materials into bulk containers at the Crossroads Facility for shipment south to recycling brokers or purchasers. WMDSM's ability to manage recyclables at a regional level and transport these material to facilities such as ecomaine, is critical to the ability of these communities to recycle waste that would otherwise have to be landfilled.

WMDSM also implements a number of additional programs to reduce or recycle waste. These programs include a waste evaluation and consulting program to reduce waste generation at its source, a battery and e-waste diversion program, a partnership with BDS Waste Disposal to beneficially reuse tires, removing 33,611 tons of whole tires in 2017 alone, a corrugated cardboard recycling program, and a landfill gas renewable energy plant at the Facility that generates approximately 21,685,000 kilowatt hours of electricity per year. As part of the Phase 14 Project, WMDSM proposes to significantly upgrade its existing transfer station at the Facility, expand education and outreach to customers to improve recycling and waste reduction efforts, and implement a new textile diversion and reuse program, an organics diversion and reuse program, and a hazardous waste collection and reuse program. WMDSM will also work with its customers and all stakeholders to address the ongoing recycling crisis and explore options for continuing and expanding existing recycling efforts.

WMDSM has operated the Crossroads Facility since 1990. It has and continues to provide necessary and cost-effective disposal options to its many Maine customers and contributes to its host community, the region, and the State. It looks forward to the opportunity to continue to do so beyond 2024, when current capacity at the Facility will be fully utilized. This application demonstrates that the proposed Project will meet the long-term needs of the State, is consistent with the State's Solid Waste Management and Recycling Plan and promotes the State's Waste Management Hierarchy, and is not inconsistent with local, regional, or state waste collection, storage, transportation, processing or disposal.

1.0 INTRODUCTION AND CROSSROADS FACILITY BACKGROUND

1.1 Introduction

Waste Management, Inc. ("Waste Management"), the world's largest environmental services provider, has a strong presence in New England. Waste Management provides integrated waste management services, including recycling, collection, waste-to-energy, transfer station management, landfilling and sustainability consulting to municipalities and businesses throughout the region. Waste Management's comprehensive environmental services are provided to Maine municipalities and businesses by way of the Crossroads Facility ("Crossroads" or the "Facility").

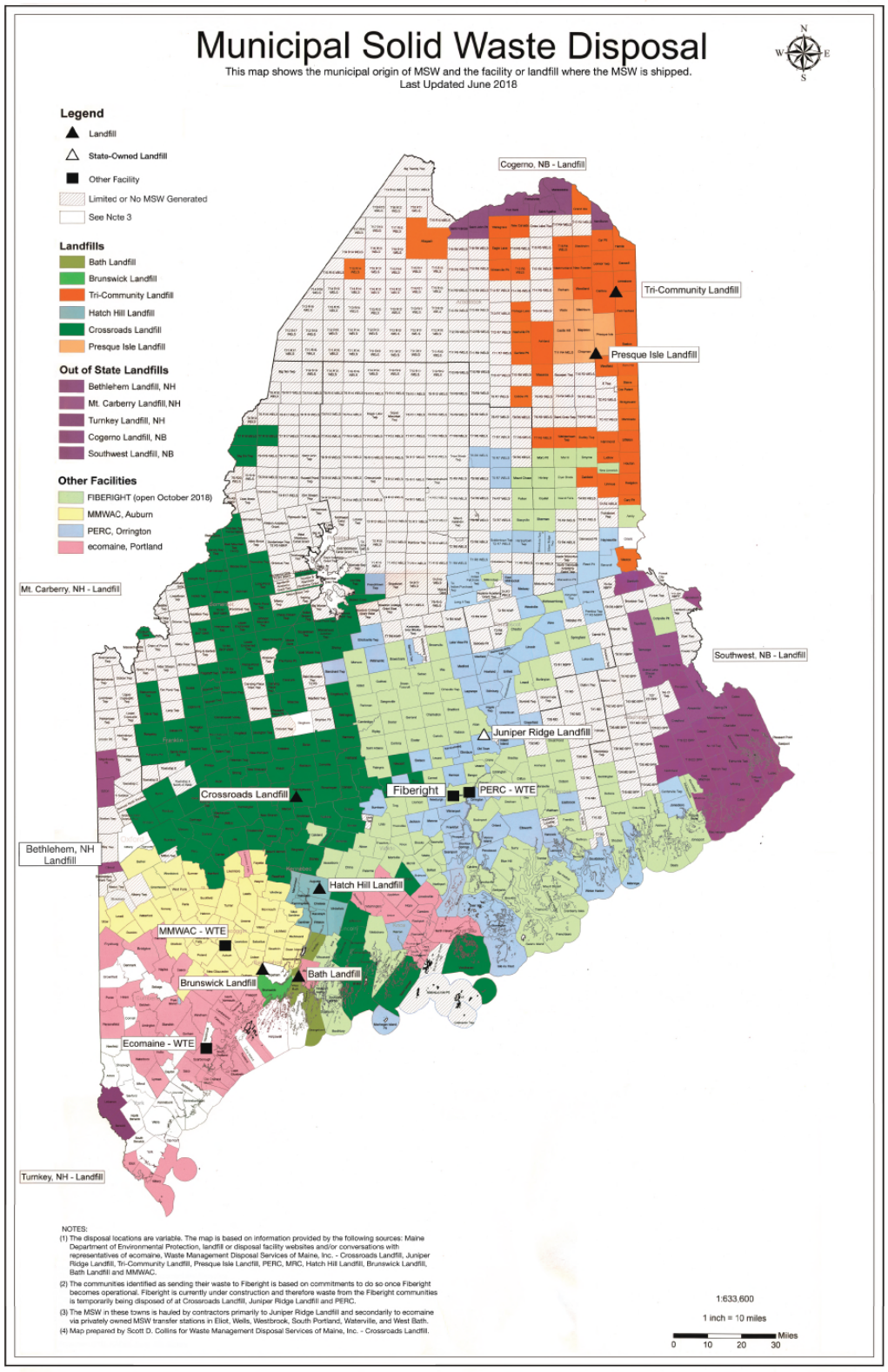
Waste Management Disposal Services of Maine, Inc. ("WMDSM") owns and operates the Crossroads Facility located in Norridgewock, Maine, as shown on the map provided as Figure 1 of Appendix A. Together, the components of the Facility promote an integrated approach to waste management. The 933 acre site includes a recycling transport center, a community transfer station, a tire beneficial reuse processing facility, a woodwaste recycling program, a renewable energy power plant and a landfill licensed by the Maine Department of Environmental Protection ("DEP" or the "Department") to dispose of non-hazardous wastes.[1] A site map depicting the Facility is provided in Figure 2 of Appendix A. WMDSM's local expertise and commitment, combined with the strength of its parent company, the nation's largest environmental services provider, ensures that the Crossroads Facility is environmentally sound, technically strong, and financially stable, both today and into the future.

For the state of Maine, the Crossroads Facility serves an essential role in the management of waste materials for municipalities and businesses. For the municipalities and businesses in the northwestern and central region of Maine, the Crossroads Facility is an important cost-effective disposal option and for many, the only real viable option. Due to the region's geographic location and size, numerous municipalities and businesses transport materials significant distances to reach the Facility. Crossroads also promotes facilities higher up on the State's Waste Management Hierarchy, such as Mid-Maine Waste Action Corp. (or "MMWAC") and Fiberight, where a long-term disposal contract is in place to support that operation and help ensure the facility's viability. Figure 3 below depicts the region served by the Crossroads Facility and other landfills and facilities in the State.

The Crossroads Facility is also the only licensed commercial disposal facility within the state of Maine. The presence of the Facility ensures that the costs to municipalities and businesses for collection, transportation and disposal of wastes remain competitive. Natural competition within the State's waste disposal market significantly decreases the risk that overconsolidation will produce unnaturally high or supracompetitive waste prices.

[1] The Crossroads Facility accepts three primary waste materials: special wastes, municipal solid wastes ("MSW") and construction and demolition debris ("CDD"). For the purpose of this Application, CDD is treated separately from MSW unless otherwise indicated.

FIGURE 3: MAINE MUNICIPAL SOLID WASTE DISPOSAL MAP – MAY 2018



**An enlarged version of Figure 3 is provided in Appendix A*

The Crossroads Facility receives waste materials through three primary sources: (1) a commercial transportation and hauling network; (2) a regional network of transfer stations with materials transported by municipalities, private contractors and WMDSM; and (3) a small curbside collection program serving two nearby communities. While the Facility operates multiple programs to divert waste materials from the landfill, the majority of wastes arriving at the Facility have no other disposal option.

In addition to being an essential component of the State's waste management infrastructure, the Facility provides both the town of Norridgewock and the surrounding region with significant economic benefits. The Maine Chamber of Commerce estimates that WMDSM's investments in the Crossroads Facility have a six-fold benefit to the regional economy in terms of employment and construction contracts. Based upon this information, the $94.9 million expended by WMDSM in costs associated with the existing permitted units at the Facility has had a $569.4 million benefit to the region to date. Crossroads also contributes nearly one-third of Norridgewock's annual operating budget through payment of host fees and property taxes, and no-cost waste disposal and recycling services.

Based on WMDSM's most recent data, the Crossroads Facility is projected to exhaust available disposal capacity at the Facility by the end of 2024.[2] For the Facility to continue providing a cost-effective and environmentally sound disposal option for Maine municipalities and businesses, it will need to develop an additional secure disposal unit. Thus, WMDSM is proposing the development of its Phase 14 Project ("Phase 14" or the "Project") for the Crossroads Facility.

Prior to requesting a license from the DEP to construct an additional secure disposal unit, an applicant must demonstrate that the project provides a substantial public benefit to the state of Maine.[3] The standards for a positive Public Benefit Determination are set forth below:

- The proposed facility meets immediate, short-term, or long-term capacity needs of the State;
- The proposed facility is consistent with the State Solid Waste Management and Recycling Plan; and
- The proposed facility is not inconsistent with local, regional, or state waste collection, storage, transportation, processing or disposal.[4]

The subsequent sections of this Application demonstrate that WMDSM's Phase 14 Project satisfies these standards and provides Maine municipalities and businesses with a substantial public benefit now and into the future.

[2] Careful stewardship of airspace at the Crossroads Facility extended the original life expectancy for Phase 8 by 12 years, from 2012 to 2024.
[3] 38 M.R.S.A. § 1310-AA (2013); *see also* 06-096 C.M.R. ch. 400 § 5.
[4] *Id.*

1.2 **History of Stewardship at the Crossroads Facility**

The Crossroads Facility has a strong history of environmental stewardship. Beginning in October of 1990, Waste Management, the parent company of WMDSM, acquired the Facility and its assets from Consolidated Waste Services. WMDSM sought and received DEP approval for the transfer of all facility-related licenses. Since then, DEP has issued licenses for other secure disposal units at the Crossroads Facility, including Phase 7 in July 1992; Phase 10 in May 1995; Phases 9, 11, and 12 in October 1997; and Phase 8 in August 2002.

WMDSM has emphasized careful and prudent engineering and operational procedures at the Crossroads Facility. This approach has maximized disposal capacity, improved environmental conditions, and conserved critical air space. WMDSM's emphasis on stewardship has achieved results: Phases 8, 9, 11 and 12 have all significantly exceeded initial site life projections. Perhaps the most notable example is Phase 8, which was originally designed in 2000-2001 to provide additional disposal capacity without requiring lateral expansion of the Facility. The Phase 8 permit application was submitted in 2001 for a 45-acre lined landfill to be constructed partly as an overfill in newly lined areas, partly over undisturbed areas, and partly over an area where existing unlined waste (deposited by the previous owners) would be voluntarily removed by WMDSM. In order to improve the environmental conditions at the site while maximizing the disposal capacity, several innovative engineering features and operational procedures were developed and utilized, including: (1) excavation and relocation of the unlined waste; (2) wick drains; (3) mechanically stabilized earth ("MSE") perimeter berms; (4) extensive construction and post-construction geotechnical monitoring and slope modifications; and (5) high in-place waste density. Details of these innovative engineering and operational initiatives are provided below.

- *Waste Excavation.* A significant portion of the Phase 8 expansion was built over the area occupied by an existing unlined MSW Landfill unit. This required excavation of approximately one million cubic yards of old waste and relocation into newly lined areas, thereby significantly enhancing long-term protection of the environment at the Facility and in the surrounding areas. WMDSM accomplished this by often working 24-hours a day during winter months and utilizing extensive controls to prevent odors or other nuisance issues for the community.

- *Wick Drains.* The Phase 8 area is underlain by a very soft glaciomarine foundation clay deposit, the Presumpscot Formation, which is ubiquitous throughout much of Maine. Phase 8 was one of the first landfill designs in the United States that included wick drains to accelerate drainage and pore pressure dissipation of the glaciomarine clays, thereby increasing the strength of the foundation under Phase 8. Since then, wick drains have been employed at other facilities in Maine to provide similar results.

- *MSE Berms.* The disposal capacity provided by Phase 8 was further increased by construction of a MSE perimeter berm around much of the lined perimeter. The internally reinforced berm has an average height of about 20 feet, with a total length of nearly 5,000 feet. By effectively increasing the loading (and therefore the strength) of the foundational clays under the landfill toe and by optimizing the positioning of the berm

allowed by the steepened exterior MSE face, an additional 20% disposal capacity was provided in Phase 8 compared to the same footprint that would have been provided by an unreinforced berm. Since then, Waste Management has constructed MSE berms at more than a dozen landfills, and the use of MSE berms at landfills in New England has seen considerable growth including the Turnkey Landfill in New Hampshire.

- *Geotechnical Monitoring and Slope Modifications.* Since the Phase 8 landfill was first conceived, extensive stability monitoring has been performed using slope inclinometers and vibrating-wire piezometers. The locations of the instrumentation were selected to correspond to critical cross sections identified during the stability design analyses as being the most important for monitoring during excavation/relocation of the unlined waste and subsequent waste filling of the lined unit. WMDSM's engineering consultants contributed considerably to advancing the state-of-practice in designing civil engineering structures over the Presumpscot Formation. This work has been published in technical journals and was featured in presentations at the 2015 University of Maine Second *Symposium on the Presumpscot Formation*.

- *Waste Compaction.* Since Phase 8 became operational, WMDSM has achieved an average in-place waste density of 0.9 tons per cubic yard.[5] The density of in-place waste (also referred to as the Airspace Utilization Factor ("AUF")) is an indicator of how efficiently the disposal capacity in a landfill is used. The AUF is a function of the types of waste, the manner in which the waste is blended during placement in the landfill, the amount of compaction effort exerted by the site operations personnel, and how well the waste is being decomposed in the landfill. A higher AUF correlates to better efficiency in consuming airspace; the Crossroads landfill has a very high AUF compared to other landfills in Maine, further exemplifying the importance WMDSM places on good stewardship of landfill airspace.

Table 1 below provides an itemized summary of the modifications and resulting changes in disposal capacity which WMDSM has achieved with DEP approval since initial permitting of Phase 8. As shown, through careful engineering analyses, the capacity has been increased by nearly 1.3 million cubic yards, representing a 30% increase in the overall capacity of Phase 8. More importantly, Phase 8 was originally projected to reach capacity in 2012, but is now currently projected to remain available for waste disposal through 2024 due to filling rates and WMDSM's diligence in these engineering and operational initiatives.

[5] Maine 2009 Solid Waste Generation and Disposal Capacity Report indicates commercial landfills optimize available capacity by achieving a one-to-one ratio of tons-to-cubic yards. Maine State Planning Office, *Solid Waste Generation & Disposal Capacity Report for Calendar Year 2009*, 19 (January 2011), http://www.maine.gov/dep/sustainability/publications/documents/waste-gen-disp-capacity2009.pdf. We are not aware of any landfills in Maine with a higher AUF than the 0.9 tons per cubic yard achieved at Crossroads.

TABLE 1: SUMMARY OF PHASE 8 DISPOSAL CAPACITY MODIFICATIONS – CROSSROADS LANDFILL, NORRIDGEWOCK, MAINE

Modification Number	Reference Document or Drawing	Date	Change in Disposal Capacity [cyd]
1	*Modification to Temporary Waste Grades in Phase 9*	24-Oct-2002	38,470
2	Sheet 17 - Phase 8A Constr. Dwgs.	May-2003	-29,170
3	*Phase 8B Leachate Collection System Construction*	9-Jun-2003	1,180
4	Sheet 12 - Phase 8B Constr. Dwgs.	Aug-2003	7,450
5	RFI 04-04	18-Feb-2004	31,120
6	*Phase 8C' Waste Excav/Relo. Plan*	6-Jul-2004	51,000
7	Sheet 14 - Phase 8C' Constr. Dwgs.	Sept-2004	-12,480
8	RFI 04-02	22-Nov-2004	175,480
9	*Stage 0 Ph8C' Waste-Fill Sequence*	1-Nov-2005	48,370
10	*Phase 8C' Waste-Fill Sequence Plans (Stages 1, 2, 2A & 3)*	16-Dec-2005	68,090
11	Sheet 16 - Phase 8C" Constr. Dwgs.	Dec-2006	-40,200
12	*Phase 8A Sideslope Modification*	16-Jan-2009	228,356
13	*Proposed Waste Placement Submittal #1, Phases 7&9,* *Proposed Waste Placement Submittal #2, Phases 7&9 (F-13 Terrace)* *Proposed Waste Placement Submittal #3 - Phase 7&9 and Phase 8B*	8-Dec-2010	207,933
14	*Revised Final Cover System Engineering Report (Revision 1)*	1-Jun-2012	94,541
15	*Proposed Waste Placement Submittal No. 1, Phase 1 and 8C' East Sideslope Modification* *Proposed Waste Placement Submittal #2 - Phase 1 and 8C' East Sideslope Modification*	13 Jul 2012 25 Sept 2012	298,500
16	*Phase 8C" Permit Modification*	29-May-2014	-249,537
17	*Phase 8 Upper Sideslope and Topdeck Modification – Submittal #1* *Phase 8 Upper Sideslope and Topdeck Modification – Submittal #2* *Phase 8 Upper Sideslope and Topdeck Modification – Submittal #3*	17 June 2016 24 Aug 2016 11 Nov 2016	441,000
		TOTAL	**1,360,103**

The history of stewardship at the Crossroads Facility goes beyond efforts related directly to waste disposal. WMDSM supports many additional initiatives, some of which are discussed below, including a Single-Sort Recycling Program, a Beneficial Tire Reuse Program, a Woodwaste Recycling Program, a gas-to-energy collection system, and electronic waste recycling, in addition to others. Phase 14 provides the Crossroads Facility with the opportunity to grow its environmental stewardship efforts by launching new initiatives, such as an Organics Diversion Program, Hazardous Waste Collection events, a transfer station upgrade, and a Textile Diversion Program. Careful stewardship of Maine's natural resources has always been a priority at the Crossroads Facility and will continue to be with the successful implementation of the Phase 14 Project.

1.3 Municipalities and Businesses Served by the Crossroads Facility

The Crossroads Facility serves municipalities and businesses throughout the entire state of Maine. The primary disposal network extends as far north as Jackman, as far south as Bath, as far east as Vinalhaven and to the State's western border, as illustrated by Figure 3. As further discussed in Section 2.3.3, the Phase 14 Project is of particular importance to western and

northern portions of the Crossroads disposal network given their geographic location. The Crossroads' disposal network is listed below in Tables 2 through 4.

TABLE 2: MAINE MUNICIPALITIES CURRENTLY SERVED BY THE CROSSROADS FACILITY[6]

Somerset	Franklin	Kennebec	Oxford
Anson	Carrabassett Valley	Belgrade	Andover
Athens	Carthage	China	Bethel
Canaan	Chesterville	Clinton	Byron
Cornville	Eustis	Fayette	Dixfield
Detroit	Farmington	Mount Vernon	Hebron
Embden	Industry	Readfield	Mexico
Fairfield	Jay	**Rome**	Peru
Hartland	Kingfield	Sidney	Roxbury
Jackman	Madrid	Vassalboro	Rumford
Madison	**New Sharon**	**Vienna**	
Mercer	New Vineyard	Waterville	
Palmyra	Phillips	Windsor	
Pittsfield	Rangeley Plantation	Winslow	
Norridgewock	Rangeley		
Skowhegan	Stratton		
Smithfield	Strong		
Solon	Temple		
Somerset County Commissioners	Wilton		

Lincoln	Knox	Penobscot	Androscoggin
Boothbay	Saint George	Etna	MMWAC*
Boothbay Harbor	Vinalhaven	Newport	
Bristol/South Bristol Transfer Station		Municipal Review Committee/Fiberight*	
Edgecomb			
Monhegan			
Nobleboro/Jefferson Transfer Station			
Southport			

**Municipalities within consortiums are listed below in Table 3.*

[6] Bolding indicates the communities in close proximity to the Crossroads Facility that utilize the transfer station on Airport Road in Norridgewock.

TABLE 3: MAINE SOLID WASTE CONSORTIUMS AND THEIR MEMBER COMMUNITIES CURRENTLY SERVED BY THE CROSSROADS FACILITY[7]

Mid-Maine Waste Action Corp. or MMWAC	
Members	**Non-Members**
Auburn	Bath
Bowdoin	Bowdoinham
Buckfield	Brunswick
Lovell	Dresden
Minot	Gray
Monmouth	Greene
New Gloucester	Hebron
Poland	Leeds
Raymond	Lewiston
Sumner	Lisbon
Sweden	Lisbon Falls
Wales	Litchfield
	Mechanic Falls
	Norway
	Oxford
	Richmond
	Sabattus
	South Paris
	Topsham
	Turner
	Wiscasset
	Woolwich

Municipal Review Committee ("MRC")/Fiberight		
Abbot	Addison	Albion
Alexander	Alton	Amherst
Atkinson	Aurora	Baileyville
Bangor	Bar Harbor	Baring
Beals	Belfast	Benton
Blue Hill	Boothbay	Boothbay Harbor
Bowerbank	Bradford	Bradley
Bancroft	Brewer	Brooklin
Brooks	Brooksville	Brownville
Bucksport	Burnham	Camden
Carmel	Castine	Centerville
Central Penobscot	Charleston	Cherryfield
Chester	China	Clifton

[7] As discussed in Section 2.1, the Crossroads Facility supports operations at MMWAC and the proposed Fiberight Facility, and as a result the many communities served by those two facilities.

Clinton	Columbia	Columbia Falls
Corinna	Corinth	Cranberry Isles
Crawford	Cushing	Dedham
Dexter	Dixmont	Dover-Foxcroft
Drew Plt.	East Millinocket	Eddington
Edgecomb	Edinburg	Enfield
Etna	Exeter	Fairfield
Franklin	Freedom	Friendship
Garland	Glenburn	Gouldsboro
Grand Lake Stream	Great Pond	Greenbush
Guilford	Hampden	Hancock
Harrington	Haynesville	Hermon
Holden	Hope	Howland
Hudson	Jackson	Jonesport
Kenduskeag	Knox	LaGrange
Lamoine	Lee	Levant
Lincoln	Lincolnville	Luceme
Machias	Mariaville	Mars Hill
Mattawamkeag	Maxfield	Medford
Medway	Midcoast	Mid-Maine
Milbridge	Milford	Millinocket
Milo	Monson	Montville
Mt. Desert	N Katahdin	Newburg
Oakfield	Oakland	Old Town
Orland	Orono	Osborn
Otis	Owls Head	Palmyra
Parkman	Passadumkeag	Penobscot Co.
Piscataquis Co.	Pleasant River SWD	Plymouth
Reed Plt.	Rockland	Rockport
Sangerville	Searsmont	Searsport
Sebec	Sedgewick	Sherman
Sorrento	South Thomaston	Southport
Southwest Harbor	Springfield	St. Albans
Stetson	Steuben	Stockton Springs
Stonington	Sullivan	Surry
Swans Island	Talmadge	Thomaston
Thorndike	Topsfield	Tremont
Trenton	Tri-County	Troy
Union River SWD	Unity	Vassalboro
Veazie	Verona	Waite
Waldoboro	Waltham	Waterville
West Gardiner	Winn	Winslow
Winter Harbor	Winthrop	Wiscasset

TABLE 4: SELECTED MAINE BUSINESSES AND INSTITUTIONS SERVED BY THE CROSSROADS FACILITY

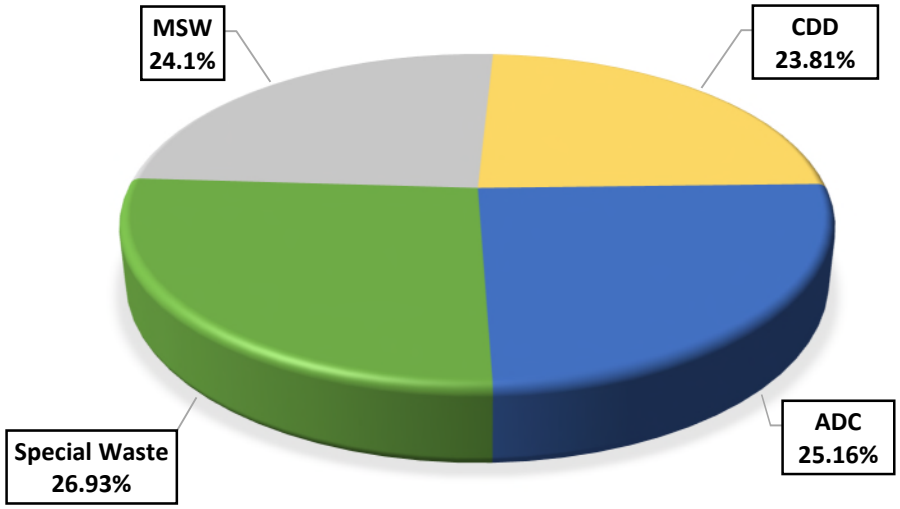
Abatement Professionals
Backyard Farms
Bath Iron Works
BDS Waste
Central Maine Power
Cianbro
Clean Harbors
Colby College
Envirovantage
Fiberight/CRM
Fisher Engineering
Global Construction
Huhtamaki
Irving Forrest Products
Keystone Management
Nichols Portland
Pioneer Plastics
Portland Water District
ReEnergy
Sappi
Sargent Corp.
Sheridan Corp.
Sugarloaf Mountain Corp.
Tasman Leathers
Unity College
University of Maine at Farmington
Wright-Ryan

1.4 Materials Managed at the Crossroads Facility

To meet the needs of Maine residents and businesses, WMDSM manages a variety of non-hazardous waste materials at the Crossroads Facility. Materials generally include, residential, commercial, and institutional MSW, front-end process residues ("FEPR"), CDD and a range of special wastes including, municipal incinerator ash, wastewater treatment plant sludge, contaminated media, and light industrial solid waste. On average, since 2004, 26.93% of the wastes managed at the Crossroads Facility from Phases 8 and 11 have constituted special waste, 24.1% have constituted MSW, 25.16% have consisted Alternative Daily Cover ("ADC") and 23.81% have constituted CDD, as seen in Figure 4. WMDSM projects these percentages to generally continue during its Phase 14 Project.[8, 9]

[8] 2004 corresponds to the commencement of the Phase 8 secure disposal unit at the Crossroads Facility.
[9] For the purposes of this Application, special waste includes asbestos-containing waste, unless otherwise specified.

FIGURE 4: PERCENTAGE OF MATERIALS MANAGED AT CROSSROADS: 2004 - 2017



Special Waste:

The Crossroads Facility provides special waste disposal services to municipalities and commercial waste generators throughout the state of Maine. The primary generators of special waste managed throughout Phase 8 are as follows.

- Maine Energy Recovery Company – Ash
- ReEnergy – Ash
- Grimmel Industries – Auto Shredder Residue
- Pioneer Plastics – Plastic Pellet Dust
- City of Portland, Maine – Municipal Wastewater Sludge

During the past five years, the average annual amount of special waste managed within Phase 8 of the Crossroads Facility, excluding asbestos-containing waste, was 47,733.6 tons.

Construction and Demolition Debris:

Commercial waste generators and municipalities throughout the State utilized the Crossroads Facility for disposal of CDD. The primary Maine generators utilizing the Crossroads Facility for disposal of CDD during Phase 8 are as follows.

- Commercial Haulers
- Commercial Transfer Stations
- Municipal Transfer Stations
- MMWAC Member Communities

During the past five years, the average annual amount of CDD managed within Phase 8 of the Crossroads Facility was 55,709.6 tons.

Alternative Daily Cover:

The Crossroads Facility also manages waste for use as ADC from commercial waste generators and municipalities throughout the State. The most significant generators of ADC that utilized the Crossroads Facility during Phase 8 are as follows.

- ReEnergy – Wood Ash
- Gimmel Industries – Auto Shredder Residue
- Pioneer Plastics – Pellet Dust
- Global – Utility Pole Chips
- Municipal Wood Waste – Chips

During the past five years, the average annual amount of ADC managed within Phase 8 of the Crossroads Facility was 76,134.2 tons.

Municipal Solid Waste:

Municipalities and businesses within Maine also utilize the Crossroads Facility for disposal of MSW. The primary Maine generators of MSW managed at the Crossroads Facility during Phase 8 are as follows.

- Commercial Haulers
- Waste Management
- Northern Oxford Regional Transfer Station
- Skowhegan Transfer Station
- Madison Transfer Station
- Newport Transfer Station

During the past five years, the average annual amount of MSW managed within Phase 8 of the Crossroads Facility was 82,153.2 tons. Consistent with Maine's preference to utilize incineration over landfilling, WMDSM has not sought to expand its MSW customer base beyond the region it has traditionally served. Additionally, the Crossroads Facility is a vital broker of MSW for incinerators and for production of biofuels. Crossroads supports the MMWAC Facility by providing it with additional MSW during downturns in volume that would otherwise curtail its operations. Crossroads also recently entered into an agreement with Fiberight to send MSW bridge capacity waste to Penobscot Energy Recovery Company ("PERC").

All MSW managed by the Crossroads Facility is generated by municipalities and communities within the state of Maine. The vast majority of all material sent to the Crossroads Facility also comes from within the state of Maine. Since April 2001, when WMDSM initiated reporting gate receipts in compliance with the Phase 8 public benefit determination, less than 25% of the total volume of waste received at the Facility has come from out-of-state. This is substantially below the 35% reporting threshold set forth in the Phase 8 public benefit determination. All of the out-of-state waste has been special waste, primarily ADC, municipal wastewater sludge and contaminated soils. The percentage of non-remediation special waste has been less than 15%, substantially below the 25% reporting threshold in the public benefit determination for Phase 8. A significant percentage of the out-of-state waste is used as ADC, which does not reduce airspace that would otherwise be available for Maine generated waste.

Daily cover is required by the solid waste regulations and absent revenue generating sources of cover, WMDSM would have to obtain fill from on-site or purchase it from third parties. Additionally, the State has recognized that use of waste as shaping, grading or ADC at landfills is a form of recycling.[10]

To remain viable, it is critical that WMDSM continue to accept out-of-state special waste. Annual percentages will likely continue to fluctuate based on market conditions including economic growth, which increases generation of special waste, as well as changes in the regional disposal landscape. Overall, WMDSM expects that Phase 14, like Phase 8, will serve predominantly Maine customers and businesses, and WMDSM will ensure that it provides an ongoing benefit to Maine businesses and communities by providing cost-effective and competitive waste management options.

1.5 **Project Description**

For the Crossroads Facility to be able to continue serving the residents and businesses of Maine, it requires additional disposal capacity which will be provided by Phase 14. Phase 14 will be located east of the existing main access road into the Facility, as seen in Figure 5 of Appendix A. Development of Phase 14 is anticipated to include the following: (1) excavation of topsoil and designated amounts of underlying soils; (2) construction of a liner and leachate collection system; (3) construction of perimeter berms and an access road; (4) construction of landfill gas and leachate transfer pipes to the existing on-site landfill gas and leachate management facilities; and (5) construction of stormwater management features including stormwater detention basins.

Based on the current preliminary design, the calculated waste capacity of Phase 14 is approximately 7 million cubic yards[11] within a lined footprint of about 51 acres. Based on WMDSM's projected rate of 450,000 tons of waste per year to be accepted at the Crossroads Facility, Phase 14 will provide municipalities and businesses in Maine with disposal capacity for approximately 15 years beyond the currently projected closure of Phase 8. The Phase 14 Project is expected to extend Facility life until the year 2040.

1.6 **Project Benefit to Host Community and Region**

The Crossroads Facility and the town of Norridgewock (the "Town") have a strong working relationship. WMDSM is committed to Norridgewock's wellbeing and support of the local community. As evidence of this commitment, Crossroads currently employs approximately 30 local individuals at the Facility and has done so annually for the past 15 years. WMDSM also assists the Town financially through payment of property taxes and host community fees. Norridgewock also receives waste and recycling services at no cost. In 2017, the monetary value of this service totaled approximately $350,000. A summary of taxes and fees provided to Norridgewock and to the State of Maine through Phase 8 are detailed below in Table 5. WMDSM has also assisted the Town with tangible benefits, such as construction of its sand and

[10] 38 M.R.S.A. § 1310-N(5-A)(B)(2) (2015).
[11] Waste density of 1 ton per cubic yard is assumed for capacity citations in this Application.

salt shed, procurement of a thermal imaging camera, and ongoing road maintenance at no cost to the Town.

TABLE 5: CROSSROADS LANDFILL COMMUNITY BENEFITS AND STATE DISPOSAL FEES
2004 - 2018

	Norridgewock		Disposal Fees paid to State of Maine
	Host Fees	Property Taxes	
2018 YTD	$191,720.84	TBD	$818,231.35
2017	$600,696.50	$253,328.54	$1,488,635.92
2016	$412,337.41	$263,486.32	$639,029.65
2015	$307,316.93	$286,734.32	$662,037.64
2014	$438,209.63	$296,775.43	$939,143.23
2013	$352,325.94	$266,524.60	$726,068.74
2012	$262,870.06	$250,921.23	$572,274.36
2011	$289,684.15	$248,644.50	$552,988.87
2010	$308,086.82	$262,432.80	$700,887.88
2009	$282,117.84	$299,680.35	$609,984.26
2008	$311,096.77	$258,059.47	$558,975.89
2007	$414,190.87	$217,994.06	$851,148.58
2006	$463,262.74	$198,363.20	$753,404.72
2005	$383,787.69	$218,935.73	$669,514.88
2004	$269,880.25	$235,213.14	$452,937.56
Total	**$5,287,584.44**	**$3,557,093.69**	**$10,995,263.53**

In addition to the benefits provided to Norridgewock, the region surrounding Crossroads also receives important benefits from the Facility. As discussed above, the Maine Chamber of Commerce estimates that WMDSM's financial investments in the Crossroads Facility have a six-fold benefit to the regional economy in terms of employment and construction contracts. Based on this information, it is estimated that the $49.7 million costs associated with Phase 14, will contribute $298.2 million to the region over the life of the Project. Finally, on an annual basis, the State of Maine also receives significant licensing and operating fees from the Crossroads Facility as demonstrated in Table 5. The disposal fees paid to the State of Maine over the 14.5-year period detailed above have averaged over $750,000 per year. The benefits described above will continue with the successful development of the Phase 14 Project.

2.0 THE PROJECT PURPOSE AND CAPACITY NEEDS

The Crossroads Facility plays an essential role in management of the State's solid waste, and Phase 14 will ensure that it can continue to do so beyond 2024, when remaining capacity at the Facility will be exhausted.[12]

2.1 Landfills Play an Essential Role in Management of the State's Solid Waste

Maine law recognizes the need for and public benefit provided by landfills, which complement the remaining waste management strategies in the State's Solid Waste Management Hierarchy (the "Waste Hierarchy" or the "Hierarchy"). Reduction of waste is at the top of the Hierarchy, and 2010 regional data indicated that Mainers generated approximately 0.566 tons of MSW per person on an annual basis; less than any other New England state.[13] Additionally, total MSW disposal (excluding CDD and waste-to-energy ash) decreased 5.5% in the four-year period from 2008 to 2012.[14] Although Maine's per capital disposal rate has increased slightly since then to 0.571 tons,[15] it generally remains lower than national rates.[16]

Even as society moves toward more efficient use of material and seeks to reduce the total volume of waste generated,[17] there will always be a need to manage solid waste, which typically increases in volume with economic growth.[18] There are also limitations on how much solid waste can be recycled and reused. As discussed in greater detail in Section 3.0, Waste Management is the nation's largest residential recycler, and WMDSM has made a substantial investment in improving recycling programs in the municipalities it serves. This has continued at a time when recycling costs have increased and markets have seen an upturn in volatility. Recently, the waste industry has been facing market volatility and multiple challenges associated with the export of processed materials. This has impacted the ability to increase recycling volumes with commercial and municipal customers in Maine and elsewhere. The most recent recycling figures for Maine indicate a recycling rate in 2016 of 36.79% for MSW (excluding CDD), and a recycling/beneficial reuse rate of 11.38% for CDD.[19]

The majority of MSW in Maine is recycled or incinerated in one of Maine's three operating waste-to-energy plants.[20] Maine currently has three licensed and operating waste-to-

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[12] This Application utilizes the most current data available from the DEP and the former Maine State Planning Office. In some instances, data for the most recent calendar years is limited and includes gaps.
[13] Maine Dep't of Envtl. Prot., *Maine Materials Mgmt. Plan: 2014 State Waste Mgmt. and Recycling Plan Update and 2012 Waste Generation and Disposal Capacity Report*, 7 (January 2014), http://digitalmaine.com/cgi/viewcontent.cgi?article=1022&context=dep_docs.
[14] *Id.*
[15] Maine Dep't of Envtl. Prot., *Maine Solid Waste Generation and Disposal Capacity Report for Calendar Year 2016*, 4 (Jan. 2018), http://www.maine.gov/tools/whatsnew/attach.php?id=775003&an=1.
[16] States of a rural nature tend to generate less MSW and CDD per capita.
[17] As discussed further in Section 3.3, WMDSM is also proposing to develop a program to help divert organics from the landfill, thereby advancing what the DEP has identified as the "largest opportunity to reduce Maine's waste stream."
[18] *See Maine Materials Mgmt. Plan: 2014 State Waste Mgmt. and Recycling Plan Update and 2012 Waste Generation and Disposal Capacity Report*, at 6-7.
[19] *Maine Solid Waste Generation and Disposal Capacity Report for Calendar Year 2016*, at 5.
[20] *Id.* at 3.

energy facilities. These facilities collectively are licensed to process 544,000 tons of MSW annually.[21] Specifically, the MMWAC operates a waste-to-energy facility located in Auburn, Maine, and is licensed to process 70,000 tons of waste annually.[22] The ecomaine facility in Portland is licensed to process 170,000 tons of waste annually.[23] The PERC facility in Orrington has traditionally served the MRC, which include 187 municipalities and inter-municipal entities located in central, eastern, and northern Maine. It is licensed to process 304,000 tons of waste annually.[24] In 2015, these three facilities combusted 470,510 tons of waste, generated 112,183 tons of ash and produced 57,920 tons of FEPR.[25] The 112,183 tons of ash and the 57,920 tons of FEPR subsequently required landfilling.

Landfills complement incineration by providing disposal capacity for (1) incinerator ash and other byproducts of incineration, (2) FEPR, which is material that is not suitable for incineration and is therefore removed prior to incineration, and (3) bypass, which is material that cannot be handled by an incinerator due to outages or other operational constraints. The Crossroads Facility facilitates incineration of solid waste by providing a cost effective option for disposal of all three categories of waste. An important example of the Crossroads Facility facilitating incineration is its contractual arrangement with the MMWAC facility. Crossroads accepts MSW during times of limited capacity at MMWAC (i.e., summer months) and provides additional MSW to MMWAC during downturns in volume (i.e., winter months) that would significantly limit operating capacity. Crossroads also accepts CDD from MMWAC that cannot be incinerated and solid waste bypass. Crossroads has provided these services to MMWAC for a decade.

The MRC has recently partnered with Fiberight, LLC, a private entity, to construct and operate a regional solid waste processing facility in Hampden, Maine (the "Fiberight Facility"). The Fiberight Facility is currently under construction and is expected to begin accepting waste later in 2018. It is designed to accept and process 650 tons of MSW daily, with an annual projected capacity of 145,000 tons. MSW will be processed and/or converted into renewable fuels and residues for potential recycling or disposal. Fiberight estimates that between 70 to 80% of the waste by volume will be converted to renewable fuels or recycled, and the remaining 20 to 30% will be process residues that require off-site disposal in a secure landfill.[26] Process residues include bulky waste, textiles, dissolved air floatation system residues and combined boiler ash.[27] WMDSM has contracted with Fiberight to take its residuals and bypass waste. As noted in its license, "the availability of secure landfill disposal capacity is an integral part of the development of an interpreted system for solid waste management in accordance with the [State hierarchy]."[28] The Phase 14 project provides that critical landfill capacity.

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[21] *Maine Solid Waste Generation and Disposal Capacity Report for Calendar Year 2016*, at 7.
[22] *Id.*
[23] *Id.*
[24] *Id.*
[25] Maine Dep't of Envtl. Prot., *Maine Solid Waste Generation and Disposal Capacity Report for Calendar Year 2015*, 17, (Jan. 2017), https://www.maine.gov/decd/meocd/landfills/docs/Waste_CapacityReport%202017.pdf.
[26] Municipal Review Committee, Inc. and Fiberight, LLC Hampden, Penobscot County, Maine Solid Waste Processing Facility, *Solid Waste License*, #S-022458-WK-A-N, 1-6, (July 14, 2016).
[27] *Id.* at 29.
[28] Municipal Review Committee, Inc. and Fiberight, *Solid Waste License*, at 29.

Landfills also provide disposal options for waste types that cannot be incinerated, recycled or beneficially reused. For example, bulky waste, CDD and other special wastes may require specialized handling. For these wastes, landfills are the only viable disposal option. The majority of the waste disposed of in the Phase 8 portion of the Crossroads Facility has been special waste and CDD, which is material not suitable for incineration. This is expected to remain consistent during the operation of the Phase 14 Project.

Landfills, while not at the top of Maine's Waste Hierarchy, are a critical component of the Hierarchy. They facilitate incineration or processing of MSW and provide disposal options for wastes that cannot be further recycled, reused, incinerated or processed.

2.2 **Phase 14 is Necessary For Maine's Long-Term Capacity Needs**

As discussed above, the Crossroads Facility serves an existing need for essential and cost-effective disposal of MSW for approximately 55 communities and special waste from various commercial and institutional generators. Through sustained careful utilization of currently permitted airspace, WMDSM estimates that it can continue to serve Maine communities and businesses through 2024, thereby helping the State to meet its immediate (three year) and short-term (five year) land disposal needs.[29] Existing capacity at Crossroads is projected to be fully utilized by the end of 2024, however, and therefore Phase 14 is needed to meet the State's long-term (defined as in the next ten years) land disposal needs beyond 2024.[30] WMDSM's goal for Phase 14 is not to compete with other presently available solid waste disposal facilities, but to continue to provide necessary and cost-effective disposal services for the communities, businesses and institutions currently served by the Crossroads Facility. Without Phase 14, there will be a capacity shortfall that will have an adverse impact on Maine residents, municipalities and businesses, particularly in the region currently served by the Crossroads Facility.

To ensure that the State's long-term disposal capacity needs are met without interruption of service to its customers, WMDSM has begun the planning and permitting process for Phase 14 well in advance of when existing capacity will be exhausted. The construction process for Phase 14 will be phased over a period of several years to minimize disruption to active landfill operations. To ensure that capacity is fully operational by the end of 2024, and to allow for contingencies in the construction process, WMDSM is intending to commence initial clearing and grubbing of the Project area in 2021. Land clearing is expected to be followed by initial construction of stormwater controls, berms, and access roads in 2022, and cell and liner construction in 2023 and transitioning operations to Phase 14 in 2024. Because of the time required to obtain necessary approvals and the uncertainty inherent in the permitting process, to meet the 2021 construction start-date, WMDSM is intending to file its State solid waste application on or about mid-2019.

Consistent with the above time-line, WMDSM has already taken significant steps to advance the Phase 14 Project. In 2017, WMDSM acquired the land needed to accommodate the project and submitted the required Preliminary Investigation Report to the DEP. Before it can

[29] 38 M.R.S.A. § 1310-AA(3)(A) (2013).
[30] *Id.*

submit a solid waste application to DEP, WMDSM must obtain a positive Public Benefit Determination pursuant to 38 M.R.S.A. § 1310-AA and negotiate a Host Community Agreement with the Town of Norridgewock in accordance with 38 M.R.S.A. § 1310-X(3). Thus, although the State's immediate and short term capacity needs may be currently being met, to meet the State's long-term needs, the substantial time required for permitting and landfill construction requires WMDSM to begin the solid waste permitting process now.

2.2.1 **Long-Term Need for Landfill Capacity in Maine**

Based on the data from calendar year 2016, the most recent data available, there is an ongoing need to manage approximately 1,556,711 tons of Maine-generated MSW including CDD annually.[31] Of that amount, 772,758 tons of MSW and 40,205 tons of CDD were recycled or incinerated, and 429,098 tons of MSW and 314,649 tons of CDD were landfilled.[32] While the amount of MSW and CDD generated annually will likely fluctuate based on changes in population and economic activity, as well as advances in minimizing waste generation, it is reasonable to assume a similar or potentially higher amount of MSW and CDD will be generated beyond 2024.

In 2015, Maine generated 738,913 tons of special waste.[33] The majority of special waste generated in Maine in 2015 required disposal in landfills (511,090 tons out of the total 738,913).[34,35] The largest volumes of special waste generated included ash from coal, oil and multi-fuel boilers as well as from incinerators, which in 2015 accounted for 298,222 tons or 40% of the total, and wastewater treatment plant sludge from industrial and municipal sources, which accounted for 189,282 tons or 26% of the total.[36]

Most special wastes, by virtue of the physical, chemical or biological properties or by the overall quantity of the waste, require disposal in landfills. While some fluctuation may occur, it is reasonable to assume that the current volumes of special waste generated within the State will likely continue into the future. To ensure Maine's municipalities and businesses can properly dispose of special wastes in both environmentally and economically responsible manners, it will be critical for special waste disposal capacity to exist within Maine beyond 2024.

2.2.2 **Current and Future Landfill Disposal Capacity in Maine**

The Crossroads Facility is the only commercial landfill operating in Maine. Moreover, due to a statutory ban on new commercial landfills, no new commercial landfills may be licensed absent a legislative change.[37] The last secure landfill unit permitted at the Crossroads Facility

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[31] *Maine Solid Waste Generation and Disposal Capacity Report for Calendar Year 2016*, Table 1 at 3.
[32] *Id.*
[33] *Maine Solid Waste Generation and Disposal Capacity Report for Calendar Year 2015*, Table 3 at 12. The State report for calendar year 2016 did not include special waste generated in Maine and therefore the most recent data on special waste appears to be for calendar year 2015.
[34] *Id.*
[35] For example, the MRC website includes a list of materials that the PERC facility will not accept for incineration. http://mrcmaine.org/municipalities/
[36] *Maine Solid Waste Generation and Disposal Capacity Report for Calendar Year 2015*, Table 3 at 12
[37] 38 M.R.S.A. § 1310-X(1) (2012).

was Phase 8 in 2002 which was expected to provide 4 million cubic yards of air space. As discussed in Section 1.2, through careful engineering and design, WMDSM has increased that original capacity of the Phase 8 expansion by an additional 1.8 million cubic yards and extended its site life through 2024.

The Juniper Ridge Landfill ("JRL") is owned by the State and operated by NEWSME Landfill Operations, LLC, a wholly owned indirect subsidiary of Casella Waste Systems, Inc. In 2017, the DEP approved an additional 9.35 million cubic yards of capacity, extending the facility's site life an additional 10 to 12 years or until 2030-2031[38]. The facility is licensed to accept a range of non-hazardous wastes, including by-pass MSW from in-state incinerators, and up to 81,800 tons of non-bypass in-state MSW for the one-year period ending March 31, 2019.[39]

There are also five municipal MSW landfills that serve the needs of the immediate area in which they are located, and two public landfills used for the disposal of ash and other residues from the ecomaine and MMWAC incinerators. These landfills generally provide disposal options for the host and proximate communities and businesses.[40]

Data collected by the DEP indicates that landfill capacity, taking into account all landfills, will drop significantly after 2021 and, absent expansion of the Crossroads Facility or further expansion of the Juniper Ridge Landfill,[41] landfill capacity will drop from a high of 13,884,263 cubic yards in 2021, to 8,156,495 cubic yards in 2026, and only 2,387,839 cubic yards in 2036.[42] More than 80% of the capacity available in 2026 will be from the Juniper Ridge, Presque Isle and Tri-Community landfills,[43] which, due to their geographic location north of Bangor and other license restrictions, are not feasible options for the communities served by the Crossroads Facility. The remaining projected landfill capacity consists of municipal landfills and the two waste-to-energy ash landfills, which likewise do not provide disposal options for the MSW or special waste that is currently sent to the Crossroads Facility. The following table identifies the available licensed and projected capacity of landfills in Maine through 2036:

[38] Juniper Ridge Landfill, *Solid Waste Landfill Expansion*, #S-020700-WD-BI-N and #L-19015-TG-D-N, 6 (June 1, 2017); *see Maine Solid Waste Generation and Disposal Capacity Report for Calendar Year 2016*, at 8.
[39] Juniper Ridge Landfill, *Solid Waste Landfill Expansion*; Juniper Ridge Landfill, *Solid Waste License Amendment*, #S-020700-WD-BL-A (March 31, 2018).
[40] *See* Figure 3 provided in Appendix A.
[41] The capacity estimates reflect recent approval of 9,380,000 cubic yards of capacity at the Juniper Ridge Landfill.
[42] *Maine Solid Waste Generation and Disposal Capacity Report for Calendar Year 2016*, Table 4 at 8. Note, this figure includes permitted, but not yet constructed capacity at JRL.
[43] *Id.*

TABLE 6: AVAILABLE LICENSED MSW DISPOSAL CAPACITY AND PROJECTED LANDFILL LIFE AS OF DECEMBER 31, 2016[44]

Landfills	*2016 Fill rate (yd^3)*	*2016 available (yd^3)*	*2021 available (yd^3)*	*2026 available (yd^3)*	*2036 available (yd_3)*	Years of licensed capacity remaining at current fill rate
State-owned landfills						
Carpenter Ridge – T2 R8	N/A	not constructed	not constructed	not constructed	not constructed	N/A
Juniper Ridge – Old Town	744,393	764,104	8,072,439	4,350,474	0	15.8
Municipal MSW landfills						
Hatch Hill (Augusta)	54,945	759,500	484,775	210,050	0	13.8
Bath	9,939	432,100	382,405	332,710	233,320	43.5
Brunswick	8,570	191,070	0 (closed)	0 (closed)	0 (closed)	4.0
Presque Isle	13,551	1,402,650	1,334,895	1,267,140	1,131,630	103.5
Tri-Community (Fort Fairfield)	35,561	1,566,047	1,388,242	1,210,437	854,827	44.0
W-T-E ash landfills						
ecomaine	17,764	622,422	533,602	444,782	0	35.0
Lewiston	17,284	513,742	427,322	340,902	168,062	29.7
Commercial landfill						
Waste Management Crossroads – Norridgewock	333,585	2,928,509	1,260,584	0	0	8.8
Total remaining licensed landfill capacity (yds^3)	-	9,180,144	13,884,264	8,156,495	2,387,839	N/A

2.2.3 Regional Considerations

Although it is informative to evaluate state-wide data on waste generation and disposal, cost-effective and sustainable disposal options are very much driven by regional considerations. Indeed, when evaluating whether a facility meets the capacity needs of the State the DEP is directed to:

> [C]onsider relevant local and regional needs as appropriate and the regional nature of the development and use of disposal capacity due to transportation distances and other factors.[45]

[44] *See Id.*
[45] 38 M.R.S.A. § 1310-AA(3) (2013).

In the region served by Crossroads, for many municipalities and businesses, the Facility is the only economically-feasible disposal option. Crossroads' primary disposal network extends as far north as Jackman, as far south as Bath, as far east as Vinalhaven and to the State's western border. Municipalities such as Rumford, Rangeley and Carrabassett Valley already transport wastes roughly 50 miles to reach the Crossroads Facility. Costs associated with transporting wastes this distance already consume valuable economic resources. Without the Crossroads Facility, these municipalities and the businesses located within their borders would be forced to transport wastes nearly twice the current distance to reach the nearest disposal options, such as Juniper Ridge,[46] if it were licensed to take such waste, or PERC. As the cost of transportation fuels continue to rise, these long-distance disposal routes—an increase in trucking distance of roughly 50 miles to over 100 miles—could become economically unjustifiable.

In addition to increased costs, long-distance disposal routes also have a significant impact on the environment. Doubling haul distances also doubles the amount of greenhouse gasses and air pollution emitted during transportation of wastes. These environmental impacts contradict well-established priorities of the DEP and many Maine residents.[47]

The Crossroads Landfill provides a cost-effective and environmentally sustainable disposal option for a multitude of reasons. First, the majority of wastes disposed of at the Facility are special wastes and have no higher disposal option. Further, without Crossroads, the distance many communities within the Crossroads disposal network would be required to transport wastes would be cost-prohibitive. In addition, the Crossroads Facility accepts MSW that exceeds the combined capacity of the States' waste-to-energy and processing facilities, including Fiberight.[48] Finally, the Crossroads Facility accepts residuals and bypass from operating MMWAC and the Fiberight Facility and is critical to their long-term success.

2.3 **The Importance of Competitive Markets**

The Crossroads Facility also plays a critical role in advancing competitive markets for solid waste services in Maine. The competitive benefits extend not only to users of landfill capacity, but all disposal options, as well as waste collection and transportation.

Phase 14 is important to ensuring disposal costs within the State remain competitive beyond 2024. State law requires the DEP to warn the Governor and Legislature when a decline

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[46] As noted above, JRL has limited ability to accept MSW and therefore the only other options would be one of the existing incinerators or the under-construction Fiberight facility.

[47] *See*, i.e., 38 M.R.S.A. ch. 3-A et seq.

[48] Putting aside transportation costs, Maine's three waste-to-energy plants and the Fiberight Facility do not have the capacity to meet Maine's annual MSW disposal needs. For example, the DEP has calculated that the three waste-to-energy plants and Fiberight Facility, once operational, will have a combined capacity of 595,000 tons per year, but there is a projected need in 2018 to manage 757,014 tons of MSW through incineration and landfilling. Juniper Ridge Landfill, *Solid Waste License – Partial Approval with Conditions*, #S-020700-WD-BL-A, 20, (March 31, 2018). Because the Fiberight Facility will serve the MRC communities previously served by the PERC facility, and because of changes in the market for energy output, it is not clear what capacity the PERC facility will provide once the Fiberight Facility becomes fully operational. DEP assumed in its calculation that PERC would achieve a stable operating annual capacity of 210,000 tons. *Id.* The waste-to-energy plants and Fiberight Facility also cannot handle special waste and CDD, which represents 75% of the material handled at Crossroads.

in available landfill capacity is likely to generate supracompetitive prices.[49] Supracompetitive prices are generated when disposal capacity is overconcentrated within one or a few dominant facilities and the threat of new facilities entering the market fails to exist.[50] Although there are a number of landfills in Maine, many of them serve designated groups of municipalities or a waste-to-energy facility. Only two landfills currently provide disposal options for central, western and southern Maine: one is operated by Casella and the other is the Crossroads Facility.

Without Phase 14, by 2026, more than 50% of landfill capacity within the State will be concentrated at one facility, the Juniper Ridge Landfill, as depicted in Table 6.[51] Moreover, of the five municipal MSW landfills, an additional 30% of landfill capacity at that time will be concentrated in the Tri-Community and Presque Isle landfills, neither of which provide significant competitive benefits to western, central or southern Maine. The remaining three MSW landfills serve only the needs of the immediate area in which they are located and have limited competitive benefits and the two waste-to-energy landfills accept incinerator ash and residuals from the ecomaine and MMWAC incinerators. The Phase 14 Project is therefore critical to ensuring competitive disposal options remain in western, central and southern Maine, particularly for disposal of special waste, and will avoid a scenario where there is essentially one de facto landfill available to serve the needs of communities and businesses for nearly the entire State.

Although the majority of waste accepted at the Facility is waste that cannot be incinerated, see Section 2.1, the Facility also provides an important disposal option for MSW from communities in central and western Maine. Without this option, such communities would incur substantial costs to transport waste to an incinerator, assuming one were available and had the capacity to accept such waste,[52] or even further to another landfill in Maine or to an out-of-state option. By providing a cost-effective alternative, the Project will help to ensure available disposal options for a great number of Maine cities and towns and that the overall cost for disposal at incinerators and landfills remain competitive.

Finally, the Crossroads Landfill also supports Waste Management's other operations in Maine, including its transportation networks. Ensuring there are multiple providers in these ancillary but critical areas provides additional and important competitive benefits.[53]

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[49] 38 M.R.S.A. § 2124-A (2013).

[50] *See Maine Solid Waste Generation and Disposal Capacity Report for Calendar Year 2016*, at 14.

[51] *Maine Solid Waste Generation and Disposal Capacity Report for Calendar Year 2016*, Table 4 at 8.

[52] As noted above, the existing and planned incinerators, assuming they are all operating in 2024, do not have the capacity to handle all the MSW generated in the State.

[53] The importance of competition in these other areas is heightened by the fact that the operator of JRL, Casella Waste Systems, Inc., is also a vertically integrated company with a substantial footprint in the collection and transportation sectors in Maine.

3.0 THE PROJECT'S PROMOTION OF THE STATE'S SOLID WASTE MANAGEMENT HIERARCHY

The Crossroads Facility currently supports numerous initiatives that promote the State's Waste Management Hierarchy. WMDSM's Phase 14 Project will ensure that the current initiatives continue and that the Facility has the opportunity to promote new initiatives in furtherance of the State's Waste Hierarchy.

3.1 State Solid Waste Management Hierarchy

The State of Maine has developed and adopted an integrated approach to solid waste management. Central to this approach is the State's Solid Waste Management Hierarchy.[54] The Waste Hierarchy sets forth a tiered list of priorities for the processing of solid waste as stated below:

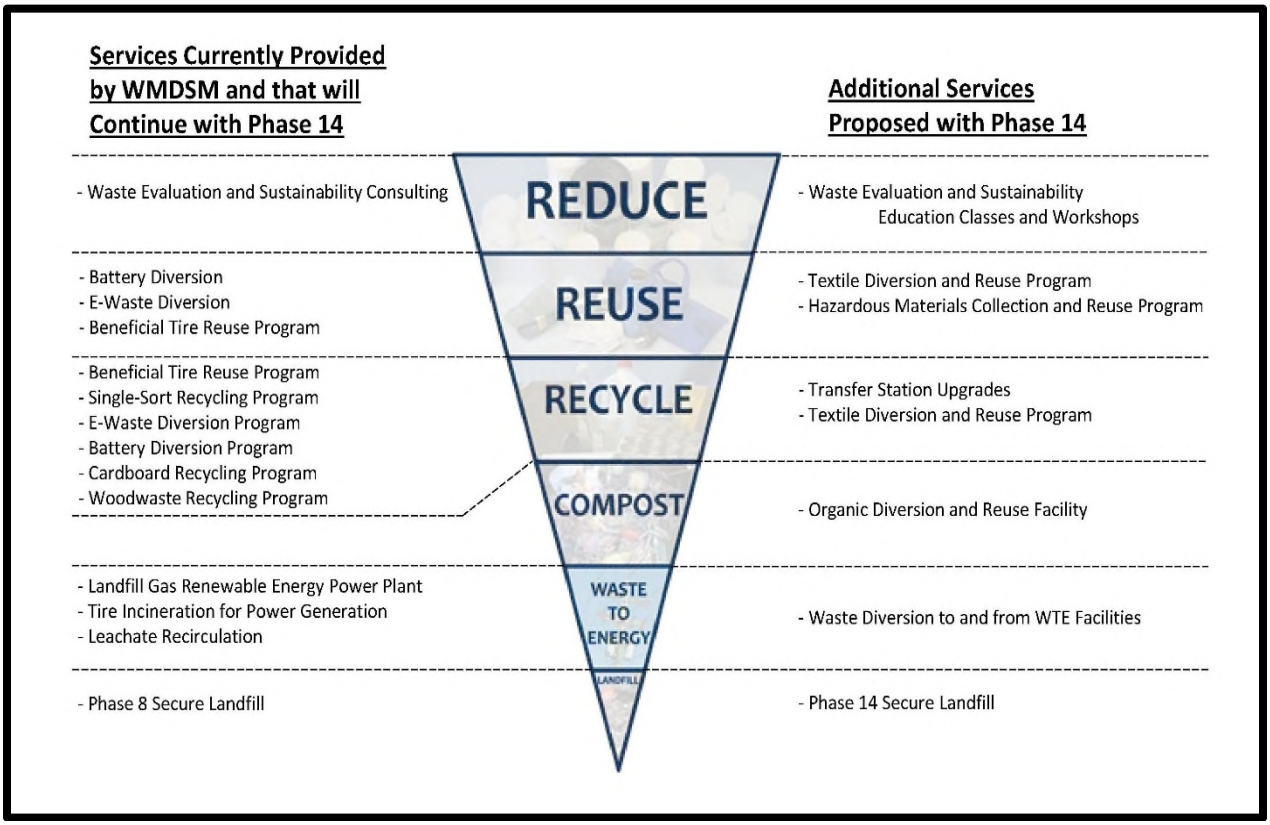
A. Reduction of waste generated at the source, including both amount and toxicity of the waste;
B. Reuse of waste;
C. Recycling of waste;
D. Composting of biodegradable waste;
E. Waste processing that reduces the volume of waste needing land disposal, including incineration; and
F. Land disposal of waste.[55]

The State uses the priorities within the Waste Hierarchy as guiding principles when making decisions related to solid waste management.

The Phase 14 Project proposed for the Crossroads Facility is fully consistent with and supportive of the State's Waste Hierarchy. The Crossroads Facility currently operates multiple programs that effectively promote waste reduction, beneficial reuse and recycling. The Phase 14 Project will provide an opportunity for these programs to continue into the future and in many cases, grow in size and effectiveness. Phase 14 will also provide new opportunities for the Crossroads Facility to promote the Maine State Waste Hierarchy. Figure 6 below illustrates current and Phase 14 initiatives that promote the State's Waste Hierarchy. Additional details regarding each of these programs are provided below. The following sections demonstrate that the Phase 14 Project fully promotes the State's Waste Hierarchy.

[54] *See* 38 M.R.S.A. § 2101(1)(A)-(F) (2008).
[55] 38 M.R.S.A. § 2101(1)(A)-(F) (2008).

FIGURE 6. CONSISTENCY OF PHASE 14 WITH MAINE STATE SOLID-WASTE HIERARCHY



3.2 The Project's Promotion of the Waste Hierarchy

3.2.1 Waste Reduction Programs

3.2.1(a) Organics Diversion and Reuse Program

The 2014 Maine Materials Management Plan estimates that compostable material comprise 38.41% of the State's disposed MSW.[56] While the plan concludes that diverting organics from the States' MSW stream presents the single largest opportunity to reduce the overall volume of waste generated in Maine, the State also experienced a decrease in the amount of organic material diverted from disposal in 2016 as compared to 2015.[57,58]

WMDSM recognizes and appreciates the opportunity that the diversion of organic and other biodegradable materials presents for waste reduction within Maine. WMDSM also appreciates that it is uniquely situated to assist the State with organics diversion. WMDSM's

[56] *Maine Materials Mgmt. Plan: 2014 State Waste Mgmt. and Recycling Plan Update and 2012 Waste Generation and Disposal Capacity Report*, at 6.
[57] *Id.*
[58] *Maine Solid Waste Generation and Disposal Capacity Report for Calendar Year 2016*, at 1.

efforts can help slow the trend of decreased organics diversion and assist the State with achieving its waste reduction goal by diverting organics from the MSW waste stream.

To further the State's MSW reduction goal and to promote its Waste Hierarchy, WMDSM plans to launch an Organics Diversion and Reuse Program ("Organics Diversion Program") at the Crossroads Facility. The Organics Diversion Program will assist in diverting organic material from the MSW stream and target large-volume commercial entities (i.e., restaurants, schools, etc.). The Organics Diversion Program will be developed in conjunction with the development of Phase 14. While the Organics Diversion Program promotes the Waste Hierarchy's first and second tiers (waste reduction and reuse respectively), the details of WMDSM's Organics Diversion Program are discussed below in Section 3.2.3 which addresses promotion of the Waste Hierarchy's fourth tier: Composting of Biodegradable Waste.[59]

3.2.1(b) Textile Diversion and Reuse Program

The 2011 Maine Residential Waste Characterization Study identified textiles as making up 4.26% of Maine's annual residential waste stream.[60] Nationally, the percentage of textiles within the national waste stream has nearly doubled in the past twenty years, now accounting for 16.2 million tons annually.[61] It is likely that this trend will continue given the rise in popularity of inexpensive and low quality garments known as "fast fashion."[62]

To address this growing need, WMDSM plans to develop and implement a Textile Diversion and Reuse Program ("Textile Diversion Program") as part of the Phase 14 Project. The program will reduce the amount of textiles sent to the landfill, thereby conserving airspace and advancing the State's Waste Hierarchy.

WMDSM's Textile Diversion Program will provide the communities in proximity to the Crossroads Facility with a central textile diversion location. The communities participating in the program will include those listed in Table7.

TABLE 7: TEXTILE DIVERSION AND REUSE COMMUNITIES

Anson	Norridgewock
Embden	Rome
Fairfield	Smithfield
Madison	Vienna
New Sharon	

[59] *See* 38 M.R.S.A. § 2101(1)(D) (2008).
[60] George K. Criner, Travis L. Blackmer, *2011 Maine Residential Waste Characterization Study*, The University of Maine, 10-11, (2011), https://umaine.edu/wp-content/uploads/sites/2/2017/04/2011-Maine-Residential-Waste-Characterization-Study.pdf http.
[61] Arlene Karidis, *Early Efforts to Tackle Mounting Textile Waste*, Waste 360, 2, (May 30, 2018), http://www.waste360.com/waste-reduction/early-efforts-tackle-mounting-textile-waste-part-one
[62] *Id.*

Each community participating in the program will be contacted through targeted outreach and education at the municipal level. Textiles collected through the program will be donated to local charitable organizations, such as Goodwill and the Salvation Army. Textiles that cannot be reused will be transported to a recycling facility. WMDSM will receive data quantifying the volume of textiles collected. This data will assist WMDSM in evaluating the effectiveness of its Textile Diversion Program and help generate an aggregate volume of textiles diverted from the Crossroads Facility on an annual basis. Subsequent phases of the Textile Diversion Program may be implemented by WMDSM, most likely in partnership with the Maine Resource Recovery Association ("MRRA"), based on the success of the initial phase.

3.2.1(c) Household Hazardous Materials Collection and Reuse Program

The State's 2009 Waste Management and Recycling Plan identifies the removal of toxics from the MSW waste stream as a key priority.[63] To further this priority and to promote the State's Waste Hierarchy, WMDSM proposes to include a Household Hazardous Materials Collection and Reuse Program as part of the Phase 14 Project.

Starting in 2019, a one-day Household Hazardous Waste collection event ("HHWC Day") will be organized in Norridgewock on an annual basis. Typical household hazardous materials include: unwanted and expired cleaners, solvents, paints, pool/hot tub chemicals, cements/ adhesives, and pesticides and herbicides. Paints, stains, varnishes, etc. will be collected separately from the other hazardous materials, and recycled by PaintCare Maine.

This event will be offered to serve the nine member communities. To help ensure the success of the events, WMDSM will engage a licensed hazardous materials management company, with experience in planning and implementing HHWC Days. WMDSM will ensure the company selected has strong environmental credentials and makes reuse of waste materials a priority where possible. WMDSM will also collect and tabulate data derived from each event. This data will assist WMDSM in evaluating the effectiveness of its Hazardous Materials Collection and Reuse events.

3.2.1(d) Battery Diversion Program

Single-use batteries account for the third largest percentage of Household Hazardous waste within the State of Maine.[64] While these batteries make up a small percentage of the State's overall waste stream, batteries' potential to contribute hazardous and toxic substances to landfills warrants the development of an affirmative diversion program.

WMDSM has developed a program to encourage the diversion of rechargeable, button, and single-use mercury batteries from disposal within the Crossroads Landfill. The communities participating in the Battery Diversion Program include those listed in Table 8.

[63] Maine State Planning Office, *Waste or Resource? Rethinking Solid Waste Policy*, 36, (January 2009), https://www1.maine.gov/decd/meocd/landfills/docs/2009%20State%20SWM%20Plan.pdf.
[64] *2011 Maine Residential Waste Characterization Study*, at 14.

TABLE 8: BATTERY DIVERSION COMMUNITIES

Anson	Norridgewock
Embden	Rome
Fairfield	Smithfield
Madison	Vienna
New Sharon	

WMDSM's Battery Diversion Program provides residents of the communities listed in Table 8 with a free recycling program for rechargeable, button and single-use batteries. Residents are encouraged to collect and leave used batteries in a central receptacle located at the Airport Road Transfer Station operated by WMDSM. Data from the Battery Diversion Program is collected and quantified. This information assists WMDSM in evaluating the effectiveness of the program and calculating the volume of hazardous wastes diverted from the Crossroads Facility over time.

In addition to the Battery Diversion Program, WMDSM's parent company, Waste Management, currently provides customers with a service dedicated to proper collection and recycling of used dry-cell batteries known as BatteryTracker®. BatteryTracker® allows batteries to be collected and shipped from any location to a certified recycling facility. BatteryTracker® encourages the reuse of valuable natural resources such zinc and manganese while also diverting batteries from the Crossroads Facility and others that may contain potentially hazardous metals such as cadmium, nickel and lead. Both the Crossroads Battery Diversion Program and BatteryTracker® serve as examples of WMDSM's dedication to developing programs that promote the principals of Sustainable Materials Management as well as the State's Waste Hierarchy.

3.2.1(e) Electronic Waste Diversion Program

In 2014, 3.36 million tons of electronic waste or "E-Waste" was generated within the United States.[65] E-Waste includes cathode ray tubes, computer equipment, fluorescent light bulbs, smoke detectors, and other mixed electronics devices such as cell phones. Given the rapid evolution of electronic devices, the EPA estimates that "E-Waste" is currently and will continue to be the fastest growing category of solid waste nationwide.[66] Electronic devices also contain precious and rare earth metals. Diversion of electronic devices provides an important opportunity to reuse these valuable metals that would otherwise be lost when devices are disposed of in a landfill or incinerated.

[65] U.S. Envtl. Prot. Agency, *Advancing Sustainable Materials Management: 2014 Tables and Figures*, 16 (Dec. 2016), https://19january2017snapshot.epa.gov/sites/production/files/2016. https://www.epa.gov/sites/production/files/2016-11/documents/2014_smm_tablesfigures_508.pdf

[66] U.S. Envtl. Prot. Agency, *Improved Information Could Better Enable EPA to Manage Electronic Waste and Enforce Regulations*, 1 (June 2013), https://www.epa.gov/sites/production/files/2015-09/documents/20130621-13-p-0298.pdf.

To address these growing reuse and disposal concerns, WMDSM has developed a comprehensive electronics diversion program for the municipalities in proximity to the Crossroads Facility listed in Table 9.

TABLE 9: ELECTRONIC WASTE COMMUNITIES

Anson	Norridgewock
Embden	Rome
Fairfield	Smithfield
Madison	Vienna
New Sharon	

WMDSM's Electronic Waste Diversion Program allows residents to deliver an extensive list of electronic items to the Crossroads Facility for recycling. By providing this no-cost option, WMDSM has collected more than 168 tons of E-Waste since the program's inception five years ago. This has allowed recycling and reuse of the precious and rare earth metals and diversion of the materials from landfilling at Crossroads or elsewhere.

WMDSM partners with local recyclers, such as Electronics End in Brewer, Maine, to ensure that products collected are reused where possible and recycled in an environmentally sustainable manner when necessary. To evaluate the effectiveness of its Electronic Waste Diversion Program, WMDSM has implemented a data collection system to quantify and capture the volume of E-Waste diverted from the Crossroads Landfill through the program. This data assists WMDSM in evaluating and monitoring volumes of Electronic Waste diverted from the Crossroads Landfill over time.

WMDSM's parent company, Waste Management, also provides numerous services dedicated to the proper reuse and diversion of E-Waste. Some of the more prominent programs are listed below.

- eScrapTracker® allows electronic waste to be collected and shipped from any location to a certified recycling facility. eScrapTracker® only utilizes recyclers that comply with one or both of the following certification standards: e-Stewards®, R2 (Responsible Recycling) and/or RIOS (Recycling Industry Operating Standards).

- LampTracker® provides secure storage, handling, transportation and recycling of fluorescent lamp blubs. In addition to providing a certified recycling outlet, LampTracker® minimizes the single greatest risk of mercury exposure within workplaces.

- BallastTracker® provides a similar service for collection and shipment of non-PCB ballasts and capacitors.

WMDSM's Electronic Waste Diversion Program and the additional programs provided by Waste Management support the State's toxic waste reduction initiatives.

3.2.1(f) Waste Evaluation and Sustainability Consulting

Waste evaluations have proven to be an effective tool for reducing the volume of waste generated by a host of entities, including businesses, institutions and local governments. Waste evaluations analyze inputs, raw materials, individual waste streams and provide recommendations for reducing the amount of waste generated and increasing the amount of materials reused or recycled.

WMDSM, along with its parent company Waste Management, actively performs waste evaluations for its customers within the Crossroads disposal network. Evaluations can often lead to the development and implementation of waste reduction and recycling programs. Successful waste evaluations have been performed for a variety of customers, including Bath Iron Works, Fisher Engineering, Sappi and Colby College.

Another sustainability tool provided by Waste Management to improve waste reduction and diversion rates for municipalities is the implementation of Pay-As-You-Throw programs. Pay-As-You-Throw programs have been shown to reduce the amount of waste generated and increase the amount of material recycled by communities. Support for such programs includes consultation with municipal planners and staff considering the implementation of Pay-As-You-Throw programs as well as preparation and management support of such programs within local communities.

Waste evaluations and sustainability programs provide an important service that diverts material from the Crossroads Facility. Both services help identify opportunities for the implementation of long-term waste management strategies that promote the States' Waste Hierarchy.

3.2.2 **Beneficial Reuse and Recycling Programs**

3.2.2(a) Beneficial Tire Reuse Program

WMDSM has partnered with BDS Waste Disposal, which operates the only successful tire beneficial reuse facility within the state of Maine. WMDSM has invested both significant time and resources to this beneficial reuse program. Used tires from throughout the state are transported to the Crossroads Facility for beneficial reuse. Many of these tires would otherwise be disposed of in statewide landfills, stockpiled or disposed of illegally. In 2017 alone, approximately 33,611.41 tons of whole tires and 28,176.66 tons of tire shreds were managed through the Beneficial Tire Reuse Program. In addition, 9.46 tons of aluminum rims, 327.03 tons of steel rims, 49.2 tons of scrap steel and 187 tons of Off-the-Road tire segments were shipped from the Facility for reuse or recycling.

The primary use of the scrap tires processed by BDS at Crossroads is for generation of power at Maine paper mills. In 2017 alone, the Beneficial Tire Reuse Program contributed 52,947.42 tons of tire fuel chips to two Maine paper mills.

Reused tires have also been utilized by WMDSM extensively for on-site construction projects. For example, nearly 7 million used tires have been shredded/chipped for use as components of the landfill liner (leachate collection) system and the gas collection/control system.

Since the Beneficial Tire Reuse Program's inception, WMDSM has gathered data regarding the volume of tires beneficially reused and diverted from disposal. WMDSM will continue to assemble data concerning this program and utilize this information to evaluate its effectiveness over time.

Recently, WMDSM identified a material being disposed of within its landfill that could be diverted by the Beneficial Tire Reuse Program. Blasting mats, due to their rugged nature, were disposed of in the landfill at the Crossroads Facility. WMDSM recognized that the steel cables weaving the rubber panels together could be clipped, allowing the mats to be pulled apart, leaving the rubber panels to be beneficially reused and the cables to be recycled. In 2016 and 2017, WMDSM's initiative diverted 1934.43 tons of material from the landfill at the Crossroads Facility. This initiative exemplifies WMDSM's dedication to continually identifying opportunities for waste diversion and ensuring ongoing promotion of the State's Waste Hierarchy.

3.2.2(b) Single-Sort Recycling Program

WMDSM's parent company, Waste Management, is the North America's largest residential recycler. On an annual basis, it manages nearly 15,000,000 tons of recyclable material and operates 120 recycling facilities throughout the nation.

At the Crossroads Facility, WMDSM is actively committed to assisting the State of Maine achieve its goal of increased recycling.[67] To achieve this goal, WMDSM continues to be committed to the implementation and expansion of recycling programs for municipalities and business within the Crossroads disposal network that maximize the amount of material recycled and reused, while minimizing contamination and disposal. Table 10 below provides a list of the communities and commercial entities where WMDSM currently provides recycling services.

[67] 38 M.R.S.A. § 2132.1 (2016)

TABLE 10: COMMUNITIES/INSTITUTIONS AND COMMERCIAL ENTITIES SERVED BY WMDSM RECYCLING SERVICES[68]

Communities	Businesses and Institutions
Anson	Colby College
Carrabassett Valley	Sappi
Embden	Sugarloaf Mountain Corp.
Eustis	Unity College
Fairfield	
Jackman	
Kingfield	
Madison	
Mercer	
Mohegan	
Mount Vernon	
New Sharon	
New Vineyard	
Norridgewock	
Phillips	
Rangeley	
Rangeley Plantation	
Rome	
Smithfield	
Somerset County Commissioners	
Vienna	
Waterville	
Winslow	

To increase recycling rates, WMDSM introduced its Single-Sort Recycling program in 2010. Participants in the program could collect glass, metal, cans, plastics, office paper, newspaper, boxboard and corrugated cardboard in one convenient bin. To ensure the program's success, WMDSM developed and implemented a targeted outreach and education campaign throughout its recycling locations. WMDSM works directly with municipalities, schools and businesses to ensure Single-Sort participants are educated about how to identify the appropriate materials for recycling and how those materials should be prepared for proper collection.

To date, WMDSM Single-Sort Program has been highly successful. Following introduction of the program, WMDSM saw an increase in the volume of recyclable materials collected.[69] Once collected, most materials are transported to the Crossroads Material Recovery Facility where they are loaded into bulk containers for shipment south to recycling brokers or purchasers. As provided in Table 11, in the past three years, WMDSM's Single-Sort Recycling Program has diverted, 17,516.07 tons of recycled material from disposal at Crossroads.[70]

[68] Bolding indicates the communities in close proximity to the Crossroads Facility that utilize the transfer station on Airport Road in Norridgewock.
[69] WMDSM has sought data on the recycling rates of the communities it serves, but there is only limited and incomplete data currently available.
[70] This figure includes Single-Sort recycling materials, which include corrugated cardboard ("OCC").

TABLE 11: SINGLE-STREAM MATERIALS DIVERTED FROM CROSSROADS LANDFILL: 2015-2017

Tons	Single-Stream Program	Corrugated Cardboard	Annual Total
2017	2,369.65	4,047.24	6,416.89
2016	2,407.70	3,829.60	6,237.30
2015	2,132.53	2,729.35	4,861.88
			17,516.07

This figure is even more impressive when considering that the materials are collected from a region that is distant from processing and recycling facilities. Without WMDSM's recycling services, these materials would be geographically stranded; transportation to other facilities would be cost-prohibitive. The Department has recognized that capturing recyclables on a regional level at a central processing facility increases overall recycling.[71]

Operation of such a large collection and transportation network for recyclable materials comes at considerable cost to WMDSM. WMDSM, has however, absorbed many of these costs out of a commitment to preserving capacity at the Crossroads Facility and managing the greatest amount of waste as high up on the State's Waste Hierarchy as possible.

As discussed above, the Crossroads Facility operates a transfer station located on Airport Road. This transfer station manages materials for the nine municipalities in close proximity to the Facility.[72] To capitalize on many of the Phase 14 initiatives, WMDSM plans to significantly enhance the capabilities of this facility.

The primary focus of the facility's enhancement will be to maximize waste diversion efforts. First and foremost, the facility will emphasize recycling and do so in a manner that strives to minimize recycling contamination. Clear and strategically-placed education materials will remind facility users of what can and cannot be recycled. Especially problematic items, such as plastic bags, will have dedicated disposal containers adjacent to the primary recycling containers along with educational materials instructing users that plastic bags, whether being used to collect and transport recyclable materials or on their own, cannot be recycled with single-stream materials.

The enhanced facility will also provide dedicated collection bins for organic materials placed in a location to maximize use. Collected organic materials will be fed into the Phase 14 Organics Diversion Program also located at the Crossroads Facility. Dedicated collection locations will also be established for household hazardous wastes, textiles, electronic wastes, single-use batteries, waste oil, unwanted or expired medicines and clean woodwastes. Materials currently managed at the existing transfer station on Airport Road, such as scrap metals, used tires, demolition materials and yard wastes will continue to be collected at the enhanced facility. As part of the facility's upgrade, a new traffic circulation pattern will be established. Reuse

[71] Municipal Review Committee, Inc. and Fiberight, *Solid Waste License*, Figure 20.D at 28.
[72] Anson, Embden, Fairfield, Madison, New Sharon, Norridgewock, Rome, Smithfield and Vienna.

locations, recycling containers and composting bins will all be positioned before trash containers to further emphasize and promote the disposal priorities identified within of the State's Waste Hierarchy.

To maximize the enhancements made at the Airport Road transfer station, WMDSM will develop "best practice" materials for transfer stations seeking to maximize recycling and reuse while minimizing contamination. These resources will be made available to municipalities within the Crossroads disposal network. If further interest exists, WMDSM could convene a dialogue of key stakeholders, including experts from Waste Management and ecomaine, to discuss and develop strategies for municipalities within its network to increase recycling and waste diversion rates while minimizing contamination in furtherance of the State's recycling goals.[73]

In addition to its Single-Sort Recycling Program, WMDSM undertakes specific measures at the Crossroads Facility to divert materials that can be recycled from entering the landfill. Crossroads staff monitor wastes entering the landfill for high volumes of recyclable materials. Recently, Crossroads staff became aware of large volumes of glass being sent to the landfill by one of the State's largest glass distributors. WMDSM staff worked with the customer to develop a process at its facility for diverting the glass from its waste and located a recycler that could accept the composition of glass which had previously been difficult to recycle. WMDSM estimates that over the past 18 months, nearly 6,000 tons of glass has been diverted from the landfill and recycled.

Diversion efforts at the Crossroads Facility extend beyond the Single-Sort Recycling Program and active monitoring of wastes for recyclable materials. The Crossroads Facility also promotes and encourages the diversion of a variety of additional materials from the landfill including, metals, concrete, brush and sawdust. WMDSM plans to continue both its Single-Sort Recycling Program, its active monitoring of waste for recyclable materials and diversion initiates with implementation of the Phase 14 Project.

3.2.2(c) Cardboard Recycling Program

In conjunction with its Single-Sort Recycling Program, the Crossroads Facility also operates a Cardboard Recycling Program. Cardboard is either brought to the Facility sorted or staff at Crossroads manually remove large volumes of cardboard from the Single-Sort Recycling Program. Removing cardboard from Single-Sort recycling makes sorting at facilities such as ecomaine less time-consuming and allows recyclable materials to be shipped more efficiently. Separated cardboard is then bailed at the Crossroads Facility and shipped to end users or recyclers. As illustrated by Table 11 above, over the last three years, 10,606.19 tons of cardboard has been diverted from the Crossroads Landfill. The Crossroads Cardboard Recycling program will continue with the Phase 14 Project.

[73] *See* 38 M.R.S.A. § 2132(1) (2016)

3.2.2(d) Woodwaste Recycling Program

The Crossroads Facility also operates a Woodwaste Recycling Program. This program diverts or reuses clean woodwaste, preserving valuable air space within the disposal unit.[74] Clean woodwaste entering the facility is stored and ultimately ground into chips that can be utilized on-site for daily cover or shipped off-site for a variety of end uses. Over the life of Phase 8, 13,717 cubic yards of clean woodwaste have been reused at the Crossroads Facility as cover. This program will continue to operate during the proposed Phase 14 Project.

3.2.3 **Organics Diversion and Reuse Program**

As introduced in Section 3.2.1(a), WMDSM proposes to launch an Organics Diversion Program at the Crossroads Facility as part of Phase 14. WMDSM's Organics Diversion Program will promote the Waste Hierarchy and assists the State in achieving its goal of recycling or composting 50% of the State's solid waste on an annual basis.[75] WMDSM's Organics Diversion Program also directly promotes the State's recently enacted Food Recovery Hierarchy.[76]

WMDSM will develop a composting operation to convert organic and other biodegradable materials into a reusable compost product. WMDSM's compost facility operators will attend the Maine Compost School. It is WMDSM's intention to begin the compost operation upon the startup of Phase 14.

Communities within proximity to Crossroads and commercial entities will be educated by WMDSM in cooperation with the DEP prior to being provided the opportunity to participate in the Organics Diversion Program. Participants will be encouraged to bring collected food scraps and other biodegradable waste (i.e., unbleached paper plates, napkins and food-soiled paper products, etc.) in 5 to 30 gallon containers (provided by WMDSM at no charge) to the Airport Road Transfer Station. There will be no disposal fee for organic materials. WMDSM will transport the material to the compost operation location at the Crossroads Facility where the material will be handled, composted and stored in accordance with DEP regulations for compost facilities.

Targeted outreach to select large volume commercial and educational institutions will also take place. Participants of the program will be entitled to receive finished compost on designated days throughout the year.

Education will also play a critical role in the Organics Diversion Program. WMDSM plans to work closely with local municipalities and large volume stakeholders to promote the benefits of composting. Tours of the composting operation can be provided to local students, citizens, DEP and municipal officials. Tours will focus both on the biological processes at work

[74] Creosote and pressure-treated wood is not accepted at the Woodwaste Recycling Facility and must be managed and disposed of in the secure landfill.
[75] 38 M.R.S.A. § 2132(1) (2016).
[76] *See* 38 M.R.S.A. § 2101-B(1) (2016).

within the composting facility but also on the concept of compositing as a Sustainable Materials Management practice.

As with all WMDSM programs, the volume of organic and other biodegradable materials contributed to the program will be collected and quantified. This data will assist WMDSM in evaluating the effectiveness of its Organics Diversion Program. The data will also provide WMDSM with the opportunity to monitor the volumes of organics being diverted from disposal.

3.2.4 **Gas-To-Energy Infrastructure**

In its 2018 report to the state legislature, the Maine DEP discussed the tiers within the States' Waste Hierarchy.[77] The report highlights the environmental benefit associated with landfills utilizing gas recovery systems as a source of fuel.[78] This view is consistent with the U.S. Environmental Protection Agency's updated Solid Waste Management Hierarchy which includes landfills equipped with gas recovery systems in its "Energy Recovery" tier, its third of four tiers, along with waste-to-energy facilities.[79]

The Crossroads Landfill Gas Renewable Energy Power Plant ("Renewable Energy Plant" or "Plant") has been operational since March 9, 2009. The Renewable Energy Plant collects gas that is produced through a natural process of bacterial decomposition of the waste disposed within the landfill. The decomposition process creates an anaerobic environment producing methane gas that is captured and burned by the engines at the Plant and converted into electricity.

On an annual basis, the Renewable Energy Plant at Crossroads collects and combusts on average 470,000 million standard cubic feet of landfill gas, which creates approximately 21,684,958 kilowatt hours per year. This is the heat equivalent to the Plant generating 13,300 barrels of oil annually. The Renewable Energy Plant has operated at a runtime greater than 99% since conception. WMDSM will continue to operate and potentially expand the Renewable Energy Plant to recover landfill gas and create electricity from Phase 14.

3.2.5 **Landfilling**

As shown in Section 2.0, landfills are a necessary component of the State's Waste Hierarchy and Phase 14 will fill a need for continued landfill capacity beyond 2024.

3.3 **National Recognition**

WMDSM is a subsidiary of Waste Management, Inc. This relationship provides WMDSM with a multitude of resources that directly benefit the local Crossroads Facility, its

[77] *Maine Solid Waste Generation and Disposal Capacity Report for Calendar Year 2016*, at 2.
[78] *Id.*
[79] *See* U.S. Envtl. Prot. Agency, *Sustainable Materials Management: Non-Hazardous Materials and Waste Management Hierarchy*, https://www.epa.gov/smm/sustainable-materials-management-non-hazardous-materials-and-waste-management-hierarchy.

disposal network and the State of Maine. Such benefits include technical expertise from some of the world's foremost landfill design experts.

Waste Management's operational excellence and its commitment to environmental stewardship has been consistently recognized by a multitude of forums. Some of Waste Management's recent achievements include:

- Overarching
  - World's Most Ethical Companies, 9 consecutive years as recognized by the Ethisphere Institute
  - Dow Jones Sustainability Index, 13 of the past 14 years as recognized by the Ethisphere Institute
  - S&P 500 Climate Disclosure Leadership Index, GHG Reporting since 2004 as recognized by the CDP (formerly Carbon Disclosure Project)

- Sustainability
  - Change the World, Fortune Magazine 2015
  - FTSE4Good Index Series 2011-2016
  - Euronext Vigeo World 120 Index 2012-2015
  - 100 Best Corporate Citizens, Corporate Social Responsibility Magazine 2015

- Environmental
  - 50 Hottest Companies in Bioenergy, Biofuels Digest 2014-2015
  - Champions of the Environment Award, New York City College of Technology 2015
  - Sports for the Environment Winner, Beyond Sport 2024

- Community
  - Community Partner of the Year, Wildlife Habitat Council 2015
  - Corporate Lands for Learning of the Year, Wildlife Habitat Council 2015
  - Best Community Partner, Neighborhood Alliance of Central Oklahoma 2015
  - Gold Award for Educational Program Excellence, SWANA 2015

- Business Recognition
  - Supplier of the Year Services Award, BASF 2015
  - Recycler of the Year Business Category, MassRecycle 2015
  - Supplier Leadership Award, Sustainable Purchasing Leadership Council 2016

- Workplace Recognition
  - "Best for Vets" Employer, Military Times 2010-2016
  - Corporate Equality Index Score 90+, human Right Campaign 2011-2016
  - Top Military Friendly® Employer, G.I. Jobs 2010-2015

- 50 Best Companies to Sell For, Selling Power Magazine 2015-2016
- Employer of Excellence Award, Texas Workforce Commission 2015
- Top 50 Employers, Equal Opportunity Publications 2015

3.4 **Promotion of Hierarchy – Conclusion**

WMDSM has a strong track record of working closely with DEP, local community members, and stakeholders across the State of Maine to promote and provide services that are aligned with and support the State Waste Hierarchy. These programs and services will continue for many years into the future with implementation of the Phase 14 Project.

4.0 THE PHASE 14 PROJECT IS CONSISTENT WITH THE STATE WASTE MANAGEMENT AND RECYCLING PLAN

In January of 2014, the DEP published its most current version of the Maine Materials Management Plan (the "Plan").[80] The Plan provides information, guidance and direction for implementing integrated approaches to solid waste management within the State. The centerpiece of the Plan is the State's Waste Management Hierarchy. The Hierarchy ranks management strategies in a specific order of priority. Two additional components central to the Plan are the States' goal of recycling or composting 50% of in-state MSW tonnage and reducing the generation of MSW by 5% every two years. The Plan also includes four initiatives selected by the DEP as having the greatest impact on improving waste reduction and disposal within the State.

As demonstrated in Sections 1.0, 2.0 and 3.0 above, the proposed Phase 14 Project is consistent with each element of the State's Plan. The Crossroads Facility subjects the vast majority of wastes to reduction, recycling or processing or disposes of wastes that have no higher management options. CDD is processed for reuse and recycling, multiple initiatives minimizing MSW volume through materials diversion, and Phase 14 ensures that a critical component of the State's infrastructure for wastes with no alternative disposal option remains viable into the future. Thus, the Phase 14 Project directly assists the State with achieving its recycling/composting goal and its goal of reducing MSW, while affirmatively promoting the State's Waste Hierarchy.

The Crossroads Facility also specifically furthers each of the four initiatives identified within the Plan. The Phase 14 Organics Diversion Program directly furthers the strategies and actions outlined in Section V.A. The Crossroads' Battery Diversion Program advances a collection strategy specifically identified as a priority in Section V.B. The Phase 14 Hazardous Waste Collection Program also supports an area of need within the State's collection and recycling network as identified in Section V.C. Finally, all initiatives proposed within Phase 14 will collect and analyze data to develop reliable diversion figures and evaluate program effectiveness, satisfying the largest component of Section V.D.

In January of 2018, the Department identified in its annual report to the Maine Legislature, that global recycling markets were facing grave uncertainty and volatility.[81] Six months later, the global recycling market has entered into or is very near a crisis point.[82] China's actions to limit and ban certain types of plastic and paper over the course of two years, while also imposing limits on contamination, has had a major impact on recycling markets across the United States. With Chinese markets closing and other South Asian markets quickly following suit,[83] it is unclear where domestic materials can be sent to be recycled.

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[80] The Plan's full title is, "Maine Materials Management Plan: 2014 State Waste Management and Recycling Plan Update and 2012 Waste Generation and Disposal Capacity Report."
[81] *Maine Solid Waste Generation and Disposal Capacity Report for Calendar Year 2016*, at 5.
[82] Livia Albeck-Ripka, *Your Recycling Gets Recycled, Right? Maybe, or Maybe Not*, The N.Y. Times, (May 28, 2018), https://www.nytimes.com/2018/05/29/climate/recycling-landfills-plastic-papers.html.
[83] Albeck-Ripka, *Your Recycling Gets Recycled, Right? Maybe, or Maybe Not*, at 4.

As DEP predicted, Maine recycling markets have not been insulated from this crisis.[84] Recently, at one of the State's largest recyclers, prices for some loads of materials have tripled. Municipalities and businesses faced with such a sharp increase in recycling costs may be forced to make difficult decisions about the viability of their recycling programs. These tough decisions may require a temporary greater reliance on disposal locations in Maine until alternative markets can be secured, putting increased pressure on the State's overall projected disposal capacity.

While the recycling crisis is a global issue, WMDSM is dedicated to the success of its Single-Sort Recycling Program in Maine. As discussed above in Section 3.3.3(b), as part of the Phase 14 Project, WMDSM plans to enhance its Airport Road Transfer Station to maximize the amount of materials reused and recycled at the facility and to minimize contamination and disposal. WMDSM also plans to provide municipalities within its disposal network with access to educational materials and technical expertise to further promote an increase in reuse and recycling rates. Finally, WMDSM stands ready to offer insights and expertise from its parent company, the nation's largest residential recycler, to assist the state of Maine and specifically, the DEP, navigate the challenges presented by the impending recycling crisis.

The initiatives presented in this Application demonstrate that wastes managed by the Crossroads Facility are reduced, reused, recycled, composted, and/or processed to the maximum extent practicable prior to landfilling. WMDSM employs multiple initiatives to promote and encourage diversion efforts at the Crossroads Facility. In 2017 alone, the Facility diverted over 15,000 tons of waste from disposal within the landfill through the combined efforts of its Single-Sort Recycling Program, active monitoring of wastes and targeted diversion programs. In addition, the Facility further reduced the amount of MSW disposed of in the landfill by diverting materials to other disposal operations higher up on the State's Waste Hierarchy, such as waste-to-energy facilities. WMDSM will continue to employ diversion initiatives such as these to increase overall diversion rate at the Crossroads Facility.

This Application demonstrates that the Crossroads Facility is consistent with the State's Waste Management and Recycling Plan and the Phase 14 Project ensures that the Facility will remain consistent with the Plan, furthering the State's waste disposal objectives for years to come.

[84] *Maine Solid Waste Generation and Disposal Capacity Report for Calendar Year 2016*, at 5.

5.0 THE PHASE 14 PROJECT IS CONSISTENT WITH LOCAL, REGIONAL OR STATE WASTE COLLECTION, STORAGE, TRANSPORTATION, PROCESSING OR DISPOSAL

The Crossroads Facility is the only commercial landfill within the State of Maine. Its disposal network provides vital long-term waste capacity for municipalities and businesses throughout the state, primarily in a region that is distant from other waste management options. The Facility is consistent with State's Waste Management Hierarchy and the proposed Phase 14 Project will create new opportunities for the Facility to actively promote the Hierarchy into the future. The Phase 14 Project also provides critical outlets for disposal of waste from and/or waste volumes for incinerators and processing facilities that is essential to their success.

Extending the life of the Crossroads Facility with Phase 14 ensures that the State's solid waste market continues to remain competitive, cost-effective and naturally functioning. Without the Facility, one large, vertically integrated waste disposal company would own the majority of collection, transportation and disposal services within the State. This overconsolidation would significantly increase the risk that Maine communities and businesses would be subjected to unnaturally high, or supracompetitive waste prices.

Without the Crossroads Facility, communities and businesses currently serviced by its disposal network would face significant logistical and financial impediments in finding a viable disposal alternative. Transporting wastes double and triple the current disposal distances would significantly increase Maine's greenhouse gas emissions. The departure of the nation's largest environmental services company would also eliminate invaluable technical and financial resources currently dedicated to the management of Maine's waste, recyclable and reuse materials.

The Phase 14 Project fulfils the State's long-term disposal needs, guards against overconsolidation and supracompetitive prices, is consistent with the State's Waste Management and Recycling Plan, and promotes Maine's Solid Waste Hierarchy. Thus, WMDSM's Phase 14 Project is consistent with local, regional and state waste collection, storage, transportation, processing and disposal priorities.

6.0 **TITLE, RIGHT OR INTEREST**

Pursuant to state regulation, an applicant must demonstrate that it has sufficient title, right or interest in all of the property that is proposed for development or use.[85] WMDSM owns the land that constitutes the existing permitted facility, as well as an adjacent parcel where a portion of the Phase 14 Project will be located.[86] WMDSM's ownership of the land is evidence by a series of deeds and documents included in Appendix C.

[85] 06-096 C.M.R. ch. 2 § 11.D.
[86] *Id.*

7.0 **PUBLIC NOTICE**

WMDSM published its corrected Notice of Intent to File ("Notice") with DEP in the Morning Sentinel on June 30, 2018, and sent a copy of the Notice to the abutters and the Town by certified mail. A copy of the published notification can be found in Appendix D. Appendix D also contains a copy of the DEP application form for a determination of public benefit for an expanded solid waste facility, a list of abutters, a tax map showing the Facility and abutting properties, and the certification of mailings to each abutter and the Town.

LIST OF APPENDICES

Appendix A: Figures

Appendix B: Tables

Appendix C: Property Deeds

Appendix D: Public Notice and Documents

Appendix E: References

Fn 5: Maine State Planning Office, *Solid Waste Generation & Disposal Capacity Report for Calendar Year 2009*, (January 2011).

Fn 13: Maine Dep't of Envtl. Prot., *Maine Materials Management Plan: 2014 State Waste Management and Recycling Plan Update and 2012 Waste Generation and Disposal Capacity Report*, (January 2014).

Fn 15: Maine Dep't of Envtl. Prot., *Maine Solid Waste Generation and Disposal Capacity Report for Calendar Year 2016*, (Jan. 2018).

Fn 25: Maine Dep't of Envtl. Prot., *Maine Solid Waste Generation and Disposal Capacity Report for Calendar Year 2015*, (Jan. 2017).

Fn 26: Municipal Review Committee, Inc. and Fiberight, LLC Hampden, Penobscot County, Maine Solid Waste Processing Facility, Solid Waste License, #S-022458-WK-A-N (July 14, 2016).

Fn 35: Materials accepted at the PERC facility for incineration as indicated by the MRL website.

Fn 39: Juniper Ridge Landfill, Solid Waste Landfill Expansion, #S-020700-WD-BI-N and #L-19015-TG-D-N (June 1, 2017); Juniper Ridge Landfill, Solid Waste License Amendment, #S-020700-WD-BL-A (March 31, 2018).

Fn 60: George K. Criner, Travis L. Blackmer, *2011 Maine Residential Waste Characterization Study*, The University of Maine (2011).

Fn 61: Arlene Karidis, *Early Efforts to Tackle Mounting Textile Waste*, Waste 360 (May 30, 2018).

Fn 63: Maine State Planning Office, *Waste or Resource? Rethinking Solid Waste Policy*, (January 2009).

Fn 65: U.S. Envtl. Prot. Agency, *Advancing Sustainable Materials Management: 2014 Tables and Figures*, (Dec. 2016).

Fn 66: U.S. Envtl. Prot. Agency, *Improved Information Could Better Enable EPA to Manage Electronic Waste and Enforce Regulations*, (June 2013).

Fn 79: U.S. Envtl. Prot. Agency, *Sustainable Materials Management: Non-Hazardous Materials and Waste Management Hierarchy.*

Fn 82: Livia Albeck-Ripka, *Your Recycling Gets Recycled, Right? Maybe, or Maybe Not*, The N.Y. Times, (May 28, 2018).

APPENDIX 16A
Public Benefit Determination

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION
17 STATE HOUSE STATION AUGUSTA, MAINE 04333-0017

DEPARTMENT ORDER

IN THE MATTER OF

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC. - CROSSROADS LANDFILL SOMERSET COUNTY, MAINE LANDFILL EXPANSION #S-010735-W5-XY-N (APPROVAL WITH CONDITIONS)	))))))	PHASE 14 PUBLIC BENEFIT DETERMINATION

Pursuant to the provisions of the *Maine Hazardous Waste, Septage and Solid Waste Management Act*, 38 M.R.S. §§ 1301 to 1319-Y, *Solid Waste Management and Recycling*, 38 M.R.S. §§ 2101 to 2236, the *Rule Concerning the Processing of Applications and Other Administrative Matters*, 06-096 C.M.R. ch. 2 (last amended June 9, 2018), and the *Solid Waste Management Rules: General Provisions*, 06-096 C.M.R. ch. 400 (last amended April 6, 2015), *Landfill Siting, Design and Operation*, 06-096 C.M.R. ch. 401 (last amended April 12, 2015), the Department of Environmental Protection ("Department") has considered the application of WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC. - CROSSROADS LANDFILL ("WMDSM"), with all supportive data, agency review comments, public comments and other related materials on file, and FINDS THE FOLLOWING FACTS:

1. APPLICATION SUMMARY

A. Application

WMDSM has applied for a determination of public benefit for a proposed expansion (Phase 14) at their Crossroads Landfill in Norridgewock for disposal of municipal solid wastes, construction and demolition debris and special wastes.

B. History

Several landfill phases have been developed over time on the same site (a composite of several parcels of land purchased at different times). Licensing actions relevant to this approval include:

(1) On July 24, 1985, then owner/operator Consolidated Waste Services ("CWS") received approval for the construction and operation of the first secure landfill for the disposal of special wastes (Phases 1-6) and a leachate storage pond (Board of Environmental Protection Order ("Board Order") #L-010735-07-A-N).

(2) On October 10, 1990, Waste Management, Inc. ("WMI"), the parent company of WMDSM, purchased all properties and assets of CWS and received approval for the transfer of all licenses (Board Order #S-010735-WR-EB-T).

(3) On May 5, 1993, WMDSM received approval for a Leachate Storage Tank facility to replace the leachate holding pond (Board Order #S-010735-WH-HU-N). Operation of the Leachate Storage Tank facility began in April 1994. The leachate holding pond was subsequently decommissioned.

(4) On May 10, 1995, WMDSM received approval for the construction and operation of a secure special waste landfill known as Phase 10 (Department Order #S-010735-WD-IF-N).

(5) On March 29, 1996, WMDSM received a public benefit determination for Phases 9, 11 and 12. This public benefit determination approved approximately 2,030,000 cubic yards of disposal capacity to be utilized over approximately 12 years.

(6) On October 16, 1997, WMDSM received approval for the construction and operation of a secure special waste landfill known as Phases 9, 11 and 12 (Department License #S-010735-WD-OK-N).

(7) On March 29, 2001, WMDSM received a modified public benefit determination for Phases 9, 11 and 12 and Phase 8 (Department License #S-010735-W5-UP-N). The modified public benefit determination approved approximately 4 million cubic yards of disposal capacity to be utilized over approximately 8 years.

(8) On August 31, 2002, WMDSM received approval for the construction and operation of the Phase 8 Expansion (Board Order #S-010735-WD-UW-N).

C. Summary of Proposal

The Application for a Determination of Public Benefit for a New or Expanded Solid Waste Disposal Facility ("Application"), dated July 2, 2018, was accepted as complete for processing on July 16, 2018. The proposed expansion (Phase 14) totals approximately 50 acres in size, with an estimated net capacity of 7 million cubic yards to be utilized over about 15 years, based upon a facility average waste placement rate of 450,000 tons per year. The Department commented on the Application in an August 9, 2018 review letter. On September 14, 2018, WMDSM submitted a response to comments. The Department provided follow-up comments in a letter dated October 3, 2018, and WMDSM responded to the follow-up comments on October 31, 2018. Supplemental information was provided by Verrill Dana LLP, on behalf of WMDSM, in a November 21, 2018 letter to the Department.

WMDSM intends to file its application for a landfill expansion during mid-2019. Project construction is proposed to commence in 2021, with filling operations transitioning to the new phase in 2024. It is expected that the current active phase, Phase 8, will be fully utilized by 2024.

2. PUBLIC PARTICPATION

A. Notice of Intent to File

A Notice of Intent to File an application was published in the Morning Sentinel on June 30, 2018, in addition to being mailed to the abutters and Town of Norridgewock municipal office. The notice and mailing of the notice fulfilled the public and local participation requirement of 38 M.R.S. § 1310-S(1) and the public notice requirements of 06-096 C.M.R. ch. 2, § 14.

B. Public Meeting and Comments Submitted

The Department held a public informational meeting on the Application on August 30, 2018 at the Mill Stream Elementary School in Norridgewock pursuant to 38 M.R.S. § 345-A and 06-096 C.M.R. ch. 2, § 8. The public meeting was noticed in the Morning Sentinel on August 20, 2018 and posted on the Department's website with interested persons being separately notified. Approximately 100 people attended the public meeting and approximately 24 total speakers commented on the Application. Additional written comments were received over the course of the licensing process. The Department received 54 written comments from a variety of people and entities including municipalities, businesses, organizations and public individuals.

Comments received included, but were not limited to: WMDSM serves a critical role in the regional management of waste materials; WMDSM provides instrumental support in the community; concern that Maine's solid waste management hierarchy ("hierarchy") will not be met; concern that WMDSM accepts out-of-state waste; concern that the projected fill rate does not match the existing customer base; and a statement that the projected landfill life should be reduced to 10 years.

3. APPLICABLE LAW

Determinations of substantial public benefit are governed by *Public Benefit Determination*, 38 M.R.S. § 1310-AA, which establishes the process and standards to be used in determining whether proposed new solid waste disposal capacity provides a substantial public benefit. 38 M.R.S. § 1310-AA, in relevant part, states:

3. **Standards for determination**. The Commissioner shall find that the proposed facility under subsection 1 or the acceptance of waste that is not generated within the State under subsection 1-A provides a substantial public benefit if the applicant demonstrates to the commissioner that the proposed facility or the acceptance of waste that is not generated within the State:

(1) Meets immediate, short-term, or long-term capacity needs of the State. For purposes of this paragraph, "immediate" means within the next 3 years, "short-term" means within the next 5 years and "long-term" means within the next 10 years. When evaluating whether a proposed facility meets the capacity needs of the State, the commissioner shall consider relevant local and regional needs as appropriate and the regional nature of the development and use of disposal capacity due to transportation distances and other factors;

(2) Except for expansion of a commercial solid waste disposal facility that accepts only special waste for landfilling, is consistent with the state waste management and recycling plan and promotes the solid waste management hierarchy as set out in section 2101;

(3) Is not inconsistent with local, regional, or state waste collection, storage, transportation, processing or disposal.

4. CAPACITY NEEDS

A. Applicable Law

Pursuant to *Solid Waste Generation and Disposal Capacity Report*, 38 M.R.S. § 2124-A "the department shall submit a report to the joint standing committee of the Legislature having jurisdiction over environmental and natural resources matters and the Governor setting forth information on statewide generation of solid waste, statewide recycling rates and available disposal capacity for solid waste." Further, "when the department determines that a decline in available landfill capacity has generated or has the potential to generate supra-competitive prices, the department shall include this finding in its report and shall include recommendations for legislative or regulatory changes as necessary. The report submitted under this section must include an analysis of how the rate of fill at each solid waste landfill has affected the expected lifespan of that solid waste landfill and an analysis of consolidation of ownership in the disposal, collection, recycling and hauling of solid waste."

Capacity needs of the State are projected in the most recent update of the Maine Materials Management Plan ("State Plan"), dated January 2014 and the Maine Solid Waste Generation and Disposal Capacity Report for Calendar Year 2016 ("Capacity Report"), dated January 2018.

B. WMDSM's Requested Capacity

If approved, the proposed expansion to the Crossroads Landfill will provide an additional 7 million cubic yards and approximately 15 years of disposal capacity based on an average waste placement rate of 450,000 tons per year. WMDSM serves as the primary disposal option for 55 of Maine's municipalities and supports more limited disposal needs for 16 others, several unincorporated communities, more than two dozen business entities, regional waste haulers, one of Maine's incinerators, a municipal solid waste processing facility, and several special waste contractors who provide clean-up services statewide.

In its Application, WMDSM states that the wastes proposed to be disposed in the proposed expansion are similar to the waste types currently received for disposal at WMDSM. In its September 14, 2018 response (page 2), WMDSM states that these waste types "did not include out-of-state MSW" and "[s]hould exceptional circumstances arise requiring out-of-state MSW to be disposed of in Phase 14, WMDSM is willing to notify the Department in advance." Wastes currently received for disposal include: (1) special wastes including asbestos-containing waste and other wastes that require special handling, transportation and disposal procedures ("Special Waste"); (2) alternate daily cover including approved special waste streams and chipped utility poles ("ADC"); (3) municipal solid waste sourced from Maine households and commercial businesses ("MSW"), and (4) construction and demolition debris ("CDD"). All wastes accepted at the landfill must be non-hazardous.

In its Application (page 11), WMDSM states that since 2004, on average, the following percentages of ADC, CDD, MSW and Special Waste out of its total waste stream were managed at the Crossroads Landfill.

Table 1 – Type of Solid Waste Managed at Crossroads Landfill

Type of Solid Waste Managed	Percentage of Total Waste Stream
ADC	25.2
CDD	23.8
MSW	24.1
Special Waste	26.9

WMDSM estimates that these percentages will generally continue during the proposed Phase 14 project. Semi-annual capacity reports submitted by WMDSM to the Department, in accordance with license #S-010735-W5-UP-N (Phases 9, 11 and 12 and Phase 8) indicate that WMDSM's disposal rate has fluctuated from a low of 239,273 tons in 2012 to a high of 447,097 tons in 2017.

In its Application (page 21), WMDSM states that "Phase 14 is important to ensuring disposal costs within the State remain competitive beyond 2024." Further, WMDSM notes that "[w]ithout Phase 14, by 2026, more than 50% of landfill capacity within the State will be concentrated at one facility, the Juniper Ridge Landfill" (page 22).

C. Department Analysis

In determining whether a facility achieves a substantial public benefit, the facility must meet the immediate (3 years), short-term (5 years) or long-term (10 years) needs of the State. Immediate and short-term needs of the State are currently being met with the operation of Phase 8 which will reach its full capacity by 2024.

While the percentages of waste types are expected to remain relatively consistent, actual disposal rates at the Crossroads Landfill fluctuate over time and are dependent upon a variety of factors, including economic well-being and growth rates, emergence of new technologies, solid waste disposal capacity in Maine, support provided to Maine's incinerators and processing facilities, and amount of out-of-state waste accepted.

(1) Economic Well-being and Growth Rates

In general, waste disposal rates fluctuate with the economy. The Maine Consensus Economic Forecasting Commission ("CEFC") stated in its March 1, 2010 Report[1] that the "Maine Coincident Economic Activity Index, an economic indicator that is a proxy for State GDP ("Gross Domestic Product"), which measures the value of economic activity within the State, decreased 4.5% in November 2009 over November 2008. Maine's year over year change has been negative since June 2008" (page 1). In its consensus forecast, the CEFC found in 2010 a "continued stabilization of the decline in economic activity that began in the fall of 2008" at the onset on the recession (page 4). Coincident with economic activity, WMDSM's disposal rate was 307,265 tons during 2008 and 258,376 tons during 2010.

[1] http://legislature.maine.gov/legis/ofpr/revenue_forecasting_committee/reports/rfc_2010mar_prelim_summary.pdf

In its April 1, 2017 Report[2], the CEFC found that "Maine's real GDP increased 1.2% in the third quarter of 2016. This was the sixth consecutive quarter of real GDP growth" (page 2). WMDSM's disposal rate was 245,803 tons in 2015, 351,342 tons in 2016, and 447,097 tons in 2017. However, the report noted that "the primary source of concern for the CEFC continues to be Maine's demographic situation, with an aging population and little to no population growth" (page 6). The CEFC projects that "employment reaches a 0.0 percent growth level in 2019 and stays at that point through 2020 and 2021" (page 5). Thus, during the previous 10-year period economic growth slowed and stagnated, has since largely recovered, but economic growth remains uncertain. The Department concludes that this uncertainty is likely to cause disposal rates to continue to fluctuate.

(2) Emergence of New Technologies

In July 2016, the Department licensed a proposed MSW processing facility in Hampden, consisting of technology new to Maine's solid waste management industry. The Fiberight LLC ("Fiberight") facility is currently under construction and will include the sorting of recyclables and conversion of organic material to certain byproducts including bio-methane. While construction of Fiberight is underway, some uncertainty exists regarding its schedule for full-scale operations and reaching its optimum throughput capacity.

WMDSM currently serves the needs of the Municipal Review Committee, Inc. ("MRC") and Fiberight in accepting MSW bridge capacity waste for disposal, and upon full-scale operation will provide disposal services for MSW process residue and bypass. WMDSM has executed an exclusive Solid Waste Disposal Agreement ("Agreement"), dated August 24, 2015, with the MRC for the disposal of MSW bridge capacity waste, process residues and bypass from the Fiberight facility at WMDSM's Crossroads Landfill. WMDSM is expected to landfill up to 40,000 tons per year of process residue from the Fiberight facility. The amount of MSW bypass requiring landfilling is uncertain and is dependent upon the frequency of time when Fiberight is unable to process MSW including during scheduled maintenance events and unscheduled outages. WMDSM is currently accepting bridge capacity waste from MRC-contracted communities for disposal. Bridge capacity waste is defined as MSW collected within MRC-contracted communities requiring disposal from April 1, 2018 to the start of

[2] http://www.maine.gov/dafs/economist/sites/maine.gov.dafs.economist/files/inline-files/Report%20of%20the%20CEFC%20Meeting%20Apr2017.pdf

commercial operations of the Fiberight facility. MRC expects to generate approximately 10,000 to 18,000 tons per month of MSW during the bridge period. The MRC and Fiberight may also accept MSW from in-state non-MRC communities that decide to contract with the MRC and Fiberight. The Department states that capacity needed for MSW including process residues and bypass from Fiberight is uncertain and is dependent on certain factors such as Fiberight's commercial start-up schedule, scheduled maintenance events and unscheduled outages, and schedule to reach its optimum throughput capacity.

(3) Solid Waste Landfill Disposal Capacity in Maine

Solid Waste Management and Recycling, 38 M.R.S. § 2123-A provides that "the state plan must identify existing solid waste disposal and management capacity within the State and the potential for expansion of that capacity." Disposal capacity includes incineration and landfilling. Table 1 of the Capacity Report presents the amount and disposition of Maine-generated MSW and CDD. During 2016, 63% of MSW including ash resulting from incineration and 89% of Maine-generated CDD was landfilled. At the Crossroads Landfill, approximately 75% of the total waste stream disposed since 2004 was CDD and special wastes. While land disposal occupies the lowest level of the hierarchy, the portion of the waste stream that cannot be recycled or reused in addition to residues resulting from processing and reduction efforts must be landfilled to maintain the health, safety and environment of Maine's citizens consistent with 38 M.R.S. § 1302.

The completion of the Fiberight facility will help to promote solid waste management at a level higher on the solid waste management hierarchy. However, even with Fiberight, Maine does not have enough processing and incineration capacity for all the MSW it produces. The Capacity Report states that Maine's generation rate for MSW during 2016 was approximately 760,000 tons per year. Beginning sometime in 2019, Maine will have 595,000 tons per year of MSW incineration and processing facility capacity. In addition, Maine's regional landfills provide disposal capacity for another 87,000 tons per year of MSW, and WMDSM provides disposal capacity for approximately 85,000 tons per year of MSW based on 2016 annual report data. Collectively, these facilities provide sufficient capacity to manage Maine's MSW based on current generation rates.

Other than the State-owned Juniper Ridge Landfill, the active landfills remaining for MSW disposal include seven municipally-owned landfills serving local needs, located in the southern, central and coastal regions of

the State, or in Aroostook County. One of these is scheduled to close before 2021, one has approximately 10 years of remaining capacity, and two primarily serve incinerators located in the southern and coastal regions of the State, by landfilling incinerator ash. The incinerators depend upon either the State landfill or WMDSM for disposal of wastes that cannot be incinerated. The landfills proposed to remain active have adequate capacity to serve a long-term demand for capacity in their respective regions, but do not have capacity to accept waste from other regions of the State.

In 2016, 1,235,592 cubic yards[3] of landfill capacity were utilized statewide (page 9 of Capacity Report). Crossroads Landfill represented approximately 32% of that capacity, largely serving the central and western regions of the State, where other capacity is not readily available. Thus, WMDSM serves to meet a State and regional need for landfill capacity and without the proposed expansion, WMDSM's capacity will cease as of 2024.

Future Commercial Waste Disposal Facilities, 38 M.R.S. § 1310-X prohibits the Department from approving an application for a new commercial solid waste disposal facility. Based on Table 4 of the Capacity Report, without the development of Phase 14, more than 50% of potentially needed landfill capacity within the State will be concentrated at one facility having the potential to create supra-competitive pricing.

(4) Support Provided to Maine's Incinerators and Processing Facilities

WMDSM states on page 16 of the Application that it supports the Mid-Maine Waste Action Corporation ("MMWAC") incinerator, which provides disposal for 27 communities, by accepting MSW during times of limited capacity at MMWAC such as the summer months. Additionally, WMDSM provides MSW to MMWAC during downturns in volume such as during the winter months. WMDSM also accepts oversized waste and CDD and other bypass waste from MMWAC that cannot be incinerated and must be landfilled. As described in Section 4(B)(2) above, WMDSM also provides disposal services to Fiberight for bridge capacity waste and upon full scale operation will provide disposal services for process residues and bypass from Fiberight.

[3] This capacity does not include special wastes disposed in generator-owned landfills affiliated with specific industrial facilities and operations.

(5) Amount of Out-of-State Waste Accepted

WMDSM operates the only commercial landfill within Maine and may accept solid waste generated out-of-state for disposal. In accordance with its modified public benefit determination for Phases 9, 11, and 12 and Phase 8 (Conditions 2 and 3 of license #S-010735-W5-UP-N), WMDSM is required, in part, to submit an analysis of waste received at the Crossroads Landfill on a semi-annual basis from both in-state and out-of-state generators. Beginning with the reporting period July 1, 2016 through December 31, 2016, WMDSM has been reporting to the Department that more than 35% of the annual total of waste received at the facility has been out-of-state waste.

WMDSM states in its March 20, 2018 semi-annual report that this data "is not representative of historical operations and is not expected to continue for a significant period of time." In addition, WMDSM notes that there are disposal constraints at other landfills in New England and WMI is seeking authorization to increase disposal capacity at its facility in New Hampshire. Further, WMDSM specifies that there is a current effort to develop rail transfer capacity to transport waste to more distant disposal sites with excess capacity. In the supplemental response to Department comments submitted on October 31, 2018 by Verrill Dana, LLP on behalf of WMDSM it was stated that several things served to increase the quantity of out-of-state waste accepted: (1) increased amounts of ADC were needed to manage active operations in both Phases 8 and 11 and a sufficient quantity of material was not available in-state; (2) additional ADC was needed to bring waste to finish grades to facilitate final capping of Phase 11 in 2018, based upon a schedule approved by the Department and (3) asbestos waste accepted under a single contract was four times that generated by typical remediation activities. Regarding the acceptance of ADC, WMDSM states that the "use of out-of-state waste material does not reduce airspace that would otherwise be available for disposal of Maine wastes" since daily cover is required by the solid waste management regulations.

D. Department Findings

The Department finds that in consideration of the State Plan and Capacity Report, expansion of the Crossroads Landfill as proposed by WMDSM, meets immediate, short-term, or long-term capacity needs of the State. The Department further finds that the 7-million cubic yards of capacity, as proposed by WMDSM, is reasonable as a basis for design given that actual disposal rates fluctuate over time depending on a variety of factors, including economic well-being and growth rates, emergence

of new waste technologies, solid waste landfill disposal capacity in Maine, support provided to Maine's incinerators and processing facilities, and amount of out-of-state waste accepted. However, the Department also finds that if exceptional circumstances arise requiring out-of-state MSW to be disposed of in Phase 14, WMDSM must notify the Department in advance. As part of the notification, alternatives to landfilling that are higher on the hierarchy must be identified and evaluated.

5. CONSISTENCY WITH STATE WASTE MANAGEMENT PLAN AND HIERARCHY

A. Applicable Law

Solid Waste Management and Recycling Plan, 38 M.R.S. § 2122 requires the Department to "prepare an analysis of, and a plan for, the management, reduction and recycling of solid waste for the State. The plan must be based upon the [established] priorities and recycling goals." Ensuring that the State has adequate disposal capacity for Maine solid wastes is part of the State Plan.

Solid Waste Management Hierarchy, 38 M.R.S. § 2101 requires that waste generated in and imported into the State should be managed in accordance with the following priority:

A. Reduction of waste generated at the source, including both amount and toxicity of the waste;
B. Reuse of waste;
C. Recycling of waste;
D. Composting of biodegradable waste;
E. Waste processing that reduces the volume of waste needing land disposal, including incineration; and
F. Land disposal of waste.

Waste Reduction and Recycling, 38 M.R.S. § 2132 states that "[i]t is goal of the State to recycle or compost, by January 1, 2021, 50% of the municipal solid waste tonnage generated each year within the State." The State's recycling rate continues to fall short of its goal for recycling or composting. Based on the Capacity Report, Maine's recycling rate for MSW, exclusive of CDD[4], was 37%. The recycling rate for CDD was 11%.

[4]For the purposes of the State Plan, Maine calculates the MSW recycling rate consistent with U.S. Environmental Protection Agency procedures which excludes CDD from the calculation. In Maine, MSW has historically been defined as solid waste typically managed by municipalities including CDD.

B. State Waste Management Plan Priorities

The priorities for sustainable materials management under the current State Plan are to:

(1) Encourage the development of new infrastructure for separation from the waste stream and utilization of organics, including composting and technologies such as anaerobic digestion ("Priority 1");

(2) Encourage increased beneficial use and recycling of materials, including identification of incentives and removal of unnecessary barriers ("Priority 2");

(3) Provide tools and assistance to municipalities and businesses to support waste reduction and diversion efforts ("Priority 3"); and

(4) Continue refinement of data sources and data management systems to more accurately and consistently assess progress toward statewide reduction and recycling goals, and to evaluate the effectiveness of programs and strategies ("Priority 4").

C. WMDSM's Existing Programs

WMDSM provides recycling services to 23 of the 55 communities utilizing the Crossroads Landfill for disposal of MSW (Table 10, page 31 of Application). While recycling rates vary, all of the communities it directly serves, have recycling programs in place. WMDSM describes ongoing programs to reduce waste and encourage recycling among its customers in its Application including:

(1) Battery Diversion. WMDSM operates a battery diversion program to collect rechargeable, button and single-use batteries from its nine-member communities for recycling. A central receptacle for battery collection is provided at WMDSM's Airport Road Transfer Station.

(2) Electronic Waste Diversion. WMDSM operates an electronic waste diversion program that allows residents from its nine-member communities to deliver electronic items such as cathode ray tubes, computer equipment, fluorescent light bulbs, smoke detectors and cell phones for recycling. Based on WMDSM's annual report for 2017, WMDSM collected approximately 45 tons of electronic waste that was diverted from landfilling.

(3) Waste Evaluations. WMDSM in conjunction with its parent company, WMI, actively performs waste evaluations for its customers. Waste evaluations serve to analyze inputs, raw materials, individual waste streams and provide recommendations for reducing the amount of waste generated and increasing the amount of materials reused or recycled. In its Application, WMDSM states that "[s]uccessful waste evaluations have been performed for a variety of customers, including Bath Iron Works, Fisher Engineering, Sappi and Colby College" (page 29).

(4) Tire Processing. WMDSM facilitates the operation of a tire processing facility by BDS Waste Disposal, Inc., which in 2017, processed approximately 33,600 tons of scrap whole tires and managed approximately 28,200 tons of tire shreds sourced from within Maine. By-products of the processing, including steel and aluminum, were shipped off-site for recycling. The facility shipped off-site approximately 53,000 tons of tire derived fuel to Maine paper mills and 192 reusable tires in 2017. Shredded and chipped tires are also used as components of the Crossroads Landfill leachate and gas collection and control systems. Since 2016, recycling of blasting mats has been added to this program.

(5) Single-sort Recycling. WMDSM in conjunction with its parent company, WMI, implements a single-sort recycling program for municipalities and businesses to encourage and maximize the amount of material recycled and reused. Glass, metal, cans, plastics, office paper, newspaper, boxboard, and corrugated carboard are collected in single-sort containers. Working directly with participants, WMDSM educates users about appropriate handling and preparation of materials for collection. For the years 2015 through 2017, more than 17,000 tons of recyclables have been removed from WMDSM's regional waste stream.

(6) Cardboard Recycling. WMDSM operates a cardboard recycling program in conjunction with its single-sort recycling program. Separated cardboard is baled by WMDSM and subsequently shipped to end users or recyclers. In 2017, WMDSM collected and diverted 4,047 tons of cardboard from landfilling.

(7) Woodwaste Recycling. Approximately 640 tons of woodwaste including utility poles, pallets, brush and other pre-sorted woodwaste was chipped and reused as daily cover or shipped off site for other uses in 2017. WMDSM reported in its 2017 Annual Report to the Department that it reused approximately 118,300 tons of treated utility poles chipped on-site, boiler ash, auto shredder residue, and contaminated soil as alternative daily cover

in substitution for clean soil materials to meet Rule requirements for daily cover of waste.

(8) Landfill Gas-to-Energy. WMDSM operates a gas-to-energy plant at the Crossroads Landfill to recover gas from the anaerobic decomposition of the waste disposed within the landfill. On an annual basis, WMDSM collects and combusts approximately 470,000 cubic feet of landfill gas creating 21,685,000 kilowatt hours of electricity per year. The gas-to-energy plant will serve the proposed Phase 14, as well as the existing landfill.

D. WMDSM's Proposed Programs

WMDSM proposes to expand its waste reuse, reduction, recycling and composting efforts, in conjunction with the operation of the proposed Phase 14, to include:

(1) Expansion of Airport Road Transfer Station[5]. WMDSM proposes to expand recycling services at its on-site transfer station serving local communities to collect organic materials, household hazardous wastes, textiles, electronic wastes, single-use batteries, clean woodwastes and unwanted or expired medicines. WMDSM notes that this initiative has the potential to have a significant effect on reducing the toxicity of MSW landfilled from the nine-member communities. As part of the transfer station upgrade, WMDSM will establish a new traffic circulation pattern and will position recycling containers and composting bins prior to trash containers to further emphasize and promote Maine's priority regarding waste management.

Enhancing its educational programs, WMDSM proposes to develop "best-practice" materials for its customers to minimize contamination of recyclable materials.

(2) Organics Diversion and Reuse. WMDSM proposes, in its Application (page 34), to construct a composting facility on site at the Crossroads Landfill facility. Residents from the nine-member communities will collect food scraps and other biodegradable waste (i.e., unbleached paper plates, napkins and food-soiled paper products) in 5 to 30 gallon containers and take to a central repository at the Airport Road Transfer Station. WMDSM will subsequently transport the material to the compost operation where the

[5]In its Application, WMDSM originally proposed to collect waste oil (page 32); however, WMDSM noted in a December 18, 2018 letter to the Department that "waste oil is better managed by authorized collection centers or vendors focused on management and recycling of waste oil." Therefore, the proposed collection of waste oil at WMDSM's Airport Road Transfer Station has been removed from the Application.

material will be handled, composted and stored. Participants in the program will be offered finished compost throughout the year. To enhance its educational programs, tours of the facility will be offered to local students, citizens and State and municipal officials.

Further, WMDSM will be assisting the Farmington Compost Cooperative to address a short-term space need by offering a location for a temporary compost operation at the Crossroads Landfill facility. While the location is temporary, WMDSM states that the pilot program will be an important building block in preparation for WMDSM's future full-scale operation (page 2 of the November 21, 2018 letter). The pilot program will occur during December 2018 through April 2019.

(3) Textile Diversion and Reuse. WMDSM proposes to develop and implement a textile diversion and reuse program. Reusable textiles will be donated to charitable organizations. Those that cannot be reused will be transported to a recycling facility. This program is proposed to begin with the nine-member communities and may be expanded based on the effectiveness of the program.

(4) Household Hazardous Materials Collection and Reuse Program. WMDSM proposes to host a one-day annual household hazardous materials collection event in Norridgewock starting in 2019. The event will serve the nine-member communities. A licensed hazardous materials management company, with experience in planning and implementing these type of collection events, will assist with the proposed program. WMDSM will collect and tabulate data derived from each event to evaluate the effectiveness of the proposed program.

(5) Informational Meetings. WMDSM proposes, in a November 21, 2018 supplement to the application, to "host a series of informational meetings for its municipal and commercial customers to (i) gather data on measures its customers are taking to recycle, (ii) identify barriers to recycling, and (iii) explore steps that would facilitate increased recycling."

E. Market Availability for Recyclables

Market availability for recyclables is uncertain. In its Application, WMDSM notes that "recycling costs have increased and markets have seen an upturn in volatility" (page 15). Further, WMDSM states that "China's actions to limit and ban certain types of plastic and paper over the course of two years, while also imposing limits on contamination, has had a major impact on recycling markets across the United

States" (page 38). While WMDSM has plans to improve the quality of collected recyclables, and has a proven outlet for most of its collected materials at ecomaine, recycling capacity will take time to recover. WMDSM states that "[m]unicipalities and businesses faced with such a sharp increase in recycling costs may be forced to make difficult decisions about the viability of their recycling programs. These tough decisions may require a temporary greater reliance on disposal locations in Maine until alternative markets can be secured, putting increased pressure on the State's overall projected disposal capacity." In its September 14, 2018 response to Department review comments, WMDSM further clarified that, "[it] does not intend to landfill potential recyclables and is utilizing efforts described in Section 3 of its Application and the responses provided to comment 5(a) [waste reduction programs] to avoid this scenario."

F. Department Analysis

Maine's Solid Waste Management Rules ("Rules"), *General Provisions,* 06-096 C.M.R. ch. 400, § 6 provides that, in order to receive a license to expand a solid waste disposal facility, the applicant must receive a determination by the Department that the volume of the waste has been reduced to the maximum extent practicable by recycling and source reduction prior to being landfilled or incinerated. For purposes of this rule section, reducing, reusing, recycling, composting and/or processing waste to the "maximum extent practicable" prior to disposal means handling the greatest amount of waste possible through means as high on the solid waste management hierarchy as possible, resulting in maximizing waste diversion and minimizing the amount of waste disposed, without causing unreasonable increases in facility operating costs or unreasonable impacts on other aspects of the facility's operation.

Determination of the "maximum extent practicable" includes consideration of the availability and cost of technologies and services, transportation and handling logistics, and overall costs that may be associated with various waste handling methods. Where waste has been subjected to reduction or recycling programs, voluntary or otherwise, that waste may only be accepted for final disposal, if the standards of those programs are at least as effective as those imposed by state law[6].

(1) WMDSM's Existing Programs. The Department concludes that WMDSM has existing programs in-place to reduce and reuse waste and encourage recycling including battery diversion, electronic waste diversion, waste evaluations, tire processing, single-sort recycling, cardboard recycling, woodwaste recycling, and landfill gas-to-energy. The Department further

[6] *Solid Waste Facility Licenses,* 38 M.R.S. § 1310-N(5-A)(A).

concludes that WMDSM's existing beneficial use and recycling programs, and waste evaluations serve to meet two of the four priorities (Priority 2 and 3) outlined in the State Plan.

On page 31 of the Application, WMDSM notes that their single-sort program has been highly successful to date; however, WMDSM additionally notes that recycling data for the communities it serves is limited and incomplete. The Department concludes that for communities utilizing landfilling as their primary means of disposal, more effort needs to be made to track and report this data. Better tracking of the data will serve to meet Priority 4 of the State Plan.

(2) WMDSM's Proposed Programs. As part of the Application, WMDSM proposes to expand and reconfigure its Airport Road Transfer Station; construct and operate a compost facility; develop and implement a textile diversion and reuse program; host an annual household hazardous materials collection event; and host a series of informational meetings to gather recycling data, identify barriers and explore steps to increase recycling. The Department concludes that for all communities utilizing landfilling as their primary means of disposal, more effort to divert recyclable and compostable materials needs to be made and is being proposed. With the implementation and operation of these programs, WMDSM will meet Priority 1, 2, 3 and 4 of the State Plan.

(3) Market Availability for Recyclables. The Capacity Report specifies that beginning January 1, 2018, China intends to prohibit the import of certain solid wastes and scrap into their country, including mixed paper and mixed plastics. Based on this, worldwide recycling capacity diminished in 2018 and contamination by the public of collected recyclables has increased rejection of loads at recycling facilities and caused municipalities to limit recycling efforts. WMDSM notes in its Application that it "is dedicated to the success of its Single-Sort Recycling Program in Maine" (page 39). The Department concludes that WMDSM does not intend to landfill potential recyclables and "plans to enhance its Airport Road Transfer Station to maximize the amount of materials reused and recycled at the facility and to minimize contamination and disposal" (page 39 of Application) thereby meeting Priority 2 of the State Plan. The Department concludes that Phase 14 should not be used for the disposal of marketable recyclables. For the purposes of this public benefit determination, "marketable recyclables" are defined as solid waste that has undergone collection, separation, processing or recovery with the intent of recovering and recycling the solid waste.

G. Department Findings

The Department finds that the expansion of the Crossroads Landfill as proposed by WMDSM, is consistent with the State Plan and promotes the solid waste management hierarchy as set forth in 38 M.R.S. § 2101, in that the volume of waste proposed to be accepted at WMDSM will be reduced to the maximum extent practicable by recycling and source reduction prior to being landfilled, provided that:

(1) WMDSM's proposed reuse, reduction, recycling and composting programs begin on or before the commencement of operations in Phase 14;

(2) All municipalities and communities utilizing the Crossroads Landfill as their primary option for disposal of MSW continue to be provided with the infrastructure and services necessary to reduce the waste landfilled to the maximum extent practicable;

(3) Marketable recyclables are not disposed in Phase 14. For the purposes of this public benefit determination, "marketable recyclables" are defined as solid waste that has undergone collection, separation, processing or recovery with the intent of recovering and recycling the solid waste. WMDSM may request approval from the Department to accept marketable recyclables if the need is based on a catastrophic event such as a fire or an extreme weather event, and other options higher on the hierarchy are not viable. Recycling market pricing is not a valid reason to seek approval from the Department for disposal of these marketable recyclables; and

(4) WMDSM collects and reports in each Annual Report to the Department data on the amount of waste received, the sources of the wastes, and estimated recycling rates associated with waste received for each of the nine-member communities that utilize WMDSM's Airport Road Transfer Station.

6. CONSISTENCY WITH LOCAL, REGIONAL, OR STATE WASTE MANAGEMENT

A. Local and Regional Provision of Services

WMDSM operates a local residential transfer station serving nine surrounding communities. During 2017, approximately 6,400 tons of waste materials were recycled and diverted from disposal. WMDSM is proposing to make retrofits to the transfer station to maximize the diversion of materials that may be reused, recycled, or composted as described in Section 5(D) above.

Cost associated with the transportation of waste is a significant issue in a large rural state such as Maine. WMDSM's service region extends to a total of 71 communities[7] and several Maine businesses, in addition to supporting other regional waste facilities such as the MMWAC incinerator and the anticipated acceptance of process residues and bypass from Fiberight. These facilities do not provide disposal services for the MSW or special waste that is currently sent to WMDSM. Without WMDSM, the transportation distances, and costs to haul to other facilities would increase. The Department received a total of 37 letters of support from municipalities and waste haulers served by the facility, suggesting the continuance of service for waste disposal at the Crossroads Landfill will minimize the impact of waste management expense on strained budgets. More significantly, while other facilities in the region accept MSW, they cannot accept special wastes. To this extent, WMDSM does not compete with other regional facilities, but partners with and compliments them. The Department also received comments from numerous business entities engaged in the handling, processing, recycling, or beneficial use of waste streams stating that a regional disposal option for residues, largely special wastes, resulting from their processes is an essential asset for their business operations.

WMDSM states in its Application that less than 25% of the total volume of waste received at the Crossroads Landfill for the past 10-year period comes from out-of-state. This is substantially below the 35% reporting threshold imposed by the WMDSM Phase 8 public benefit determination. All of this out-of-state waste has been special waste, not MSW. A significant part of this out-of-state waste is used as alternative daily cover, which does not reduce airspace that would otherwise be available for Maine generated waste. In its Application, WMDSM asserts that "[t]o remain viable, it is critical that WMDSM continue to accept out-of-state special waste" (page 13). In its September 14, 2018 response to Department comments, WMDSM states that, "the same reporting threshold would be an acceptable condition for the life of the proposed Project."

B. State Waste Management Considerations

As stated in Department license #S-010735-W5-UP-N, to further ensure a benefit to the State of Maine, WMDSM accepts for disposal any Maine generated solid waste provided that the waste meets the facility's acceptance criteria as approved by the Department and that the waste conforms to WMDSM's established business, administrative, and safety requirements. In addition, if Maine waste disposal volumes at the facility remain consistent with recent experience, then WMDSM

[7]This number includes the nine-member communities that utilize WMDSM's Airport Road Transfer Station. See Table 2 in the Application.

anticipates that over the life of the expansion, the percentage of out-of-state waste would not exceed 35%, resulting in an estimated 65% of Phase 14 disposal capacity being available to Maine-generated solid wastes.

To ensure that the capacity of Phase 14 will consistently provide a substantial public benefit to the citizens of Maine, WMDSM will collect data on the amount of waste received from both in-state and out-of-state generators, the in-place density of the landfilled waste, the volume of airspace utilized during the reporting period and the estimated remaining permitted disposal capacity expressed in cubic yards. This information will be submitted to the Department on an annual basis in the Annual Report.

If the amount of special waste unrelated to environmental clean-up and remediation projects accepted from out-of-state generators is more than 25% of the annual total of waste disposed at the facility, or that the amount of all wastes accepted from out-of-state generators is more than 35% of the annual total of waste disposed in Phase 14, WMDSM will notify the Department of this in the Annual Report. Based upon an ongoing review of the variations in life expectancy, disposal rate, ratio of in-state to out-of-state wastes and other relevant information, the Department may require WMDSM to make adjustments to ensure that Phase 14 will continue to be operated to provide a substantial public benefit as evidenced by the life expectancy of Phase 14 and the disposal capacity available for the disposal of Maine generated wastes. Actions or modifications proposed by the Department would be subject to, and carried out under, the provisions 38 M.R.S. § 1310-AA(5) and based upon any findings of fact as determined by the Department.

C. Department Findings

The Department finds that the expansion of the Crossroads Landfill as proposed by WMDSM, meets capacity needs of the relevant local communities and the region. Further, the Department finds that expansion of the landfill facility as proposed by WMDSM: (1) provides a critical role in maintaining competitive markets for solid waste services in Maine beyond the year 2024; (2) meets capacity needs of the relevant local communities and the region; and (3) meets the State waste management infrastructure goals, provided that WMDSM:

(1) Submits in each Annual Report documentation of the amount of and type of waste received from both in-state and out-of-state generators, the in-place density of the landfilled waste, the volume of airspace utilized during the reporting period and the estimated remaining permitted disposal capacity expressed in cubic yards;

(2) Notifies the Department if the amount of non-remediation special waste accepted from out-of-state generators is more than 25% of the annual total of waste disposed in Phase 14, or that the amount of all wastes accepted from out-of-state generators is more than 35% of the annual total of waste disposed at the facility. Based on an ongoing review of this data, the Department may require WMDSM to make adjustments to ensure it continues to provide a substantial public benefit for the disposal of Maine-generated wastes; and

(3) Prioritizes for disposal at WMDSM's Crossroad's Landfill Maine generated solid waste provided that the waste meets the facility's acceptance criteria as approved by the Department and that the waste conforms to WMDSM's established business, administrative, and safety requirements.

BASED on the above Findings of Fact, and subject to the Conditions listed below, the Department makes the following CONCLUSIONS:

1. Posting of the public notice in a local newspaper and mailing of the notice to abutters fulfilled the public and local participation requirement of 38 M.R.S. § 1310-S(1) and the public notice requirements of 06-096 C.M.R. ch. 2, § 14.

2. In consideration of the State Plan and Capacity Report, expansion of the Crossroads Landfill as proposed by WMDSM, meets immediate, short-term, or long-term capacity needs of the State provided that, if exceptional circumstances arise requiring out-of-state MSW to be disposed of in Phase 14, WMDSM notifies the Department in advance to identify and evaluate alternatives to landfilling.

3. Expansion of the Crossroads Landfill as proposed by WMDSM, is consistent with the State Plan and promotes the solid waste management hierarchy as set forth in 38 M.R.S. § 2101, in that the volume of waste proposed to be accepted at WMDSM will be reduced to the maximum extent practicable by recycling and source reduction prior to being landfilled, provided that:

   A. WMDSM's proposed reuse, reduction, recycling and composting programs begin on or before the commencement of operations in Phase 14;

   B. All municipalities and communities utilizing the Crossroads Landfill as their primary option for disposal of MSW continue to be provided with the infrastructure and services necessary to reduce the waste landfilled to the maximum extent practicable;

C. Marketable recyclables are not disposed in Phase 14. For the purposes of this public benefit determination, "marketable recyclables" are defined as solid waste that has undergone collection, separation, processing or recovery with the intent of recovering and recycling the solid waste. WMDSM may request approval from the Department to accept marketable recyclables if the need is based on a catastrophic event such as a fire or an extreme weather event, and other options higher on the hierarchy are not viable. Recycling market pricing is not a valid reason to seek approval from the Department for disposal of these marketable recyclables; and

D. WMDSM collects and reports in each Annual Report to the Department data on the amount of waste received, the sources of the wastes, and estimated recycling rates associated with waste received for each of the nine-member communities that utilize WMDSM's Airport Road Transfer Station.

4. Expansion of the landfill facility as proposed by WMDSM meets capacity needs of the relevant local communities and the region.

5. The Department finds that the expansion of the Crossroads Landfill as proposed by WMDSM provides: (1) a critical role in maintaining competitive markets for solid waste services in Maine beyond the year 2024; (2) meets capacity needs of the relevant local communities and the region; and (3) meets the State waste management infrastructure goals, provided that WMDSM:

A. Submits in each Annual Report documentation of the amount and type of waste received from both in-state and out-of-state generators, the in-place density of the landfilled waste, the volume of airspace utilized during the reporting period, and the estimated remaining permitted disposal capacity expressed in cubic yards;

B. Notifies the Department if the amount of non-remediation special waste accepted from out-of-state generators is more than 25% of the annual total of waste disposed in Phase 14, or that the amount of all wastes accepted from out-of-state generators is more than 35% of the annual total of waste disposed at the facility. Based on an ongoing review of this data, the Department may require WMDSM to implement measures to make adjustments to ensure it continues to provide a substantial public benefit for the disposal of Maine-generated wastes; and

C. Prioritizes for disposal at WMDSM's Crossroad's Landfill Maine generated solid waste provided that the waste meets the facility's acceptance criteria as approved by the Department and that the waste conforms to WMDSM's established business, administrative, and safety requirements.

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC. - CROSSROADS LANDFILL SOMERSET COUNTY, MAINE LANDFILL EXPANSION #S-010735-W5-XY-N (APPROVAL WITH CONDITIONS)	23)))))	PHASE 14 PUBLIC BENEFIT DETERMINATION

THEREFORE, the Department APPROVES the noted application of WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC. - CROSSROADS LANDFILL, SUBJECT TO THE ATTACHED CONDITIONS and all applicable standards and regulations:

1. The Standard Conditions of Approval, a copy attached as Appendix A.

2. The invalidity or unenforceability of any provision, or part thereof, of this determination shall not affect the remainder of the provision or any other provisions. This determination shall be construed and enforced in all respects as if such invalid or unenforceable provision or part thereof had been omitted.

3. WMDSM shall:

   A. Notify the Department in advance to identify and evaluate alternatives to landfilling if exceptional circumstances arise requiring out-of-state MSW to be disposed of in Phase 14;

   B. Not dispose of marketable recyclables in Phase 14. For the purposes of this public benefit determination, "marketable recyclables" are defined as solid waste that has undergone collection, separation, processing or recovery with the intent of recovering and recycling the solid waste. WMDSM may request approval from the Department to accept marketable recyclables if the need is based on a catastrophic event such as a fire or an extreme weather event, and other options higher on the hierarchy are not viable. Recycling market pricing is not a valid reason to seek approval from the Department for disposal of these marketable recyclables;

   C. Implement all proposed reuse, reduction, recycling and composting programs described in Section 5(D) of this License, on or before the commencement of operations in Phase 14;

   D. For all municipalities and communities utilizing landfilling at the Crossroads Landfill as their primary option for disposal of MSW, continue to provide the infrastructure and services necessary to reduce the waste landfilled to the maximum extent practicable; and

   E. Collect and report in each Annual Report to the Department, data on the amount of waste received, the sources of the wastes, and estimated recycling rates associated with waste received for each of the nine-member communities that utilize WMDSM's Airport Road Transfer Station.

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC. - CROSSROADS LANDFILL SOMERSET COUNTY, MAINE LANDFILL EXPANSION #S-010735-W5-XY-N (APPROVAL WITH CONDITIONS)	24)))))	PHASE 14 PUBLIC BENEFIT DETERMINATION

4. WMDSM shall:

A. Submit in each Annual Report documentation of the amount and type of waste received from both in-state and out-of-state generators, the in-place density of the landfilled waste, the volume of airspace utilized during the reporting period, and the estimated remaining permitted disposal capacity expressed in cubic yards;

B. Notify the Department if the amount of non-remediation special waste accepted from out-of-state generators is more than 25% of the annual total of waste disposed in Phase 14, or that the amount of all wastes accepted from out-of-state generators is more than 35% of the annual total of waste disposed at the facility. Based on an ongoing review of this data, the Department may require WMDSM to make adjustments to ensure it continues to provide a substantial public benefit for the disposal of Maine-generated wastes; and

C. Prioritize for disposal at WMDSM's Crossroad's landfill Maine generated solid waste provided that the waste meets the facility's acceptance criteria as approved by the Department and that the waste conforms to WMDSM's established business, administrative, and safety requirements.

DONE AND DATED AT AUGUSTA, MAINE, THIS 21st DAY OF December, 2018.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY: Melanie Loyzim
Melanie Loyzim, Acting Commissioner

PLEASE NOTE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES.

Date of initial receipt of application: July 2, 2018
Date of application acceptance: July 16, 2018

Date filed with Board of Environmental Protection:

Filed
DEC 21 2018
State of Maine
Board of Environmental Protection

XLB83350

Appendix A

STANDARD CONDITIONS TO ALL SOLID WASTE LANDFILL LICENSES

STRICT CONFORMANCE WITH THE STANDARD AND SPECIAL CONDITIONS OF THIS APPROVAL IS NECESSARY FOR THE PROJECT TO MEET THE STATUTORY CRITERIA FOR APPROVAL. VIOLATIONS OF THE CONDITIONS UNDER WHICH A LICENSE IS ISSUED SHALL CONSTITUTE A VIOLATION OF THAT LICENSE AGAINST WHICH ENFORCEMENT ACTION MAY BE TAKEN, INCLUDING REVOCATION.

1. **Approval of Variations from Plans.** The granting of this approval is dependent upon and limited to the proposals and plans contained in the application and supporting documents submitted and affirmed by the license. Any consequential variation from these plans, proposals, and supporting documents is subject to review and approval prior to implementation.

2. **Compliance with All Applicable Laws.** The licensee shall secure and comply with all applicable federal, state, and local licenses, permits, authorizations, conditions, agreements, and orders prior to or during construction and operation, as appropriate.

3. **Compliance with All Terms and Conditions of Approval.** The licensee shall submit all reports and information requested by the Department demonstrating that the licensee has complied or will comply with all terms and conditions of this approval. All preconstruction terms and conditions must be met before construction begins.

4. **Transfer of License.** The licensee may not transfer the solid waste facility license or any portion thereof without approval of the Department.

5. **Initiation of Construction or Development Within Two Years.** If the construction or operation of the solid waste facility is not begun within two years of issuance of within 2 years after any administrative and judicial appeals have been resolved, the license lapses and the licensee must reapply to the Department for a new license unless otherwise approved by the Department.

6. **Approval Included in Contract Bids.** A copy of the approval must be included in or attached to all contract bid specifications for the solid waste facility.

7. **Approval Shown to Contractors.** Contractors must be shown the license by the licensee before commencing work on the solid waste facility.

8. **Background of key individuals.** A licensee may not knowingly hire as an officer, director or key solid waste facility employee, or knowingly acquire an equity interest or

STANDARD CONDITIONS TO ALL SOLID WASTE LANDFILL LICENSES

debt interest in, any person convicted of a felony or found to have violated a State or federal environmental law or rule without first obtaining the approval of the Department.

9. **Fees.** The licensee must comply with annual license and annual reporting fee requirements of the Department's rules.

10. **Recycling and Source Reduction Determination for Solid Waste Disposal Facilities.** This condition does not apply to the expansion of a commercial solid waste disposal facility that accepts only special waste for landfilling.

    The solid waste disposal facility shall only accept solid waste that is subject to recycling and source reduction programs, voluntary or otherwise, at least as effective as those imposed by 38 M.R.S. Ch. 13.

11. **Deed Requirements for Solid Waste Disposal Facilities.** Whenever any lot of land on which an active, inactive, or closed solid waste disposal facility is located is being transferred by deed, the following must be expressly stated in the deed:

    A. The type of facility located on the lot and the dates of its establishment and closure.

    B. A description of the location and the composition, extent, and depth of the waste deposited.

    C. The disposal location coordinates of asbestos wastes must be identified.

APPENDIX 18A
Host Community Agreement

HOST COMMUNITY AGREEMENT BETWEEN TOWN OF NORRIDGEWOCK, MAINE AND WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.

October 16, 2019

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Attachments

A Section of the Crossroads Water Quality Monitoring Plan
B Property Value Assurance Guarantee
C Transporter Rules and Requirements
D Waste Management, Inc. Guarantee

AGREEMENT

This Agreement ("Agreement") is made and entered into this 16th day of October, 2019, by and between the TOWN OF NORRIDGEWOCK, a Maine municipal corporation (the "Town"), and WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE ("WMDSM"), a Maine corporation.

Recitals

1. WMDSM owns and operates a solid waste disposal facility, located on property owned by WMDSM in Norridgewock, Maine. The facility is commonly known as the Crossroads Landfill.

2. The facility is currently permitted by the Maine Department of Environmental Protection ("DEP") for the disposal of non-hazardous waste materials. Also on the site are closed solid waste and asbestos landfills.

3. WMDSM desires to expand its disposal operation at the facility to provide for an additional capacity of approximately 7,000,000 to 8,000,000 cubic yards (the "Phase 14 project"). The Phase 14 project includes, construction of a new lined landfill and associated infrastructure such as access roads and leachate, landfill gas, and stormwater management systems. The currently permitted landfill areas and the Phase 14 landfill together shall hereinafter be referred to as the "Facility".

4. WMDSM has agreed to cause Waste Management, Inc. ("WMI"), as set forth herein to be guarantor of the conditions set forth in this Agreement.

NOW THEREFORE, in consideration of the mutual covenants and agreements hereinafter set forth and assuming all of the required state, federal and local permits are obtained by WMDSM, the Town and WMDSM agree as follows:

Agreement

1. Scope and Effective Date of Agreement.

This Agreement supersedes the January, 2002 Host Community Agreement between the Town and WMDSM. This agreement shall take effect upon execution by a majority of the Town's Board of Selectmen and a duly authorized representative of WMDSM (the "effective date").

2. Term of Agreement.

The term of this Agreement (the "term") will commence on the effective date and will continue in effect during the entire period of time the Facility is permitted by DEP, or any successor agency to accept waste materials for disposal. The Town reserves the right to renegotiate this Agreement in the event of any expansion beyond Phase 14.

3. Acceptance of Incoming Waste.

3.1. The terms "solid waste", "special waste" and "hazardous waste", as used in this Agreement, will have the meanings set forth in the laws of the State of Maine, which definitions may change from time to time. The term "waste materials" will include both solid waste and special waste, but will exclude regulated hazardous waste.

3.2. WMDSM agrees it will not accept materials classified by the State of Maine or by federal statute, rule or regulation as hazardous or nuclear wastes, which classifications may change from time to time.

3.3 In consideration of the sum of $1.00 per year paid by the Town to WMDSM, WMDSM agrees to accept at its Facility all solid waste emanating from domestic and normal commercial sources generated in the Town.

3.4. Any resident of the Town who wishes to transport, in personal vehicles, solid waste to the Facility may do so provided they display, in clear view, a window decal issued by the Town, or its agent, for purposes of residential identification. Commercial haulers disposing of

solid waste generated in the Town shall also be allowed the use of the Facility for the above stated annual consideration.

3.5. The Town acknowledges and agrees to WMDSM's acceptance of waste materials regardless of state of origin and quantity, but in accordance with state and federal regulations provided that such waste is not "hazardous waste" or "nuclear waste" as those terms are defined by the State of Maine and federal law, statute and regulation, which definitions may change from time to time.

3.6. Hours of Operation.

Except for mandated loads which WMDSM is required to accept at its facility (such as time-sensitive deliveries that must be accepted after normal business hours), WMDSM will not admit vehicles transporting solid waste to its Facility at Norridgewock, Maine, before 6:30 A.M., and not later than 6:30 P.M., and transporting vehicles shall not be permitted to park outside the Facility awaiting entrance during the off hours. Except for the types of deliveries identified above, WMDSM will not conduct normal operations including the acceptance of solid waste deliveries, at its landfill Facility on the following holidays:

New Year's Day
Easter
Memorial Day
Thanksgiving Day
Christmas Day

3.7. WMDSM will maintain on file with the Town its current Emergency Action Plan. If said plan requires modification, the Town will be notified in advance writing of the proposed modification and afforded the opportunity to provide input regarding the modification.

3.8. The Facility shall designate and utilize only one entrance at any one time for vehicles transporting waste materials for disposal, except as necessary for the citizen drop-off transfer station.

4. Intentionally left blank.

5. Environmental Monitoring Program.

5.1. WMDSM shall provide to the Town and its designated consultants, reasonable access to the Facility to observe landfill construction, operation, mitigation, closure, or monitoring activities. WMDSM shall provide to the Town copies of documents available to state or federal regulatory agencies as requested by the Town and its consultants. Where practicable, WMDSM will provide information required by this Section 5 to the Town electronically.

5.2. WMDSM shall provide to the Town one copy (two upon request) of each report required to be submitted to the Maine DEP in the Section of the WMDSM Water Quality Monitoring Plan (WQMP) - titled Reporting, simultaneous with the submission to DEP. A copy of that section of the WQMP is provided as Attachment A to this Agreement for reference. The appended section will be replaced only by DEP approved updates, with such updates provided to the Town by WMDSM within 60 days of approval. WMDSM shall concurrently provide one copy to the Town Manager of any notice made to the DEP per that section of the WQMP addressing potential exceedances. Subsequent to such notice, WMDSM will provide to the Town prompt copies of all DEP correspondence pertaining to that notice (such as well resampling, work plans, and evaluations, if required).

5.3. If requested by the Town, WMDSM shall provide to the Town and its consultants splits of any or all samples collected by WMDSM during surface water, groundwater, and leachate monitoring activities. WMDSM and the Town shall mutually agree upon the EPA

certified laboratories and analytical protocols to be used by the Town for analysis of the splits. The laboratories and protocols agreed upon shall be adhered to unless or until WMDSM and the Town agree to changes in writing.

5.4. WMDSM has previously paid $160,000.00 to the Town and the Town has maintained such amounts in a fund that is controlled by the Town (the "Technical Assistance Fund"). To date, the Town has not used any of the funds in the Technical Assistance Fund. The Town agrees to use the Technical Assistance Fund solely for direct technical support necessary for the conduct of municipal planning and decisionmaking consistent with the purposes set forth in 38 M.R.S. § 1310-N(9)(B)(3) and 06-096 CMR Section 400.7.A.(2)(c) and (3). If the entirety of the Technical Assistance Fund has been spent consistent with 38 M.R.S. § 1310-N(9)(B)(3) and 06-096 CMR Section 400.7.A.(2)(c) and (3), upon written request from the Town, WMDSM will provide the Town with an additional $100,000.00 to replenish the Technical Assistance Fund, and thereafter will replenish the Technical Assistant Fund with $100,000.00 each time the Technical Assistance Fund is fully depleted, until such time as Phase 14 waste disposal operations cease. If there are funds remaining in the account upon final closure of Phase 14 the Town may transfer the balance to its general fund.

6. Compliance with Applicable Laws.

WMDSM agrees to conduct all Facility operations in compliance with all permits and applicable federal, state, county and municipal laws and regulations. The performance of this Paragraph may be suspended by WMDSM in the event that the disposal of waste materials is prevented by a cause or causes beyond the reasonable control of WMDSM. Such causes will include, but not be limited to acts of God, fire, explosion, accident or flood. If WMDSM is unable

to perform under this Agreement due to such cause, WMDSM shall notify the Town as soon as practicable.

WMDSM agrees to provide the Town, within thirty (30) days of receipt, with copies of any and all Notices of Violation, warning letters, inspection reports or other documents alleging a violation of any permits or applicable federal, state, county and municipal laws and regulations received by WMDSM regarding the Facility from any court or federal, state or local environmental agency.

7. Real and Personal Property Taxes.

WMDSM agrees to pay its real and personal property taxes to the Town and agrees not to seek any exemption under State law from the requirement that it do so. Nothing in this provision is intended to preclude WMDSM from seeking an exemption under State law from the requirement that it pay State sales and/or use tax on any material or equipment associated with construction or operations at the Facility.

8. Host Community Fees.

8.1 Except as set forth in Section 8.3 below, WMDSM will pay to the Town as an Annual Host Fee the following sums for each ton of waste brought in to and landfilled at the Facility.

Period	Per Ton Rate
For the period commencing upon the effective date and continuing until December 31, 2019	$1.70 ("Current Rate")
For the period commencing January 1, 2020 and continuing until issuance of final non-appealable federal, State and local approvals for the Phase 14 project	$2.50 ("Interim Rate")
For the period commencing upon issuance of final non-appealable federal, State and local approvals for the Phase 14 project and continuing until commencement of Phase 14 waste disposal	$3.25 ("Phase 14 Approval Rate")
For the period commencing upon commencement of Phase 14 waste disposal and continuing throughout the remaining life of the Phase 14 project	$3.80 ("Phase 14 Operation Rate")

Each of the Interim, Phase 14 Approval, and Phase 14 Operation rates above, as well as the ADC Rate specified in Section 8.5 below, shall increase annually by 3% as an agreed upon consumer price index adjustment ("CPI adjustment"), except that once the per ton rate reaches $5.00, the CPI adjustment will be reduced to 1% annually.

For purposes of this Agreement, final, non-appealable federal, State and local approvals for the Phase 14 project means that all approvals required by the U.S. Army Corps of Engineers, the Maine Department of Environmental Protection, and the Town of Norridgewock for construction and operation of the Phase 14 project (collectively "regulatory approvals") have been issued and are final and (i) the applicable deadline for bringing an administrative or judicial appeal of any such regulatory approval has run and no administrative or judicial appeal has been filed, or (ii) if an appeal has been filed, the appeal has been satisfactorily resolved allowing the Phase 14 project to proceed and the regulatory approval is not subject to further appeal.

8.2 Payment shall be made to the Town on or before the 25th day of each month following the last calendar day of the preceding month. Payment of the Annual Host Fee shall be based upon the Monthly Tickets Summary Report prepared for and filed with the Maine Department of Environmental Protection, which shall be provided to the Town. The Town may use the Annual Host Fee for any purpose, including, but not limited to the following: (a) improvement, maintenance and repair of local roads directly affected by traffic to and from the Facility and of other infrastructural elements directly affected by the Facility; (b) development and maintenance of adequate local emergency response capacity to accommodate the Facility; (c) financial support for personnel or other means to provide technical assistance to the municipality in interpreting data and to advise the municipality on other technical issues concerning the Facility; and (d) other issues determined on a case-specific basis by the Town. WMDSM's obligation to pay the Annual Host Fee to the Town shall terminate if WMDSM is subsequently required by any ordinance adopted by the Town to establish a Trust Fund for accidental occurrences with monies to be provided by WMDSM.

8.3 WMDSM shall not be required to pay an Annual Host Fee on waste emanating from the Town and accepted at the Facility pursuant to Sections 3.3 and 3.4 of this Agreement.

8.4. If the Annual Host Fee is less than $75,000 (the guaranteed minimum), WMDSM shall pay the difference to the Town on or before the 25th day of the eighth month following the close of such twelve month period. WMDSM shall not be required, however, to pay the guaranteed minimum if it is prevented by any federal, state or local regulatory body or federal or state court or Acts of God from accepting and/or disposing of waste at the Facility.

8.5. Commencing January 1, 2020, materials approved by the State of Maine as Alternative Daily Cover and used as such are subject to a Host Community Fee of 50 cents per ton (the "ADC Rate").

9. Property Value Guarantees.

Within three months of the date of receipt of all final, non-appealable federal, State and local regulatory approvals for Phase 14 of the Facility, upon request, WMDSM will offer to enter into property value guarantee agreements ("Property Value Guarantees"), a copy of which is attached as Attachment B, with the owners of real property which abuts the Facility and which contain single family residences occupied by the persons who own such property on the Effective Date. WMDSM will enter into a Property Value Guarantee with any such property owner who chooses to do so.

10. Intentionally left blank.

11. Intentionally left blank.

12. Waste Transporters.

12.1. Upon execution of this Agreement, WMDSM will require all waste transporters using the Facility to comply with WMDSM's Transporter Rules and Requirements. These requirements shall address, at a minimum, routing, scheduling, load securing, reasonable community concerns (e.g., odor, speed limits, etc.) and non-compliance. A copy of the current Transporter Rules and Requirements is attached as Attachment C.

13. Attorney's Fees.

13.1. Within 60 days of execution of this Agreement, WMDSM agrees to reimburse the Town its reasonable attorney's fees, in an amount not to exceed $10,000, incurred in negotiating this Agreement.

14. Intentionally left blank.

15. Indemnity, Release and Duty to Defend.

15.1. WMDSM agrees to defend, indemnify and save harmless the Town from and against any and all liabilities, penalties, fines, forfeitures, demands, claims, causes of action, suits,

and costs and expenses incidental thereto (including cost of defense, settlement, and reasonable attorney's fees), which any and all of them may hereafter suffer, incur, be responsible for or pay out as a result of bodily or personal injuries (including death) to any person, damage (including loss of use) to any property (public or private), arising out of breach of any of the terms hereof by WMDSM, or the willful misconduct or negligent act or omission of WMDSM, its employees or subcontractors in the performance of this Agreement whether occasioned by environmental pollution or other cause arising from the general operation of the Facility. The foregoing notwithstanding, WMDSM shall not indemnify the Town from any such liabilities or costs arising from the negligence or willful misconduct of the Town, its employees, officers, agents or third parties not under contract to or control of WMDSM.

15.2. In the event WMDSM fails to maintain its insurance coverages set forth in this Agreement, ceases to exist, declares either voluntary or involuntary bankruptcy or insolvency, merges or consolidates those events, WMDSM, its successors and assignees will agree to defend, indemnify and save harmless the Town from and against any and all liabilities, penalties, fines, forfeitures, demands, claims, causes of action, suits, and costs and expenses incidental thereto (including cost of defense, settlement, and reasonable attorney's fees) which any or all of them may hereinafter suffer, incur be responsible for or pay out as a result of bodily or personal injuries (including death) to any person, damage (including loss of use) to any property (public or private), including clean up and related costs directly or indirectly caused by or arising out of breach of any of the terms hereof by WMDSM, or the willful misconduct or negligent act or omission of WMDSM, its employees or subcontractors in the performance of this Agreement whether occasioned by environmental pollution or other cause arising from the general operation of the Facility.

15.3. The obligations and indemnification provided in this Agreement shall be guaranteed by WMI as provided in Attachment D.

15.4. Whenever the Town receives notice of any claim or action that the Town believes is covered by the indemnification provisions of this Agreement, the Town shall, within 10 working days after receiving such notice, present WMDSM with written notice of the action or claim and shall make a demand of WMDSM to cover the costs of defending such claim or action pursuant to the provisions of this Agreement.

15.5. No action or inaction of the Town shall be deemed a waiver of the indemnity provisions of this Agreement.

15.6. The indemnification provisions of this section specifically survive termination of this Agreement.

16. Insurance.

16.1. WMDSM shall provide the Town annually with evidence of insurance, issued by a carrier qualified to do business in the State of Maine, in the amounts and coverage set forth below or such other amounts as the parties may agree from time to time:

Coverages	Limits of Liability
Worker's Compensation	Statutory
Employer's Liability	$10,000,000
Personal Bodily Injury Liability Combined Single Limit	$10,000,000

Automobile Bodily Injury Combined Single Limit	$10,000,000
Automobile Property Damage Combined Single Limit	$10,000,000
Excess Umbrella Liability each occurrence	$2,000,000
Pollution Legal Liability Annual Aggregate	$12,000,000

The Town agrees that the underlying limits of liability may be less than the above minimum amounts if made up for by excess umbrella liability coverage. Such certificates of coverage shall stipulate that the insurance will not be cancelled without 30 days' prior written notice to the Town except for nonpayment of premiums, in which case it will be 10 days' prior written notice..

16.3. WMDSM shall direct its insurance carriers to name the Town as an additional insured where appropriate in the context of the coverage, including all endorsements and extensions in effect on January 1st of each year, but not less than the limits in effect on January 1, 1993.

17. Default.

In the event of any default under or breach of any of the terms of this Agreement, WMDSM shall have thirty (30) days from the date of written notice of such default by the Town to effect a cure of the default. The time provided to cure under this section may be extended upon agreement by the parties. In the event of a failure to cure the breach or default within the time frame provided, the Town may demand and shall be entitled to receive from WMDSM, liquidated damages in the amount of $50.00 per day for each additional day that WMDSM fails to cure the default. The parties agree that the Town's actual damages as a result of WMDSM's default are difficult to predict and that the amount set forth herein as liquidated damages is a reasonable

amount in light of all the circumstances surrounding this Agreement. WMDSM agrees to pay any liquidated damages under this Section 17 within 30 days of receipt of the notice of breach or default, except to the extent there is a dispute over whether a breach or default has occurred, in which case WMDSM agrees to pay any liquidated damages within 30 days of a final judicial determination that a breach or default has occurred. If a breach or default is not remedied in the time specified herein, the Town may seek the following remedy, including all reasonable costs and reasonable attorney's fees to seek such remedy: judicial remedies of specific performance or actual damages for personal injury, property damage, harm to the environment or any other actual damages suffered by the Town as a result of the act or failure of WMDSM in performing its obligations under this Agreement.

18. Assignment/Transfer of Permit.

This Agreement may not be assigned by WMDSM, and the Facility's permit may not be transferred, the Facility sold, or the operation of the Facility transferred to any person not a party to this Agreement unless WMDSM obtains a written agreement from such person to be bound by the terms of this Agreement.

19. Specific Performance.

The parties agree that any breach of the provisions of this Agreement cannot be remedied by damages and that any party shall have the right to seek specific performance to enforce compliance with the material provisions of this Agreement. Such remedy, however, shall not be exclusive, but shall be in addition to any other remedy which such party may have.

20. Consequential and Incidental Damages.

In no event under this Agreement shall either party be liable to the other for consequential or incidental damages arising from the breach or alleged breach of the Agreement, except to the

extent such damages may be part of a third-party claim that is covered under the indemnification provisions of Section 15 of this Agreement.

21. Miscellaneous.

21.1. Each of the parties agrees to execute and deliver to the other party any and all documents or instruments that may be necessary or appropriate to effectuate the provisions of this Agreement.

21.2. This Agreement and the performance hereof will be construed and interpreted in accordance with the laws of the State of Maine, without regard to the conflicts of laws rules of the State of Maine or any other state.

21.3. This Agreement constitutes the entire Agreement between the parties in connection with the subject matter hereof. This Agreement may not be modified orally or by any ordinance, rule or regulation of the Town, and no modification will be effective unless in writing and signed by the parties to be bound, making specific reference to the changes made to this Agreement. A facsimile signature of either party shall have the same binding legal effect as an original signature.

21.4. Each of the parties agrees that this Agreement is legal and binding upon them and that the Agreement inures to the benefit of both parties, and their respective successors and assigns.

21.5. All required notices and other communications permitted or required will be made in writing, and will be deemed to have been given if delivered or mailed by certified mail or by a nationally recognized overnight mail service, or via facsimile, to the parties, at the following addresses:

To the Town:	Chairman, Board of Selectmen Town of Norridgewock P.O. Box 7 Norridgewock, Maine 04957
To WMDSM:	Site Manager Waste Management Disposal Services of Maine, Inc. Crossroads Facility P.O. Box 629, Route 2 Norridgewock, Maine 04957

21.6. Each party represents to the other that the individuals executing this Agreement on their behalf are duly authorized and empowered to do so.

21.7. This Agreement is for the exclusive benefit of the parties and will not be deemed to give any legal or equitable right, remedy or claim whatsoever to any other person.

21.8. This Agreement may be executed in counterparts, each such counterpart will constitute an original and all such counterparts will constitute one and the same instrument.

IN WITNESS WHEREOF, the parties have executed this Agreement as of the 16th day of October, 2019.

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.

By: _____

Its: PRESIDENT

TOWN OF NORRIDGEWOCK BOARD OF SELECTMEN

Ronald Frederick, Chair

James Lyman, Vice Chair

Joshua Chartrand

Matthew Everett

Sara Wilder

ATTACHMENT A

MONITORING PLAN

WATER QUALITY MONITORING PLAN – REVISION 6.3

Crossroads Landfill
Norridgewock, Maine

Submitted To: Maine Department of Environmental Protection
Bureau of Remediation and Waste Management
17 State House Station
Augusta, Maine 04333 USA

Submitted By: Waste Management Disposal Services of Maine, Inc.
Crossroads Landfill
P.O. Box 629
357 Mercer Road
Norridgewock, Maine 04957 USA

Prepared By: Golder Associates Inc.
670 North Commercial Street, Suite 103
Manchester, New Hampshire 03101 USA

Distribution:

2 Copies – Maine DEP
2 Copy – WMDSM
1 Copy – Town of Norridgewock
1 Copy – Golder Associates

March 2018

Project No.: 983-6836

A world of capabilities delivered locally

Golder Associates

9.0 REPORTING

WMDSM will submit the EDD and corresponding laboratory reports for each tri-annual sampling event to Maine DEP within 30 days of receipt of the complete laboratory EDD in accordance with MSWR Chapter 405.3.C. After the first tri-annual sampling event (April/May) WMSDM will submit an annual report summarizing all data collected since the previous annual report was submitted in accordance with MSWR Chapter 405.3 C. The report will be titled the "Annual Sampling Report".

WMDSM also submits an Annual Water Quality Monitoring Summary every April for the previous calendar year. This summary is a required component of WMDSM's Facility-Wide Operational Annual Report (Chapter 401(4)(D)). Section 9.2 describes the information included in the Annual Water Quality Monitoring Summary.

9.1 Annual Sampling Report

As presented above, WMDSM will prepare an annual sampling report each year for submission to the Maine DEP. The items outlined below will be included in each report.

- Cover letter identifying any VOC detections and any inorganic detections exceeding applicable standards
- Introduction
- Overview of sampling locations including:
  - Groundwater
  - Surface Water
  - Leachate Collection and Leak Detection
  - Wick Drains
- Overview of sampling collection protocols
- Field inspection results for monitoring wells and surface water sampling locations
- Analytical results of QA/QC samples including trip blanks and field duplicates
- A summary of office QA/QC activities including review of the following:
  - Chain-of-custody forms for completeness
  - Sample cooler temperatures for laboratory receipt of coolers at ≤ 6°C
  - Sample holding times for analysis within holding times
  - Laboratory narratives for identification of analytical issues and potential bias in results
  - Data validation completed according to the MEDEP Basic Data Review Checklist
- Tabulation of relative percent differences (RPD) for duplicate samples and identification of RPDs greater than 10%
- Identification of all parameters detected in trip blanks
- Evaluation of analytical results for the following media:
  - Groundwater – include tabulation and/or discussion of:

- Turbidity versus TSS
- TDS versus specific conductivity (SC) ratios and identification of ratios outside the 0.55 to 0.75 range
- Major ion (cation/anion) electrical balance. Balances between 10-20% will be noted. Balances exceeding 20% will be reviewed and discussed.
- All detections of VOCs, and comparison to the USEPA Maximum Contaminant Level (MCL) and secondary standards and Maine's Maximum Exposure Guideline (MEG) values (see Appendix F).
- Inorganic compounds that exceed the USEPA MCL, Secondary MCLs, and/or Maine's MEG values.
- Historical groundwater data
- Analytical results outside of historical ranges (i.e., new maximum and minimum detections) for locations with five or more samples
- Trace metal detections
- A statistical analyses of groundwater quality results in accordance with the Maine DEP-approved statistical analysis program presented in Appendix G. The statistical analysis program includes an interwell statistical analysis of groundwater quality data surrounding Phases 11 and 12 and a site-wide intrawell trend analysis.
- An evaluation of the results from the statistical analysis. This will include a discussion of any potential change in groundwater quality including increasing or decreasing trends identified in the intrawell analysis and downgradient results above the background values identified in the interwell groundwater analysis of Phases 11 and 12.
- An overview of additional sampling locations including the following water supply wells:
    - The "New Office" and "Garage" wells are water supply wells on the Crossroads property. Maine DEP does not require monitoring of these locations; however, samples may be collected and analyzed from these wells annually at WMDSM's discretion.
    - The "Totman" well located upgradient of the Crossroads property and is considered a water supply well, but is not used as a drinking water supply well. The Maine DEP does not require monitoring of the "Totman" well, but samples may be collected and analyzed from this well annually at WMDSM's discretion.
- Micro-purging performance data as described in Appendix D

- Surface Water – include tabulation and/or discussion of:
    - All detections of VOCs, and comparison to Surface Water Quality Criteria (SWQC) (see Appendix F).
    - Inorganic compounds that exceed SWQC
    - Historical surface water data
    - Analytical results outside of historical ranges (i.e., new maximum and minimum detections) for surface water locations with five or more samples
    - Trace metal detections

  - Surface water flow rates
  - Time-series trend plots for a subset of indicator parameters including: Na, Ca, COD, and TOC. A visual trend analysis of these indicator parameters will be conducted.
- Leachate Collection and Leak Detection – include tabulation and/or discussion of:
  - Leachate collection and leak detection flow rates
  - Leachate collection and leak detection historical data
- Wick Drains – include tabulation and/or discussion of:
  - All detections of VOCs, and comparison to USEPA MCL and secondary MCL standards and Maine's MEG values (see Appendix F)
  - Inorganic compounds that exceed USEPA MCL, secondary MCLs, and Maine's MEG values
  - Historical wick drain data
- Landfill gas migration monitoring including data from landfill gas permanent monitoring probes and manhole monitoring locations (including percent methane, ambient temperature, and barometric pressure).

- Summary of the findings and conclusions of the tri-annual event

The annual report will also include the following figures:

- Site location
- Groundwater, surface water, and water supply well sampling locations
- Wick drain, leachate collection, and leak detection sampling locations
- Groundwater potentiometric surface contours for phreatic, till, and bedrock

Hard copies of the laboratory analytical reports will not be included in the annual sampling reports, but will be sent electronically with the EDD.

9.2 Annual Water Quality Monitoring Summary

In accordance with Chapter 401(4)(D), WMDSM will submit an Annual Water Quality Monitoring Summary in April for the previous calendar year as part of WMDSM's Facility-Wide Operational Annual Report. The Annual Water Quality Monitoring Summary will present a discussion of data collected during the prior year, including:

- Identification of exceedances of MCLs, Secondary MCLs, and MEGs in groundwater
- Identification of exceedances of SWQCs in surface water
- A summary of quantity and quality of leachate collected throughout the year
- A summary of quantity and quality of liquid collected in the leak detection systems throughout the year
- A summary of landfill gas migration monitoring results
- A summary of condition of the monitoring wells

- A summary of proposed changes to the WQMP

The Annual Water Quality Monitoring Summary will also include:

- Graphs showing the quantity of leachate in the leachate collection system and the quantity of liquid collected in the leak detection system at each phase of the landfill in the prior year.
- Time-series trend plots showing the quality of leachate collected over the available history of the phase. Time-series trend plots will include the following parameters:
  - Magnesium (Mg)
  - Potassium (K)
  - Sodium (Na)
  - Calcium (Ca)
  - Chloride (Cl)
  - Alkalinity
- A summary of the statistical analyses from the annual report, as requested by the Maine DEP.

ATTACHMENT B

ATTACHMENT B

PROPERTY VALUE ASSURANCE AGREEMENT

This Agreement made and entered this day of , 1997, by and between Waste Management Disposal Services of Maine, Inc., a corporation having its local offices at _____ (hereinafter referred to as "WMDSM") and _____, owner(s) of _____ acres of residential property listed at _____, being known as Tax Map Parcel No._____, and/or Tax Account No._____(hereinafter referred to as "Owner(s)").

WHEREAS, WMDSM has proposed to construct and operate an expansion of the existing Crossroads Landfill ("the Landfill Expansion") in the Town of Norridgewock, Somerset County, Maine. The Landfill Expansion will provide several elements critical to an integrated solid waste management system, including a drop-off area for source-separated materials, a wood chipping/grinding operation for beneficial reuse of wood waste and a secure, lined landfill unit for disposal of solid wastes. The Landfill Expansion will include numerous state-of-the-art containment and engineering features and WMDSM believes that such a use will not have a negative effect on any property values; and

WHEREAS, some individuals have expressed concerns about the impact of the Landfill Expansion and WMDSM is offering this Agreement as further assurance that the value of real estate will not be negatively impacted by the existence of the Landfill Expansion.

NOW, THEREFORE, it is agreed between WMDSM and the Owner(s) as follows:

1. Definitions

Appraiser shall mean an appraiser selected jointly by WMDSM and Owner(s) pursuant to Section 6 of this Agreement who shall have at least five (5) years experience appraising residential property in Maine, who is certified by the State of Maine and who is a member of at least one national appraisal association.

Appraised Value shall mean the value of the Property, certified in writing to WMDSM by the Appraiser. The appraisal containing the Appraised Value shall have been done no more than 180 days prior to the date of the Sale of the Property. The appraisal shall disregard any impact on property value resulting from the existence or operation of the Landfill Expansion.

Date of Operation shall mean the day when the Landfill Expansion receives its initial load of solid waste for disposal.

Landfill Expansion shall mean the proposed solid waste landfill expansion described in the preamble of this Agreement, to be located _____ _____ _____. The Landfill Expansion is bordered on the north by _____ _____, on the east by _____, on the west by _____ _____, and on the South by _____.

WMDSM shall mean Waste Management Disposal Services of Maine, Inc., a Maine corporation.

OPERATION shall mean the receipt of solid waste for disposal.

Owner(s) shall mean the person(s) described in the preamble of this Agreement and who owns fee simple absolute title of the Property described in Appendix A hereto at the time of the Sale of the Property.

Property shall mean the residential real estate located in Norridgewock, Maine, owned in fee by the Owner(s) and which is identified on Appendix A. The Property shall consist of the principal residence of the Owner and contiguous land on which Owner's principal residence is located provided that said real estate is not subdivided and sold as separate lots. This Agreement shall not apply to portions of said Property that are subdivided.

Selling Price shall mean the gross price received by the Owner(s) for the Sale of the Property from an independent, and unaffiliated Buyer who is acting on an arm's length basis and who is not under any obligation to buy the Property.

Sale shall be the final closing of the Sale of the Property and giving of a deed by the Owner(s) in exchange of receipt of the Selling Price.

Term shall mean the term of this Agreement specified in Section 8 below.

2. **Representations and Warranties of Owner**

The Owner(s) hereby represents and warrants to WMDSM that (i) the Owner(s) is a full time resident (at least eight (8) months per year) of Norridgewock, Maine; (ii) the Owner(s)

lives in the Property as his/her principal residence; (iii) the Property abuts the Landfill Expansion property; and (iv) that the Owner(s) has owned the Property in fee simple before May 14, 1996.

3. Release

Owner(s) hereby release WMDSM and its predecessors, successors, subsidiaries and parent corporations from any and all liabilities, claims for damages and causes of action related to the value of their Property which Owner(s) directly or indirectly may now have, or which they had at any time prior to the date hereof, which are caused by or in any way related to the development, construction, permitting and lawful operation of the Landfill Expansion.

4. Payment to Owner of Property

WMDSM hereby agrees that, subject to the fulfillment of the conditions and limitations specified in Section 5 below, if during the Term of this Agreement the Selling Price received by the Owner(s) is less than the Appraised Value, WMDSM shall pay the Owner(s) the difference between the Selling Price and the Appraised Value.

5. Conditions of Payment

The obligation of WMDSM to make the payment specified in Section 4, above, shall be contingent on the fulfillment of all of the following conditions:

A. The Landfill Expansion has received all the permits, licenses and authorizations required for construction and operation of the Landfill Expansion under applicable local, State and Federal laws and regulations, and said permits, licenses and authorizations are final and not subject to any appeals .

B. The Landfill Expansion has commenced Operation.

C. The Property is sold by the Owner(s) within the earlier of eight (8) years of the Landfill Expansion commencing Operation or the date that WMDSM ceases disposal operations on the Landfill Expansion property.

D. The Owner(s) of the Property owns the Property at the time of the sale of the Property, and sells the Property to a buyer who is independent of the Owner(s) meaning that Buyer and Owner(s) are not related in any way (i.e., blood, marriage, etc.), there is no business affiliation between Buyer and Owner(s), and Buyer and Owner(s) have not made any special financial sharing arrangement or adjustment to the Selling Price due to the existence of this Agreement.

E. Owner(s) shall give WMDSM notice of a real estate broker with whom they wish to list the Property before executing any Listing Agreement and shall obtain WMDSM's approval of said broker. Approval by WMDSM shall not be unreasonably withheld. If WMDSM objects to said broker, it shall so state its objections in writing to Owner(s) within seven (7) days of receipt of written notice from Owner(s) of the identity of the broker. In addition to stating its objections, WMDSM shall also include a list of at least three (3) approvable brokers for the Owner(s) to choose from. Owner(s) shall not sign the listing contract until after said seven (7) days have elapsed and shall not sign the listing contract if they have received the written objection within said time until the said objection is resolved to the satisfaction of both parties such as by the selection of a mutually acceptable broker, or the Owner(s) select one of the brokers offered by WMDSM.

F. The Property must have been on the market and available and offered for sale for at least 180 days, at a price at least equal to the Appraised Value (the "asking price") by a real estate broker approved by WMDSM pursuant to Section 6(E) above, who is licensed to sell real estate in Maine and who is regularly employed on a full time basis selling residential real estate in the Somerset County, Maine area, not related in any way to Owner(s), who is a member of the Multiple Listing Exchange of the local Board

of Realtors, and who shall have listed the property with all appropriate Multiple Listing Service (MLS) offices. The Owner(s) and his/her broker must make a reasonable number of advertisements and showings of the Property typical for residential Property in the Norridgewock area, which shall be demonstrated by the Owner(s) to WMDSM. Both WMDSM and Owner(s) shall act in good faith concerning any attempts to obtain fair market value for the Property.

G. Said Listing Agreement shall specifically provide that the broker shall list the Property with the Multiple Listing Exchange. Owner(s) shall cooperate with the broker in obtaining a purchaser pursuant to the terms set forth in the Listing Agreement and shall, in good faith, make all reasonable efforts necessary to conclude a sale pursuant to its terms.

H. The Property has received normal maintenance typical for a residence in Norridgewock, Maine and has not been destroyed, substantially damaged or subject to abuse.

I. The Owner must accept the highest Selling Price offered for the Property.

J. Owner(s) agree to provide WMDSM, by Certified Mail, Return Receipt Requested, at the address described in Section 6 of this Agreement, a copy of every offer to purchase which they receive for the Property which is less than the appraised value, and not to accept any of the same until WMDSM has given its approval in writing. WMDSM agrees to respond in writing within 48 hours of receipt of written notice of said offer from Owner(s). If WMDSM approves an offer to purchase at a price below the appraised value, WMDSM agrees to pay at closing to Owner(s) the difference between the appraised value and the actual selling price, subject to the conditions and limitations

herein, in accordance with Section 4 above. WMDSM agrees that it will not unreasonably withhold its approval of any offer received by the Owner.

K. WMDSM may also require that the price set forth in any offer to purchase which is less than the appraised value be countered, and in the event the prospective buyer accepts any such counteroffer, WMDSM agrees to pay at closing to Owner(s) the difference between the appraised value and the amount of the accepted counteroffer, subject to the conditions and limitations herein.

L. WMDSM shall also have the option, at any time after the appraised value is established, to purchase the Property for said appraised value. Said option may be exercised by WMDSM at any time before WMDSM approves an offer pursuant to Section 5 hereof, by giving Owner(s) written notice of WMDSM's intention to exercise its option.

M. Within fifteen (15) days after giving Owner(s) written notice of WMDSM's intention to exercise its purchase option, WMDSM shall obtain a commitment for the issuance of an ALTA Owner's Title Insurance Policy Form B-1970 (amended 10/17/70) in the amount of the purchase price as provided above, to be issued by a title insurance company selected by WMDSM, showing title to the Property to be free and clear of all liens, encumbrances, and easements except municipal ordinances, easements of roads, and privileges or rights of public service companies, if any; otherwise title to the Property must be good and marketable and such as will be insured by WMDSM's title company at regular rates. After receipt of such commitment, WMDSM shall have thirty (30) days to notify Owner(s) of any defects in title not conforming to the above stated requirement. Any such defect shall be cured at the expense of Owner(s). If

any defect cannot be cured and WMDSM is not willing to waive the same, then WMDSM shall have no obligation to purchase the property.

N. In the event Owner(s) are able to convey marketable and insurable title as above stated, Closing shall occur within sixty (60) days after written notice is given by WMDSM pursuant to Section 5(K) above (unless otherwise mutually agreed upon); otherwise, Closing shall occur within sixty (60) days after Owner(s) cure any defects in the title. Owner(s) shall convey the Property to WMDSM by good and sufficient special warranty deed. Owner(s) shall warrant and represent that they have neither notice nor knowledge of any planned public improvements which may result in special assessments or special charges against the Property.

O. This Agreement shall have been executed by the Owner and acknowledged by a Notary Public and returned to WMDSM no later than sixty (60) days after Owner(s) receive written notice from WMDSM that the Maine Department of Environmental Protection (MDEP) has notified WMDSM that its Application for a Solid Waste Disposal Facility is approved.

6. Notice of Proposed Sale by Owner

If during the Term of this Agreement an Owner desires to sell his/her Property, the Owner shall give written notice to WMDSM by Certified Mail, Return Receipt Requested. The Notice shall be sent to: Division President, Waste Management Disposal Services of Maine, P.O. Box 629, Norridgewock, Maine with a copy to: Vice President and General Counsel, 420 Lincoln Highway, Fairless Hills, Pennsylvania 19030.

Owner(s) shall hire a state certified Appraiser approvable by WMDSM who shall appraise the Property and determine its Appraised Value. The Appraisal shall be done no more than 180 days prior to the date of sale of the Property. WMDSM shall pay the Appraiser's fee

and deduct the amount of said fee from any payment made pursuant to Section 4 of this Agreement.

If WMDSM does not approve the Appraiser selected by Owner(s), WMDSM may retain a state certified appraiser at its own expense, who shall appraise the Property and determine its Appraised Value. If Owner(s) do not accept WMDSM's Appraised Value, they may instruct the two previously selected Appraisers to choose a third state certified Appraiser to appraise the Property. The Appraised Value shall then be the arithmetic average of the three appraised values. The appraisal fee for the third Appraiser shall be paid by the Owners. WMDSM agrees that its approval of the appraiser shall not be unreasonably withheld.

7. Payment by WMDSM to Owner

If a payment is required by WMDSM to Owner(s) pursuant to the terms of Section 4 above, Owner(s) shall give written notice to WMDSM to the address specified in Section 6 hereof. WMDSM shall make the Payment required by Section 4 thirty (30) days after receipt of said notice from Owner(s).

8. Term

The term of this Agreement shall be from the date hereof until the earlier of eight (8) years after the Landfill Expansion's Date of Operation or the date that WMDSM ceases disposal operations on the Landfill Expansion property.

9. Termination of WMDSM's Obligations

This Agreement shall terminate and WMDSM shall have no obligation to make any payment to Owner(s) and shall have no option to purchase Property of Owner(s) upon the occurrence of either one of the following events:

a. Expiration of the Term of this Agreement pursuant to Section 8 above; or

b. The sale, transfer, devise, abandonment, surrender, or relinquishment of title by the Owner(s) to the Property which is the subject of this Agreement; or

c. The sale, transfer, devise, abandonment, surrender or relinquishment of title in any way by WMDSM of its property rights associated with the Landfill Expansion property adjoining the Property of Owner(s) or WMDSM's assets supporting the operation of the Landfill Expansion.

10. Cooperation

WMDSM and Owner(s) agree to cooperate to the extent necessary to carry out the terms and conditions of this Agreement, to include, but not limited to, any efforts by WMDSM to record a short form memorandum of this Agreement for the purpose of recording its option to purchase, pursuant to Section 5(M) above.

11. Neither this Agreement nor the rights under it may be assigned, conveyed, or otherwise transferred by Owner(s). The Agreement is personal and does not run with the land; however, said Agreement shall inure to the benefit of Owner(s) and their personal representative, trustees, guardians, custodians or heirs; provided, however, WMDSM's obligations under the Agreement shall nevertheless terminate as set forth in Section 9 hereof.

IN WITNESS WHEREOF, the parties hereto execute this Agreement by their hand and seal.

Waste Management Disposal Services of Maine, Inc.

By: _____

Title: _____

Witness: _____

Owner

_____

_____

_____

Witness: _____

ACKNOWLEDGMENT

State of Maine

County of _____

Before me appeared _____
known to me as of _____
and executed the above Agreement as
free act and deed this ___ day of 1997.

_____
Notary Public
My Commission Expires:_____

ACKNOWLEDGMENT

State of Maine

County of _____

Before me appeared _____
known to me as of _____
and executed the above Agreement as
free act and deed this ___ day of 1997.

_____
Notary Public
My Commission Expires:_____

ATTACHMENT C

WMDSM-Crossroads
Norridgewock, Maine

Transporter Rules and Regulations

As the acknowledged leader in the solid waste industry, our responsibility is to establish and maintain the highest waste management standards.

These standards provide maximum protection to our customers, employees, and the community, ensuring that we conform to both the letter and the spirit of all laws, regulations and permits governing our operations.

A key component of this management process is the transportation of wastes to our facility. Safe transport is as important as safe disposal. Hence, we have developed very stringent transporter requirements to ensure the safety of our employees, our neighbors, and people in the communities in which we do business. Moreover, our concern for safety demands that we rigidly enforce these rules and regulations.

Therefore, we require that EVERY driver obey the letter and the spirit of all Local, State and Federal laws, and our WMDSM-Crossroads transporter rules and regulations. Your safety, as well as the safety of our employees and the public depends upon it.

Jeff McGown
Sr.District Manager
WMDSM-Crossroads

WMDSM-Crossroads compliance:

Transporters will comply with all Federal and State DOT requirements, as well as Maine DEP requirements. All transporters will also comply with this document, the WMDSM-Crossroads Transporter Rules and Regulations.

Scheduling:

- All trucks will be scheduled for arrival on site during operating hours.
- No trucks can arrive and park at the facility before operating hours commence.
- Trucks carrying wastes will be scheduled for arrival during the hours of 7:15 a.m. and 4:30 p.m. (unless prior approval is given).

Designated Route:

- All trucks must travel on State/Federal Highways.
- This also applies to vehicles leaving the facility.
- Absolutely NO DEVIATION from the designated route.

Community Requirements:

- Observe all posted speed limits.
- Observe extreme caution in school zones.
- Do not use engine (Jake) brakes in the town of Norridgewock.
- Ensure all loads are secured to prevent litter and odor issues.

Non-Compliance:

Non-compliance with any of the above rules may result in rejection or delay in servicing of the specific load and/or exclusion of the non-complying driver from the facility.

- A first offense will subject the driver to a verbal warning.
- A second offense by the same driver within one month will subject the driver and hauling contractor to a written warning.
- A third offense within one month will subject the driver to a 2 week ban from the facility.

THE TRANSPORTER AGREES AND CERTIFIES THAT:

A. ALL TRANSPORTER employees will comply with all Federal, State and Local Safety Laws and Rules.

B. ALL TRANSPORTER employees will comply with all WMDSM-Crossroads Safety and Operating Rules and Regulations as posted by signs or communicated by other means at the Norridgewock, Maine facility.

C. ALL TRANSPORTER employees have been trained in the applicable work tasks to be performed by them.

D. ALL TRANSPORTER employees, working in the site designated asbestos area, will be trained and are medically qualified.

E. ALL TRANSPORTER employees will observe the facility scheduled receiving hours.

F. ALL TRANSPORTER employees have been properly instructed to insure strict observation of all safety rules, regulations and routing.

G. ALL TRANSPORTER employees have been provided with a copy of this document and instructed to carry it in their vehicles at all times.

H. HE/SHE will take positive action to cause all such employees to comply with all laws, rules and regulations contained in this document.

_____ _____

Signature of Contractor/Authorized Agent Date

_____

Company Name

_____

Company Address

ATTACHMENT D

ATTACHMENT D

WASTE MANAGEMNT GUARANTEE

Name of Underlying Contract:	Host Community Agreement between Town of Norridgewock, Maine and Waste Management Disposal Services of Maine, Inc.
Date of Underlying Contract:	Dated as of October 16, 2019
Beneficiary:	Town of Norridgewock, Maine
Address:	P.O. Box 7 Norridgewock, Maine 04957
Waste Management Contracting Company:	Waste Management Disposal Services of Maine, Inc.
Maximum Guarantee Obligation:	$500,000
Date of Guarantee:	
Expiration Date of Guarantee:	Date of termination of the above contract

TO THE BENEFICIARY IDENTIFIED ABOVE:

With respect to that certain underlying contract identified above (hereinafter the "Agreement") dated as of the above specified date by and between the Waste Management Contracting Company identified above (the "Contractor") and the beneficiary identified above (the "Beneficiary"), and subject to the terms of this letter agreement (the "Guarantee"), Waste Management, Inc, a Delaware corporation (hereinafter "Waste Management"), hereby irrevocably and unconditionally guarantees to the Beneficiary the due and punctual payment of all amounts payable by the Contractor to the Beneficiary under the Agreement when the same shall become due and payable in accordance with the terms of the Agreement, provided, however, that Waste Management's maximum aggregate obligation under this Guarantee (other than interest and enforcement costs payable as provided herein) shall be the Maximum Guarantee Obligation specified above, and provided further, that in no event shall any amount be or become due hereunder for any matter as to which demand for payment hereunder as provided herein is not made prior to the close of business on the expiration date specified above. Upon failure of the Contractor punctually to pay any such amounts, and upon written demand by the Beneficiary to Waste Management at its address set forth below (or to such other address or person as Waste Management may specify in writing), Waste Management agrees to pay or cause to be paid such amounts. Waste Management shall pay interest on all amounts owed hereunder which are not paid when due at a rate equal to the Prime Rate announced from time to time by Bank of America, Chicago, Illinois, which rate shall change as such Prime Rate changes.

Notwithstanding the foregoing, Waste Management's obligations hereunder as to any claim suit, proceeding, event or other matter in respect of which the Beneficiary at any time shall be seeking payment hereunder (referred to herein as "Guarantee Events") shall be subject to the preconditions that (i) the Beneficiary shall have given written notice of such Guarantee Event to the Contractor promptly after learning thereof, (ii) in the case of any failure by the Contractor to perform any obligation under the Agreement, shall have afforded Waste Management a reasonable opportunity to cure such failure, and (iii) there shall not have occurred and be continuing any material breach by the Beneficiary of its obligations under the Agreement. In any action brought against Waste Management to enforce, or for damages for breach of, its obligations hereunder, Waste Management shall be entitled to all defenses, if any, that would be available to the Contractor in an action to enforce, or for damages for breach of, the Agreement (other than discharge of, or stay of proceedings to enforce, obligations under the Agreement under bankruptcy law).

Waste Management hereby agrees that, except as expressly provided herein, its obligations hereunder will be unconditional and will be discharged only by complete satisfaction of its obligations hereunder, irrespective of any claim as to me lack of authority of the Contractor to execute or deliver the Agreement, the absence of any action to enforce the Agreement, the failure to obtain any judgment against the Contractor, the failure to commence any action to enforce a judgment against the Contractor under the Agreement or any similar circumstance which might otherwise constitute a legal or equitable discharge or defense of a guarantor generally.

Except as set forth above, Waste Management hereby waives diligence, presentment, demand on the Contractor for payment, filing of claims, requirement of a prior proceeding against the Contractor and protest or notice, except as provided for in the Agreement with respect to amounts payable by the Contractor. If at any time payment under the Agreement is rescinded or must be otherwise restored or returned by the Beneficiary upon the insolvency, bankruptcy, or reorganization of the Contractor or Waste Management or otherwise, Waste Management's obligations hereunder with respect to such payment shall be reinstated upon such restoration or return being made by the Beneficiary.

Waste Management represents to the Beneficiary as of the date hereof that:

(1) it is duly organized and validly existing under the laws of the jurisdiction of its incorporation and has full corporate power and legal right to execute and deliver this Guarantee and to perform the provisions of this Guarantee on its part to be performed;

(2) its execution, delivery, and performance of this Guarantee have been and remain duly authorized by all necessary corporate action and do not contravene any provision of its certificate of incorporation or by-laws or any law, regulation, or contractual restriction binding on it or its assets; and

(3) this Guarantee is its legal, valid and binding obligation enforceable against it in accordance with its terms except as enforcement hereof may be limited by applicable bankruptcy, insolvency, reorganization, or other similar laws affecting the enforcements of creditors' rights or by general equity principles.

By accepting this Guarantee and entering into the Agreement, the Beneficiary agrees that Waste Management shall be subrogated to rights of the Beneficiary against the Contractor in respect of any amounts paid by Waste Management pursuant to this Guarantee.

Waste Management acknowledges that the Contractor is a direct or indirect subsidiary of Waste Management and that Waste Management will receive substantial benefit from the performance of the Agreement.

Neither this Guarantee nor the Agreement may be amended without the advance written consent of Waste Management and the Beneficiary. No amendment shall be effective unless set forth in a written instrument so executed.

If Waste Management shall default in the performance of its obligations hereunder, Waste Management shall pay to the Beneficiary all costs incurred by the Beneficiary in enforcing its rights hereunder against Waste Management, including reasonable attorney fees and court costs.

Any notice or other communication required or permitted by the terms hereof shall be in writing and shall be given in a commercially reasonable manner to Waste Management, Inc., 1001 Fannin, Suite 4000, Houston, Texas, 77002 Attention General Counsel, or to such other address as Waste Management shall specify in writing to the Beneficiary at its above-specified address or such other address as the Beneficiary shall notify to Waste Management as provided herein.

This Guarantee shall be governed by and construed in accordance with the internal laws of the State of Illinois applicable to contracts made and to be performed therein.

The Beneficiary's receipt and acceptance of this Guarantee shall constitute the Beneficiary's acceptance of and agreement to each and every term hereof.

WASTE MANAGEMENT, INC.

By: _____

Its: _____

RECEIVED AND ACCEPTED
TOWN OF NORRIDGEWOCK, MAINE

By: _____

Its: _____

APPENDIX 19A

Municipal Intervenor Letter to Town of Norridgewock

WASTE MANAGEMENT

CROSSROADS LANDFILL
P.O. Box 629
357 Mercer Road
Norridgewock, ME 04957
207 634 2714
207 634 4519 Fax

July 2, 2019

Certified Mail/Return Receipt Requested

David Burns, Director
Bureau of Remediation and Waste Management
Maine DEP
17 State House Station
Augusta, ME 04333-0017

Municipal Officers
Board of Selectmen
ATTN: Ronald Frederick, Chair of Board of Selectmen
PO Box 7
Norridgewock, ME 04957-0007

To the Maine DEP and the Town of Norridgewock Municipal Officers:

Please be advised that Waste Management Disposal Services of Maine, Inc. (WMDSM) intends to file an application to expand its existing solid waste disposal facility located in Norridgewock, Maine (referred to as the Phase 14 expansion project) with the Maine Department of Environmental Protection (DEP) in or around early September, 2019. This preliminary notice is being provided in accordance with 38 M.R.S. § 1310-S and Chapter 400, Section 7(B) of the DEP Rules. Copies of the referenced statutory provision and rules are enclosed.

Please be advised that the municipal officers of the Town of Norridgewock have the right to apply for and to receive grants not exceeding $50,000 to support certain activities to intervene before the DEP in the licensing proceeding for the project. The municipal officers of the Town of Norridgewock must request intervenor status within 60-days of this notice or they will have been deemed to have waived the right to receive municipal intervenor grants. The municipal officers of the Town of Norridgewock should contact Linda Butler at the Maine DEP, (207) 287-7885 or Linda.J.Butler@maine.gov, if they have any questions on the process for requesting intervenor status.

Additional public notice of intent to file an application and the date, time and location of the required public informational meeting will be provided at a later date.

If you have any questions on this notice, please contact Sherwood McKenney at (207) 240-9787.

cc: Linda Butler (w/enc.) (via email)

Title 38: WATERS AND NAVIGATION

Chapter 13: WASTE MANAGEMENT

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§1310-S. PUBLIC AND LOCAL PARTICIPATION

In addition to provisions for public participation provided pursuant to Title 5, chapter 375, the following provisions apply to an application for a solid waste disposal facility. [1989, c. 890, Pt. A, §40 (AFF); 1989, c. 890, Pt. B, §249 (AMD).]

1. **Notification.** A person applying for a license under this article or giving notice to the commissioner pursuant to section 485-A shall give, at the same time, written notice to the municipal officers of the municipality in which the proposed facility may be located and shall publish notice of the application in a newspaper of general circulation in the area.

[2011, c. 655, Pt. GG, §14 (AMD); 2011, c. 655, Pt. GG, §70 (AFF) .]

1-A. **Preliminary notice.** Sixty days prior to submitting an application to the commissioner regarding a specific site for a solid waste disposal facility, the applicant shall notify by certified mail the municipal officers of the municipality in which the site is located or, in the unorganized territories, the county commissioners with jurisdiction over the site.

[1989, c. 890, Pt. A, §40 (AFF); 1989, c. 890, Pt. B, §249 (AMD) .]

2. **Public hearing.** The department may hold an adjudicatory public hearing within the municipality in which the facility may be located or in a convenient location in the vicinity of the proposed facility. The department shall hold an adjudicatory public hearing on an application for a new or expanded commercial or state-owned solid waste disposal facility that accepts special waste upon request from a resident or a property owner in the municipality in which the proposed facility is located. Upon a timely request for an adjudicatory hearing from 5 or more residents in the municipality in which the facility is located or abutting property owners of the facility, the commissioner shall hold an adjudicatory public hearing on an application for a vertical increase in the approved final elevation that would increase the waste disposal capacity of a commercial or state-owned solid waste disposal facility that accepts special waste or the commissioner shall request that the board assume jurisdiction in accordance with section 344, subsection 2-A. At a hearing on an application for a vertical increase in the approved final elevation that would increase the waste disposal capacity, the testimony is limited to issues related to relevant standards of review under chapter 13, subchapter 1-A. The hearing must be conducted in accordance with Title 5, chapter 375, subchapter 4. Administrative expenses of a hearing held pursuant to this subsection and all costs incurred by the department in processing an application must be paid for by the person applying for the license as provided in department rules.

[2005, c. 341, §1 (AMD) .]

3. **Automatic municipal intervenor status.** The municipal officers, or their designees, from the municipality in which the facility would be located have intervenor status if they request it within 60 days of notification under subsection 1. The intervenor status granted under this subsection applies in any proceeding for a license under this article. Immediately upon the commissioner's receipt of such a request, the intervenors have all rights and responsibilities commensurate with this status.

[1989, c. 890, Pt. A, §40 (AFF); 1989, c. 890, Pt. B, §249 (AMD) .]

3-A. **Automatic abutter intervenor status.** An abutting property owner has intervenor status in any public hearing held pursuant to subsection 2 if the property owner requests it no later than 10 days following public notice of the hearing. Immediately upon the commissioner's receipt of such a request, the intervenor has all rights and responsibilities commensurate with this status. A party granted intervenor status under this subsection is not eligible for intervenor assistance grants or reimbursements pursuant to subsection 4.

For purposes of this subsection, "abutting property owner" means an owner of property that is both contiguous to the property on which a facility is proposed and within 1 mile of the location of the proposed facility site, including property directly across a public or private right-of-way.

[1997, c. 624, §16 (NEW) .]

4. **Financial assistance.** The commissioner shall reimburse or make assistance grants for the direct expenses of intervention of any party granted intervenor status under subsection 3, not to exceed $50,000. The board shall adopt rules governing the award and management of intervenor assistance grants and reimbursement of expenses to ensure that the funds are used in support of direct, substantive participation in the proceedings before the department. Allowable expenses include, without limitation, hydrogeological studies, waste generation and recycling studies, traffic analyses, the retention of expert witnesses and attorneys and other related items. Expenses not used in support of direct, substantive participation in the proceedings before the department, including attorney's fees related to court appeals, are not eligible for reimbursement under this subsection. Expenses otherwise eligible under this section that are incurred by the municipality after notification pursuant to subsection 1 are eligible for reimbursement under this subsection only if a completed application is accepted by the department. The commissioner may make an additional assistance grant not to exceed $50,000, to be paid by the applicant as provided in department rules, to any party granted intervenor status under subsection 3 on an application for the expansion of a commercial solid waste disposal facility that accepts only special waste for landfilling when the intervenor demonstrates to the commissioner that the size, nature, location, geological setting or other relevant factors warrant additional expenditures for technical assistance. The board shall also establish rules governing:

A. The process by which an intervenor under subsection 3 may gain entry to the proposed facility site for purposes of reasonable inspection and site investigations under the auspices of the department; and [1989, c. 890, Pt. A, §40 (AFF); 1989, c. 890, Pt. B, §249 (AMD).]

B. The reduction in the maximum level of reimbursable costs to the extent the municipality establishes by local ordinance any substantially similar financial requirements of the applicant. [1987, c. 517, §25 (NEW).]

[1997, c. 624, §17 (AMD) .]

5. **Unincorporated townships and plantations.** For the purposes of this section, county commissioners shall act as municipal officers for unincorporated townships, and assessors of plantations shall act as municipal officers for plantations.

[1987, c. 557, §3 (NEW) .]

SECTION HISTORY
1987, c. 517, §25 (NEW). 1987, c. 557, §3 (AMD). 1989, c. 15, §§1,2 (AMD). 1989, c. 585, §E32 (AMD). 1989, c. 890, §§A40,B249 (AMD). 1991, c. 794, §1 (AMD). 1993, c. 378, §8 (AMD). 1995, c. 465, §A19 (AMD). 1995, c. 465, §C2 (AFF). 1995, c. 656, §A25 (AMD). 1997, c. 624, §§15-17 (AMD). 2005, c. 341, §1 (AMD). 2011, c. 655, Pt. GG, §14 (AMD). 2011, c. 655, Pt. GG, §70 (AFF).

06-096

Department of Environmental Protection

Maine Solid Waste Management Rules

CHAPTER 400

GENERAL PROVISIONS

Last Revised: April 6, 2015

(2) For an application related to a state-owned solid waste disposal facility, shall conduct a review that is in accordance with the provisions of this section and is independent of any other contract or agreement between the State and the facility operator or any other party concerning the operation or development of the facility.

H. Modifications. Public benefit determinations may be revised by the department if the department finds that a material change in the underlying facts or circumstances upon which a public benefit determination was based has occurred or is proposed, including, but not limited to a change related to disposal capacity or a change of the owner or operator of a facility. The department may require the holder of a public benefit determination to submit an application for modification of that determination if the department finds that a change in the underlying facts or circumstances has occurred or is proposed.

6. **Recycling.** Except as provided below, in order to receive a license for a new or expanded solid waste disposal facility a person must receive a determination by the Department that the volume of the waste and the risks related to its handling and disposal have been reduced to the maximum practical extent by recycling and source reduction prior to being landfilled or incinerated.

A. Applicability. This section applies to the licensing of any new or expanded solid waste disposal facility, except for the following:

(1) To the extent that solid waste disposal contracts in effect on June 29, 1987 are inconsistent with the provisions of 38 M.R.S.A. §1310-N(5-A)(A), those provisions apply at the expiration of the term of those contracts without consideration of any renewals or extensions of those contracts; or

(2) An expansion of a commercial solid waste disposal facility that accepts only special waste for landfilling is exempt from the requirements of this section.

B. Requirements. The recycling and source reduction requirements of this section are satisfied when an applicant demonstrates that all of the following requirements have been satisfied.

(1) **Consistent with state recycling programs**. The proposed solid waste disposal facility will only accept solid waste that is subject to recycling and source reduction programs, voluntary or otherwise, at least as effective as those imposed by provisions of state law; and

(2) **State Plan**. Except for solid waste disposal facilities established prior to October 3, 1973, an applicant shall demonstrate compliance with the recycling provisions of the State Plan.

7. **Host Community Agreements and Municipal Intervenor Grants**

A. Host Community Agreements. This subsection applies to all applications for new or expanded commercial solid waste disposal facility licenses.

(1) **Licensing Requirements**. An applicant for a new or expanded commercial solid waste disposal facility license shall demonstrate one of the following:

(a) The applicant is complying with municipal ordinances requiring host community benefits;

(b) The applicant has negotiated in good faith, including mediation and binding arbitration if appropriate, with the municipality(ies) in which the facility is proposed to be located to formulate a host community agreement;

(c) The applicant has developed and will implement a host community agreement; or

(d) The applicant has renegotiated, if appropriate, the terms of an existing host community agreement.

(2) **Provisions of host community agreements**. Based upon the nature, size, and projected impacts of the proposed facility, host community agreements must, when applicable, include provisions regarding the following:

(a) Improvements, maintenance, and repair of local roads directly affected by traffic to and from the facility and of other infrastructure elements in the community directly affected by the facility;

(b) Development and maintenance of adequate local emergency response capacity to accommodate the facility;

(c) Financial support for personnel or other means to provide technical assistance to the municipality during the license period in interpreting the data and to advise the municipality on other technical issues concerning the facility; and

(d) Other issues determined on a case-specific basis by the applicant and the municipality to be appropriate given the nature of the facility.

(3) **Expenditure of funds for direct technical support**. Financial support allocated under provision (2)(c) above may only be expended by the host community for direct technical support necessary for the conduct of municipal planning and decision making. This includes, but is not limited to, costs associated with services provided by hydrogeologists, geotechnical engineers, environmental engineers, and other environmental professionals as appropriate.

B. Municipal Intervenor Grants. This subsection establishes procedures for the use of funds by a municipality that has requested intervenor status, pursuant to 38 M.R.S.A. §1310-S, in the Department's licensing proceedings for a new or expanded solid waste disposal facility proposed to be located in that municipality. A municipal intervenor may request financial assistance, consistent with the provisions of this subsection, to pay for direct expenses associated with its substantive participation in the Department's application review process.

(1) **Applicability**. This subsection applies to all new and expanded solid waste disposal facilities, except for the following:

(a) A facility that is permitted by rule under any chapter of these rules; or

(b) Where the applicant is a municipality that, either singly or in cooperation with other parties, applies to locate a facility within its borders.

(2) **Notification of Potential Municipal Intervenors.** In addition to the requirements of 06-096 CMR 2, an applicant for a new or expanded solid waste disposal facility must provide the following:

(a) Preliminary notice. At least sixty days prior to submitting an application with the Department for a solid waste disposal facility license, the applicant shall notify by certified mail the Department and the municipal officers of the municipality in which the facility site is to be located or, in the unorganized territories, the county commissioners with jurisdiction over the proposed facility site; and

(b) This preliminary notice must include a description of the right of the municipal officers to apply for municipal intervenor status, their right to receive grants not exceeding $50,000 to support certain activities to intervene before the Department, and the requirement that they must request intervenor status within 60 days of this notification or be deemed to have waived the right to receive municipal intervenor grants.

(3) **Municipal Intervenor Status.** The municipal officers of the municipality in which the proposed solid waste facility is to be located, or their designees, have automatic intervenor status if they request it within 60 days of being notified under subsection 7(B)(2) above. Upon the Department's receipt of the request, the intervenors have all rights and responsibilities commensurate with this status.

The host municipality loses its right to the municipal intervenor grant if it fails to notify the Department within 60 days after being notified by the applicant under subsection 7(B)(2) above.

(4) **Fees Paid by the Applicant.** In addition to the licensing and processing fees required under 38 M.R.S.A. §§352 and 353, applicants for a solid waste disposal facility shall pay a $50,000 fee at the time of filing. Applications are not complete for processing until this fee has been submitted to the Department, to be deposited in the Maine Environmental Protection Fund. These funds shall be disbursed by the Department to a municipal intervenor or its designees for documented direct expenses associated with its substantive participation in the Department's application review process.

The Department may require the applicant to pay the Department an additional fee not to exceed $50,000 for an application for the expansion of a commercial solid waste disposal facility that accepts special waste for landfilling when the municipal intervenor demonstrates to the Department that the size, nature, location, geological setting or other relevant factors warrant additional expenditures for technical assistance.

(5) **Grant Procedures.** The following procedures are established for the issuance of grants to municipal intervenors in solid waste disposal facility license proceedings before the Department.

(a) **Grant Documents.** The Department shall draft a grant agreement as soon as possible after a qualified municipality has requested intervenor status. All grant agreements must be made with the municipal intervenor. This agreement will formalize the type of services to be used; the frequency and conditions of billing, grant payment or

reimbursement; the required documentation of costs and work output; and audit and grant repayment conditions.

(b) **Eligible Costs**. The major consideration for evaluating whether an expense is eligible for grant funds is whether it is a direct cost that contributes to the municipal intervenor's substantive participation in the Department's application review process. These expenses may include:

(i) Payment or retainer for expert witnesses or hiring qualified professionals in environmentally-related fields and other fields including, but not limited to, engineering, geology, public health, finance or law;

(ii) The cost of using professional services in these fields to evaluate the application, to determine whether to oppose or support it, and to represent or intervene on behalf of the municipality;

(iii) The cost of examining all aspects of the project or license application which must be considered by the Department in determining whether the proposed project may be licensed or not; and

(iv) The direct costs of the municipal officers and their consultants meeting with Department staff, attending hearings, and participating in Department meetings relating to the application or its proceedings.

(c) **Qualified Professionals**. For the purposes of this subsection "qualified professionals" are defined as individuals, companies, and agencies whose primary occupation is to provide the service or expertise in question. A qualified professional may include college professors and other individuals having expertise in the areas or issues being examined. If required by the State of origin, that individual, company, or agency must have all necessary certification to provide the professional service in question.

In selecting and acquiring qualified professionals and expert witnesses, the municipal officers, county commissioners, assessors, or designee may not have any direct or indirect pecuniary interest in the selection or acquisition of any of these services. Direct or indirect pecuniary interest in this case means that the public official is an officer, director, partner, associate, employee or stockholder of a private corporation, business or other economic entity with which the municipality, county government, or quasi-municipal entity contracts, or the public official is directly or indirectly the owner of at least a 10 percent interest in the business or other economic entity.

(d) **Ineligible Costs**. Costs not eligible for grant funds are costs that do not contribute to substantive participation in the Department's application review process and costs that are required of the applicant under a substantially similar financial requirement established through local ordinance. Ineligible expenses include, but are not limited to:

(i) The costs of developing or amending local ordinances or of processing local applications;

(ii) The costs of developing and submitting evidence for Board appeal proceedings which is ruled to be not admissible;

(iii) The costs of court appeals;

(iv) The costs of negotiating a host community agreement with the applicant;

(v) The costs of assisting other interested parties or intervenors with their inquiries or testimony;

(vi) Any costs not documented by the intervenor to the Department;

(vii) Any otherwise eligible costs that are recoverable from the applicant under a substantially similar financial requirement established through local ordinance; or

(viii) "In kind" services. "In kind" services include such items as the rent, maintenance, or overhead of buildings or municipal, county, or plantation operations. In addition, these services include the salaries of any municipal, county, or plantation officers or employees who are involved in the intervenor process as part of their overall duties. The salaries of any officers, members, or employees of any designees are also not eligible for grant reimbursement or payment unless that designee is a qualified professional hired by the municipality, county or plantation to provide specific services.

(e) **Grant Payments**. Upon approval of a grant agreement, grant payments must be made upon the request of the municipal intervenor unless payment is denied for one of the reasons in subparagraph (f) below. Grant payments may be made to the municipal intervenor or, upon written request by the municipality, to its designees.

(f) **Denial of Grant Payments**. A request for payment of grant funds may be denied in whole or part for the following reasons:

(i) The work was undertaken: before the municipality requested intervenor status; after the withdrawal of the solid waste disposal facility application and the municipality has been notified by the applicant that the application was withdrawn; or after withdrawal of the intervenor;

(ii) Expenses otherwise eligible that are incurred by the municipality but the license application is never accepted by the Department;

(iii) Breach of the grant agreement;

(iv) False statements made in any grant submission; or

(v) Expenses are ineligible for payment under subparagraph (d).

(g) **Records, Audits, and Grant Recovery**

(i) **Records**. The municipal intervenor and its designee shall maintain all books, documents, payrolls, papers, accounting records, work product, travel expenses, retainers, and other evidence pertaining to costs incurred under the grant agreement. These materials must be available at their offices at all reasonable times and must be kept for three years following conclusion of all substantive proceedings before the Department and all licensing appeal proceedings for inspection by the Department or any authorized representative of the State of Maine. Copies must be furnished if requested. The municipal intervenor may avoid the need to retain all records for a three year period by turning over all original documents or certified accurate and complete copies of documents to the Department.

(ii) **Audits**. The applicant does not have any right to audit the municipal intervenor's spending. Upon request, the Department shall provide an audit report to the applicant after all the application and appeal proceedings before the Department have concluded.

(iii) **Grant Recovery**. The municipal intervenor must reimburse the Department within 60 days of any determination by the Department that grant funds have been mistakenly paid for ineligible work or any other reason enumerated in subparagraph (f) above. The amount of the reimbursement required shall be the difference between the total grant funds paid and the intervenor's documented eligible expenses.

(h) **Reduction of Grant Total**. A municipal intervenor has the right to utilize all intervenor grant money for direct expenses associated with its substantive participation in the Department's application review process, unless otherwise eligible costs are required of the solid waste disposal facility applicant under substantially similar financial requirements through local fee requirements or ordinances. Any such money required from the applicant for intervention must be subtracted from the grant total. No other funds raised or committed locally or awarded through another grant process may be subtracted from the available grant total.

(i) **Return of Unexpended Grant Funds**. Any grant funds not spent by the municipal intervenor for eligible costs must be returned to the solid waste disposal facility applicant within 60 days of the Department's final disbursement to the intervenor but in no case later than 120 days after final Department action.

(j) **Right of Municipal Intervenors to Gain Entry**. On reasonable notice, officers and qualified professionals hired by a municipal intervenor are permitted entry to a proposed solid waste disposal facility site to accomplish reasonable inspection and investigation of the facility site. Access to the facility site must be during normal working hours and agreed to by the applicant, property owner and the municipal intervenor.

(i) **Reasonable Inspection and Investigation**. Reasonable inspection and site investigation includes: visual inspection and measuring, conducting soil analyses with a handheld soil auger, surveying, photographing, sampling, and other work that will not alter the physical characteristics of the facility site or interfere with the applicant's activity on the property.

(ii) **Restrictions**. An applicant or property owner may require the intervenor to wear and use reasonable safety equipment, remain in the presence of the applicant's representative, only take samples in the presence of the applicant, split samples with the applicant, indicate the analysis and testing to be undertaken, and sign an agreement outlining reasonable conditions of indemnity and liability of each party.

(iii) **Disputes**. The Department shall attempt to resolve disputes regarding reasonable inspection and site investigations under this section.

8. **Right of Entry.** Pursuant to 38 M.R.S.A. §§ 347-C and 1304(4-A), any duly authorized agent or employee of the Department, upon presentation of appropriate credentials, may enter any property at reasonable hours and may enter any building with the consent of the property owner, occupant or agent in order to:

   A. Inspect the property and/or inspect or obtain samples of any solid waste including samples from any conveyance in which solid waste is being or has been transported, as well as samples of any containers or labels;

   B. Inspect and copy any records, reports, information or test results required by license or rule relating to solid waste;

   C. Take photographs or measurements of any solid waste facility;

   D. Obtain samples of the materials of construction; or

   E. Conduct environmental monitoring.

9. **Hazardous And Special Waste Handling And Exclusion Plan**

   A. Standard. Only wastes permitted by Department order may be accepted for handling at a solid waste facility. The operator shall comply with all applicable Federal and State laws regarding the detection, identification, handling, storage, transportation and disposal of special wastes, biomedical wastes and hazardous wastes.

   Unless exempted by other sections of these rules, the operator shall develop and implement a Hazardous and Special Waste Handling and Exclusion Plan for the detection, identification, handling, storage, transportation and disposal of any and all wastes that may be delivered to the facility.

   B. Submissions. A Hazardous and Special Waste Handling and Exclusion Plan for a facility must be submitted to the Department for review and approval prior to implementation. At a minimum, the plan must include the following information:

   (1) **Detection**

   (a) A description of the wastes to be received and the methods to be used for detection, identification, handling, storage, and transportation of unpermitted special and hazardous wastes delivered to the solid waste facility; and also, for solid waste facilities that are not generator-owned, all of below;

APPENDIX 20A

Hazardous and Special Waste Handling and Exclusion Plan

HAZARDOUS AND SPECIAL WASTE HANDLING AND EXCLUSION PLAN

Waste Management Disposal Services of Maine, Inc., - Crossroads Landfill
Norridgewock, Maine

As required by Maine Department of Environmental Protection (MDEP) 06-096 Chapter 400(9), this Hazardous and Special Waste Handling and Exclusion Plan (HSWHEP) has been developed for the detection, identification, handling, storage, transportation, and disposal of unpermitted wastes received at the facility. This document has been prepared as an appendix to Section I - Part B, Waste Characterization / Acceptance of the facility's Site Operations Manual, which describes Waste Management Disposal Services of Maine, Inc.'s (WMDSM's) procedures to characterize and screen wastes prior to acceptance at the facility. Only permitted wastes are accepted for disposal or transfer at the facility. However, unacceptable wastes are occasionally discovered after being discharged or placed at the facility. This HSWHEP details the processes and procedures to protect worker and public health and safety, prevent or mitigate environmental impact, and meet regulatory requirements when unpermitted wastes are identified.

As described in Section I – Part B of the Site Operations Manual, WMDSM operates five permitted disposal units at the Crossroads facility. At the (Residential) Airport Road Transfer Station, wastes are generally unloaded by residents manually and placed in designated areas or containers. At the Commercial Transfer Station*, Woodwaste Processing Facility*, and Material Recovery Facility (MRF), materials are typically discharged from commercial waste collection and hauling vehicles to a concrete or asphalt tipping surface. In the Secure Landfills, wastes are discharged from commercial waste collection and hauling vehicles to the active landfill face.

1. General Administration

(a) Facility Safety Officer: The District Manager is designated as the "Facility Safety Officer" (FSO) with respect to 06-096 Chapter 400(9)(B)(2). The FSO is responsible for health and safety concerns associated with the implementation of this plan, including providing training on applicable aspects of this plan to appropriate operational personnel. When the FSO is not available, the Operations Manager, District Engineer, or other supervisory personnel are designated to act on behalf of the FSO.

(b) Emergency Information: Notifications to outside responders and agencies should generally be made by the FSO or WMDSM managers on duty. However, in emergency situations involving critical injury or exposure, or immediate threats to employee or public health and safety, any employee may dial 911 to summon emergency responders. The following emergency telephone numbers are provided to supervisors and available at facility reception:

WMDSM Emergency Numbers

* As of March 2016, the Commercial Transfer Station (CTS) and Woodwaste Processing Facility were not operating. However, this plan was prepared inclusive of those permitted operations, should activity resume in the future. The MRF is operating in the building originally permitted as the CTS.

Ambulance	**911**
Norridgewock Fire Department	**911** or (207) 634-3330 or 2208
Maine State Police	**911** or (800) 452-4664
Somerset County Sheriff	**911** or (207) 474-9591
Redington-Fairview General Hospital (Directions below)	(207) 474-5121
Northern New England Poison Center:	(800) 222-1222
Asbestos Abatement Program (MDEP)	(207) 287-2651
Oil Spills (MDEP):	(800) 482-0777
Hazardous Material Spills (State Police/MDEP):	(800) 452-4664
Spills to Water Ways (National Response Center)	(800) 424-8802
MDEP Central Regional Office, Waste Management Division	(207) 287-7688

(c) Hospital Directions: The closest location for emergency medical care is Redington-Fairview General Hospital in Skowhegan, Maine. To get there:

- Exit the facility to the south from the facility access road
  (from the Airport Road Transfer Station, take a right and proceed south on Airport Road)
- Turn left onto Route 2, heading east
- At the light in Norridgewock, take a left, continuing on Route 2
- In Skowhegan, turn right onto Main Street
- At top of the hill, bear left onto Fairview Ave./Route 104
- The hospital is on the left - follow the signs to the Emergency Room Entrance.

(d) Emergency Access/Egress: Egress routes are posted in facility buildings, and personnel assembly points are located in front of the MRF and Main Office. If evacuation is necessary, landfill personnel will assemble in front of the MRF. If necessary, the Airport Road Transfer Station attendant will direct evacuation of that area to outside the gate on Airport Road. Emergency access for responders will be communicated during notification, and will typically be via the main facility access road from Route 2, unless the emergency is occurring at the Airport Road Transfer Station, in which case it will be directly to the Airport Road gate.

2. Training

(a) Initial Training: Employees are provided initial training by the FSO, or their designee, upon placement into roles that involve management of waste or recycling materials, or that include activities within the active disposal units at the Crossroads facility. Training includes review and discussion of the HSWHEP, and may involve additional instruction as applicable to employees' respective roles. Training will be documented in facility training records, and at a minimum, initial training will include:

- HSWHEP availability and administration
- WMDSM chain of command
- Emergency notification process and numbers
- Basic hazard assessment

- Evacuation procedures and egress routes
- Detection and identification of unacceptable wastes
- Handling and storage of unacceptable wastes
- Transportation and disposal of special and hazardous wastes
- Reporting requirements

(b) Refresher Training: Refresher training is provided to applicable employees on an annual basis, and includes a review of this HSWHEP. Refresher training may provide updates based on employee roles, and include reviews of specific incidents or situations. Refresher training is documented in the facility training records.

(c) Related Training: WMDSM follows a thorough annual training program covering many aspects of solid waste management and general health and safety. Many of these training programs overlap with aspects of the HSWHEP, and may be used, in part, to comprise refresher training.

3. Reporting

(a) Random Inspection and Unacceptable Waste Log: The results of random inspections of discharged wastes in the Secure Landfill, and unacceptable wastes that have been discharged or deposited and are observed through the course of normal operations at any of the disposal units, are documented on the Random Inspection and Unacceptable Waste Log. A copy of the log form is attached to this HSWHEP.

(b) Hazardous Waste & Hazardous Material Spill Reports: Written reports are required to be submitted to MDEP Bureau of Remediation and Waste Management within 15 days for any incident involving hazardous waste, and within 30 days for any incident involving hazardous materials. The report should be prepared on a form provided by MDEP, and attached to this HSWHEP. Copies of reports should be provided to the Solid Waste Management Division, and kept in the facility records.

(c) WM Spill Form: Spills of oil or hazardous materials should also be documented on Waste Management's internal spill report form and provided to WM Environmental Protection.

4. Detection of Unacceptable Wastes

WMDSM's waste characterization and acceptance program prevents the receipt of most unacceptable wastes. However, unacceptable wastes are occasionally deposited at the facility's disposal units. WMDSM enables the detection of unacceptable waste through the following processes:

(a) Operational Observation: WMDSM's operators are trained to recognize different types of unacceptable wastes. The greatest opportunity to detect unacceptable items is through a high level of awareness and observation during the course of regular operations.

(b) **Random Inspections:** Random inspections are conducted on the secure landfill working face on an average of at least once per operating day, with loads selected at random by the landfill operators. These inspections involve a more focused observation of a load of waste during and following discharge from the hauling vehicle than under normal operations. For safety reasons, operators will generally not leave their equipment for these inspections. The inspections are recorded on the Random Inspection and Unacceptable Waste Log.

(c) **Suspicious Load Inspections:** There are some observations that may lead to suspicion of possible unacceptable wastes in a load. When Waste Management personnel observe these items or conditions, additional inspection and investigation of the load may be warranted to confirm that the waste load is acceptable. The following are some indicators of a suspicious load:

- Chemical or product containers (e.g., buckets, drums, bottles, gas cylinders)
- Warning or danger labels (e.g. toxic, reactive, flammable, biohazard, radioactive)
- Chemical or petroleum odors
- Dust, vapors, or other emissions
- Suspect asbestos-containing materials (e.g., transite, floor tiles, insulation)
- Electronics, electrical equipment, or appliances
- Red bags, or medical wastes
- Oil or chemical staining
- Liquid wastes
- Wastes inconsistent with a provided profile

5. Identification and Notification

Following detection of unacceptable wastes, facility personnel need to take safety precautions, secure the waste from disturbance, ensure proper internal and external notifications are made, and proceed with identification of the material. These steps are important for safeguarding the health and safety of facility personnel and the public, and ensuring that appropriate support and regulatory resources are involved.

(a) **Safety Precautions:** Upon detection of an unacceptable waste, personnel should take initial steps to assess hazards and protect employee and public safety. Although initial hazard assessment is crucial, health and safety assessment should be an ongoing activity until the unacceptable waste has been addressed. Any material that displays signs of an immediate health and safety hazard should result in the evacuation of that immediate area or facility until the appropriate responders (emergency contacts are provided in Section 1(b), above) can identify, contain, and neutralize the hazard. Immediate health and safety hazards include, but are not limited to:

- Fire
- Suspected asbestos dust
- Smoke, vapors, or fumes
- Active chemical reaction
- Unexploded ordnance
- Extreme hazard labeling
- Evidence of human exposure symptoms

If there is no evidence of a health and safety hazard, the immediate area around the suspected unacceptable waste may be cordoned off to prevent disturbance of the waste and, at the direction of the FSO or their designee, other operations may continue as is safely feasible. Other safety measures could include covering or containment, wetting (asbestos), and donning personal protective equipment.

(b) Notifications: Employees that have detected an unacceptable waste should immediately notify their supervisor of the type (if known) and disposition of the waste, observed or suspected hazards, and any initial actions that have been taken – including 911 calls for emergency situations – and the supervisors should immediately inform the FSO. Waste Management Environmental Protection or Engineering personnel should be notified as soon as practicable. The FSO or their designee will contact emergency and/or agency personnel as is applicable for the nature of the unacceptable waste and associated hazards, if any. If the waste has not yet been identified, and taking into account the urgency of necessary response actions, the FSO or their designee may elect to attempt to identify the material prior to making external notifications. Notifications to MDEP will be made as soon as practicable, and generally within 2 hours. WMDSM will endeavor to notify MDEP when an unacceptable waste has been received but identification efforts are ongoing.

(c) Identification: The FSO or their designee will attempt to identify the waste based on container markings, physical appearance, origin (if know), and other observations. If waste cannot be readily identified, or if it is unsafe to attempt to do so, internal Waste Management specialists or external contractors or agencies with appropriate expertise will be consulted to assist. Photographs and video may be used to expedite identification.

6. Handling, Storage, Transportation, and Disposal

(a) Handling: Small quantities of contained, intact, and stable materials may be relocated by WMDSM to the interim special and hazardous waste storage container located at the Airport Road Transfer Station, prior to removal for off-site disposal by an appropriate agency or contractor. Improperly profiled or unpermitted special waste received in the landfill, which does not present a health and safety hazard or other condition exacerbated by disturbance, may be handled using landfill equipment at the direction of the FSO. In cases of larger volumes, spills of hazardous materials or hazardous wastes, or materials presenting an active health and safety hazard, handling and storage will be coordinated with, or directed by, the appropriate regulatory agency or emergency responder. Wastes that pose an immediate health and safety hazard will typically be handled only by emergency response agencies (e.g. Fire Department or State HazMat Team) or qualified hazardous materials contractors. WMDSM shall only handle those wastes that are within their capability, training, and expertise, and as allowed by regulation (e.g. 29 CFR 1910.120 OSHA HAZWOPER). Clean-up and decontamination will be performed as necessary and applicable to the waste involved, and by qualified WMDSM personnel, agencies, or contractors.

(b) **Storage:** Storage at the facility should be avoided or minimized whenever possible. Small, contained, intact, and stable materials may be temporarily placed in the interim special and hazardous waste storage container at the Airport Road Transfer Station. At the direction of the FSO, some special wastes may be staged or stockpiled temporarily in the Secure Landfill pending characterization, profiling, or transport off-site. Any containerized storage (i.e. drums or lab packs) that is pending off-site transportation should be limited to discrete areas on pavement, secure from unauthorized access, and protected from vehicular damage. All containers must be closed and properly labeled.

(c) **Transportation and Disposal:** Transportation and disposal will be coordinated with appropriately licensed transporters and facilities under required profiles, shipping records and/or manifests. For some special wastes, the Crossroads Landfill may be an acceptable disposal location. Shipping documentation should be included with incident reports and retained in facility records.

(d) **Reports:** Incident reports are required for releases of hazardous materials and hazardous wastes, and may be required by MDEP for other incidences of unacceptable waste receipt. The content of incident reports is described in Section 3.

Random Inspection and Unacceptable Waste Log

Waste Management Disposal Services of Maine, Inc.

FACILITY: ☐Secure LF ☐Airport Road TS ☐MRF ☐Commercial TS ☐Woodwaste

TYPE[1] (RI, O)	DATE TIME	TRUCK NO. or PLATE	COMPANY or RESIDENT NAME	UNACCEPTABLE WASTE(S)	RESPONSE	MGR NOTIFIED	INITIALS
O	12/31/16 12:35 PM	406252	Waste Hauler, Inc.	Two 5 gallon buckets of pool chemicals.	Checked buckets for leaks and damage (none) and placed in interim storage container.	John Doe	BDD

[1]**RI = Random Inspection** (may result in no unacceptable materials identified), **O = Other Observation** that detected unacceptable waste.

REVISED 3/30/2016

APPENDIX IB-B

WM EZ Profile

WASTE MANAGEMENT

EZ Profile™

Requested Facility: _____ ❑ Unsure Profile Number: _____

❑ Multiple Generator Locations (Attach Locations) ❑ Request Certificate of Disposal ❑ Renewal? Original Profile Number: _____

A. GENERATOR INFORMATION (MATERIAL ORIGIN)

1. Generator Name: _____
2. Site Address: _____
   (City, State, ZIP) _____
3. County: _____
4. Contact Name: _____
5. Email: _____
6. Phone: _____ 7. Fax: _____
8. Generator EPA ID: _____ ❑ N/A
9. State ID: _____ ❑ N/A

B. BILLING INFORMATION ❑ SAME AS GENERATOR

1. Billing Name: _____
2. Billing Address: _____
   (City, State, ZIP) _____
3. Contact Name: _____
4. Email: _____
5. Phone: _____ 6. Fax: _____
7. WM Hauled? ❑ Yes ❑ No
8. P.O. Number: _____
9. Payment Method: ❑ Credit Account ❑ Cash ❑ Credit Card

C. MATERIAL INFORMATION

1. Common Name: _____
   Describe Process Generating Material: ❑ See Attached

2. Material Composition and Contaminants: ❑ See Attached

1.	
2.	
3.	
4.	
Total comp. must be equal to or greater than 100%	≥100%

3. State Waste Codes: _____ ❑ N/A
4. Color: _____
5. Physical State at 70°F: ❑ Solid ❑ Liquid ❑ Other: _____
6. Free Liquid Range Percentage: _____ to _____ ❑ N/A
7. pH: _____ to _____ ❑ N/A
8. Strong Odor: ❑ Yes ❑ No Describe: _____
9. Flash Point: ❑ <140°F ❑ 140°–199°F ❑ ≥200° ❑ N/A

D. REGULATORY INFORMATION

1. EPA Hazardous Waste? ❑ Yes* ❑ No
   Code: _____
2. State Hazardous Waste? ❑ Yes ❑ No
   Code: _____
3. Is this material non-hazardous due to Treatment, Delisting, or an Exclusion? ❑ Yes* ❑ No
4. Contains Underlying Hazardous Constituents? ❑ Yes* ❑ No
5. From an industry regulated under Benzene NESHAP? ❑ Yes* ❑ No
6. Facility remediation subject to 40 CFR 63 GGGGG? ❑ Yes* ❑ No
7. CERCLA or State-mandated clean-up? ❑ Yes* ❑ No
8. NRC or State-regulated radioactive or NORM waste? ❑ Yes* ❑ No

***If Yes, see Addendum (page 2) for additional questions and space.**

9. Contains PCBs? → If Yes, answer a, b and c. ❑ Yes ❑ No
   a. Regulated by 40 CFR 761? ❑ Yes ❑ No
   b. Remediation under 40 CFR 761.61 (a)? ❑ Yes ❑ No
   c. Were PCB imported into the US? ❑ Yes ❑ No
10. Regulated and/or Untreated Medical/Infectious Waste? ❑ Yes ❑ No
11. Contains Asbestos? ❑ Yes ❑ No
    → If Yes: ❑ Non-Friable ❑ Non-Friable – Regulated ❑ Friable

E. ANALYTICAL AND OTHER REPRESENTATIVE INFORMATION

1. Analytical attached ❑ Yes
   Please identify applicable samples and/or lab reports:

2. Other information attached (such as MSDS)? ❑ Yes

F. SHIPPING AND DOT INFORMATION

1. ❑ One-Time Event ❑ Repeat Event/Ongoing Business
2. Estimated Quantity/Unit of Measure: _____
   ❑ Tons ❑ Yards ❑ Drums ❑ Gallons ❑ Other: _____
3. Container Type and Size: _____
4. USDOT Proper Shipping Name: ❑ N/A
   _____

G. GENERATOR CERTIFICATION (PLEASE READ AND CERTIFY BY SIGNATURE)

By signing this EZ Profile™ form, I hereby certify that all information submitted in this and all attached documents contain true and accurate descriptions of this material, and that all relevant information necessary for proper material characterization and to identify known and suspected hazards has been provided. Any analytical data attached was derived from a sample that is representative as defined in 40 CFR 261 - Appendix 1 or by using an equivalent method. All changes occurring in the character of the material (i.e., changes in the process or new analytical) will be identified by the Generator and be disclosed to Waste Management prior to providing the material to Waste Management.

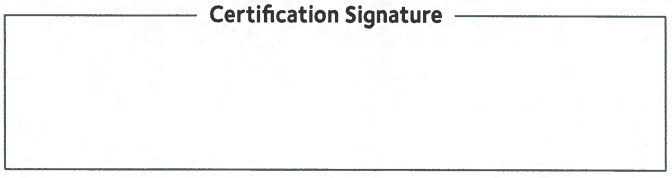
If I am an agent signing on behalf of the Generator, I have confirmed with the Generator that information contained in this Profile is accurate and complete.

Name (Print): _____ Date: _____

Title: _____

Company: _____

Certification Signature



EZ Profile™ Addendum

Only complete this Addendum if prompted by responses on EZ Profile™ (page 1) or to provide additional information. Sections and question numbers correspond to EZ Profile™.

Profile Number: _____

C. MATERIAL INFORMATION

Describe Process Generating Material (Continued from page 1): If more space is needed, please attach additional pages.

Material Composition and Contaminants (Continued from page 1): If more space is needed, please attach additional pages.

5.	
6.	
7.	
8.	
9.	
Total composition must be equal to or greater than 100%	≥100%

D. REGULATORY INFORMATION

Only questions with a "Yes" response in Section D on the EZ Profile™ form (page 1) need to be answered here.

1. EPA Hazardous Waste
   a. Please list all USEPA listed and characteristic waste code numbers:

   b. Is the material subject to the Alternative Debris standards (40 CFR 268.45)? ❑ Yes ❑ No
   c. Is the material subject to the Alternative Soil standards (40 CFR 268.49)? → If Yes, complete question 4. ❑ Yes ❑ No
   d. Is the material exempt from Subpart CC Controls (40 CFR 264.1083)? ❑ Yes ❑ No
      → If Yes, please check **one** of the following:
      ❑ Waste meets LDR or treatment exemptions for organics (40 CFR 264.1082(c)(2) or (c)(4))
      ❑ Waste contains VOCs that average <500 ppmw (CFR 264.1082(c)(1)) – will require annual update.
2. State Hazardous Waste → Please list all state waste codes: _____
3. For material that is Treated, Delisted, or Excluded → Please indicate the category, below:
   ❑ Delisted Hazardous Waste ❑ Excluded Waste under 40 CFR 261.4 → Specify Exclusion: _____
   ❑ Treated Hazardous Waste Debris ❑ Treated Characteristic Hazardous Waste → If checked, complete question 4.
4. Underlying Hazardous Constituents → Please list all Underlying Hazardous Constituents:

5. Industries regulated under Benzene NESHAP include petroleum refineries, chemical manufacturing plants, coke by-product recovery plants, and TSDFs.
   a. Are you a TSDF? → If yes, please complete Benzene NESHAP questionnaire. If not, continue. ❑ Yes ❑ No
   b. Does this material contain benzene? ❑ Yes ❑ No
      1. If yes, what is the flow weighted average concentration? _____ ppmw
   c. What is your facility's current total annual benzene quantity in Megagrams? ❑ <1 Mg ❑ 1–9.99 Mg ❑ ≥10 Mg
   d. Is this waste soil from a remediation? ❑ Yes ❑ No
      1. If yes, what is the benzene concentration in remediation waste? _____ ppmw
   e. Does the waste contain >10% water/moisture? ❑ Yes ❑ No
   f. Has material been treated to remove 99% of the benzene or to achieve <10 ppmw? ❑ Yes ❑ No
   g. Is material exempt from controls in accordance with 40 CFR 61.342? ❑ Yes ❑ No
      → If yes, specify exemption: _____
   h. Based on your knowledge of your waste and the BWON regulations, do you believe that this waste stream is subject to treatment and control requirements at an off-site TSDF? ❑ Yes ❑ No
6. 40 CFR 63 GGGGG → Does the material contain <500 ppmw VOHAPs at the point of determination? ❑ Yes ❑ No
7. CERCLA or State-Mandated clean up → Please submit the Record of Decision or other documentation with process information to assist others in the evaluation for proper disposal. A "Determination of Acceptability" may be needed for CERCLA wastes not going to a CERCLA approved facility.
8. NRC or state regulated radioactive or NORM Waste → Please identify Isotopes and pCi/g: _____

WASTE MANAGEMENT

Additional Profile Information

Profile Number: _____

C. MATERIAL INFORMATION

Material Composition and Contaminants (Continued from page 2): If more space is needed, please attach additional pages.

10.	
11.	
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31.	
32.	
33.	
34.	
35.	
36.	
37.	
38.	
39.	
40.	
Total composition must be equal to or greater than 100%	≥100%

D. REGULATORY INFORMATION

1. EPA Hazardous Waste
   a. Please list all USEPA listed and characteristic waste code numbers (Continued from page 2):

APPENDIX 21A
Liability Insurance Policy Statement

CERTIFICATE OF LIABILITY INSURANCE

1/1/2020

DATE (MM/DD/YYYY): 12/4/2018

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER
LOCKTON COMPANIES
3657 BRIARPARK DRIVE, SUITE 700
HOUSTON TX 77042
866-260-3538

CONTACT NAME:
PHONE (A/C, No, Ext):
FAX (A/C, No):
E-MAIL ADDRESS:

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A : ACE American Insurance Company	22667
INSURER B : Indemnity Insurance Co of North America	43575
INSURER C : ACE Fire Underwriters Insurance Company	20702
INSURER D :	
INSURER E :	
INSURER F :	

INSURED
1300299
WASTE MANAGEMENT HOLDINGS, INC. & ALL AFFILIATED, RELATED & SUBSIDIARY COMPANIES INCLUDING:
WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
P.O. BOX 629
357 MERCER ROAD
NORRIDGEWOCK ME 04957

COVERAGES MENORRID **CERTIFICATE NUMBER:** 14447726 **REVISION NUMBER:** XXXXXXX

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY CLAIMS-MADE X OCCUR X XCU INCLUDED X ISO FORM CG00010413 GEN'L AGGREGATE LIMIT APPLIES PER: POLICY X PRO-JECT X LOC OTHER:	Y	Y	HDO G71212993	1/1/2019	1/1/2020	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG 	$ 5,000,000 $ 5,000,000 $ XXXXXXX $ 5,000,000 $ 6,000,000 $ 6,000,000 $
A	AUTOMOBILE LIABILITY X ANY AUTO X OWNED AUTOS ONLY SCHEDULED AUTOS X HIRED AUTOS ONLY X NON-OWNED AUTOS ONLY X MCS-90	Y	Y	MMT H2527863A	1/1/2019	1/1/2020	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident) 	$ 1,000,000 $ XXXXXXX $ XXXXXXX $ XXXXXXX $ XXXXXXX
A	X UMBRELLA LIAB X OCCUR EXCESS LIAB CLAIMS-MADE DED RETENTION $	Y	Y	XOO G27929242 004	1/1/2019	1/1/2020	EACH OCCURRENCE AGGREGATE 	$ 15,000,000 $ 15,000,000 $ XXXXXXX
B A C	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) Y / N: N If yes, describe under DESCRIPTION OF OPERATIONS below	N / A	Y	WLR C65435846 (AOS) WLR C65435809 (CA & MA) SCF C65435883 (WI)	1/1/2019 1/1/2019 1/1/2019	1/1/2020 1/1/2020 1/1/2020	X PER STATUTE OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	 $ 3,000,000 $ 3,000,000 $ 3,000,000
A	EXCESS AUTO LIABILITY	Y	Y	XSA H25278598	1/1/2019	1/1/2020	COMBINED SINGLE LIMIT $9,000,000 (EACH ACCIDENT)	

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)
BLANKET WAIVER OF SUBROGATION IS GRANTED IN FAVOR OF CERTIFICATE HOLDER ON ALL POLICIES WHERE AND TO THE EXTENT REQUIRED BY WRITTEN CONTRACT WHERE PERMISSIBLE BY LAW. CERTIFICATE HOLDER IS NAMED AS AN ADDITIONAL INSURED (EXCEPT FOR WORKERS' COMP/EL) WHERE AND TO THE EXTENT REQUIRED BY WRITTEN CONTRACT.

CERTIFICATE HOLDER

14447726

TOWN OF NORRIDGEWOCK
P.O. BOX 7
NORRIDGEWOCK ME 04957

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

APPENDIX 23A
Full Disclosure Statement

DISCLOSURE STATEMENT

Waste Management Disposal Services of Maine, Inc.
P.O. Box 629
357 Mercer Road
Norridgewock, Maine 04957

Waste Management Disposal Services of Maine, Inc. (WMDSM) is providing this Disclosure Statement in support of an application for a new solid waste license for Phase 14 of the Crossroads Landfill. The numbered sections below correspond with the sections of Chapter 400(12)(A).

(1) Persons. The applicant, Waste Management Disposal Services of Maine, Inc., is a business entity and, as such, WMDSM is responding to Chapter 400(12)(A)(1)(b). Under this section, the following persons are required to disclose:

b. Business entity. Waste Management Disposal Services of Maine, Inc. - incorporated in the State of Maine on December 22, 1983.

i. **Any officers, directors, and partners.** The following list includes the officers and directors of WMDSM. There are no partners for WMDSM.

Officers and Directors of Waste Management Disposal Services of Maine, Inc.*
(at the time of application)

Name	Title	Title Role
DeSantis, Christopher P.	Director	Director
Tippy, Courtney A.	Director	Director
DeSantis, Christopher P.	President	Officer
Bauman, Brian J.	Vice President	Officer
Haas, Carl D.	Vice President and Assistant Secretary	Officer
Lockett, Mark A.	Vice President and Assistant Treasurer	Officer
Nagy, Leslie K.	Vice President, Chief Financial Officer and Controller	Officer
Reed, David L.	Vice President and Treasurer	Officer
Tippy, Courtney A.	Vice President and Secretary	Officer
Tsai, S. John	Vice President and Assistant General Counsel	Officer
Wilson, James A.	Vice President	Officer
Bennett, Jeff R.	Assistant Treasurer	Officer
Lynch, Gail M.	Assistant Secretary	Officer
Skoutelas, John S.	Assistant Secretary	Officer

*Officers and Directors are elected annually in May, and are subject to change.

ii. **Persons or business concerns having managerial or executive authority and holding more than 5% equity or debt.** There are no persons or business

concerns having managerial or executive authority and holding more than 5% equity or debt in WMDSM.

iii. **Persons or business concerns having a 25% or greater financial interest.** Waste Management Holdings, Inc. (WMH) has a 25% or greater financial interest in WMDSM.

iv. **Managerial person with operational responsibility for the facility.** The following personnel have operational responsibility for the facility.

Operational Responsibility for Waste Management Disposal Services of Maine, Inc.

Name	Title
McGown, Jeffrey	Senior District Manager
Poggi, Steven	Area Director of Disposal Operations

(2) Applicant Information. The full name, business address, and Federal Employer Identification Number of the persons required to disclose under Chapter 400(12)(A)(1)(b) is provided in the table below. To prevent against potential identity theft, WMDSM prefers to keep personal identification information such as home addresses, dates of birth and social security numbers confidential. Please contact WMDSM for further information, if needed.

Applicant Information for Persons Required to Disclose

Name	Disclosure Requirement	FEIN	Business Address
Waste Management Disposal Services of Maine, Inc.	Applicant	01-0392888	357 Mercer Road, Norridgewock, ME 04957
DeSantis, Christopher P.	Officer/Director	-	26 Patriot Place, Suite 300, Foxboro, MA 02035
Tippy, Courtney A.	Officer/Director	-	1001 Fannin, Suite 4000, Houston, TX 77002
Bauman, Brian J.	Officer	-	100 Brandywine Blvd., 3rd Floor, Newtown, PA 18940
Haas, Carl D.	Officer	-	26 Patriot Place, Suite 300, Foxboro, MA 02035
Lockett, Mark A.	Officer	-	1001 Fannin, Suite 4000, Houston, TX 77002
Nagy, Leslie K.	Officer	-	1021 Main Street, Houston, TX 77002
Reed, David L.	Officer	-	1001 Fannin, Suite 4000, Houston, TX 77002
Tsai, S. John	Officer	-	1001 Fannin, Suite 4000, Houston, TX 77002
Wilson, James A.	Officer	-	720 E. Butterfield Road, 4th Floor, Lombard, IL 60148
Bennett, Jeff R.	Officer	-	1001 Fannin, Suite 4000, Houston, TX 77002
Lynch, Gail M.	Officer	-	4 Liberty Lane West, Hampton, NH 03842
Skoutelas, John S.	Officer	-	100 Brandywine Blvd., 3rd Floor, Newtown, PA 18940
Waste Management Holdings, Inc.	>25% Financial Interest	36-2660763	1001 Fannin Street, Houston, TX 77002
McGown, Jeffrey	Operational Responsibility	-	357 Mercer Road, Norridgewock, ME 04957
Poggi, Steven	Operational Responsibility	-	4 Liberty Lane West, Hampton, NH 03842

(3) Related Companies. Of the persons required to disclose under Chapter 400(12)(A)(1)(b), listed above, WMH holds at least a 5% equity interest in numerous companies that collect, transport,

treat, store, or dispose of solid waste or hazardous waste. Due to the significant number of related companies, WMDSM has attached to this section an excerpt from a U.S. Securities and Exchange Commission Form 10-K that lists all related companies. For the purposes of this disclosure, it is suitable to use the business address for WMH, 1001 Fannin Street, Houston, TX 77002. Note that not all companies listed collect, transport, treat, store, or dispose of solid waste or hazardous waste. None of the other persons required to disclose hold a 5% equity interest in companies that collect, transport, treat, store, or dispose of solid waste or hazardous waste.

(4) Criminal Convictions. None of the persons required to disclose under Chapter 400(12)(A)(1)(b), listed above, has criminal convictions of the State, other states, the United States, or another country.

(5) Civil Violations. None of the persons required to disclose under Chapter 400(12)(A)(1)(b), listed above, has adjudicated civil violations of environmental laws or rules administered by the State, other states, the United States, or another country in the five years immediately preceding the filing of the application.

(6) Consent Decrees and Administrative Orders or Agreements. No administrative agreements or consent decrees have been entered into by, or administrative orders directed at, the persons required to disclose under Chapter 400(12)(A)(1)(b), listed above, for violations of environmental laws administered by the Department, the State, other states, the United States or another country in the five years immediately preceding the filing of the application.

(7) Other Proceedings. There are no ongoing court proceedings, administrative consent agreement negotiations, or similar ongoing administrative enforcement actions in which the applicant or the persons required to disclose under Chapter 400(12)(A)(1)(b), listed above, is a party and which concerns environmental laws administered by the Department or State.

(8) Other Information. Agencies outside of Maine that have regulatory responsibilities over the applicant, Waste Management Disposal Services of Maine, Inc., in connection with its collection, transportation, treatment, storage, or disposal of solid or hazardous waste include the U.S. Environmental Protection Agency, Region 1.

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UNITED STATES SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

Form 10-K

(Mark One)

☑ **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES AND EXCHANGE ACT OF 1934**

For the fiscal year ended December 31, 2018

OR

☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES AND EXCHANGE ACT OF 1934**

For the transition period from to

Commission file number 1-12154

Waste Management, Inc.

(Exact name of registrant as specified in its charter)

Delaware	**73-1309529**
(State or other jurisdiction of incorporation or organization)	*(I.R.S. Employer Identification No.)*
1001 Fannin Street **Houston, Texas**	**77002**
(Address of principal executive offices)	*(Zip code)*

Registrant's telephone number, including area code:
(713) 512-6200

Securities registered pursuant to Section 12(b) of the Act:

Title of Each Class	**Name of Each Exchange on Which Registered**
Common Stock, $0.01 par value	New York Stock Exchange

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined by Rule 405 of the Securities Act. Yes ☑ No ☐

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. Yes ☐ No ☑

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes ☑ No ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulations S-T (§ 232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files). Yes ☑ No ☐

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulations S-K (§ 229.405 of this chapter) is not contained herein, and will not be contained, to the best of Registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K. ☑

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, smaller reporting company or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company" and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer	☑	Accelerated filer ☐
Non-accelerated filer	☐	Smaller reporting company ☐
		Emerging growth company ☐

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Act). Yes ☐ No ☑

The aggregate market value of the voting stock held by non-affiliates of the registrant as of June 30, 2018 was approximately $34.8 billion. The aggregate market value was computed by using the closing price of the common stock as of that date on the New York Stock Exchange ("NYSE"). (For purposes of calculating this amount only, all directors and executive officers of the registrant have been treated as affiliates.)

The number of shares of Common Stock, $0.01 par value, of the registrant outstanding as of February 8, 2019 was 423,779,540 (excluding treasury shares of 206,502,921).

DOCUMENTS INCORPORATED BY REFERENCE

Document	**Incorporated as to**
Proxy Statement for the 2019 Annual Meeting of Stockholders	Part III

Exhibit 21.1

Entity Name	*Jurisdiction of Formation / Incorporation*
635952 Ontario Inc.	Ontario
8242348 Canada Inc.	Federally Chartered
Acaverde S.A. de C.V.	Mexico
Advanced Environmental Technical Services, L.L.C.	Delaware
Akron Regional Landfill, Inc.	Delaware
Alliance Sanitary Landfill, Inc.	Pennsylvania
Alpharetta Transfer Station, LLC	Georgia
American Landfill, Inc.	Ohio
American Oil Recovery, LLC	Texas
Ameriwaste, LLC	Maryland
Anderson Landfill, Inc.	Delaware
Antelope Valley Recycling and Disposal Facility, Inc.	California
Arden Landfill, Inc.	Pennsylvania
Atlantic Waste Disposal, Inc.	Delaware
Automated Salvage Transport Co., L.L.C.	Delaware
Avalon South, LLC	Delaware
Azusa Land Reclamation, Inc.	California
B&B Landfill, Inc.	Delaware
Big Dipper Enterprises, Inc.	North Dakota
Bluegrass Containment, L.L.C.	Delaware
Burnsville Sanitary Landfill, Inc.	Minnesota
CA Newco, L.L.C.	Delaware
Cal Sierra Disposal	California
California Asbestos Monofill, Inc.	California
Canadian Waste Services Holdings Inc.	Ontario
Capels Landfill, LLC	Delaware
Capital Sanitation Company	Nevada
Capitol Disposal, Inc.	Alaska
Carolina Grading, Inc.	South Carolina
Cedar Ridge Landfill, Inc.	Delaware
Central Disposal Systems, Inc.	Iowa
Chadwick Road Landfill, Inc.	Georgia
Chambers Clearview Environmental Landfill, Inc.	Mississippi
Chambers Development Company, Inc.	Delaware
Chambers Development of Ohio, Inc.	Ohio
Chambers of Georgia, Inc.	Delaware
Chambers of Mississippi, Inc.	Mississippi
Chemical Waste Management of Indiana, L.L.C.	Delaware
Chemical Waste Management of the Northwest, Inc.	Washington
Chemical Waste Management, Inc.	Delaware
Chesser Island Road Landfill, Inc.	Georgia
City Environmental Services, Inc. of Waters	Michigan
Cleburne Landfill Company Corp.	Alabama
Coast Waste Management, Inc.	California
Coastal Recyclers Landfill, LLC	Delaware
Connecticut Valley Sanitary Waste Disposal, Inc.	Massachusetts

Entity Name	*Jurisdiction of Formation / Incorporation*
Conservation Services, Inc.	Colorado
Coshocton Landfill, Inc.	Ohio
Cougar Landfill, Inc.	Texas
Countryside Landfill, Inc.	Illinois
CR Group, LLC	Utah
Curtis Creek Recovery Systems, Inc.	Maryland
Cuyahoga Landfill, Inc.	Delaware
CWM Chemical Services, L.L.C.	Delaware
Dafter Sanitary Landfill, Inc.	Michigan
Dauphin Meadows, Inc.	Pennsylvania
Deep Valley Landfill, Inc.	Delaware
Deer Track Park Landfill, Inc.	Delaware
Deffenbaugh Disposal, Inc.	Delaware
Deffenbaugh Group Holdings, Inc.	Delaware
Deffenbaugh Industries, Inc.	Missouri
Deffenbaugh of Arkansas, LLC	Kansas
Deffenbaugh Recycling Company, L.L.C.	Kansas
Del Almo Landfill, L.L.C.	Delaware
Delaware Recyclable Products, Inc.	Delaware
DHC Land, LLC	Texas
Dickinson Landfill, Inc.	Delaware
Disposal Service, Incorporated	West Virginia
Dolphin Services & Chemicals, LLC	Texas
Dolphin-One, LLC	Texas
Earthmovers Landfill, L.L.C.	Delaware
East Liverpool Landfill, Inc.	Ohio
Eastern One Land Corporation	Delaware
Eco-Vista, LLC	Arkansas
eCycling Services, L.L.C.	Delaware
ELDA Landfill, Inc.	Delaware
Elk River Landfill, Inc.	Minnesota
Energy Injection Services of Mississippi, LLC	Mississippi
Envirofil of Illinois, Inc.	Illinois
EnviroSolutions Dulles, LLC	Virginia
EnviroSolutions Holdings, Inc.	Delaware
EnviroSolutions Real Property Holdings, Inc.	Delaware
Evergreen Landfill, Inc.	Delaware
Evergreen Recycling and Disposal Facility, Inc.	Delaware
Finch Waste Co LLC	Delaware
Firetower Landfill, LLC	Delaware
Fred J. Eckert Sanitary Service, Inc.	Oregon
Furnace Associates, Inc.	Virginia
G.I. Industries	Utah
GA Landfills, Inc.	Delaware
Gallia Landfill, Inc.	Delaware
Garnet of Maryland, Inc.	Maryland
Gateway Transfer Station, LLC	Georgia
Georgia Waste Systems, Inc.	Georgia

Entity Name	*Jurisdiction of Formation / Incorporation*
Giordano Recycling, L.L.C.	Delaware
Glades Landfill, LLC	Florida
Glen's Sanitary Landfill, Inc.	Michigan
Grand Central Sanitary Landfill, Inc.	Pennsylvania
Greenbow, LLC	Alabama
Greenleaf Compaction, Inc.	Arizona
Greenstar Allentown, LLC	Delaware
Greenstar Georgia, LLC	Delaware
Greenstar Managed Services - Connecticut, LLC	Delaware
Greenstar Managed Services - RLWM, LLC	Illinois
Greenstar Mid-America, LLC	Delaware
Greenstar New Jersey, LLC	Delaware
Greenstar Ohio, LLC	Delaware
Greenstar Paterson, LLC	Delaware
Greenstar Pittsburgh, LLC	Delaware
Greenstar Recycled Holdings, LLC	Delaware
Greenstar, LLC	Delaware
Guadalupe Mines Mutual Water Company	California
Guadalupe Rubbish Disposal Co., Inc.	California
Ham Lake Haulers, Inc.	Minnesota
Harris Sanitation, Inc.	Florida
Harwood Landfill, Inc.	Maryland
Hedco Landfill Limited	England
High Mountain Fuels LLC	Delaware
Hillsboro Landfill Inc.	Oregon
Holyoke Sanitary Landfill, Inc.	Massachusetts
IN Landfills, L.L.C.	Delaware
International Environmental Management, Inc.	Georgia
Jahner Sanitation, Inc.	North Dakota
Jay County Landfill, L.L.C.	Delaware
K and W Landfill Inc.	Michigan
Keene Road Landfill, Inc.	Florida
Kelly Run Sanitation, Inc.	Pennsylvania
King George Landfill Properties, LLC	Virginia
King George Landfill, Inc.	Virginia
Kirby Canyon Holdings, LLC	California
L&K Group Holdings LLC	Kansas
Lakeville Recycling, L.P.	Delaware
Land South Holdings, LLC	Delaware
Landfill Services of Charleston, Inc.	West Virginia
Laurel Highlands Landfill, Inc.	Pennsylvania
LCS Services, Inc.	West Virginia
Liberty Landfill, L.L.C.	Delaware
Liquid Waste Management, Inc.	California
Longleaf C&D Disposal Facility, Inc.	Florida
Looney Bins, Inc.	California
Mac Land Disposal, Inc. II	Mississippi
Mahoning Landfill, Inc.	Ohio

Entity Name	*Jurisdiction of Formation / Incorporation*
Mass Gravel Inc.	Massachusetts
Mc Ginnes Industrial Maintenance Corporation	Texas
McDaniel Landfill, Inc.	North Dakota
McGill Landfill, Inc.	Michigan
Meadowfill Landfill, Inc.	Delaware
Michigan Environs, Inc.	Michigan
Midwest One Land Corporation	Delaware
Modesto Garbage Co., Inc.	California
Moor Refuse, Inc.	California
Mountain Indemnity Insurance Company	Texas
Mountainview Landfill, Inc.	Maryland
Mountainview Landfill, Inc.	Utah
Nassau Landfill, L.L.C.	Delaware
National Guaranty Insurance Company of Vermont	Vermont
New England CR L.L.C.	Delaware
New Milford Landfill, L.L.C.	Delaware
New Orleans Landfill, L.L.C.	Delaware
North Manatee Recycling and Disposal Facility, L.L.C.	Florida
Northwestern Landfill, Inc.	Delaware
Nu-Way Live Oak Reclamation, Inc.	Delaware
Oak Grove Disposal Co., Inc.	Oregon
Oakleaf Global Holdings, Inc.	Delaware
Oakleaf Waste Management, Inc.	Delaware
Oakleaf Waste Management, LLC	Connecticut
Oakridge Landfill, Inc.	South Carolina
Oakwood Landfill, Inc.	South Carolina
OGH Acquisition Corporation	Delaware
Okeechobee Landfill, Inc.	Florida
Ozark Ridge Landfill, Inc.	Arkansas
P & R Environmental Industries, L.L.C.	North Carolina
Pacific Waste Management L.L.C.	Delaware
Pappy, Inc.	Maryland
Peltz H.C., LLC	Wisconsin
Pen-Rob, Inc.	Arizona
People's Landfill, Inc.	Delaware
Peterson Demolition, Inc.	Minnesota
Phoenix Resources, Inc.	Pennsylvania
Pine Grove Landfill, Inc.	Pennsylvania
Pine Tree Acres, Inc.	Michigan
Prime Westport, LLC	Florida
Quail Hollow Landfill, Inc.	Delaware
Questquill Limited	England
R & B Landfill, Inc.	Georgia
RAA Colorado, L.L.C.	Colorado
RAA Trucking, LLC	Wisconsin
RCI Hudson, Inc.	Massachusetts
Recycle America Co., L.L.C.	Delaware
Recycle America Holdings, Inc.	Delaware

Entity Name	*Jurisdiction of Formation / Incorporation*
Redwood Landfill, Inc.	Delaware
Refuse Services, Inc.	Florida
Refuse, Inc.	Nevada
Reliable Landfill, L.L.C.	Delaware
Remote Landfill Services, Inc.	Tennessee
Reno Disposal Co.	Nevada
Resco Holdings L.L.C.	Delaware
Resource Control Composting, Inc.	Massachusetts
Resource Control, Inc.	Massachusetts
Richland County Landfill, Inc.	South Carolina
Riverbend Landfill Co.	Oregon
RTS Landfill, Inc.	Delaware
Rust Engineering & Construction Inc.	Delaware
Rust International Inc.	Delaware
S & J Landfill Limited Partnership	Texas
S & S Grading, Inc.	West Virginia
S&T Materials, LLC	Florida
Sanifill de Mexico (US), Inc.	Delaware
Sanifill de Mexico, S.A. de C.V.	Mexico
SC Holdings, Inc.	Pennsylvania
SF Land Acquisition, LLC	Florida
Shade Landfill, Inc.	Delaware
Shawnee Rock Company	Missouri
Sierra Estrella Landfill, Inc.	Arizona
Southern Alleghenies Landfill, Inc.	Pennsylvania
Southern One Land Corporation	Delaware
Southern Waste Services, L.L.C.	Delaware
Spruce Ridge, Inc.	Minnesota
Stony Hollow Landfill, Inc.	Delaware
Suburban Landfill, Inc.	Delaware
Swire Waste Management Limited	Hong Kong
Texarkana Landfill, L.L.C.	Delaware
Texas Pack Rat - Austin #1 LLC	Texas
Texas Pack Rat - Dallas #1 LLC	Texas
Texas Pack Rat - Houston #1 LLC	Texas
Texas Pack Rat - Houston #2 LLC	Texas
Texas Pack Rat - Houston #3 LLC	Texas
Texas Pack Rat - San Antonio #1 LLC	Texas
Texas Pack Rat Service Company LLC	Texas
The Peltz Group, LLC	Wisconsin
The Waste Management Charitable Foundation	Delaware
The Woodlands of Van Buren, Inc.	Delaware
Thermal Remediation Solutions, L.L.C.	Oregon
TN'T Sands, Inc.	South Carolina
Trail Ridge Landfill, Inc.	Delaware
Transamerican Waste Central Landfill, Inc.	Delaware
Trash Hunters, Inc.	Mississippi
Twin Bridges Golf Club, L.P.	Indiana

Entity Name	*Jurisdiction of Formation / Incorporation*
TX Newco, L.L.C.	Delaware
United Waste Systems Leasing, Inc.	Michigan
USA South Hills Landfill, Inc.	Pennsylvania
USA Valley Facility, Inc.	Delaware
USA Waste Geneva Landfill, Inc.	Delaware
USA Waste Landfill Operations and Transfer, Inc.	Texas
USA Waste of California, Inc.	Delaware
USA Waste of Texas Landfills, Inc.	Delaware
USA Waste of Virginia Landfills, Inc.	Delaware
USA Waste Services of NYC, Inc.	Delaware
USA Waste-Management Resources, LLC	New York
USA-Crinc, L.L.C.	Delaware
USB LIHTC Fund 2010-1, LLC	Delaware
UWS Barre, Inc.	Massachusetts
Valley Garbage and Rubbish Company, Inc.	California
Vern's Refuse Service, Inc.	North Dakota
Vickery Environmental, Inc.	Ohio
Vista Landfill, LLC	Florida
Voyageur Disposal Processing, Inc.	Minnesota
Warner Company	Delaware
Waste Away Group, Inc.	Alabama
Waste Management Arizona Landfills, Inc.	Delaware
Waste Management Buckeye, L.L.C.	Delaware
Waste Management China Holdings, Limited	Hong Kong
Waste Management Collection and Recycling, Inc.	California
Waste Management Disposal Services of Colorado, Inc.	Colorado
Waste Management Disposal Services of Maine, Inc.	Maine
Waste Management Disposal Services of Maryland, Inc.	Maryland
Waste Management Disposal Services of Massachusetts, Inc.	Massachusetts
Waste Management Disposal Services of Oregon, Inc.	Delaware
Waste Management Disposal Services of Pennsylvania, Inc.	Pennsylvania
Waste Management Disposal Services of Virginia, Inc.	Delaware
Waste Management Energy Services of Texas, LLC	Texas
Waste Management Holdings, Inc.	Delaware
Waste Management Inc. of Florida	Florida
Waste Management Indycoke, L.L.C.	Delaware
Waste Management International, Inc.	Delaware
Waste Management National Services, Inc.	Delaware
Waste Management National Transportation Services, Inc.	Delaware
Waste Management of Alameda County, Inc.	California
Waste Management of Alaska, Inc.	Delaware
Waste Management of Arizona, Inc.	California
Waste Management of Arkansas, Inc.	Delaware
Waste Management of California, Inc.	California
Waste Management of Canada Corporation	Nova Scotia
Waste Management of Carolinas, Inc.	North Carolina
Waste Management of Colorado, Inc.	Colorado
Waste Management of Connecticut, Inc.	Delaware

Entity Name	*Jurisdiction of Formation / Incorporation*
Waste Management of Delaware, Inc.	Delaware
Waste Management of Fairless, L.L.C.	Delaware
Waste Management of Five Oaks Recycling and Disposal Facility, Inc.	Delaware
Waste Management of Georgia, Inc.	Georgia
Waste Management of Hawaii, Inc.	Delaware
Waste Management of Idaho, Inc.	Idaho
Waste Management of Illinois, Inc.	Delaware
Waste Management of Indiana Holdings One, Inc.	Delaware
Waste Management of Indiana Holdings Two, Inc.	Delaware
Waste Management of Indiana, L.L.C.	Delaware
Waste Management of Iowa, Inc.	Iowa
Waste Management of Kansas, Inc.	Kansas
Waste Management of Kentucky Holdings, Inc.	Delaware
Waste Management of Kentucky, L.L.C.	Delaware
Waste Management of Leon County, Inc.	Florida
Waste Management of Londonderry, Inc.	Delaware
Waste Management of Louisiana Holdings One, Inc.	Delaware
Waste Management of Louisiana, L.L.C.	Delaware
Waste Management of Maine, Inc.	Maine
Waste Management of Maryland, Inc.	Maryland
Waste Management of Massachusetts, Inc.	Massachusetts
Waste Management of Metro Atlanta, Inc.	Georgia
Waste Management of Michigan, Inc.	Michigan
Waste Management of Minnesota, Inc.	Minnesota
Waste Management of Mississippi, Inc.	Mississippi
Waste Management of Missouri, Inc.	Delaware
Waste Management of Montana, Inc.	Delaware
Waste Management of Nebraska, Inc.	Delaware
Waste Management of Nevada, Inc.	Nevada
Waste Management of New Hampshire, Inc.	Connecticut
Waste Management of New Jersey, Inc.	Delaware
Waste Management of New Mexico, Inc.	New Mexico
Waste Management of New York, L.L.C.	Delaware
Waste Management of North Dakota, Inc.	Delaware
Waste Management of Ohio, Inc.	Ohio
Waste Management of Oklahoma, Inc.	Oklahoma
Waste Management of Oregon, Inc.	Oregon
Waste Management of Pennsylvania Gas Recovery, L.L.C.	Delaware
Waste Management of Pennsylvania, Inc.	Pennsylvania
Waste Management of Rhode Island, Inc.	Delaware
Waste Management of South Carolina, Inc.	South Carolina
Waste Management of South Dakota, Inc.	South Dakota
Waste Management of Texas Holdings, Inc.	Delaware
Waste Management of Texas, Inc.	Texas
Waste Management of Tunica Landfill, Inc.	Mississippi
Waste Management of Utah, Inc.	Utah
Waste Management of Virginia, Inc.	Virginia
Waste Management of Washington, Inc.	Delaware

Entity Name	*Jurisdiction of Formation / Incorporation*
Waste Management of West Virginia, Inc.	Delaware
Waste Management of Wisconsin, Inc.	Wisconsin
Waste Management of Wyoming, Inc.	Delaware
Waste Management Partners, Inc.	Delaware
Waste Management Recycling and Disposal Services of California, Inc.	California
Waste Management Recycling of New Jersey, L.L.C.	Delaware
Waste Management Service Center, Inc.	Delaware
Waste Management, Inc. of Tennessee	Tennessee
Western One Land Corporation	Delaware
Western Waste Industries	California
Western Waste of Texas, L.L.C.	Delaware
Westminster Land Acquisition, LLC	Massachusetts
Wheelabrator Technologies International Inc.	Delaware
White Lake Landfill, Inc.	Michigan
Willow Oak Landfill, LLC	Georgia
WM Avon, Inc.	Delaware
WM Bagco, LLC	Delaware
WM Billerica, Inc.	Delaware
WM Biloxi Hauling, LLC	Mississippi
WM Biloxi Transfer Station, LLC	Delaware
WM Boston CORE, Inc.	Delaware
WM CCP Solutions, LLC	Delaware
WM Conversion Fund, LLC	Delaware
WM Corporate Services, Inc.	Delaware
WM Curbside, LLC	Delaware
WM DC 1, LLC	Delaware
WM Emergency Employee Support Fund, Inc.	Delaware
WM Energy Resources, Inc.	Delaware
WM Energy Services Holdings, LLC	Delaware
WM Energy Services of Ohio, LLC	Ohio
WM Energy Solutions, Inc.	Delaware
WM Green Squad, LLC	Delaware
WM GreenOps, LLC	Delaware
WM GTL JV Holdings, LLC	Delaware
WM GTL, Inc.	Delaware
WM GTL, LLC	Delaware
WM Healthcare Solutions, Inc.	Delaware
WM Illinois Renewable Energy, L.L.C.	Delaware
WM Intellectual Property Holdings, L.L.C.	Delaware
WM International Holdings, Inc.	Delaware
WM KS Energy Resources, LLC	Delaware
WM LampTracker, Inc.	Delaware
WM Landfills of Ohio, Inc.	Delaware
WM Landfills of Tennessee, Inc.	Delaware
WM Leasing of Arizona, L.L.C.	Delaware
WM Leasing of Texas, L.P.	Delaware
WM Leasing Services of Texas, LLC	Delaware
WM LNG, Inc.	Delaware

Entity Name	*Jurisdiction of Formation / Incorporation*
WM Logistics India Private Limited	India
WM Logistics, LLC	Delaware
WM Mercury Waste, Inc.	Delaware
WM Middle Tennessee Environmental Center, L.L.C.	Delaware
WM Mobile Bay Environmental Center, Inc.	Delaware
WM ND Energy Resources II, LLC	Delaware
WM ND Energy Resources, LLC	Delaware
WM Nevada Renewable Energy, L.L.C.	Delaware
WM North Broward, Inc.	Delaware
WM of North Dakota Energy Disposal Solutions, LLC	North Dakota
WM Organic Growth, Inc.	Delaware
WM PA Holdings, LLC	Delaware
WM Pack-Rat of California, LLC	Delaware
WM Pack-Rat of Illinois, LLC	Delaware
WM Pack-Rat of Kentucky, LLC	Delaware
WM Pack-Rat of Maryland, LLC	Delaware
WM Pack-Rat of Massachusetts, LLC	Delaware
WM Pack-Rat of Michigan, LLC	Delaware
WM Pack-Rat of Nevada, LLC	Delaware
WM Pack-Rat of Ohio, LLC	Delaware
WM Pack-Rat of Rhode Island, LLC	Delaware
WM Pack-Rat, LLC	Delaware
WM Partnership Holdings, Inc.	Delaware
WM Phoenix Energy Resources, LLC	Delaware
WM PRG, L.L.C.	Colorado
WM Propane, LLC	Delaware
WM Quebec Inc.	Federally Chartered
WM RA Canada Inc.	Ontario
WM Recycle America, L.L.C.	Delaware
WM Recycle Europe, L.L.C.	Delaware
WM Recycling Latin America, LLC	Delaware
WM Refined Coal, LLC	Delaware
WM Renewable Energy, L.L.C.	Delaware
WM Resource Recovery & Recycling Center, Inc.	Delaware
WM Resources, Inc.	Pennsylvania
WM Safety Services, L.L.C.	Delaware
WM Security Services, Inc.	Delaware
WM Storage II, Inc.	Delaware
WM Storage, Inc.	Delaware
WM Texas Pack Rat, LLC	Delaware
WM Trash Monitor Plus, L.L.C.	Delaware
WM TX Energy Resources II, LLC	Delaware
WM TX Energy Resources, LLC	Delaware
WM WY Energy Resources II, LLC	Delaware
WM WY Energy Resources III, LLC	Delaware
WM WY Energy Resources, LLC	Delaware
WMI Mexico Holdings, Inc.	Delaware
WMNA Container Recycling, L.L.C.	Delaware

Entity Name	*Jurisdiction of Formation / Incorporation*
WMRE of Kentucky, LLC	Delaware
WMRE of Michigan, LLC	Delaware
WMRE of Ohio, LLC	Delaware
WMRE of Ohio-American, LLC	Texas
WMSALSA, Inc.	Texas
WTI Air Pollution Control Inc.	Delaware
WTI Rust Holdings Inc.	Delaware

APPENDIX 25A

Public Notices and Public Informational Meeting Materials

SEPTEMBER 7, 2019 NOTICE

PUBLIC NOTICE
INTENT TO FILE APPLICATIONS
PUBLIC INFORMATIONAL MEETING

Please take notice that Waste Management Disposal Services of Maine, Inc. ("WMDSM"), with its principal office at 357 Mercer Road, Norridgewock, Maine 04957, Attention Jeffrey McGown, (207) 634-2714 ext. 6, intends to file a solid waste permit application with the Maine Department of Environmental Protection ("DEP") on or about October 4, 2019 pursuant to the provisions of Title 38 M.R.S. Section 1301, et seq. and Maine's Solid Waste Management rules. At the same time, WMDSM will also file a Natural Resources Protection Act permit application pursuant to the provisions of Title 38 M.R.S. Sections 480-A through 480-HH and Maine's Natural Resource Protection Act rules, and an accompanying request for Water Quality Certification pursuant to 401 of the Clean Water Act.

The solid waste application is for a new lined solid waste disposal unit at the solid waste landfill located in Norridgewock, Maine (the "Crossroads Landfill") owned and operated by WMDSM. The project, referred to as Phase 14, will provide an estimated 17 years of additional disposal capacity at the Crossroads Landfill. In addition to construction of the new lined waste disposal unit, the Phase 14 project will include new infrastructure to manage leachate, landfill gas, and stormwater, as well as access roads and environmental monitoring system. The Natural Resources Protection Act application addresses how construction and operation of the Phase 14 project could affect natural resources.

In connection with the applications, WMDSM will hold a public informational meeting at the Mill Stream Elementary School, 26 Mercer Road, Norridgewock, Maine, on Thursday, September 19, 2019, from 6:00 P.M. to 8:00 P.M. The purpose of the meeting is for WMDSM to inform the public about the Phase 14 project and opportunities for public comment on the project.

According to Department regulations, interested parties must be publicly notified, written comments invited, and if justified, an opportunity for public hearing given on an application. A request for a public hearing, or that the Board of Environmental Protection assume jurisdiction of an application, must be received by the Department, in writing, no later than 20 days after the application is accepted by the Department as complete for processing.

The applications and supporting documentation will be available for review at the Bureau of Remediation and Waste Management (BRWM) at the DEP office in Augusta, during normal working hours. Copies of the applications and supporting documentation also will be provided to and may be seen at the municipal office in Norridgewock, Maine.

Send all correspondence to: Maine Department of Environmental Protection, Bureau of Remediation and Waste Management, 17 State House Station, Augusta, Maine 04333-0017 Attention: Linda Butler or contact Linda Butler at (207) 287-7885 or Linda.J.Butler@maine.gov

CLASSIFIED

Public Notices

Public Notices are a permanent and independent record of government and court actions. These include state and local government meetings, rule making, available contracts, zoning changes, and many more, as required by law. In addition, parties to some court proceedings, such as foreclosures, probate, and estate actions are required to publish notices to ensure notification of affected parties, as well as the general public. These notices also alert business owners, large and small, to potential government contractual jobs, helping to ensure economic activity across a level playing field. Public notices have existed to ensure transparency in all levels of government since the founding of the United States.

State and local notices are published in Maine newspapers and are also recorded at mainenotices.com, where anyone can browse or search notices, and sign up to receive email alerts when relevant notices appear.

ANNOUNCEMENTS

Public Notices

Public Notice

PUBLIC NOTICE INTENT TO FILE APPLICATIONS PUBLIC INFORMATIONAL MEETING

Please take notice that Waste Management Disposal Services of Maine, Inc. ("WMDSM"), with its principal office at 357 Mercer Road, Norridgewock, Maine 04957, Attention Jeffrey McGown, (207) 634-2714 ext. 6, intends to file a solid waste permit application with the Maine Department of Environmental Protection ("DEP") on or about October 4, 2019 pursuant to the provisions of Title 38 M.R.S. Section 1301, et seq. and Maine's Solid Waste Management rules. At the same time, WMDSM will also file a Natural Resources Protection Act permit application pursuant to the provisions of Title 38 M.R.S. Sections 480-A through 480-HH and Maine's Natural Resource Protection Act rules, and an accompanying request for Water Quality Certification pursuant to 401 of the Clean Water Act.

The solid waste application is for a new lined solid waste disposal unit at the solid waste landfill located in Norridgewock, Maine (the "Crossroads Landfill") owned and operated by WMDSM. The project, referred to as Phase 14, will provide an estimated 17 years of additional disposal capacity at the Crossroads Landfill. In addition to construction of the new lined waste disposal unit, the Phase 14 project will include new infrastructure to manage leachate, landfill gas, and stormwater, as well as access roads and environmental monitoring system. The Natural Resources Protection Act application addresses how construction and operation of the Phase 14 project could affect natural resources.

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OPEN 7 DAYS
Year Round 9AM -5PM

Food & Seafood Products

CERTIFIED ORGANIC sweet corn, $6/dozen, large order discount, available Sept 5-14. A&L organics, 696 Main St., Pittsfield. Farm stand open 8 am-7:30 pm. Closed Sunday's

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Troy General Store is looking for an individual to manage its store. This is a full time position with benefits.

Please send resume to:
Troy General Store
P.O. Box 2, Troy, ME 04987
Fax : 948-2698
E-mail:ddianne@uninets.net

No phone calls please.

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Huhtamaki is a premium manufacturer of disposable paper products and offers competitive salary and comprehensive benefit package.

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If you possess the qualifications listed and would like to be considered, please visit our website at www.huhtamaki.

The Humane Society Waterville

SEPTEMBER 7, 2019 NOTICE DOCUMENTS

Waste Management Abutters List 2019

Tax Map	Lot #	Name	Mailing Address
10	35-6	Glenn A. Jones	232 Airport Rd. Norridgewock, ME 04957
10	10	Joseph D. & Susan M. Cloutier	P.O. Box 369 Norridgewock, ME 04957
10	15	Winston L. & Linda J. Ford	251 Haynes Way Cambridge, NY 12816
10	35	Linda S. Roderick	275 Airport Rd. Norridgewock, ME 04957
10	42	Pamela L. Whitten	317 Airport Rd. Norridgewock, ME 04957
10	19	Waste Management Disposal Services of Maine, Inc.	P.O. Box 1450 Chicago, IL 60690-1450
10	24	Daren Turner*	P.O. Box 865 Skowhegan, ME 04976
13	3-1 & 3-3	Heidi Chamberland Trustee	9 Tracy Cove Circle Rome, ME 04963
13	3-5	Paul & Rebecca Alves	P.O. Box 2547 Orleans, MA 02653-6547
13	8	Norridgewock Municipal Airport	603 Airport Rd. Norridgewock, ME 04957
13	13-1	Forrest & Wilma Stevens & Julie S. McCarthy	P.O. Box 659 Norridgewock, ME 04957
13	3-2	Tammy J. Ferland	511 Airport Rd. Norridgewock, ME 04957
14	1, 2, 2-1, 2-2, 46	Waste Management Disposal Services of Maine, Inc.	P.O. Box 1450 Chicago, IL 60690-1450
14	3	Christopher J. Clark	P.O. Box 793 Norridgewock, ME 04957
14	17	Carol Decker*	180 Airport Rd. Norridgewock, ME 04957
14	13-1	Floyd Whitmore	P.O. Box 877 Norridgewock, ME 04957
14	13 & 41	Letty N. Brann	156 Airport Rd. Norridgewock, ME 04957
14	45	Rita Chaykowsky	P.O. Box 658 Norridgewock, ME 04957
14	48-4 & 48-5	Elizabeth A. Skidgell	P.O. Box 93 Smithfield, ME 04978
14	4, 6, 8-1	Edward & Gloria Frederick	362 Mercer Rd. Norridgewock, ME 04957
14	40	Lebanon Masonic Lodge	251 Mercer Rd. Norridgewock, ME 04957
14	10	Northern NE Conference of 7th Day Adventists	P.O. Box 689 Norridgewock, ME 04957
17	17-1, 20, 16	Waste Management Disposal Services of Maine, Inc.	P.O. Box 1450 Chicago, IL 60690-1450
17	12	Avis & Alice E. Emery	229 Frederick Corner Rd. Norridgewock, Me 04957
17	19	Edward & Gloria Frederick Trustee	362 Mercer Rd. Norridgewock, ME 04957

*Not an abutter but being notified with abutters.

18	7	Waste Management Disposal Services of Maine, Inc.	P.O. Box 1450 Chicago, IL 60690-1450
18	35	Edward & Gloria Frederick Trustee	362 Mercer Rd. Norridgewock, ME 04957
18	8	Parker & Rachel Parsons	134 Frederick Corner Rd. Norridgewock, ME 04957
19	66	Lois & Scott Von Husen	9415 99th Avenue #1013 Peoria, AZ 85345
19	2-5	Krista L. Bowman	290 Mercer Rd. Norridgewock, ME 04957
19	65	Richard & Lelia Von Husen	282 Mercer Rd. Norridgewock, ME 04957

*Not an abutter but being notified with abutters.

Airport Road

Frederick Corner Road

Mercer Road / Route 2

Winding Hill Road

Weeden Hill Road

Waste Management
Book 1116, Page 71
12-22-1983
Book 1116, Page 79
12-22-1983
Tax Map 17 Lot 13

Waste Management
Book 1206, Page 266
7-10-1985
Tax Map 17, Lot 14

Waste Management
Book 1511, Page 89
4-14-1989
Tax Map 17, Lot 15

Waste Management
Book 1581, Page 215
1-18-1990
Tax Map 17, Lot 17

Waste Management
Book 5174, Page 341
6-20-2012
Tax Map 14 Lot 20

Waste Management
Book 1801, Page 118
6-14-1993
Tax Map 14, Lot 18

Waste Management
Book 1671, Page 61
1-11-1993
Tax Map 14, Lot 19

Waste Management
Book 1801, Page 116
1-18-1993
Tax Map 14, Lot 10-1

Waste Management
Book 1671, Page 61
1-11-1993
Tax Map 14, Lot 14

Waste Management
Book 1636, Page 126
11-20-1992
Tax Map 14, Lot 16

LEGEND

- TRAVELED WAY
- PROPERTY BOUNDARY
- EXISTING WASTE MANAGEMENT FACILITY
- ABUTTING PROPERTY
- ABUTTING PROPERTY OF WMDSM
- ADDITIONAL AREA ASSOCIATED WITH PHASE 14

500 250 0 500 1000 1500
SCALE IN FEET

STATE OF MAINE
Somerset ss. Registry of Deeds
Received _____, 20____
at _____ h. _____ M., and Recorded
in Plan file _____ Page _____
Attest: _____ Register

12016					
DRAWN:	9/18	CHECKED:	9/18	SCALE:	9/18

SHEET TITLE:
Waste Management Property
Narrow Definition of Existing Facility

SITE LOCATION:
Mercer Road
Norridgewock, Maine

SCALE: 1" = 500'

September 3, 2019

RECORD OWNER:
WASTE MANAGEMENT
"Think green"
CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE 04957

PLAN PREPARED BY:
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INFORMATIONAL POSTERS

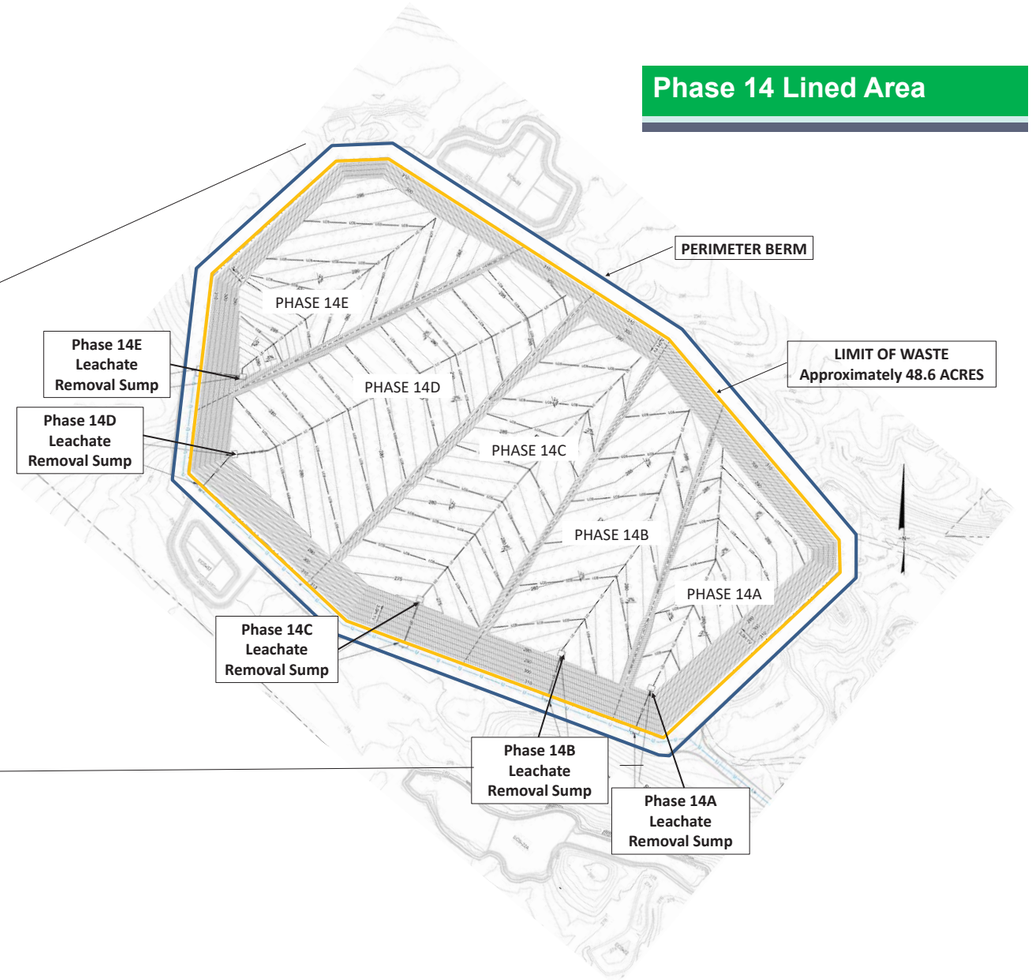
Crossroads Landfill - Phase 14
Public Information Meeting – September 19, 2019
Phase 14 Site Layout

Geosyntec consultants
engineers | scientists | innovators

WASTE MANAGEMENT

Crossroads Facility Map

Phase 14 Lined Area



KEY POINTS

Phase 14 will:

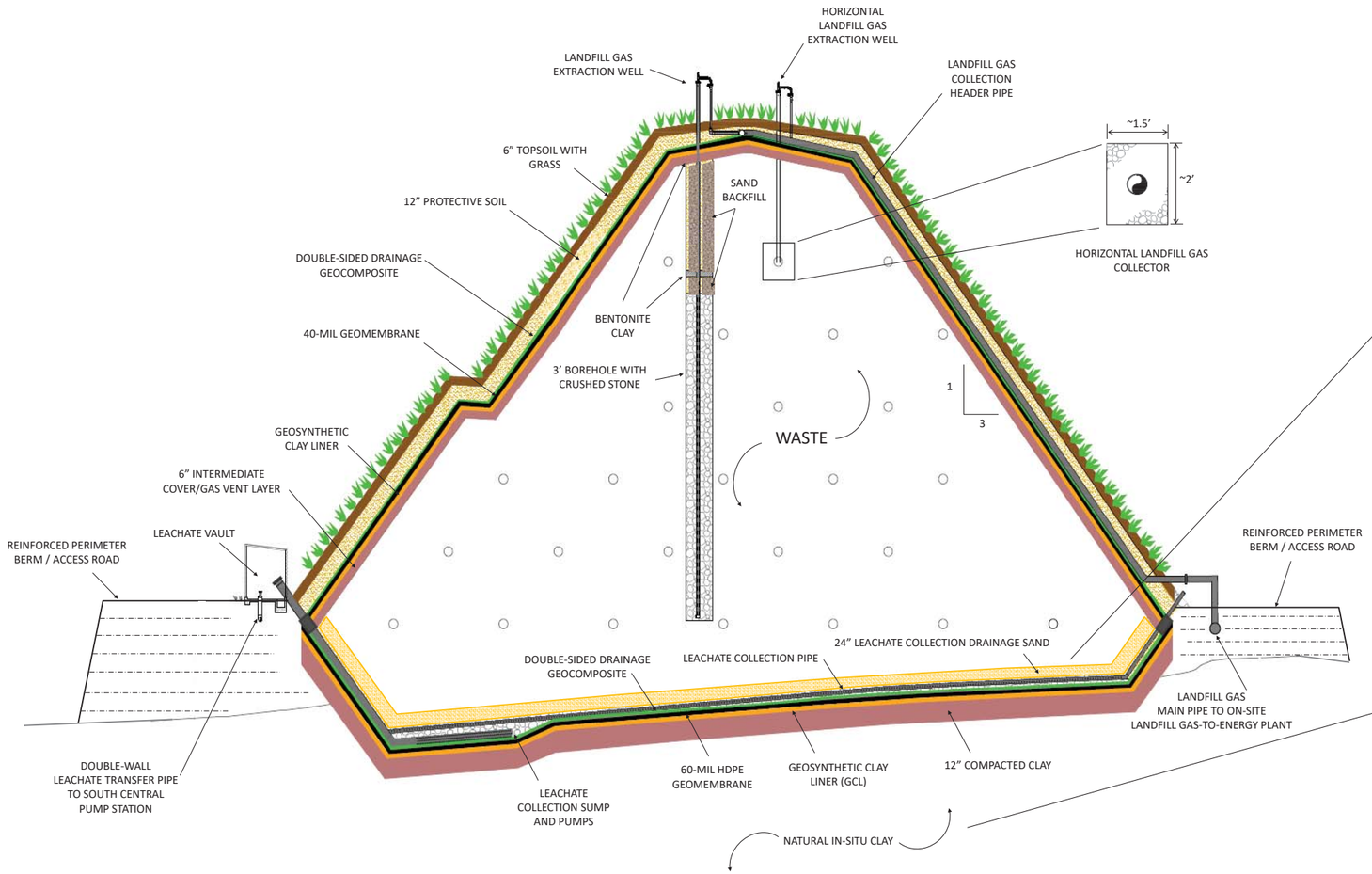
- have a lined area of approximately 48 acres
- consist of five disposal cells: Phases 14A, 14B, 14C, 14D, and 14E
- require minimal changes to site infrastructure

Crossroads Landfill - Phase 14
Public Information Meeting – September 19, 2019
Liner and Final Cover Systems, Leachate and Gas Collection

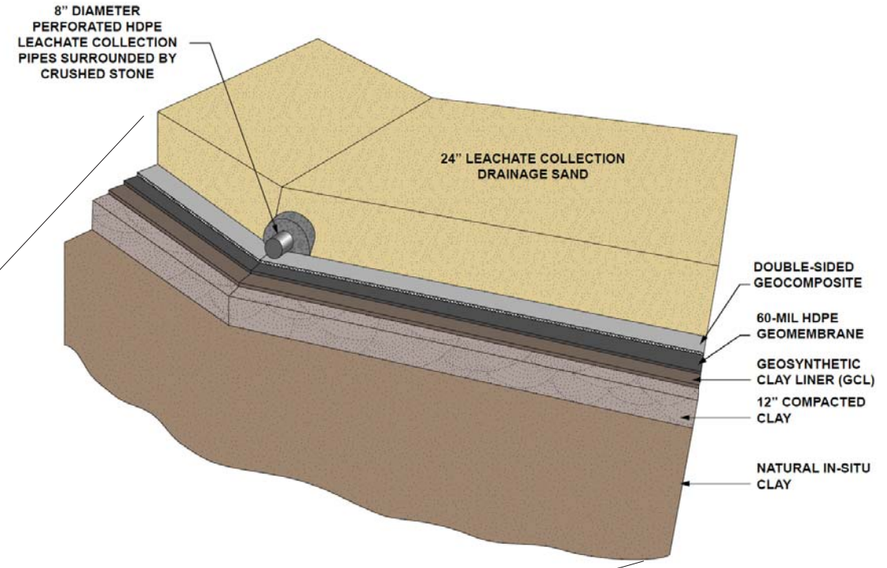
Geosyntec consultants
engineers | scientists | innovators

WASTE MANAGEMENT

Waste Containment System



Phase 14 Multi-Layered Liner System



KEY POINTS

- The Phase 14 liner system will be constructed on a thick layer of natural in-situ clay
- The multi-layered liner system will consist of:
  - Sand & Geocomposite Drainage Layer
  - High Density Polyethylene (HDPE) Geomembrane
  - Geosynthetic Clay Liner (GCL)
  - Compacted Clay
- Leachate will continue to be removed and treated at Sappi North America and/or Anson-Madison Sanitary District Wastewater Treatment facilities

Crossroads Landfill - Phase 14
Public Information Meeting – September 19, 2019
Stormwater Management

Geosyntec consultants
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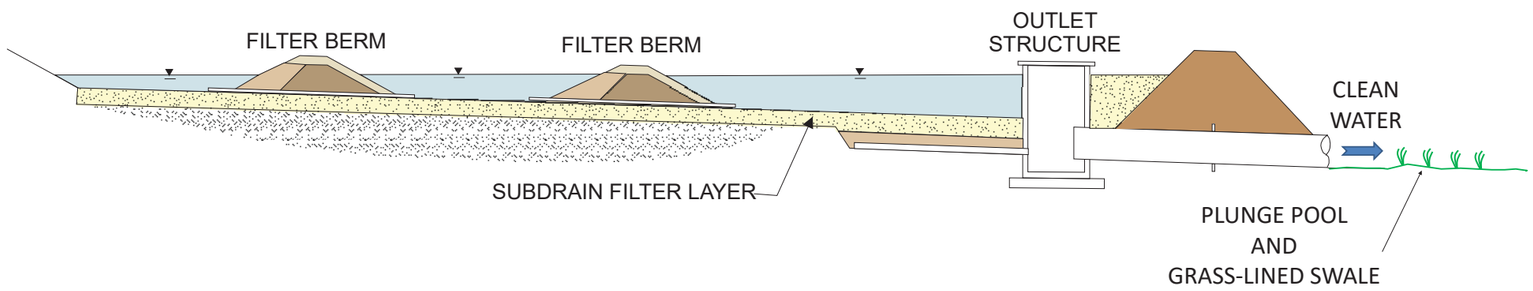
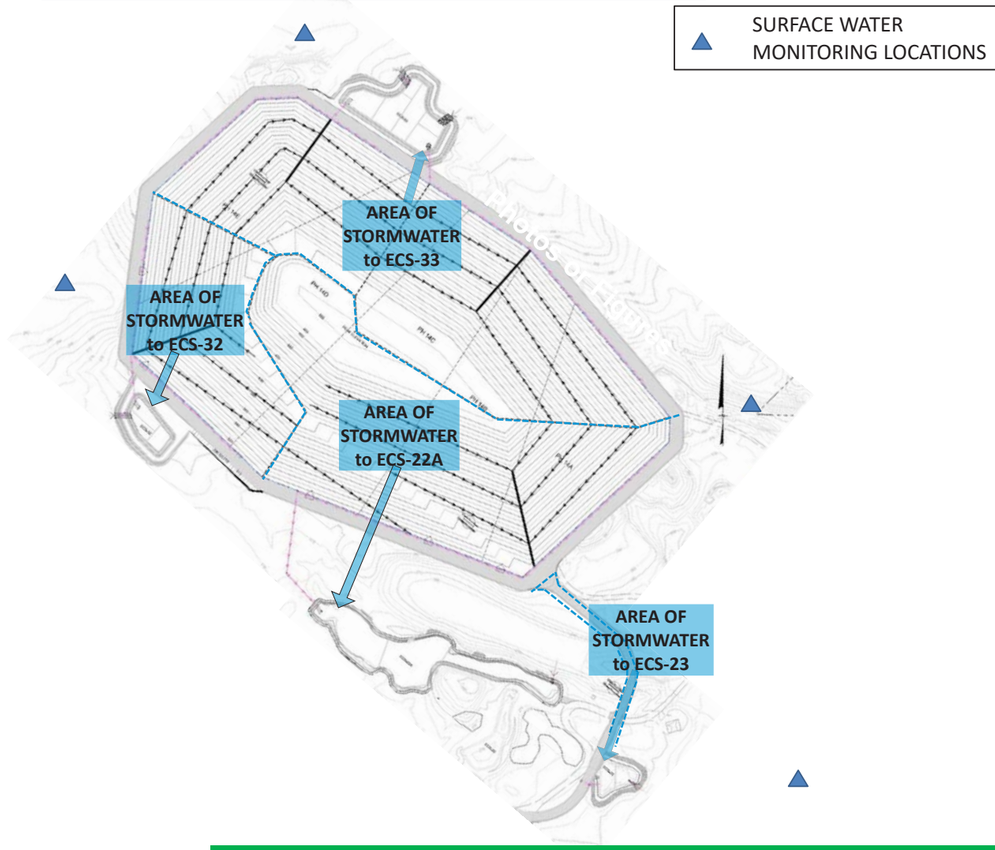
WASTE MANAGEMENT

Erosion Control Structure (ECS) Basins



Stormwater Management System



KEY POINTS

- Stormwater from the Phase 14 area will be managed by a system of four retention/detention basins
- These basins, termed Erosion Control Structures (ECS), will ensure:
  - only clean stormwater leaves the project area
  - control / management of stormwater flow
- Water quality monitoring will be performed throughout Phase 14 construction and operation

Crossroads Landfill - Phase 14
Public Information Meeting – September 19, 2019
Visual Assessment

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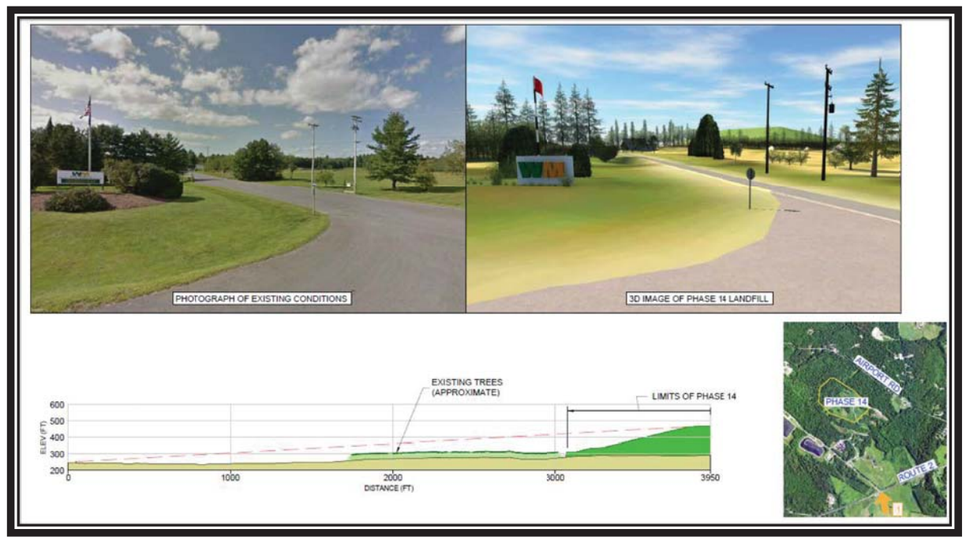
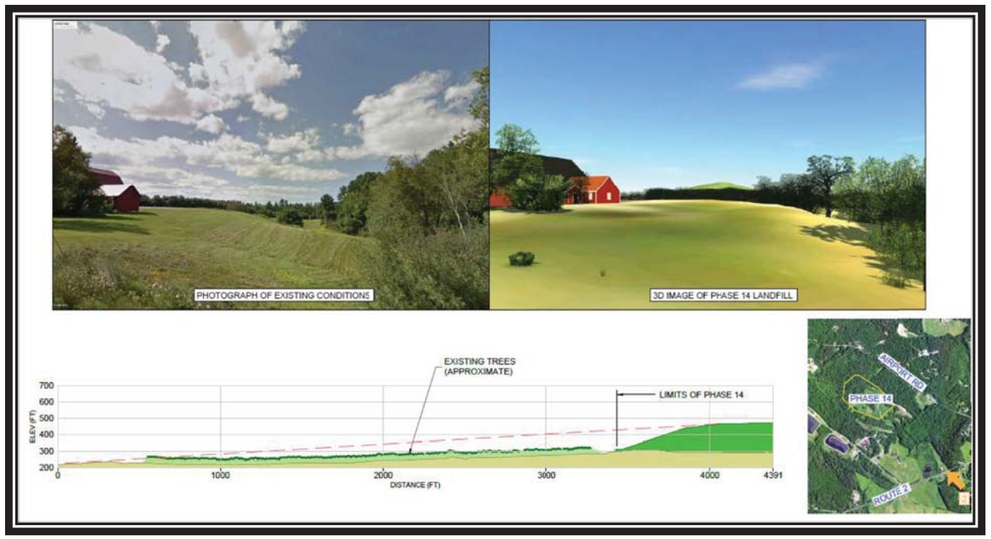
WASTE MANAGEMENT

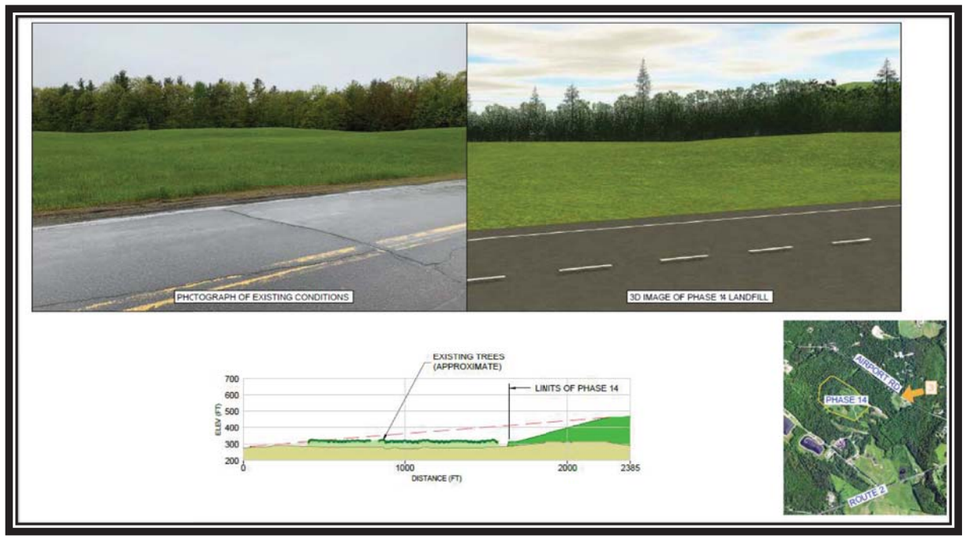
Projected View of Phase 14 Landfill - from Vantage Point #1 along Route 2



Projected View of Phase 14 Landfill - from Vantage Point #2 along Route 2



Projected View of Phase 14 Landfill - from Vantage Point #3 along Airport Rd



Existing Visual Screening (Buffer) constructed along Route 2

KEY POINTS

- Large setback distances and existing vegetation / trees will be maintained to obscure visibility of Phase 14
- Visual Screens (for example, earthen embankments with planted trees) will be constructed as necessary to further buffer visibility.

Crossroads Landfill - Phase 14
Public Information Meeting – September 19, 2019
Geology and Hydrogeology

Data Collection

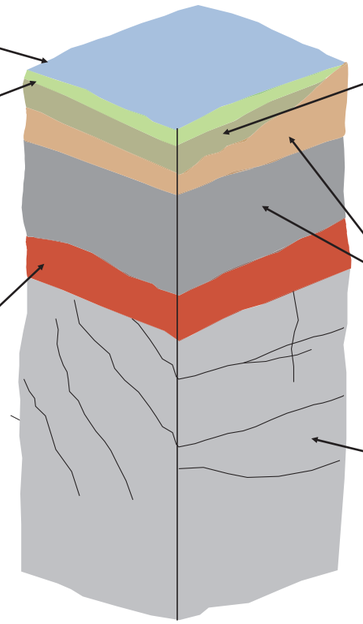
- 50+ soil borings
- 64 overburden monitoring wells and piezometers
- 4 bedrock monitoring wells
- 7 stream gauges/ piezometers
- 25 soil samples for laboratory testing of grain size, Atterberg limits and/or permeability
- 40 monitoring well/piezometer slug tests (i.e., hydraulic testing)
- 29 rounds of water level measurements

Geologic Profile

Ground surface

Undifferentiated Soils: fill material, organic silty clay, unsaturated

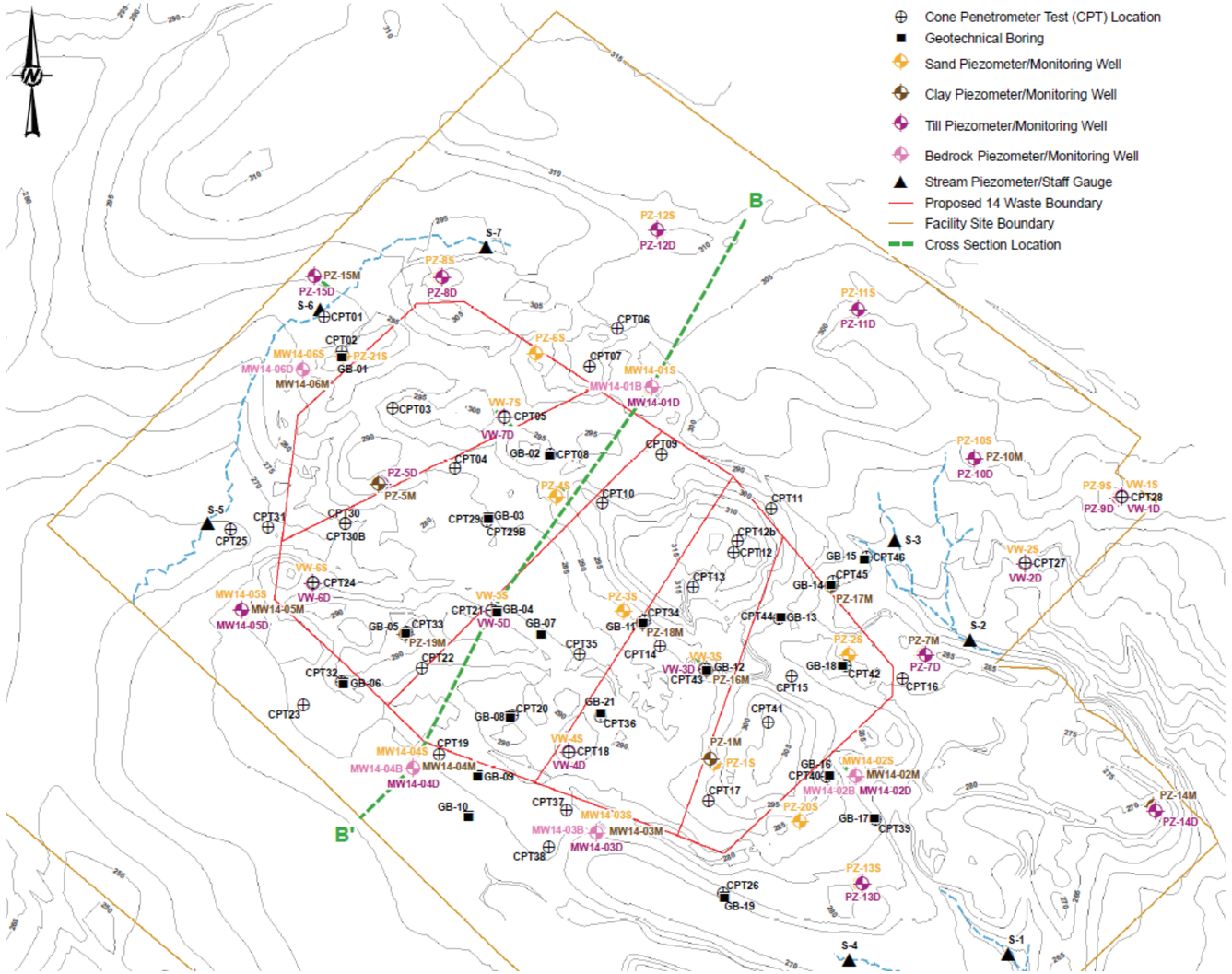
Glacial Till - clayey fine to coarse sand and fine to coarse, angular gravel



Silty fine sand – absent in some areas, unsaturated and seasonally saturated in some areas

Presumpscot Formation Clay – stiff upper facies and soft lower facies, present across entire Phase 14 footprint

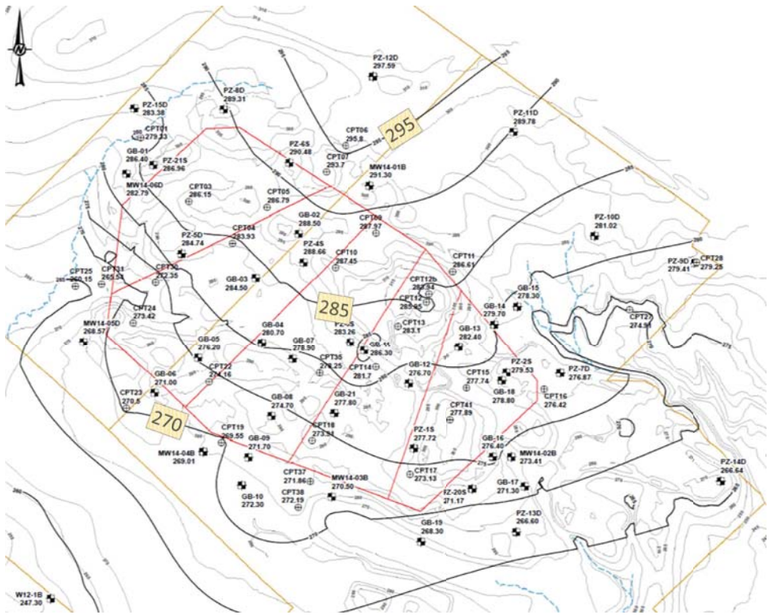
Bedrock - gray, meta-limestone



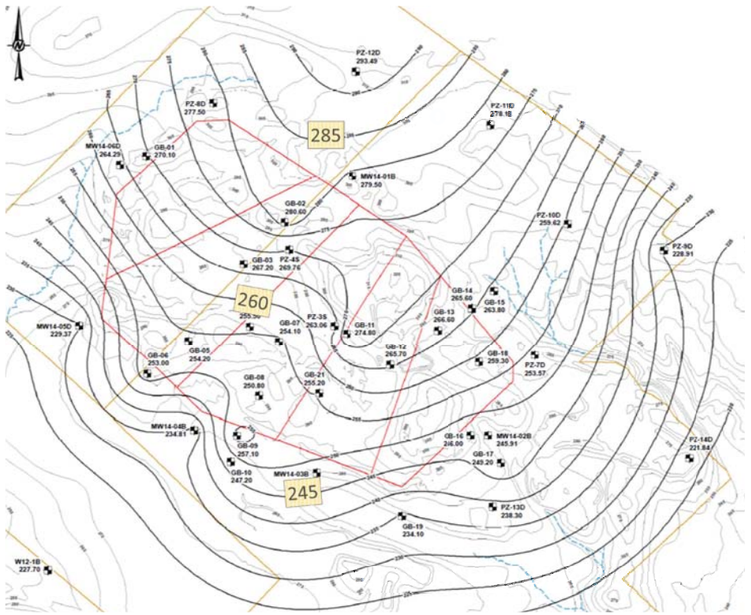
Borings, Piezometers and Well Locations

Crossroads Landfill - Phase 14
Public Information Meeting – September 19, 2019
Geology and Hydrogeology

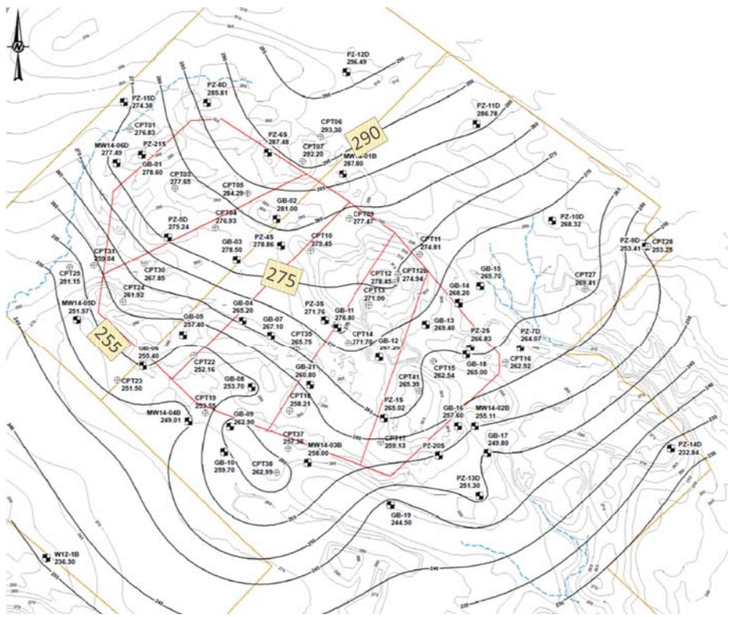
Geologic Surfaces



Top of Presumpscot Clay

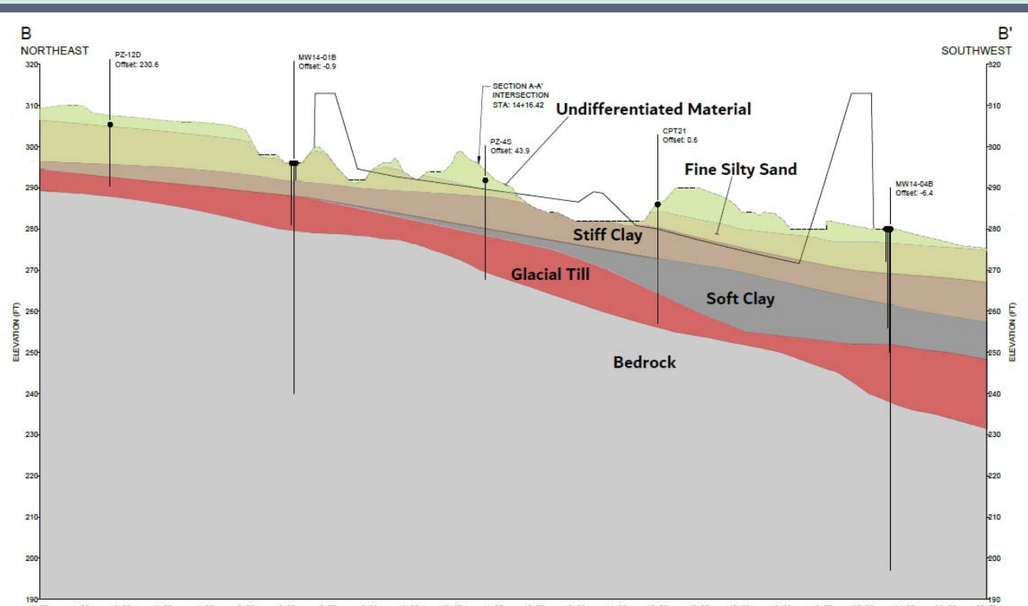


Top of Bedrock



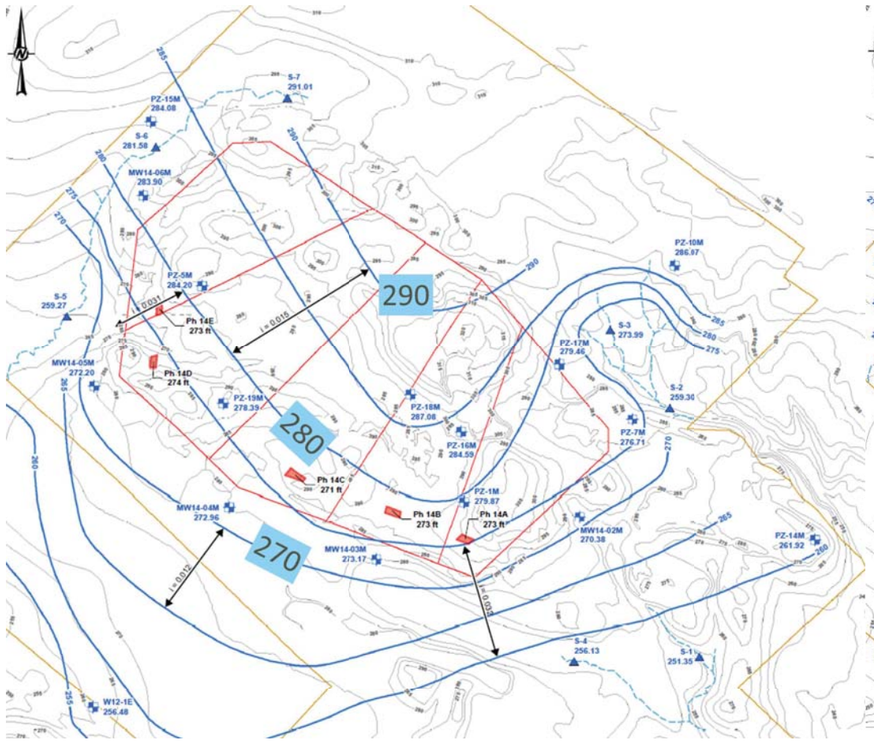
Top of Glacial Till

Geologic Profile

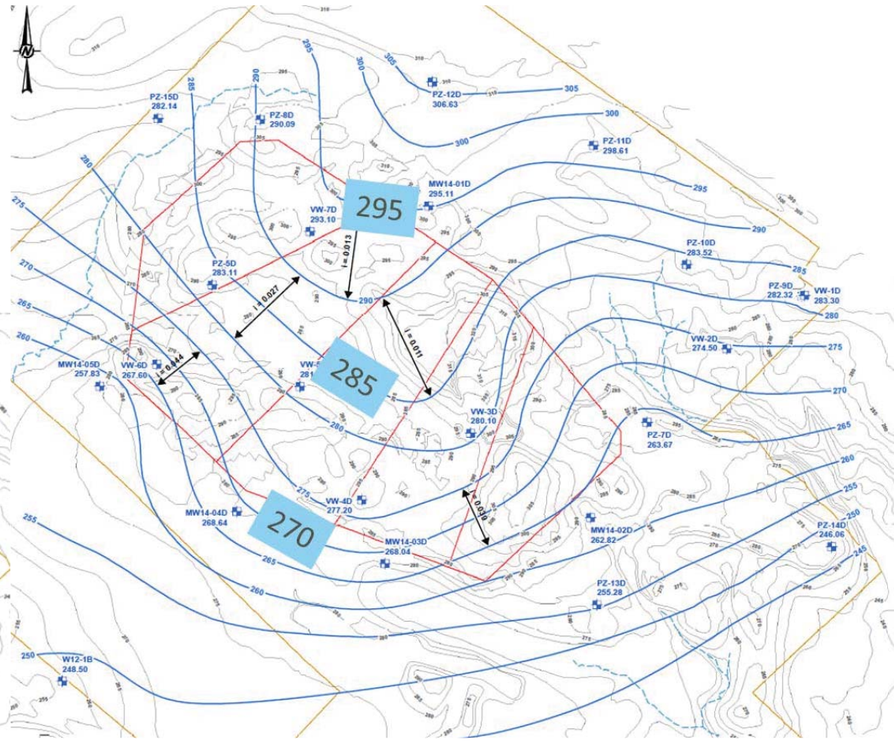


Crossroads Landfill - Phase 14
Public Information Meeting – September 19, 2019
Geology and Hydrogeology

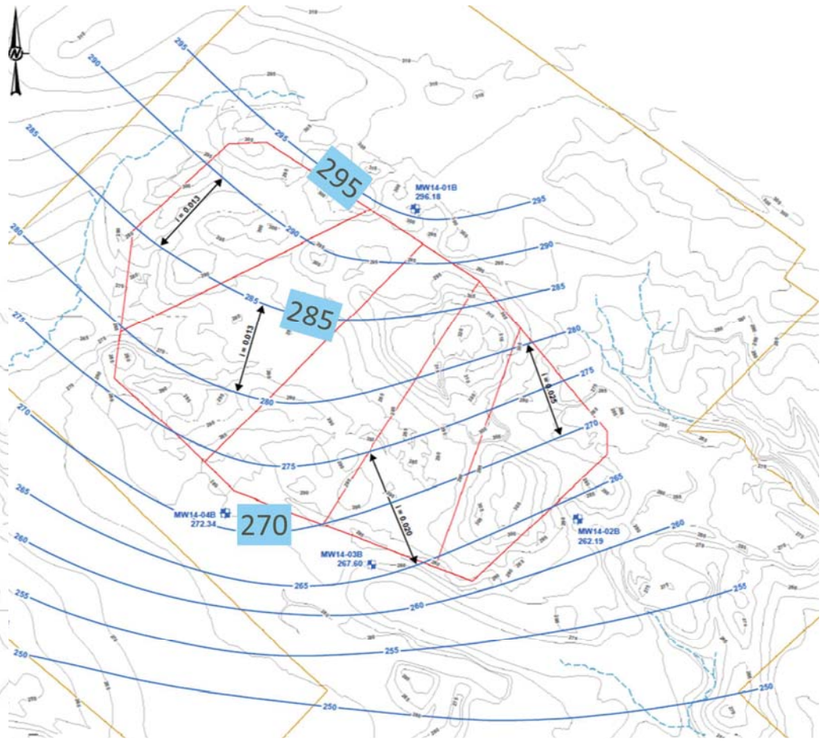
Groundwater Surfaces



Shallow Groundwater



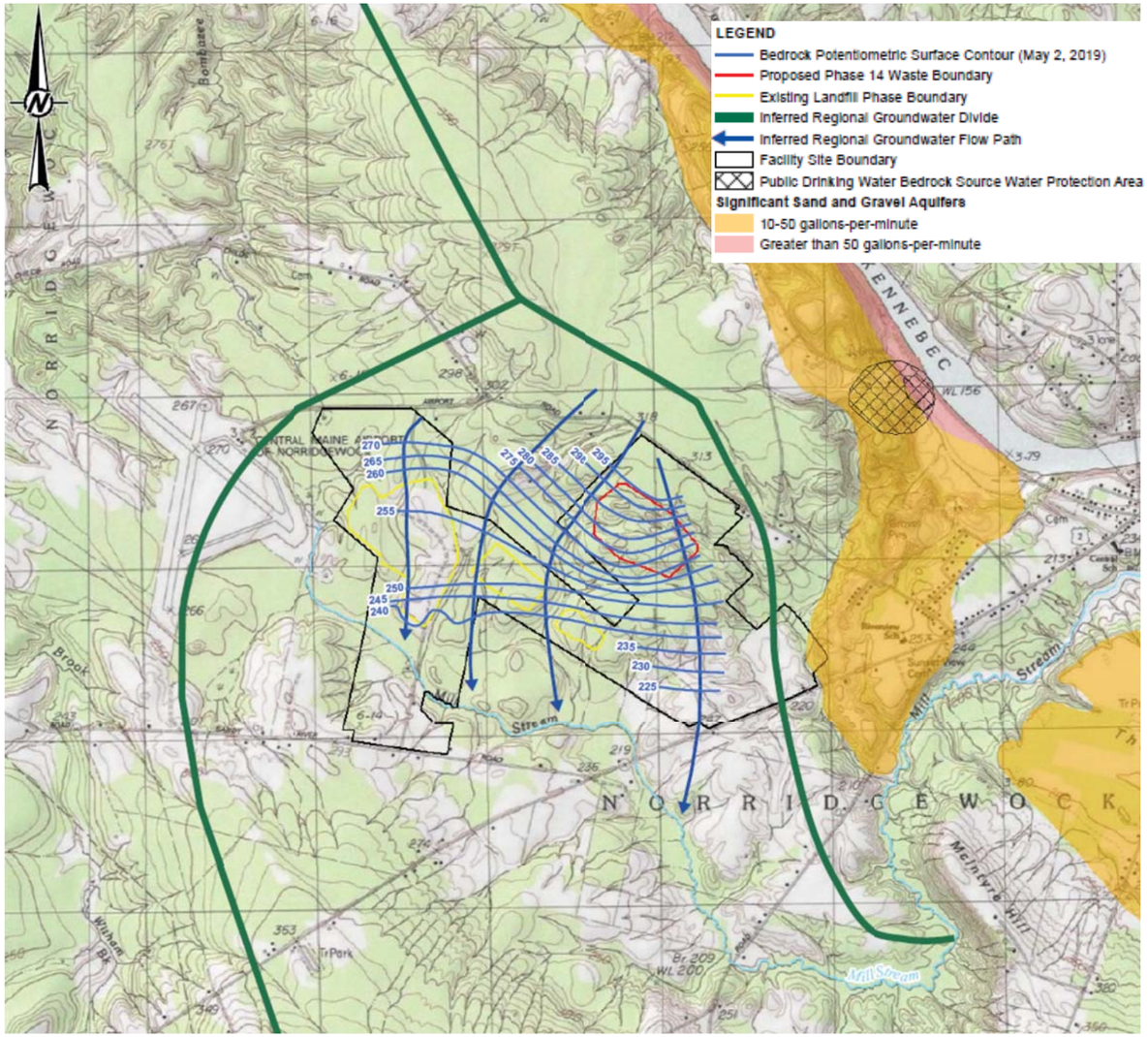
Glacial Till Groundwater Surface



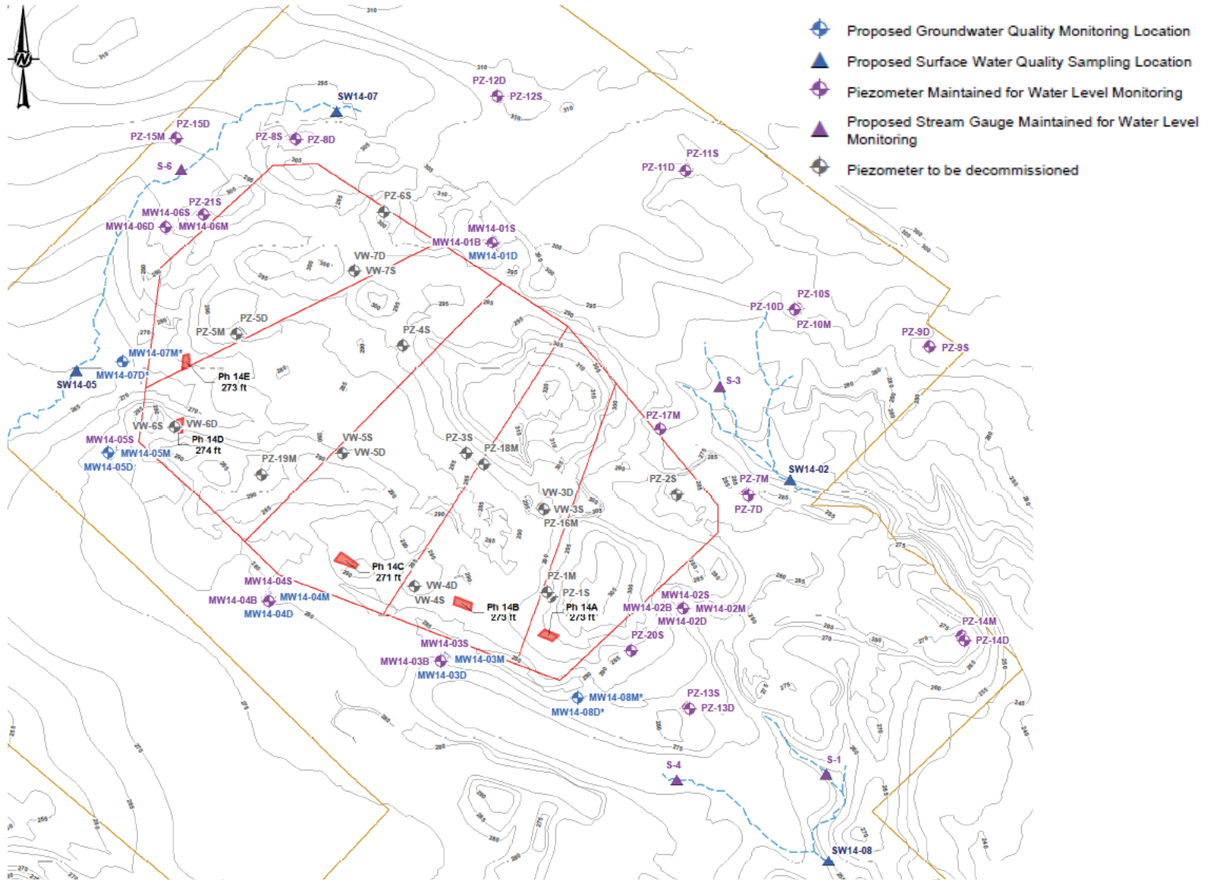
Bedrock Groundwater Surface

Crossroads Landfill - Phase 14
Public Information Meeting – September 19, 2019
Geology and Hydrogeology

Regional Bedrock Groundwater Flow



Groundwater and Surface Water Monitoring Network



Key Points

- Geologic and hydrogeologic conditions are consistent with previously permitted landfills at the WMDSM facility
- Presumpscot clay provides a natural barrier to underlying water bearing units
- Overburden geologic units generally thicken and dip to the south-southwest
- Groundwater flows to the south-southwest, towards previously permitted landfill units and away from the Town of Norridgewock water supply and the Kennebec River
- Groundwater and surface water in the area of Phase 14 will be routinely monitored at a network of monitoring wells to ensure that any changes in water quality are quickly identified.

Crossroads Landfill - Phase 14
Public Information Meeting – September 19, 2019
Natural Resources

Natural Resource Investigations

Water Resource Map

Field Data Collection and Resource Characterizations

Field assessments were completed to map natural resources in 2017, 2018 and 2019:

- **WETLANDS**
- **STREAMS**
- **VERNAL POOLS**

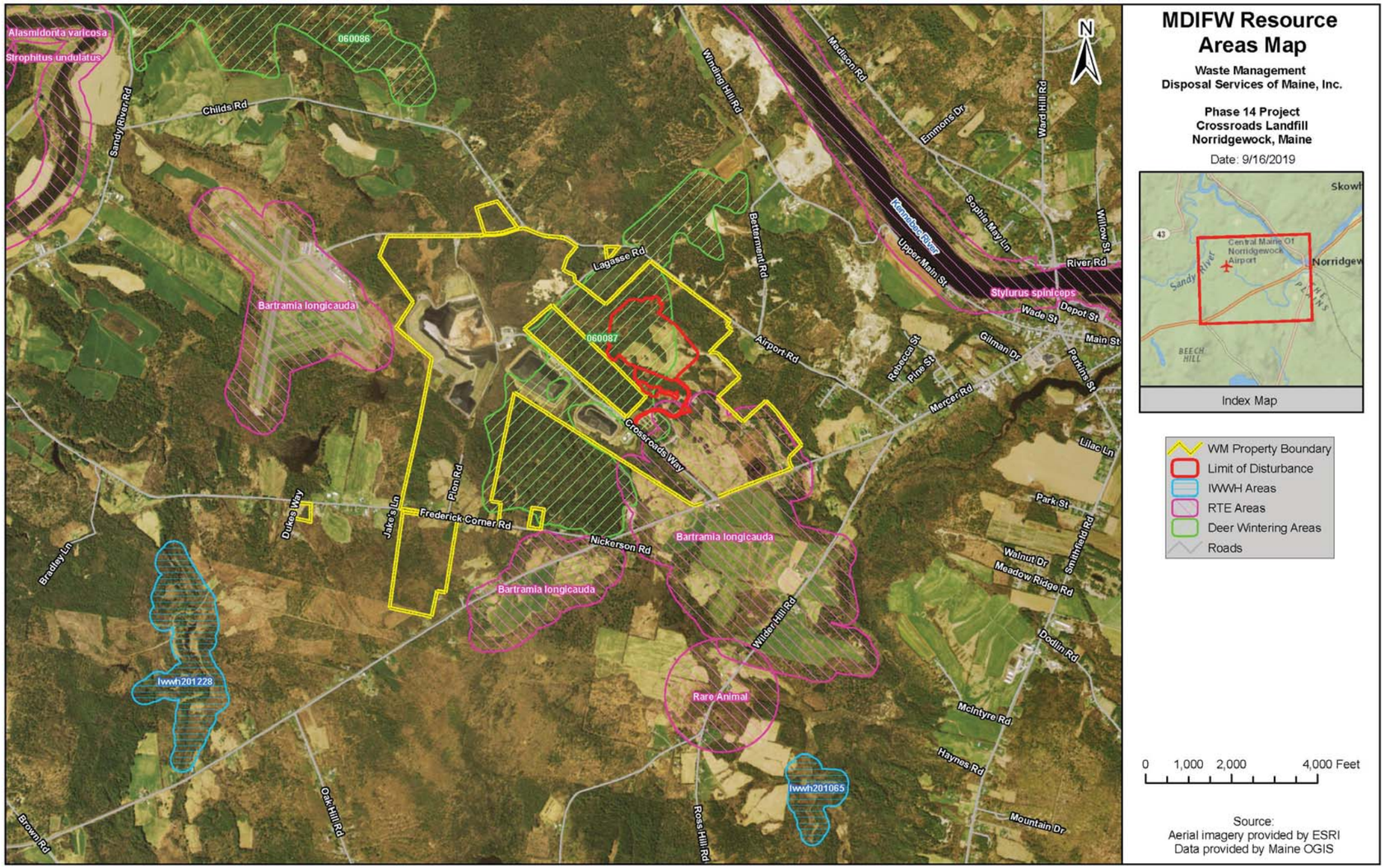
Natural Resources

Key Points

- **All streams intermittent or ephemeral; no perennial streams**
- **No Significant Vernal Pools as determined by Maine Department of Environmental Protection (MEDEP)**
- **Greater than 100 foot setback to all streams from limit of waste**
- **Proposed impacts include direct wetland and vernal pool impacts and one new stream crossing**
- **Proposed wetland, stream, and vernal pool impacts will be offset via mitigation plan**
- **Mitigation plan developed in coordination with MEDEP, US Army Corps of Engineers (USACE) and others**

Crossroads Landfill - Phase 14
Public Information Meeting – September 19, 2019
Natural Resources

Natural Resource Investigations



MDIFW Resource Areas Map

Wildlife Habitat Assessments

Field assessments were completed to investigate the presence or absence of:

- **Deer Wintering Area (DWA)**
- **Rare, threatened, or endangered (RTE) species or habitat**
- **Significant Wildlife Habitat**

Natural Resources
Key Points

- **Normandeau has coordinated with MEDEP, Maine Dept. Inland Fish & Wildlife (MDIFW), and Maine Natural Areas Program (MNAP) to identify known and potential wildlife habitat and rare species**
- **Mapped Deer Wintering Area is a candidate/unrated DWA that has been field verified as low quality**
- **No impacts to Significant Wildlife Habitat within or in close proximity to the Phase 14 Project Area**
- **No impacts to rare, threatened, or endangered species or habitat within or in close proximity to the Phase 14 Project Area**
- **MDIFW-mapped *Bartramia longicauda* (upland sandpiper) habitat not suitable within project area and no individuals observed**

Crossroads Landfill - Phase 14

Public Information Meeting – September 19, 2019

Household Hazardous Material Diversion Program

Local Collection Event

- The Phase 14 Project will include a Household Hazardous Materials Collection and Reuse Program to keep potentially hazardous materials out of residential waste.
- Local communities and residents will be encouraged to participate free of charge.
- The three adjacent pictures were taken at a collection event held at the Crossroads facility on August 24, 2019.
- Collection events for the local community will continue throughout the life of the Phase 14 Project.

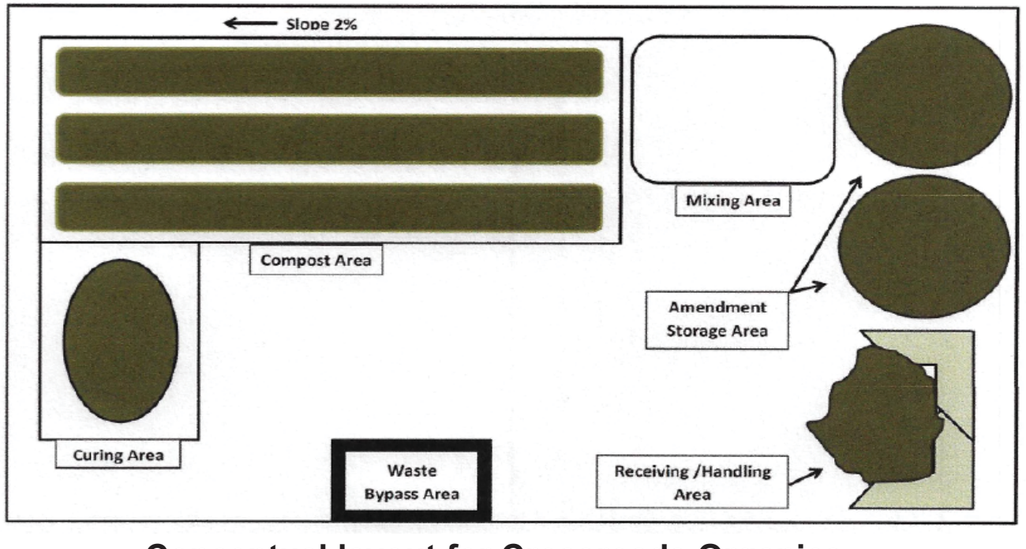
Crossroads Landfill - Phase 14

Public Information Meeting – September 19, 2019

Organics Diversion and Composting Program

Composting at Crossroads

- The Phase 14 Project will include an Organics Diversion and Composting Program.
- A facility will be developed at Crossroads to accept and process organic material.
- The goal of the program will be to keep organic materials out of wastes, thereby saving landfill capacity.
- Local residents, schools, and businesses will be encouraged to participate.
- Organic materials will be dropped off at the upgraded Airport Road Transfer Station.
- Compost produced by the program will be made available to local residents free of charge.



Conceptual layout for Crossroads Organics Diversion and Composting Program

WMDSM provided critical assistance to the development of a composting program in Farmington, Maine in 2019.
Photo by Mark King, Maine DEP, *Food Scraps Composting Pilot Program Report, 10,* (January 2019).

Crossroads Landfill - Phase 14

Public Information Meeting – September 19, 2019

Airport Road Transfer Station Upgrade

The general conceptual design for the upgraded Airport Road Transfer Station will be similar to this facility.

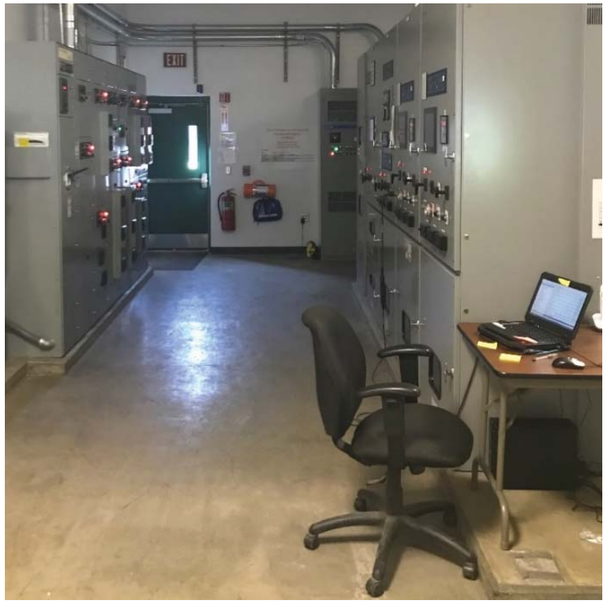
Crossroads Landfill - Phase 14

Public Information Meeting – September 19, 2019

Renewable Energy at Crossroads Facility

Crossroads Renewable Energy

- The Crossroads' Renewable Landfill Gas-to-Energy Plant has been capturing gas since March 9, 2009.
- The system collects gas from the waste decomposition process and uses it to generate electricity.
- On an annual basis, the system collects and combusts 470 million standard cubic feet of landfill gas.
- The system powers two, 20 cylinder, Caterpillar engines that are rated at 2,380 horsepower each.
- The engines generate 21,684,958 kilowatt hours of electricity per year – that is the equivalent of 13,330 barrels of oil.
- The Renewable Landfill Gas-to-Energy Plant will continue operation throughout Phase 14.



Crossroads Landfill Gas-to-Energy Plant Control Room

Caterpillar 3520 Engines

Current Opportunities: 2004 - 2018

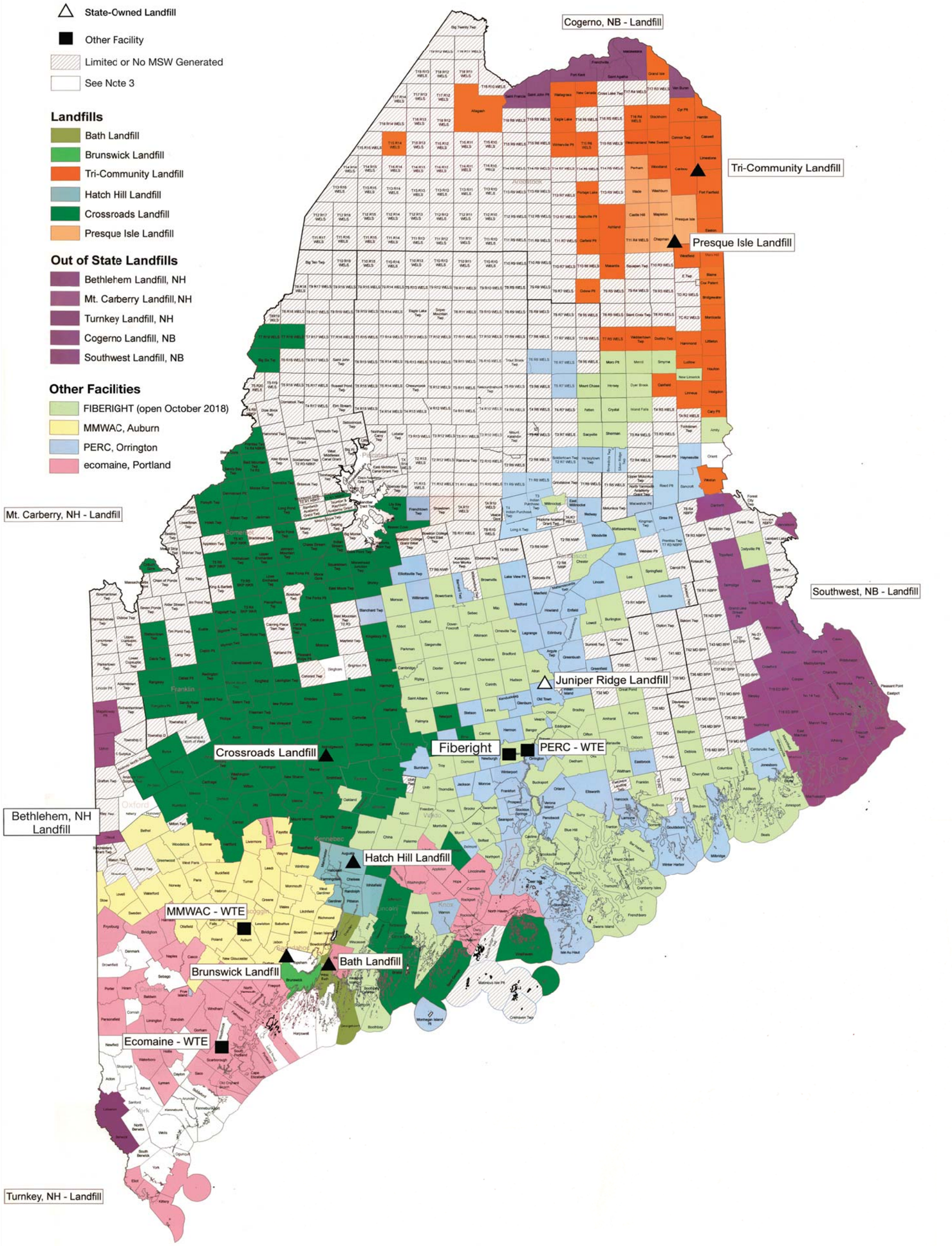
- Employment of 30 individuals at the facility.
- Payment of property taxes
  - Annual average: $254,000
- Payment of host community benefit
  - Annual average: $353,000
- Waste and recycling services at no cost
  - Annual value: $350,000
- Additional no cost benefits:
  - Sand shed construction
  - Road maintenance - ongoing
- Disposal fees paid to State of Maine
  - Annual average: $733,000

Phase 14 Estimated Opportunities: 2020 - 2041

- Employ approximately 30 individuals at the facility.
- Maine Chamber of Commerce estimates the Phase 14 Project will contribute $298.2 million to the region over its lifetime.
- Payment of property taxes
  - Annual average: Consistent with current figures
- Payment of host community benefit
  - Annual average: Pending
- Waste and recycling services at no cost
  - Annual value: $350,000
- Disposal fees paid to State of Maine
  - Annual average: Consistent with current figures

Municipal Solid Waste Disposal

This map shows the municipal origin of MSW and the facility or landfill where the MSW is shipped.
Last Updated June 2018



NOTES:

(1) The disposal locations are variable. The map is based on information provided by the following sources: Maine Department of Environmental Protection, landfill or dispcsal facility websites and/or conversations with representatives of ecomaine, Waste Management Disposal Services of Maine, Inc. - Crossroads Landfill, Juniper Ridge Landfill, Tri-Community Landfill, Presque Isle Lancfill, PERC, MRC, Hatch Hill Landfill, Brunswick Landfill, Bath Landfill and MMWAC.

(2) The communities identified as sending their waste to Fiberight is based on commitments to do so once Fiberight becomes operational. Fiberight is currently under construction and therefore waste from the Fiberight communities is temporarily being disposed of at Crossroads Landfill, Juniper Ridge Landfill and PERC.

(3) The MSW in these towns is hauled by contractors primarily to Juniper Ridge Landfill and secondarily to ecomaine via privately owned MSW transfer stations in Eliot, Wells, Westbrook, South Portland, Waterville, and West Bath.

(4) Map prepared by Scott D. Collins for Waste Management Disposal Services of Maine, Inc. - Crossroads Landfill.

1:633,600

1 inch = 10 miles

Miles
0 10 20 30

Welcome

Sign in here, please.

ADDITIONAL DOCUMENTS

Phase 14 - PROJECT SUMMARY
Waste Management Disposal Services of Maine, Inc. - Crossroads Landfill
Norridgewock, Maine

The Crossroads Landfill facility, owned and operated by Waste Management Disposal Services of Maine, Inc. (WMDSM), currently provides essential and cost-effective disposal capacity for residents, municipalities, and businesses throughout the State of Maine. More than 50 communities in central and western Maine are served by Crossroads, many of which have no other feasible alternatives for managing their waste and recyclables.

Existing disposal capacity at Crossroads will be fully utilized by early 2024. To ensure the facility can continue to serve the needs of Maine communities and businesses, WMDSM is seeking a permit to construct and operate a new waste disposal unit (Phase 14) at Crossroads. Like previously permitted disposal units, Phase 14 will provide substantial benefit to the State of Maine by providing disposal capacity and other additional waste management services through approximately the year 2041. Key environmental features of the project are listed below.

- The Phase 14 waste disposal unit will occupy approximately 48.6 acres within the 933-acre Crossroads Landfill facility property. No expansion of WMDSM's current property boundaries is required.
- The Phase 14 liner will consist of multiple layers of soil and geosynthetic materials placed directly over a natural in-situ deposit of clay, effectively resulting in a much thicker liner system than required by Maine or Federal regulations.
- In addition to the liner systems, measures to ensure the project does not affect groundwater or surface water will include frequent sampling and testing of groundwater and surface water before, during, and after waste is placed in the landfill from eleven new groundwater monitoring wells and four new surface water monitoring stations around the Phase 14 perimeter.
- Disturbances to natural resources have been avoided and minimized; unavoidable impacts will be offset by mitigation.
- No impacts to significant wildlife habitat or rare plant species will occur.
- Leachate from Phase 14 will be collected in the existing leachate storage tanks and treated at SAPPI Paper in Hinkley or Anson-Madison Sanitary District in Madison.
- Landfill gas will be collected from Phase 14 and converted to electric power at the on-site Landfill Gas-to-Energy plant.
- Traffic patterns to and from the facility will remain consistent with current traffic patterns.

- Large setback distances from WMDSM's property boundaries with trees and vegetation ensure that limited visibility of the project from public vantage points may occur only during later years of operation and after closure with a natural vegetative cover.
- Consistent with current landfill operations, no significant sound impacts are anticipated from construction or operation of Phase 14.

Additional benefits of the Phase 14 project are listed below.

- Phase 14 will continue operation of the following initiatives or programs:
    - Single-Sort Recycling
    - Electronic Waste Diversion
    - Battery Diversion
    - Cardboard Recycling
    - Woodwaste Recycling
    - Beneficial Tire Reuse
    - Waste Evaluations and Sustainability Consulting
    - Renewable Landfill Gas-to-Energy Plant operation

- Phase 14 will also implement the following initiatives or programs:
    - A comprehensive upgrade to the Airport Road Transfer Station
    - Organic Material Diversion and Composting
    - Hazardous Material Diversion
    - Textile Diversion

* * * * *

Phase 14 - LIST OF STATE, LOCAL AND FEDERAL LICENSES
Waste Management Disposal Services of Maine, Inc. - Crossroads Landfill
Norridgewock, Maine

- Solid Waste permit pursuant to 38 M.R.S. §§ 1301 et seq.
- Public Benefit Determination pursuant to 38 M.R.S. § 1310-AA
  - **Approval issued on Dec. 21, 2018**
- Preliminary Investigation Report pursuant to Chapter 06-096 CMR Chapter 401, §§ 1.B and E
  - **Approval issued on Mar. 12, 2018**
- Natural Resources Protection Act permit pursuant to 38 M.R.S. §§ 480-A through 480-JJ
- Army Corps of Engineers permit pursuant to Section 404 of the Clean Water Act, 33 U.S.C. § 1344
- Water quality certification pursuant to Section 401 of the Clean Water Act, 33 U.S.C. § 1341
- No hazard determination pursuant to the Federal Aviation Administration standards Form 7460
- Air permit pursuant to 38 M.R.S. §§ 581-610-D
- Notice of Intent to Comply with Maine's Multi-Sector General Permit – Stormwater Discharge Associated with Industrial Activity
- Permit pursuant to the Town of Norridgewock Shoreland Zone Ordinance
- Permit pursuant to the Town of Norridgewock Site Plan Review Ordinance

* * * * *

DEP INFORMATION SHEET

Public Participation in the Licensing Process

Dated: October 2008 **Contact: (207) 287-7688**

SUMMARY

Maine law charges the Commissioner of the Department of Environmental Protection (D.E.P.) with evaluating license applications for many different activities that affect Maine's environment. Individuals and legal entities may participate at various points during license application processing. Individuals must recognize that the Commissioner's charge may, under certain circumstances, be overtaken by the Board of Environmental Protection (Board). This INFORMATION SHEET, in conjunction with consulting statutory and regulatory provisions referred to in this document, will assist with your understanding of the potential opportunities for participation in the Commissioner's process; other specific provisions that apply to the Board are not addressed in this INFORMATION SHEET. A failure to participate during the licensing process will result in a person's only option for influence over that decision being the filing of an appeal. D.E.P.'s *Rules Concerning the Processing of Applications and Other Administrative Matters (Chapter 2)*, 06-096 CMR 2, was promulgated, in part, to provide guidance on this process.

1. **PUBLIC ACCESS TO INFORMATION.** Records submitted to D.E.P. are generally available to the public under Maine's Freedom of Access Law, 1 M.R.S.A. §§ 401-410. Other than portions claimed to be confidential by law when submitted to D.E.P., all license application materials are readily available for review and copying at our offices in Augusta, Portland, Bangor, and Presque Isle.

2. **PUBLIC NOTICE.** Maine law requires applicants to publicly make known their intent to submit an application to D.E.P. It is the responsibility of an individual who is interested in following or participating in the license decision-making process to act after seeking out that notice or, if you are an abutter, to act when noticed directly by mail.

   A. **Public Informational Meetings.** Informational meetings are held by persons prior to submitting a licensing application to D.E.P. for the purpose of informing the public about an anticipated project. These meetings are held at a location near to a proposed project and are by design open to the public. Abutters to the anticipated project location receive notice in the mail of the meeting time and location, and notice is also published in newspapers serving the area of the project.

   B. **Application Filing.** Prior to filing an application with D.E.P., abutters to the project location receive notice in the mail of the anticipated filing date, and it is also published in newspapers serving the area of the project.

3. **INTERESTED PERSONS.** Individuals can acquire materials submitted to D.E.P., attend public informational meetings, provide comments and request that a public hearing be held on a filed application, request that the Board take jurisdiction over an application, and provide comments on a draft decision.

   A. **Maximum Participation.** Participation in a D.E.P. licensing decision to the maximum extent possible requires a person to submit a written request stating his or her desire to acquire material related to an application. The individuals who do are known as "interested persons." Once a request is filed, interested persons will be provided with the opportunity to inspect and copy materials on file at D.E.P.; they also receive direct notice of public informational, pre-application and pre-submission meetings, and public hearings. The timing of an interested person's request to be part of the process will determine the number of events potentially available to him or her.

B. Public Informational Meetings. Informational meetings are held to inform the public about environmental impacts that are anticipated from a project. Interested persons may ask questions at such a meeting. Questioners should be aware that answers may not be available during the meeting.

C. Pre-application and Pre-Submission Meetings. D.E.P. often meets with potential applicants to identify regulatory and processing issues that need consideration. Pre-application and pre-submission meetings will typically not be attended by interested persons, in part because such a meeting is not, by law, a "public proceeding" freely open to attendance under Maine's Freedom of Access Law. Although the decision to allow individuals other than an applicant to attend is D.E.P.'s to make, interested persons invited to attend such a meeting should expect only to observe, since public input cannot be received at this time in the licensing process.

D. Application Comments. Interested persons and any other member of the public may submit written comments, including technical information, at any time during the course of an application's processing. It is in that person's interest to submit information early in the process in order to ensure adequate time for consideration by the D.E.P. staff member evaluating the application.

E. Draft Order Comments. Interested persons will receive the Commissioner's draft licensing decision at least five (5) working days prior to final action. Written comments may be submitted on that draft decision. Reasonable notice of when the Commissioner anticipates issuing a final decision on the draft order will also be provided to interested persons.

F. Public Hearing Requests. People may request that a public hearing be held on a filed application within 20 days after its acceptance as complete for processing by D.E.P. Such a request must satisfy requirements found in Section 7 of Chapter 2. The Commissioner will typically order that a hearing be held where credible conflicting technical information appears to exist regarding a licensing criterion.

G. BEP Jurisdiction Requests. People may request that the Board assume jurisdiction over a filed application within 20 days after D.E.P. accepts it as complete for processing. Such a request must satisfy Section 17 of Chapter 2. Board jurisdiction is not available for windpower development projects.

ADDITIONAL INFORMATION

If you have questions or need additional information on the appeal process, contact the D.E.P.'s Director of Procedures and Enforcement by calling (207) 287-7688. All Maine D.E.P. rules and laws are available via the internet by following the links provided at: http://www.maine.gov/dep/.

Note: D.E.P. provides this INFORMATION SHEET for general guidance only; it is not intended for use as a legal reference. Maine law governs every citizen's rights.

SIGN-IN-SHEET

WMDSM Phase 14 – Public Information Meeting – 09/19/19
SIGN-IN-SHEET

NAME	ADDRESS	E-MAIL
Janey McKeen	Sophie May Lane Norridgewock	mydogs@tds.net
Taylor Abbott	Norridgewock, ME	tabbott@centralmaine.com
Derek Lachance	Norridgewock, ME	
Jessica Vaillancourt	Norridgewock, ME	
Derek Furbush	Norridgewock, ME	
Tyler Grant	47 main st, Norridgewock	Tyler.G.Grant@gmail.com
Ronald Frederick	7 FAWN Rd Norridgewock	
DAREN TURNER	PO BX 865 Skowhegan ME 04976	
Helen Balgooyen	256 Old Kelly Rd Nrw	
Rebecca Ketchum	sophie may Lane	RKetchum1@aol.com
Sallie Wilder	Wilder Hill Rd	sewilder@tdstelme.net
Richard LaBelle	Town Manager 16 Perkins St / Po Box 7	townmanager@townofnorridgewock.com
L. Joseph Clark	148 Sophie May Lane Norridgewock	clarkjl@tdstelme.net
Gaylon Rogers	31 Upper Maine St	Gaylon Rogers
Donna Civitella	17 Harmony Ln Mercer	tthands@tds.net
Jay Clement	US Army Corps of Engineers	jay.l.clement@usace.army.mil
Ed Ferreira	New Sharon, ME	
MaryAnn Anderson	266 Fredericks Corner Rd Norridgewock	Duxojme@gmail.com
Steve Anderson	266 Frederick Corner RD - N -	eidilon@gmail.com
JOHN CHESSIA	WM	
Jamie Ledger	56 Tarbell Hill Rd - Norridgewock	ledgerdaughters@tds.net

WMDSM Phase 14 – Public Information Meeting – 09/19/19
SIGN-IN-SHEET

NAME	ADDRESS	E-MAIL
KATHY WILDER	531 WILDER HILL	kathyjwildr@aol.com

MEETING PHOTOS


41
1
Crossroads Landfill - Phase 14
Public Information Meeting – September 19, 2019
Household Hazardous Material Diversion Program
Local Collection Event
The Phase 14 Project will include a Household Hazardous Materials Collection and Reuse Program to keep potentially hazardous materials out of residential waste.
Local communities and residents will be encouraged to participate free of charge.
The three adjacent pictures were taken at a collection event held at the Crossroads facility on August 24, 2019.
Collection events for the local community will continue throughout the life of the Phase 14 Project.
Crossroads Landfill - Phase 14
Public Information Meeting – September 19, 2019
Renewable Energy at Crossroads Facility
Crossroads Renewable Energy
The Crossroads' Renewable Landfill Gas-to-Energy Plant has been capturing gas since March 9, 2009.
The system collects gas from the waste decomposition process and uses it to generate electricity.
On an annual basis, the system collects and combusts 470 million standard cubic feet of landfill gas.
The system powers two, 20 cylinder, Caterpillar engines that are rated at 2,380 horsepower each.
The engines generate 21,684,958 kilowatt hours of electricity per year – that is the equivalent of 13,330 barrels of oil.
The Renewable Landfill Gas-to-Energy Plant will continue operation throughout Phase 14.
Crossroads Landfill Gas-to-Energy Plant Control Room
Caterpillar 3520 Engines
Crossroads Landfill - Phase 14
Public Information Meeting – September 19, 2019
Airport Road Transfer Station Upgrade


EXIT
Crossroads Landfill - Phase 14
Public Information Meeting – September 19, 2019
Organics Diversion and Composting Program
Composting at Crossroads
The Phase 14 Project will include an Organics Diversion and Composting Program.
A facility will be developed at Crossroads to accept and process organic material.
The goal of the program will be to keep organic materials out of waste, thereby saving landfill capacity.
Local residents, schools, and businesses will be encouraged to participate.
Organic materials will be dropped off at the upgraded Airport Road Transfer Station.
Compost produced by the program will be made available to local residents free of charge.
Municipal Solid Waste Disposal
Crossroads Landfill - Phase 14
Public Information Meeting – September 19, 2019
Crossroads and Norridgewock
Current Opportunities: 2004 - 2018
Employment of 30 individuals at the facility.
Payment of property taxes
Annual average: $254,000
Payment of host community benefit
Annual average: $353,000
Waste and recycling services at no cost
Annual value: $350,000
Additional no cost benefits:
Sand shed construction
Road maintenance - ongoing
Disposal fees paid to State of Maine
Annual average: $733,000
Phase 14 Estimated Opportunities: 2020 - 2041
Employ approximately 30 individuals at the facility.
Maine Chamber of Commerce estimates the Phase 14 Project will contribute $298.2 million to the region over its lifetime.
Payment of property taxes
Annual average: Consistent with current figures
Payment of host community benefit
Annual average: Pending
Waste and recycling services at no cost
Annual value: $350,000
Disposal fees paid to State of Maine
Annual average: Consistent with current figures


PERIOD
We are a proud partner of:
move more kids
LET'S GO!
SOMERSET
EXIT
GOLDER
Crossroads Landfill - Phase 14
Public Information Meeting – September 19, 2019
Geology and Hydrogeology
WM


Crossroads Landfill - Phase 14
Public Information Meeting – September 19, 2019
Phase 14 Site Layout
Crossroads Facility Map
KEY POINTS
Crossroads Landfill - Phase 14
Public Information Meeting – September 19, 2019
Liner and Final Cover Systems, Leachate and Gas Collection
KEY POINTS
Crossroads Landfill - Phase 14
Public Information Meeting – September 19, 2019
Stormwater Management
KEY POINTS
Crossroads Landfill - Phase 14
Public Information Meeting – September 19, 2019
Visual Assessment

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS

Crossroads Landfill - Phase 14
Public Information Meeting – September 19, 2019
Natural Resources

WM WASTE MANAGEMENT

Natural Resource Investigations

Water Resource Map

Field Data Collection and Resource Characterizations

Field assessments were completed to map natural resources in 2017, 2018 and 2019:

- Wetlands
- Streams
- Vernal Pools

Natural Resources

Key Points

- All streams intermittent or ephemeral; no perennial streams
- No Significant Vernal Pools as determined by Maine Department of Environmental Protection (MEDEP)
- Greater than 100 foot setback to all streams from limit of waste
- Proposed impacts include direct wetland and vernal pool impacts and one new stream crossing
- Proposed wetland, stream, and vernal pool impacts will be offset via mitigation plan
- Mitigation plan developed in coordination with MEDEP, US Army Corps of Engineers (USACE) and others

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS

Crossroads Landfill - Phase 14
Public Information Meeting – September 19, 2019
Natural Resources

WM WASTE MANAGEMENT

Natural Resource Investigations

MDIFW Resource Areas Map

Wildlife Habitat Assessments

Field assessments were completed to investigate the presence or absence of:

- Deer Wintering Area (DWA)
- Rare, Threatened, or Endangered (RTE) species or habitat
- Significant Wildlife Habitat

Natural Resources

Key Points

- Normandeau has coordinated with MEDEP, Maine Dept. Inland Fish & Wildlife (MDIFW), and Maine Natural Areas Program (MNAP) to identify known and potential wildlife habitat and rare species
- Mapped Deer Wintering Area is a candidate/unrated DWA that has been field verified as low quality
- No impacts to Significant Wildlife Habitat within or in close proximity to the Phase 14 Project Area
- No impacts to rare, threatened, or endangered species or habitat within or in close proximity to the Phase 14 Project Area
- MDIFW-mapped *Bartramia longicauda* (upland sandpiper) habitat not suitable within project area and no individuals observed


Welcome
Sign in here, please.
EXIT
WASTE MANAGEMENT
THINK GREEN.
Together we can
build a more
sustainable


Poland Spring
WM
WASTE MANAGEMENT


TOWN OF NORRIDGEWOCK, MAINE
INCORPORATED 1788
SCHOOL
SPEED
LIMIT
WASTE MGMT EXPANSION
PUBLIC MEETING
9/19 6PM MSES GYM
W. Barr Hatfield Athletic Park

OCTOBER 16, 2019 NOTICE

PUBLIC NOTICE
INTENT TO FILE APPLICATIONS

Please take notice that Waste Management Disposal Services of Maine, Inc. ("WMDSM"), with its principal office at 357 Mercer Road, Norridgewock, Maine 04957, Attention Jeffrey McGown, (207) 634-2714 ext. 6, intends to file a solid waste permit application with the Maine Department of Environmental Protection ("DEP") on or about October 25, 2019 pursuant to the provisions of Title 38 M.R.S. Section 1301, et seq. and Maine's Solid Waste Management rules. At the same time, WMDSM will also file a Natural Resources Protection Act permit application pursuant to the provisions of Title 38 M.R.S. Sections 480-A through 480-HH and Maine's Natural Resource Protection Act rules, and an accompanying request for Water Quality Certification pursuant to 401 of the Clean Water Act. This notice provides an updated anticipated filing date for the applications.

The solid waste application is for a new lined solid waste disposal unit at the solid waste landfill located in Norridgewock, Maine (the "Crossroads Landfill") owned and operated by WMDSM. The project, referred to as Phase 14, will provide an estimated 17 years of additional disposal capacity at the Crossroads Landfill. In addition to construction of the new lined waste disposal unit, the Phase 14 project will include new infrastructure to manage leachate, landfill gas, and stormwater, as well as access roads and environmental monitoring system. The Natural Resources Protection Act application addresses how construction and operation of the Phase 14 project could affect natural resources.

According to Department regulations, interested parties must be publicly notified, written comments invited, and if justified, an opportunity for public hearing given on an application. A request for a public hearing, or that the Board of Environmental Protection assume jurisdiction of an application, must be received by the Department, in writing, no later than 20 days after the application is accepted by the Department as complete for processing. Public comment on the applications will be accepted throughout the processing of the applications.

The applications and supporting documentation will be available for review at the Bureau of Remediation and Waste Management (BRWM) at the DEP office in Augusta, during normal working hours. Copies of the applications and supporting documentation also will be provided to and may be seen at the municipal office in Norridgewock, Maine.

Send all correspondence on the solid waste application to: Maine Department of Environmental Protection, Bureau of Remediation and Waste Management, 17 State House Station, Augusta, Maine 04333-0017 Attention: Linda Butler or contact Linda Butler at (207) 287-7885 or Linda.J.Butler@maine.gov; and comments on the Natural Resources Protection Act application to: Maine Department of Environmental Protection, Bureau of Land Resources, 17 State House Station, Augusta, Maine 04333-0017 Attention: Dawn Hallowell or contact Dawn Hallowell at (207) 557-2624 or dawn.hallowell@maine.gov

CLASSIFIED

Public Notices

Public Notices are a permanent and independent record of government and court actions. These include state and local government meetings, rule making, available contracts, zoning changes, and many more, as required by law. In addition, parties to some court proceedings, such as foreclosures, probate, and estate actions are required to publish notices to ensure notification of affected parties, as well as the general public. These notices also alert business owners, large and small, to potential government contractual jobs, helping to ensure economic activity across a level playing field. Public notices have existed to ensure transparency in all levels of government since the founding of the United States.

State and local notices are published in Maine newspapers and are also recorded at mainenotices.com, where anyone can browse or search notices, and sign up to receive email alerts when relevant notices appear.

ANNOUNCEMENTS

Public Notices

Public Notice

NOTICE OF PUBLIC SALE

Notice is hereby given that in accordance with the Judgment of Foreclosure and Sale entered June 20, 2019 in the action entitled U.S. Bank National Association, as Trustee, for Manufactured Housing Contract Senior/Subordinate Pass-Through Certificate Trust 1998-7 v. William F. Longley, by the Skowhegan District Court, Docket No. SKODC-RE-18-62, wherein the Court adjudged the foreclosure of a mortgage granted by Christine L. Quirion and William F. Longley to Green Tree Financial Services Corporation dated August 13, 1998 and recorded in the Somerset County Registry of Deeds in Book 2459, Page 126, the period of redemption having expired, a public sale of the property described in the mortgage will be conducted on Thursday, November 14, 2019, commencing at 11:00 AM, at the Law Office of Korde & Associates, P.C., 707 Sable Oaks Dr., Suite 250, South Portland, Maine 04106.

The property is located at 67 Old Country Road, Norridgewock, Maine.

The sale will be by public auction. All bidders for the property will be required to make a deposit of $5,000.00 by certified or bank check at the time of the public sale made payable to Korde & Associates, P.C., which deposit is non-refundable as to the highest bidder. The balance of the purchase price shall be paid within forty-five (45) days of the public sale. In the event a representative of the mortgagee is not present at the time and place stated in this notice, no sale shall be deemed to have occurred and all rights to reschedule a subsequent sale are reserved. Additional terms will be announced at the public sale.

Korde & Associates, P.C., 707 Sable Oaks Dr., Suite 250, South Portland, Maine 04106, (207) 775-6223.

Public Notice

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Lost & Found

LOST dog on Rt. 150 in Madison, small mixed breed 207-612-1231

LOST Woman's wedding ring, w/cross & diamond chips, Oct 10th at the Dollar Tree Store in Augusta. Reward. 248-6342

ANIMALS & SUPPLIES

Pets

AKC black lab male puppy, shots, wormed, parents hips are excellent, E.I.C. cmn cleared. 9 weeks old, $800. 207-696-3076

MERCHANDISE

General Merchandise

AMMO for 7mm Mag., 3 boxes for $60 obro. 445-4664

ANTIQUE speedaway kids snow sled, smaller

General Merchandise

CLARINET, make is Leblanc, good condition w/case. $125. 453-0234

CRAFTSMAN VICE nice, model No. 506-51-801, USA $45. 938-2031

DOLL House Books, 10 by Kalmbach Books, like new. $20/all. 495-2220

DRY FIREWOOD about 2 pick up loads, $150 call 858-6221

FLANNEL SHIRTS men's size xl, like new 5 for $25 call 582-3979

FLEECE SHEETS 2 sets, ful size, $15 call 547-3813

GAS FIREPLACE LOGS with burner, $150/BO. Call 616-0699

GUNSMOKE VHS collectors edition, lot of 12. $25 call 465-3735

HAND TOOLS, large collection, some power tools. $200. 431-0739

HAND TOOLS WANTED Chisels, Axes, Hammers, Files, Stanley Planes, Etc. Machinist Tools Estate Lots. Collections, Liberty Tool Co. 888-405-2007

HOME FIREPLACE WOOD CRADLE nice condition $15 call 654-2414

KEROSENE HEATER, upright, good condition. $50. 215-5579.

LEATHER CHAIR, good condition, comfortable. $45. 215-3957

PATIO SET glass top table, 4 chairs, umbrella, $50 obo. 872-9635

PHONO/ CD Recorder w/cassette player, am/fm radio $10. 623-9222

POWER Chair, Jet 3 by Pride. New batteries, exc. cond. $500. 696-3611

PRIUS floor mats, (4) weather tech, excellent $65. 931-7144

PROPANE HEATER, used in work shop, 10,000 BTU. $35. 582-7659

QUARTZ HEATER, (infrared). $65.00. Call 622-9720

RADIO/TAPE PLAYER good condition $25 call 873-3990

REFRIGERATOR, dorm size, 1.7 cu. ft. Good cond. $35. 649-6994

RUG SHAMPOOER, works well, $60. Call 485-7728

SINK, stainless w/faucets & sprayer, exc. cond.

General Merchandise

SNOWSHOES, old, homemade, 4'11" wood $150. 696-4078

TIRES (2) Mastercraft, 265/70R/17, studded, like new $175. 649-7795

TIRES General Artic, studded, M/S, 15/195/65, $40. 242-9290

TOOLS, roof snowrake, spades, hoes, cutters, forks, etc. $85. 622-3840

WOOD PELLET STOVE Great working order $450 OBO 692-4278

WOODEN Shed, 8x8, w/2 doors, hip roof. $200. 458-5581

WOODSTOVE, Englander, you pickup, $400. 631-8470

RECREATION

Camping Equipment

CAMPER Trailer 2010 Cougar 30 FKV, fiberglass w/rubber roof, power awning, V-front, front kitchen, rear bedroom, 6 & 12 ft slides, AC, furnace, TV, new tires. $19,000. Chelsea 207-213-4085

SERVICE DIRECTORY

Chimney Services

CHIMNEY CLEANING Skowhegan Area, 30 mile radius, 399-9113

MID-STATE MASONRY Free Estimates, Insured. 649-3257

Coal Oil & Wood

FIREWOOD Cut/Split/Delivered (Fuel Assistance Vouchers) Visa, MC, Discover accepted. J & M Logging, Inc. Call 622-6353

SEASONED FIREWOOD $115 for half cord pile, cut/split/delivered. Call 238-0043

Contractors

JACKING Camps, barns, etc. by DL McKeage & Sons 453-8194

Handyperson

TONY CAN DO IT
So many projects, So little time From basements to roofs, decks and

Lawn &

FALL CLE REPAIRS rience,

Masonry & Brick

HOTHAM Demo, Anythin 465-5194

Moving & Storag

JIM'S Free E jimsmov 453-

Painting Paper

RON'S PA exp. Low orders fo

Roofing Gutters

ALL SEASC BY D.L Mc 453-8194

Rubbish

DUMP GU attic, g apartme Fully insu www.thec

Tree Serv

ARBORM vice, free censed, 397-4527

PARADIS VICE Fr Licensed Insured.

RH TREE Tree Remo Insured.

VALLEY A TREE SER insured, Referen ble. Ca

HELP W

General H

CARPENTE more yea Call 474-

CLASS A Bangor touch fre daily, opening 6446 for

OCTOBER 16, 2019 NOTICE DOCUMENTS

Waste Management Abutters List 2019

Tax Map	Lot #	Name	Mailing Address
10	35-6	Glenn A. Jones	232 Airport Rd. Norridgewock, ME 04957
10	10	Joseph D. & Susan M. Cloutier	P.O. Box 369 Norridgewock, ME 04957
10	15	Winston L. & Linda J. Ford	251 Haynes Way Cambridge, NY 12816
10	35	Linda S. Roderick	275 Airport Rd. Norridgewock, ME 04957
10	42	Pamela L. Whitten	317 Airport Rd. Norridgewock, ME 04957
10	19	Waste Management Disposal Services of Maine, Inc.	P.O. Box 1450 Chicago, IL 60690-1450
10	24	Daren Turner*	P.O. Box 865 Skowhegan, ME 04976
13	3-1 & 3-3	Heidi Chamberland Trustee	9 Tracy Cove Circle Rome, ME 04963
13	3-5	Paul & Rebecca Alves	P.O. Box 2547 Orleans, MA 02653-6547
13	8	Norridgewock Municipal Airport	603 Airport Rd. Norridgewock, ME 04957
13	13-1	Forrest & Wilma Stevens & Julie S. McCarthy	P.O. Box 659 Norridgewock, ME 04957
13	3-2	Tammy J. Ferland	511 Airport Rd. Norridgewock, ME 04957
14	1, 2, 2-1, 2-2, 46	Waste Management Disposal Services of Maine, Inc.	P.O. Box 1450 Chicago, IL 60690-1450
14	3	Christopher J. Clark	P.O. Box 793 Norridgewock, ME 04957
14	17	Carol Decker*	180 Airport Rd. Norridgewock, ME 04957
14	13-1	Floyd Whitmore	P.O. Box 877 Norridgewock, ME 04957
14	13 & 41	Letty N. Brann	156 Airport Rd. Norridgewock, ME 04957
14	45	Rita Chaykowsky	P.O. Box 658 Norridgewock, ME 04957
14	48-4 & 48-5	Elizabeth A. Skidgell	P.O. Box 93 Smithfield, ME 04978
14	4, 6, 8-1	Edward & Gloria Frederick	362 Mercer Rd. Norridgewock, ME 04957
14	40	Lebanon Masonic Lodge	251 Mercer Rd. Norridgewock, ME 04957
14	10	Northern NE Conference of 7th Day Adventists	P.O. Box 689 Norridgewock, ME 04957
17	17-1, 20, 16	Waste Management Disposal Services of Maine, Inc.	P.O. Box 1450 Chicago, IL 60690-1450
17	12	Avis & Alice E. Emery	229 Frederick Corner Rd. Norridgewock, Me 04957
17	19	Edward & Gloria Frederick Trustee	362 Mercer Rd. Norridgewock, ME 04957

*Not an abutter but being notified with abutters.

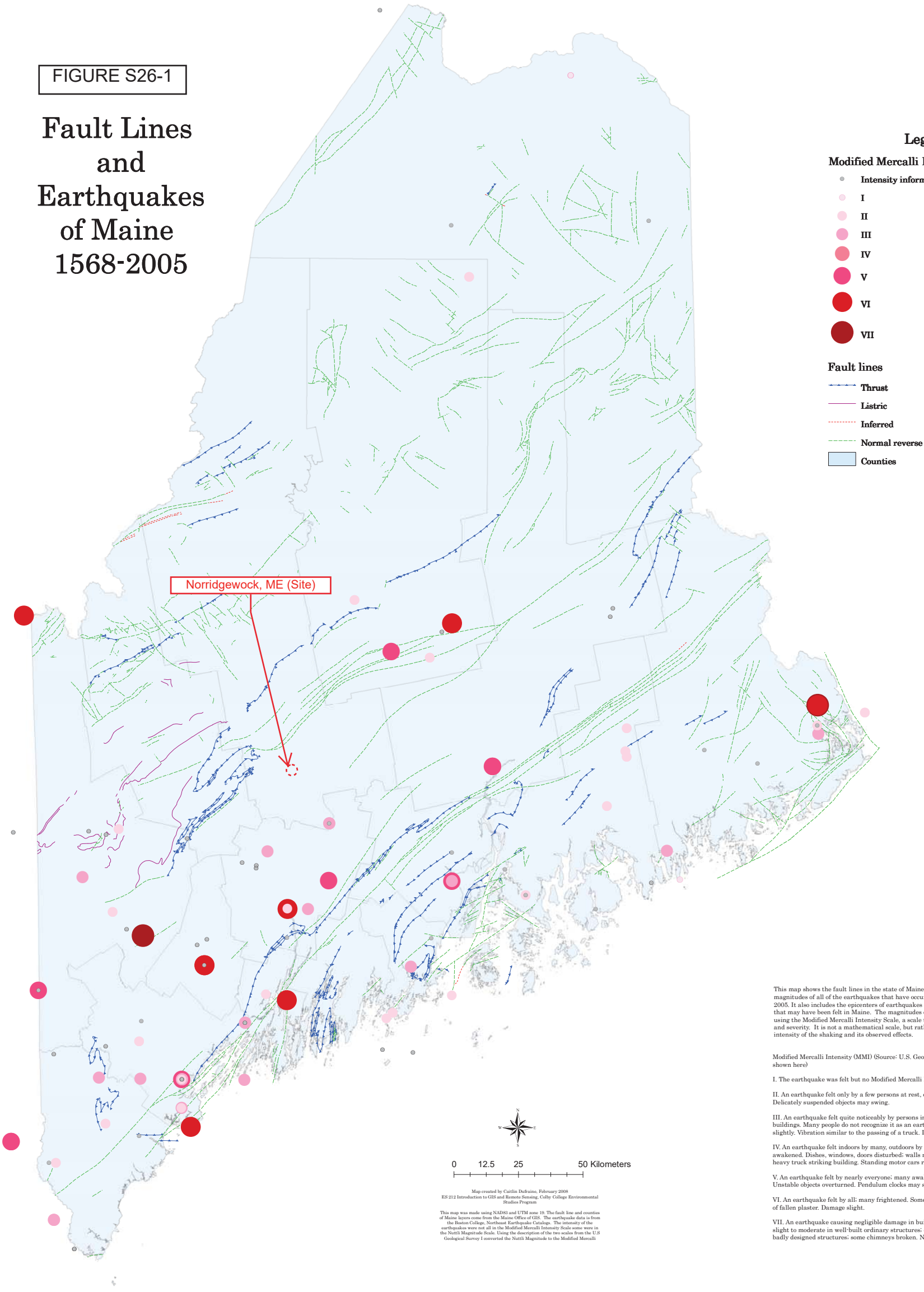
18	7	Waste Management Disposal Services of Maine, Inc.	P.O. Box 1450 Chicago, IL 60690-1450
18	35	Edward & Gloria Frederick Trustee	362 Mercer Rd. Norridgewock, ME 04957
18	8	Parker & Rachel Parsons	134 Frederick Corner Rd. Norridgewock, ME 04957
19	66	Lois & Scott Von Husen	9415 99th Avenue #1013 Peoria, AZ 85345
19	2-5	Krista L. Bowman	290 Mercer Rd. Norridgewock, ME 04957
19	65	Richard & Lelia Von Husen	282 Mercer Rd. Norridgewock, ME 04957

*Not an abutter but being notified with abutters.

APPENDIX 26A
Prohibitive and Restrictive Siting Criteria Maps

FIGURE S26-1

Fault Lines and Earthquakes of Maine 1568-2005



Legend

Modified Mercalli Earthquake Intensity

- Intensity information not available
- I
- II
- III
- IV
- V
- VI
- VII

Fault lines

- Thrust
- Listric
- Inferred
- Normal reverse
- Counties

Map created by Caitlin Dufraine, February 2008
ES 212 Introduction to GIS and Remote Sensing, Colby College Environmental Studies Program

This map was made using NAD83 and UTM zone 19. The fault line and counties of Maine layers come from the Maine Office of GIS. The earthquake data is from the Boston College, Northeast Earthquake Catalogs. The intensity of the earthquakes were not all in the Modified Mercalli Intensity Scale some were in the Nuttli Magnitude Scale. Using the description of the two scales from the U.S Geological Survey I converted the Nuttli Magnitude to the Modified Mercalli

This map shows the fault lines in the state of Maine, and respresents the locations and magnitudes of all of the earthquakes that have occurred in the state of Maine from 1568 to 2005. It also includes the epicenters of earthquakes that occurred outside of Maine but that may have been felt in Maine. The magnitudes of the earthquakes are represented using the Modified Mercalli Intensity Scale, a scale that reflects an earthquake's impact and severity. It is not a mathematical scale, but rather ranks earthquakes based on the intensity of the shaking and its observed effects.

Modified Mercalli Intensity (MMI) (Source: U.S. Geological Survey scale I-XII only I-VII shown here)

I. The earthquake was felt but no Modified Mercalli Intensity was assigned.

II. An earthquake felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.

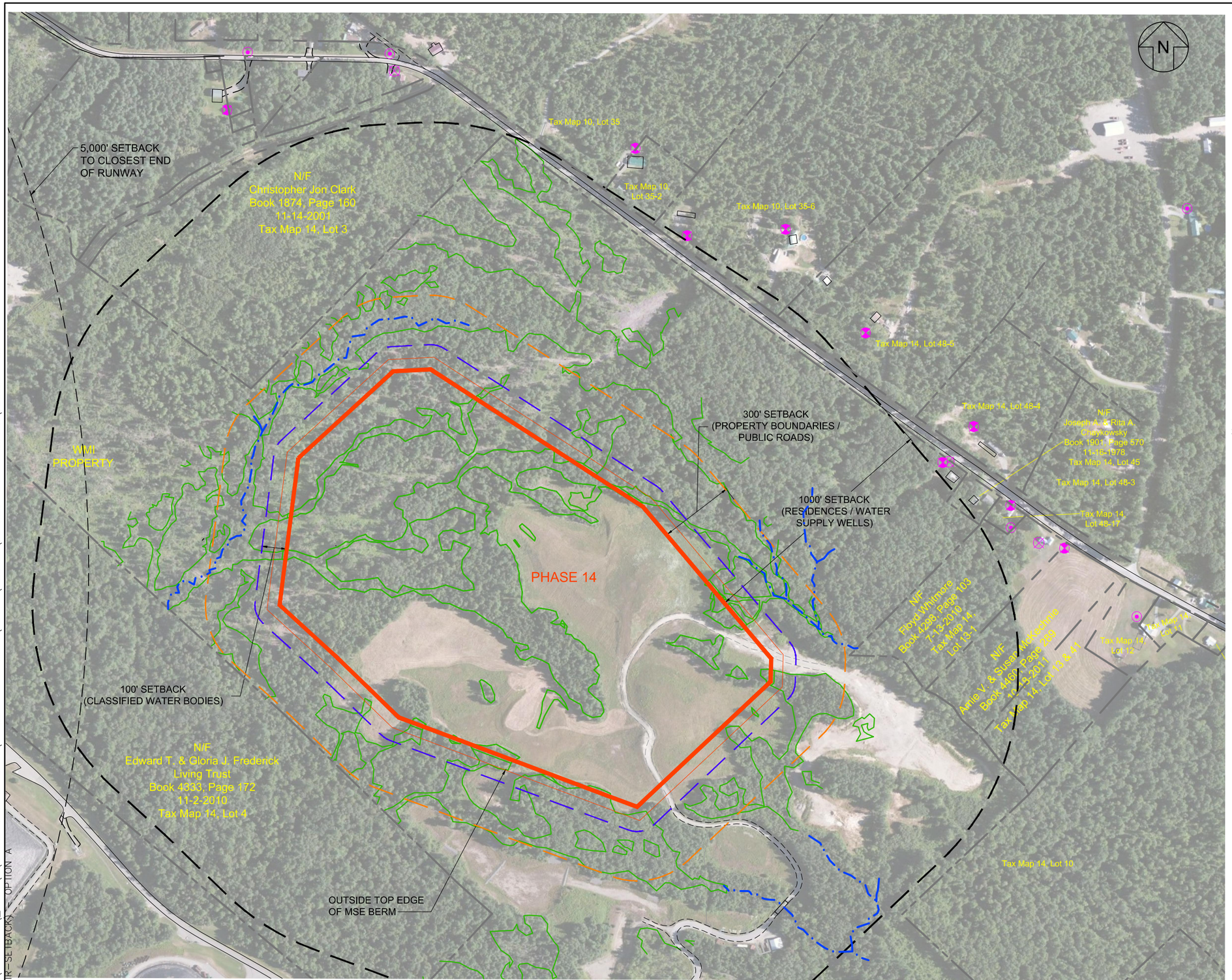
III. An earthquake felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration similar to the passing of a truck. Duration estimated in some cases.

IV. An earthquake felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.

V. An earthquake felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.

VI. An earthquake felt by all; many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.

VII. An earthquake causing negligible damage in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.



LEGEND

- PROPERTY LINE (NOTE 1)
- SETBACK LINES (NOTE 2)
- PHASE 14 PROPOSED WASTE BOUNDARY (NOTE 4)
- EXISTING WETLANDS (NOTE 3)
- EXISTING WETLANDS WITHIN LANDFILL BOUNDARY (NOTE 3)
- CLASS B STREAMS (NOTE 3)
- EXISTING PAVED / GRAVEL ROAD (NOTE 1)
- WATER SUPPLY WELL (NOTE 5)
- RESIDENCE (NOTE 6)

NOTES:

1. EXISTING FEATURES BASED ON "TOPOGRAPHIC PLAN UPDATE APRIL, 2002, WASTE MANAGEMENT LANDFILL" BY SACKETT & BRAKE SURVEY DATE OF AERIAL SURVEY 20 APRIL 2002. WASTE MANAGEMENT PROPERTY LINE FROM A SHAPE FILE PREPARED BY BOYNTON & PICKETT DATED 22 JULY 2019. ABUTTING PROPERTY LINES FROM A CAD FILE PREPARED FROM BOYNTON & PICKETT DATED 8 DECEMBER 2017
2. REFER TO 06-096 MEDEP SOLID WASTE MANAGEMENT RULES: CHAPTER 400.4.E AND 401.1.C FOR SETBACK REQUIREMENTS.
3. STREAM & WETLANDS FROM SHAPE FILES RECEIVED FROM NORMANDEAU ENVIRONMENTAL CONSULTANTS (NORMANDEAU) DATED 4 AUGUST 2017. STREAM LOCATIONS UPDATED FROM A CAD FILE RECEIVED 30 MAY 2019 FROM NORMANDEAU.
4. APPROXIMATE WASTE BOUNDARY AREA 48.6 AC.
5. EXISTING WATER SUPPLY WELL LOCATIONS FROM;
   - MAINE GEOLOGICAL SURVEY ON LINE WELL DATABASE
   - SURVEY DATA PREPARED BY BOYNTON & PICKETT RECEIVED 7 FEBRUARY 2018.
   - SHAPE FILE DATA PREPARED BY MAINE GEOLOGICAL SURVEY AND COORDINATED WITH NORRIDGEWOCK QUADRANGLE SURFICIAL MATERIALS MAP OPEN-FILE NO. 00-65 DATED 2000.
6. LOCATIONS OF RESIDENCES ARE BASED ON THE INTERPRETATION OF THE PRESENTED AERIAL IMAGE, USED ON FIGURE TITLED "WASTE MANAGEMENT BOUNDARY SURVEY 2016", FROM BOYNTON & PICKETT AND FIELD SURVEY DATA PREPARED BY BOYNTON & PICKETT, RECEIVED 7 FEBRUARY 2018.

0 200' 400'
SCALE IN FEET

SETBACKS PLAN
PHASE 14 PERMITTING

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

Geosyntec consultants

PROJECT NO: BE0232 | OCTOBER 2019

FIGURE
S26-2

T:\PROJECTS__CADD\C\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\FIGURES\2019.09 PERMIT FIGURES\BE0232 F S27-2 (PIR - SETBACKS - OPTION A