SCS ENGINEERS

Environmental Consultants & Contractors

April 16, 2021
File No. 25218040.02

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1701 North 4th Street
Superior, WI 54880-1068

Mr. David Buser
Wisconsin Department of Natural Resources
2300 North Dr. Martin Luther King Drive
Milwaukee, WI 53212-3128

Subject: Draft Property Redevelopment Plan
Boundary Road Landfill/Lauer I
Menomonee Falls, Wisconsin

Dear Ms. Endsley and Mr. Buser:

On behalf of Waste Management of Wisconsin, Inc. (WMWI), SCS Engineers (SCS) is submitting the enclosed Draft Property Redevelopment Plan (the "Plan") for the Boundary Road Landfill, Menomonee Falls, Wisconsin. In advance of requesting formal approval for the Plan, we are providing the Draft Plan for your information, discussion, and preliminary feedback.

The purpose of the Plan is to describe procedures proposed to be used to relocate waste from the Boundary Road Landfill (BRL) into the WMWI Orchard Ridge Recycling and Disposal Facility (RDF, License 3360), the Orchard Ridge RDF East Expansion (License 4491), and/or constructed portions of the proposed Orchard Ridge RDF Eastern Expansion, Southern Unit, once approved. The Plan also describes procedures for dewatering and soil and groundwater management for the waste relocation and landfill redevelopment project. Soil and groundwater sampling to be performed following waste removal is also discussed.

For purposes of formal approval and enforceability, WMWI plans to submit the Property Redevelopment Plan as part of the Plan of Operation for the Orchard Ridge RDF Eastern Expansion, Southern Unit. Portions of the Property Redevelopment Plan will also be included in a request for approval of a remediation variance to allow on-site treatment of certain hazardous wastes if encountered during the waste relocation, as addressed in the Draft Plan.

Your comments, questions, or other feedback on the Draft Plan will help us provide a submittal in the Plan of Operation that meets your needs and expectations while being workable for the project.

If you have any questions about the Draft Plan or the ongoing design and permitting process, please contact Don Smith by email at dsmith41@wm.com or by phone at 262-806-6039, or contact Sherren Clark by email at sclark@scsengineers.com or by phone at 608-225-2974.

Sincerely,

Sherren Clark, PE, PG
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SCC/AJR_lmh/EO

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Encl. Draft Property Redevelopment Plan, Boundary Road Landfill, April 2021

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Draft Property Redevelopment Plan

Boundary Road Landfill
Menomonee Falls, Wisconsin
WDNR License #11
EPA ID #WID058735994

Prepared for:

Waste Management of Wisconsin, Inc.
Orchard Ridge RDF
W124 N9355, Boundary Rd
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SCS ENGINEERS

25218040.01 | April 2021

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1.0 INTRODUCTION AND BACKGROUND

1.1 PURPOSE

On behalf of Waste Management of Wisconsin, Inc. (WMWI), this Property Redevelopment Plan has been prepared to describe procedures that will be used to relocate waste from the Boundary Road Landfill (BRL) into the WMWI Orchard Ridge Recycling and Disposal Facility (RDF, License 3360), the Orchard Ridge RDF East Expansion (License 4491), and/or constructed portions of the Eastern Expansion, Southern Unit. These three landfill areas will be collectively referred to as the Orchard Ridge Landfill, or ORL, in this plan.

This document is intended to serve as a guide to establishing the procedures for relocating and handling soil and waste materials. The procedures that are included in the document have been developed to address health, safety and environmental concerns; minimize nuisances; minimize impacts; and relocate the waste in an expeditious manner. Procedures for dewatering, groundwater characterization and management, and soil management are also addressed.

This plan also provides information in support of a request for Wisconsin Department of Natural Resources (WDNR) approval of a remediation variance pursuant to § NR 670.079, Wis. Admin. Code. The purpose of the variance would be to temporarily allow the possible on-site ex-situ storage and treatment of hazardous waste generated during the BRL waste removal, most likely consisting of waste and/or soil with volatile organic compound (VOC) concentrations exceeding toxicity characteristic regulatory limits established in Ch. NR 661, Wis. Admin. Code.

This plan is intended to be a working document, and additional information may be added as additional planning is completed, or in response to comments from the WDNR review team. Modifications to this plan will be made as needed to address review comments and/or regulatory conditions of approval for the East Expansion, Southern Unit Plan of Operation (POO) and/or the remediation variance. The revision number and date on the title page will be updated for each significant revision and the revised version will be provided to WDNR for concurrence prior to implementation of changes. Once finally approved, the amended plan will be a condition of the POO for the East Expansion, Southern Unit.

To adapt to conditions encountered during waste removal activities, modifications to this plan may be proposed by WMWI and approved by WDNR as field modifications. The field modification process will include a proposal for a modification prepared by WMWI and written concurrence by the WDNR (typically via email) prior to implementation of the modified approach. Documentation of the field modification will be included in the construction documentation report submitted by WMWI, and final WDNR approval will be issued as part of the construction documentation report review.

1.2 PROJECT DESCRIPTION AND CURRENT CONDITIONS

BRL is a National Priorities List (NPL) listed site (WDNR Landfill License #11, EPA ID #WID0558735994) located on the ORL complex.

Upon approval of the Feasibility Report (FR) and POO for the Eastern Expansion, Southern Unit, construction of the new landfill area will be sequenced with the excavation of the existing BRL. Development of the Eastern Expansion Southern Unit site will involve excavating BRL waste and re-disposing of the waste within the adjacent ORL (as defined above to include Orchard Ridge RDF, East Expansion, and constructed phases of the Eastern Expansion Southern Unit). The East

Expansion is located north of BRL and the Southern Unit expansion will be contiguous as shown on Plan Sheets 3A (Supplemental Existing Conditions) and 22 (Subbase Grades) of the December 2020 TRC Feasibility Report (FR) Addendum 1 plan set, provided in **Appendix A**.

BRL began accepting waste in or around 1954 and continued until 1971. In the early 1980s, WMWI installed an approved landfill cover with vegetation and constructed a slurry cutoff wall and leachate collection system along the southern perimeter of the site. In the late 1990s, WMWI performed remedial action (RA) according to an approved Record of Decision (ROD) and WDNR Environmental Repair Contract (#SF-90-01). The RA included placement of final cover consisting of 2 feet of compacted clay, 1.5 feet of rooting zone and 6 inches of topsoil. WMWI also completed 12 acres of asphalt and constructed three leachate extraction wells, landfill gas and leachate piping, blower and flare.

BRL waste characteristics were evaluated as part of the 1993 Remedial Investigation (RI) Report by Warzyn. Additional waste characterization investigation performed since the 1993 RI report is documented in SCS Engineers (SCS) May 2020 Waste Characterization Investigation Report (WCIR). The results of the WCIR are summarized in this plan, along with a discussion of the proposed waste removal approach.

The WCIR text, tables and figures are included in **Appendix B**. Analytical results for waste and soil samples collected within and below the BRL waste are summarized in WCIR Tables 3 through 6 and shown on WCIR Figures 5 through 7. Analytical results for groundwater, surface water and leachate samples are summarized in WCIR Tables 11 through 14.

The complete WCIR also includes information in the appendices, in addition to the WCIR text, tables and figures in **Appendix B**. The WCIR appendices include WDNR correspondence; laboratory reports for landfill gas, waste, soil and leachate samples; photographs of the waste borings; and waste boring and leachate head well documentation forms. See the complete WCIR for this information.

2.0 WASTE CHARACTERIZATION AND REGULATORY APPROACH

2.1 WASTE QUANTITY AND TYPES

Based on investigations (12 waste characterization borings) performed at BRL, the waste thickness ranges from 10.5 feet to 27 feet (WCIR Table 2) and the waste quantity estimate is approximately 1.3 million cubic yards. Waste materials encountered during sampling at the facility were generally consistent with typical municipal solid waste. The waste exhumed was generally saturated at depths from 2 to 13 feet above the base of the waste. Crushed metal drums and parts of drums were encountered in borings WC-5 and WC-8. Green and yellow paint was observed in boring WC-8. Petroleum, paint and/or solvent-like odors were noted in several borings.

The site history is briefly summarized in the Waste Characterization Investigation Work Plan (SCS, 2019). The ROD listed general waste types and sources and mentions disposal at the site of liquid hazardous waste. Based on review of WDNR files, SCS has not identified any further details on waste disposal at the site.

2.2 HAZARDOUS WASTE DETERMINATION

As explained further below, for waste characterization purposes in the execution of this project, waste characterization would occur upon exhumation of the BRL material because that is when the waste is "generated" for waste characterization purposes in a remediation context. Waste disposal at BRL ended in 1971, prior to the adoption of the Resource Conservation and Recovery Act (RCRA) and associated rules for hazardous waste characterization and management. Therefore, at the time of disposal, none of the BRL wastes were either listed or characteristic hazardous wastes.

In the landfill environment, with wastes disposed of a minimum of 50 years ago and mixed with other wastes during collection, transportation, and disposal, the source of contamination in bulk waste or soil generally is not known. If documentation of the source of contamination is unavailable or inconclusive, then the waste or soil can be assumed not to contain a listed hazardous waste. Only waste or soil that is determined to be a characteristic hazardous waste will require management as a hazardous waste. In general, the evaluation of bulk waste or soil identified as potentially hazardous will be based on Toxicity Characteristic Leaching Procedure (TCLP) analysis, unless there are field observations indicating that another hazardous characteristic is present (i.e., ignitability, corrosivity, or reactivity).

Similarly, an intact container of industrial waste, such as a 55-gallon drum, can only be determined to contain a listed hazardous waste if the source and/or generating process can be conclusively documented to meet the definition of a specific hazardous waste listing. As noted above, neither the ROD nor the WDNR file information reviewed by SCS identified any specific listed hazardous wastes as having been disposed in BRL. In the landfill environment, with wastes disposed of a minimum of 50 years ago, it is unlikely that industrial wastes can be identified as listed hazardous wastes. Therefore, if an intact container of waste is encountered, the hazardous waste determination will be based on the characteristics of the industrial waste (i.e., toxicity, ignitability, corrosivity, or reactivity).

In situ soil would be classified as a hazardous waste only if it exceeds a TCLP limit when excavated, because that is when the waste is generated.

The process for identifying and handling potentially hazardous wastes is detailed in **Section 4.3.** Wastes that may require testing and/or special management will be initially identified as "suspicious wastes," as that term is defined in **Section 4.3.1**, then evaluated as described in **Section 4.3.5.** Suspicious wastes include intact drums, transformers and bulk solid wastes identified as potentially requiring treatment prior to disposal in ORL based on the criteria outlined in **Section 4.3.5**. Bulk waste or contaminated soil that is classified as characteristic hazardous waste, based on TCLP testing, will be treated on site and rendered non-hazardous prior to disposal in ORL or it will be transported off site for treatment and/or disposal at a facility licensed to accept it. Waste or soil identified as hazardous waste must be treated to meet the RCRA Land Disposal Restrictions (LDRs) prior to disposal in ORL, as described in **Section 4.3.6**.

Wastes in intact drums or containers will be evaluated for a hazardous waste determination as described in **Section 4.3.5** and will be managed as hazardous wastes, if appropriate. Intact electrical transformers will also be segregated, characterized and managed in accordance with the Toxic Substances Control Act (TSCA) requirements and Ch. NR 157, Wis. Admin. Code, if appropriate.

Regulatory options for managing waste or soil that may potentially be classified as hazardous are discussed in the following section.

2.3 REGULATORY APPROACH FOR HAZARDOUS WASTES

WMWI anticipates the project will be completed using a combination of the following regulatory approaches for management of potentially hazardous waste that may be encountered during removal of the BRL waste or underlying soil:

- Exemption for treatment in accumulation containers
- Hazardous waste remediation variance
- Area of Contamination (AOC) policy

The proposed applicability and implementation of each of these approaches is described below. These options were developed based on WDNR's Guidance for Hazardous Waste Remediation (WDNR, 2014).

2.3.1 Treatment in Containers

Regulatory options for ex situ treatment without triggering hazardous waste treatment licensing requirements include treatment in containers, which is exempt by rule, or treatment under the terms of a remediation variance. For small quantities of waste and/or soil, treatment in containers such as roll-off boxes is likely to be the most practicable approach. Treatment in accumulation containers is exempt provided that the applicable conditions in ss. NR 662.014, 662.016 or 662.017, Wis. Admin. Code, are met, which include accumulation quantities, timelines, recordkeeping and other requirements.

2.3.2 Treatment Exemption and Variance

Due to the unknown volume of waste and/or soil that may require treatment prior to disposal, WMWI will request approval of a remediation variance to allow ex situ treatment in a pile within the BRL footprint or within the ORL lined area. The hazardous waste remediation variance approval date will be included in the final version of this plan. Treatment options are discussed in more detail in Section 4.3.6.

Waste or soil will be treated to reduce contaminant concentrations to below the TCLP limits, so that it meets the ORL acceptance limits. In addition, the LDR treatment standards will apply, as discussed in more detail in Section 4.3.6.

2.3.3 Area of Contamination Policy

The AOC policy was first established in 1990 by the USEPA and has been incorporated into the WDNR's hazardous waste remediation rules and guidance (WDNR, 2014). Under the AOC policy, waste within an AOC can be consolidated without creating a new point of generation for hazardous waste. Waste can also be treated in-situ within an AOC without triggering generation. Because there is no new generation, no hazardous waste testing or determination is needed and the LDR and Minimum Technology Requirements (MTRs) are not triggered. Ex situ treatment is not covered under the AOC policy, so it will need to be covered under a remediation variance or under the exemption for treatment in containers, as described in the previous sections.

The AOC policy will not be used with regard to the final placement of BRL waste, but will allow exhumed wastes and contaminated soil from the BRL site to be temporarily stockpiled within the BRL footprint, without triggering hazardous waste testing requirements or LDRs.

If treatment is performed in situ within the AOC, then hazardous waste testing and treatment licensing requirements will not apply. If treatment is performed ex situ (i.e., following excavation and consolidation), the AOC policy will not apply, even if the ex situ treatment is performed within the AOC. Ex situ treatment will be covered under the treatment in containers option or the treatment exemption and variance, as described above.

3.0 PROJECT APPROACH, PHASING AND SCHEDULE

3.1 WASTE EXHUMATION AND LINER DEVELOPMENT APPROACH AND PHASING

WMWI will complete the exhumation of BRL waste in phases. The waste exhumation and relocation process is anticipated to proceed as described below; however, as work progresses, the approach may be modified to optimize the process based on conditions encountered.

Per the FR (TRC, 2020), the Eastern Expansion, Southern Unit of ORL includes the adjacent lateral expansion south of the East Expansion (including exhumation of BRL) and a vertical expansion overlying the southern portion the East Expansion. The proposed expansion will be developed and operated in three phases; Phases 5, 6 and 7. Each phase will be divided into two modules, as shown on FR Plan Sheet 22 (**Appendix A**).

Topsoil in each phase will be stripped and stockpiled for future use. Construction of each phase will then require excavation of BRL final cover soil, the underlying biosoil grading layer, waste and underlying soil to the design subbase grades or to the bottom of the BRL waste, whichever is deeper. In areas of the site where the proposed subbase grades are above the base of the existing waste, the BRL waste will be removed, and then fine-grained soil fill will be placed and compacted to achieve the subbase grades.

The BRL biosoil grading layer, below the final cover and above the waste, consists of petroleum-contaminated soil that had been treated in a biopile prior to use. In addition to biosoil, the existing BRL grading layer may also include general fill soil. Management of the waste materials excavated from the BRL is described in **Section 4.0** and soil management is further described in **Section 6.0**.

Upon completion of subbase preparation for a given phase, the liner system will be constructed followed by the leachate collection system. Details regarding the proposed design and phasing for the BRL waste removal and Southern Unit cell construction will be included in the POO for the Eastern Expansion, Southern Unit.

Eastern Expansion, Southern Unit construction activities and field testing will be documented in accordance with procedures approved by the WDNR as part of the POO. Each phase will be filled and properly covered with final cover or intermediate cover to minimize infiltration and subsequent leachate generation. Engineering controls will be used to limit surface water run-on into the active areas, minimize the amount of contact water and control surface water runoff from the active fill areas. Noncontact surface water will be routed to the storm water management system and the sedimentation basins.

3.2 SCHEDULE

The waste excavation and relocation or processing phases are estimated to occur over a 6- to 8-year period, starting in 2021 following approval of the Eastern Expansion, Southern Unit POO. The estimated breakdown of waste volume and schedule by waste removal phase will be detailed in the POO.

Hours of operation for waste removal will follow those used for other construction projects at ORL. Typically, heavy construction equipment will be operated between the hours of 6:00 a.m. and 5:30 p.m. on Monday through Saturday. Waste relocation activities are typically not expected to be conducted on Sundays. Hours may be extended if approved by the Village of Menomonee Falls in accordance with the local negotiated agreement. This schedule may change due to unforeseen circumstances resulting from weather delays, the types of waste being actively excavated, or significant increases in the waste disposal rates at ORL.

4.0 WASTE EXCAVATION, PROCESSING AND FINAL USE PLAN

4.1 PRE-EXCAVATION PREPARATION

Prior to the start of waste excavation activities, other site preparation activities will occur. Pre-waste removal activities may include:

- Phased gas extraction system removal and reconfiguration (see Section 4.4)
- Phased leachate head well and/or monitoring well abandonment
- Erosion control and storm water management preparations
- Set up of suspicious and hazardous waste temporary storage/management areas (see Section 4.3.5)

4.2 WASTE EXCAVATION

The BRL waste volume is estimated to be 1.3 million cubic yards. In addition to the BRL waste, materials to be excavated will include the final cover soils (estimated 400,000 cubic yards), the biosoil grading layer (estimated 300,000 cubic yards), and soil below the BRL waste that is excavated to reach the design subbase grades (estimated 300,000 cubic yards), resulting in a total estimated excavation volume of 2.3 million cubic yards. This section of the plan addresses the waste excavation only. The approach for management of excavated soil materials above and below the waste is detailed in Section 6.0 of this plan.

Waste excavation will start on the northern end of BRL and proceed south. As waste is excavated, it will be managed as described in Section 4.3. The BRL waste exhumation activities will be performed using standard earthmoving equipment. Waste that is not separated for special management as described in Section 4.3 will be hauled to an active area of ORL for direct disposal.

Waste will generally be removed in lifts, similar to the typical filling procedure in reverse. The surface of the waste lift will be sloped to the interior and will drain to temporary sumps excavated in the waste to facilitate leachate collection and removal.

The existing BRL final cover will be removed as waste removal progresses. The clean final cover soils will be stockpiled for future use as daily/intermediate cover and/or in the liner/final cover system construction. The BRL final cover design includes 2 feet of compacted clay overlain by 1.5 feet of rooting zone soil and 6 inches of topsoil. Final cover material thicknesses identified in the 2019 waste characterization borings were generally consistent with the cap design. Topsoil, rooting zone and clay cap materials will be segregated during removal and will be stockpiled if not used directly.

Daily cover will be used on an as needed basis during the waste removal process. Due to the age of the waste and the anticipated high percentage of soil in at least some portions of the waste, WMWI anticipates that temporary daily cover will often not be needed on an overnight basis. Exposed waste will be covered if it will be left exposed for more than 24 hours. Daily cover will be used on an overnight basis if needed to control vectors, odor, fire, litter, or scavenging.

Alternative daily cover materials approved for the East Expansion, with the exception of tarps, will not be used for the BRL waste removal unless specifically approved by WDNR for that purpose. Tarps may be used as daily cover. Daily cover soils or other soils obtained from within the waste may be used as daily cover during waste removal, provided they do not have a solvent odor or other apparent indication of contamination and can be separated from the waste such that only minimal quantities of non-soil materials are included in the daily cover.

Intermediate cover will be placed on the waste cut slope and/or any other areas where waste removal has been started and additional removal is not expected to occur within 6 months.

4.3 WASTE HANDLING PROCESS AND PROCEDURES

4.3.1 Waste Screening

As waste is excavated, it will be screened for classification into waste type categories using a screening process and categories described below. The overall waste screening and management process is shown graphically as a flow diagram on **Figure 1**.

The major waste type categories include:

- Typical waste (municipal and industrial)
- Salvageable waste
- Suspicious waste
- Hazardous waste

For this project, suspicious waste is defined as the following:

- Intact, non-empty drums or containers that are at least 50 gallons in capacity.
- Intact electrical transformers.
- Waste that looks like paint, sludge, or other obvious industrial waste or has an obvious solvent odor, and is present in a significant, recoverable volume (e.g., more than 20 cubic yards).
- Soil that has an obvious solvent odor, significant staining, or other field evidence of significant impacts.
- Waste or soil encountered that creates conditions requiring a stoppage of work due to potential worker health and safety concerns.

- Waste or soil in the immediate vicinity of a location where previous waste characterization testing indicated one or more VOC total concentrations exceeding 20 times the TCLP limit or polychlorinated biphenyls (PCBs) above 50 mg/kg (e.g., waste within 5 feet in any direction from the samples collected in borings WC5 and WC6).

Specifically excluded from the definition of suspicious wastes for the BRL waste removal are:

- Waste that presents as municipal solid waste.
- Waste that presents as sludge or industrial waste without an obvious solvent odor.
- Waste that presents as other solid wastes currently or historically accepted at ORL.

Hazardous waste is defined in accordance with Ch. NR 661, Wis. Admin. Code, and the hazardous waste determination process provided in Section 2.2. Waste that is identified as potentially suspicious waste will first be evaluated through field observations or screening. Based on that evaluation, a decision will be made on the need for testing, as described in Section 4.3.5, to determine whether the material is hazardous waste.

The proposed procedure for screening waste during the waste exhumation process is as follows.

- Trained WMWI and/or third-party observers and/or equipment operators at the active face of waste excavation will visually screen excavated material for salvageable waste and suspicious waste.
- Trained operators at the active waste disposal area will visually screen excavated material during re-disposal operations for suspicious waste.

The subsequent handling process for each of these waste categories is defined in the following sections. Management of soil excavated during the waste removal and subsequent phase construction is discussed in Section 6.0.

4.3.2 Typical Waste Handling Procedures

Waste determined to be typical municipal or industrial waste will be handled as follows.

- Excavators or other heavy equipment will remove the waste and load it into articulated dump trucks.
- If particularly wet materials are excavated, they will be allowed to drain and/or be mixed with drier waste prior to loading into trucks to prevent the separation of liquids from the waste during transportation or placement, unless the disposal of BRL leachate in ORL is approved under the ORL Research, Development and Demonstration (RD&D) Plan. Leachate drained from excavated waste within BRL will be managed as described in Section 4.8.
- BRL waste will be moved to active areas in ORL where it will be commingled with incoming waste and compacted.
- The commingled wastes will be covered daily with alternative daily cover (ADC) or general site soils. WMWI will maintain a minimum 15-foot separation distance between the

commingled waste and the granular drainage layer since this material is unlikely to meet the requirements of select waste typically used for initial waste placement over newly constructed liner areas.

4.3.3 Asbestos-Containing Materials Procedures

If suspected asbestos-containing materials (ACM) are encountered, they will be evaluated to determine the following information:

- The quantity and type of ACM present (e.g., friable or nonfriable)
- The location, depth and extent of ACM
- Whether the ACM will need to be wetted so that they will not pose a dust hazard during transport

All suspected ACM will be treated as ACM. If the materials are determined to pose a dust hazard, they will be sprayed with water or an alternative dust suppression agent prior to handling and transport. Suspected ACM will be transported to ORL for disposal where they will be handled in accordance with standard ORL ACM management procedures.

4.3.4 Salvageable Waste Handling Procedures

Experience from other waste exhumation projects has shown that segregation of landfill ban materials for recycling or composting is generally not feasible. Therefore, limited recovery of salvageable wastes for recycling, although unlikely, may be pursued if feasible. Materials such as scrap metal or white goods that cannot reasonably be separated for recycling will be disposed of in an active area of ORL without segregation from other wastes.

4.3.5 Suspicious Waste Handling Procedures

If suspicious waste as defined in **Section 4.3.1** is encountered, it will be segregated from the exhumed waste stream for additional characterization, potential on-site treatment and disposal and/or off-site disposal. If a work stoppage is necessary to address potential worker health and safety concerns, the health and safety issue will be addressed and the waste at the excavation face will be inspected for the source materials prior to the resumption of waste excavation activities at that location. Source materials, if identified, will be segregated from the exhumed waste stream for additional characterization, potential on-site treatment and disposal and/or off-site treatment and disposal. If conditions allow, waste exhumation may continue in another area of the active waste removal phase while work is temporarily stopped at the suspicious waste location. WDNR will be notified if a complete work stoppage occurs.

Waste handling procedures are described below for intact drums and transformers and for bulk suspicious wastes, such as waste or soil containing high concentrations of solvents.

Intact Drums and Transformers

Prior to starting each phase of waste removal, a secure storage area will be established for temporary storage of drums, containers and transformers identified as suspicious wastes.

Intact, non-empty drums and other containers greater than 50 gallons in capacity will be segregated from the waste and will be staged in the secure storage area. Drums or containers will be considered intact if they do not appear to be crushed or perforated by corrosion or previously punctured and can be safely removed from the waste excavation in this intact condition with the mechanized equipment available. Non-intact drums that appear to contain water or leachate (i.e., liquid most likely accumulated after disposal) will be managed as non-suspicious waste and transferred with the surrounding waste to ORL for disposal. Crushed or empty drums will also not be segregated from the waste and will be handled in the same manner as the general excavated waste.

If a concentration of intact drums separated by a distance less than the width of the excavator bucket is identified, the drums will be left in place until a WMWI representative can evaluate the drums and identify safe handling procedures. Intact drums in close proximity to other drums will likely be removed individually using drum grapples or similar equipment. Drums that are intact but appear to be in poor condition will be placed in appropriate over-pack containers as necessary.

Specific handling procedures for hazardous materials will be addressed in the health and safety plan that will be developed prior to the start of work. In general, if field screening or visual observations indicate drums or other materials encountered during the excavation of waste may present an increased risk to worker safety, WMWI will perform additional assessment of the potentially hazardous material before removal activities resume. Elevated concentrations of airborne contaminants in the breathing zone or the potential for contact with liquid wastes during drum handling may require the establishment of an exclusion zone and limited operations in Level C or B personal protective equipment (PPE).

Intact drums and containers segregated from the waste and staged in the secure storage area will be screened in the storage area using a combination of visual observation of physical characteristics and fingerprint analysis. Samples of drum (or other container) contents will be collected for off-site laboratory analysis based on the suspected drum contents consistent with the requirements of the intended disposal facility.

Any intact drums or containers of liquid waste that are determined to be hazardous waste will be transported off site for treatment and/or disposal. Multiple drums of similar compatible materials may be combined for shipping. Storage, transportation and off-site treatment or disposal of drums or containers of liquid hazardous waste will be subject to hazardous waste regulations. Drums and containers determined to be potentially hazardous waste will be managed as hazardous waste unless and until testing results or other characterization information is available to document the contents as non-hazardous.

Management of hazardous waste shipped off site will be in accordance with the applicable generator requirements of Ch. NR 662, Wis. Admin. Code.

Liquid wastes determined to be non-hazardous may be disposed of in ORL in accordance with the approved RD&D Plan if they meet the criteria in the WMWI Special Waste Management Plan (SWMP). Approval and documentation requirements of both of these plans will be followed. Non-hazardous liquid waste from drums or other containers may also be transported off site for treatment or disposal at an appropriate facility.

Transformer casings identified during visual waste screening will be segregated from the waste. Transformer casings will be checked for free liquids and PCBs. If the casings contain no free liquid, they may be handled in the same manner as the excavated waste. Transformers that contain free liquids and residual PCB concentrations greater than 50 ppm will be packaged for off-site disposal at a licensed facility. Intact electrical transformers will be managed in accordance with the TSCA requirements and Ch. NR 157, Wis. Admin. Code, if necessary. All PCB-contaminated materials shipped off site will be managed in accordance with Ch. NR 157, Wis. Admin, Code, and 40 CFR 761.

Bulk Suspicious Wastes

Suspicious wastes that are bulk wastes rather than drums, containers, or transformers will be characterized and either managed/treated on site and disposed in ORL or disposed of off site. Suspicious wastes are defined in Section 4.3.1. Bulk wastes include all wastes except electrical transformers and intact, non-empty drums and other containers greater than 50 gallons in capacity.

Initial segregation of bulk suspicious wastes may be accomplished by leaving the wastes in place during characterization after marking the area as a "Non-Excavation Area" until characterization is complete. Bulk suspicious wastes may also be temporarily stockpiled within the BRL footprint or within the ORL lined area. Stockpiling within the BRL footprint may occur either within the active excavation area or on the final cover over future waste removal areas. Bulk suspicious waste that is staged or left in place while awaiting characterization may be temporarily protected with a tarp or soil cover, depending on the type of waste. Stockpiled suspicious waste that appears to contain VOCs (based on field screening or odor) or that has the potential to create nuisance odors, litter, or other problems will be covered. Suspicious waste stockpiles on the BRL final cover will be covered to prevent contaminated runoff and protected from storm water run-on with diversion berms as needed. If suspicious waste stockpiles are placed on the BRL final cover without a temporary liner separating the waste from the underlying final cover materials, the upper final cover soil materials will be scraped off with the waste and the underlying final cover soil will be evaluated in accordance with the Soil Management Plan in Section 6.0.

In addition to the measures described above, soil berms will be placed around suspicious waste stockpiles within the BRL or ORL waste areas, to provide a visual separation of these wastes from other waste and to contain contact water. Signage will be used to identify these areas to operators, contractors and the public to prevent the waste from being inadvertently moved or additional non-suspicious waste being added to the stockpile. Contact water that collects in the bermed area will be managed as leachate.

Based on the site history, characterization to determine the need for treatment prior to disposal in ORL will be limited to VOCs unless field screening (i.e., visual or odor) indicates a significant likelihood that the material could fail the TCLP test for metals or semivolatile compounds. Based on the WCIR data, the single occurrence of metals in excess of TCLP limits appears to be lead that may have been associated with paint waste. Bulk suspicious waste materials will be tested for total and/or TCLP VOCs and other parameters as needed based on field observations. If total concentrations in mg/kg are less than 20 times the TCLP regulatory limits in mg/l, then TCLP testing is not required because the TCLP limit can be presumed to be met.

Bulk suspicious wastes that do not fail the TCLP test and are not otherwise determined to be hazardous or require special treatment will be disposed of in ORL following the typical waste handling procedures previously outlined in Section 4.3.2. Bulk suspicious wastes or soils that exceed one or more TCLP limits will be managed as described in the following section.

4.3.6 Bulk Waste or Soil Treatment Procedures

Bulk suspicious wastes or soils that exceed the TCLP limits will be treated and tested prior to disposal in ORL or will be transported off site for treatment and/or disposal at a facility licensed to accept the materials. Based on the site history, the bulk suspicious materials most likely to be encountered are waste or soils containing high concentrations of VOCs.

If on-site treatment is completed in containers, such as roll-off boxes, then the process is exempt from licensing, as outlined in s. NR 670.001(3)(b)11, Wis. Admin. Code. Although WMWI anticipates treatment may be performed in containers, approval of a remediation variance is being requested in accordance with s. NR 670.079, Wis. Admin, Code, to provide more flexibility due to the unknown quantity of waste requiring treatment and unknown time required to complete treatment.

For treatment that is not performed in a container, excavated materials to be treated will be staged in a lined portion of ORL. Materials for which treatment is expected to be complete within a relatively short time frame (e.g., a few weeks) may also be treated within the BRL footprint. Material will be treated and tested prior to permanent disposal in ORL. Waste or soil that has been determined to be hazardous will be covered with plastic except as needed for treatment and sampling. Treatment within ORL will occur within a lined area of ORL, at least 30 feet above the leachate collection system.

If petroleum-contaminated waste or soil exceeding the TCLP limits is encountered during the waste removal, on-site treatment is anticipated to include biotreatment following the same general approach used for the biotreatment of non-hazardous petroleum-contaminated soil at ORL Any biopile(s) constructed to treat soil or waste exceeding the TCLP limits will be managed and monitored separately from other biopiles constructed under the existing biopile processing license.

If waste or soil exceeding TCLP limits for chlorinated solvents, metals, or other parameters is encountered during the removal work, on-site treatment is anticipated to include on-site stockpiling and mixing of the waste and/or soil with stabilization agents in order to immobilize and degrade suspected contaminants. Depending on the location and timing, it may also be possible to mix the treatment agents in situ prior to excavation.

WMWI anticipates working with a specialty contractor if treatment of chlorinated VOCs in the soil/waste is necessary. Potentially applicable treatment agents to chemically degrade the chlorinated solvent contaminants include sodium percarbonate (e.g., RegenOx), sodium persulfate (e.g., PersulfOx), zero-valent iron, or other agents. These materials are readily available; however, some planning and mobilization time will be required between the initial identification of waste or soil requiring treatment and the start of treatment. For the initial treatment event, a mobilization time of approximately 6 to 8 weeks is expected.

After the waste characterization is complete, a preliminary treatment approach will be developed based on the contaminants present, material types and material quantities. Prior to treatment of bulk suspicious waste or soil, WMWI will submit the proposed treatment approach to the WDNR for concurrence. The information submitted to the WDNR for the proposed treatment option will include the following information:

- The material type and quantity to be treated
- The waste characterization sampling results
- The treatment option selected and justification for the chosen treatment
- The location of the storage and treatment area(s)
- The proposed sampling plan for post-treatment confirmation sampling
- Any potential air management or health and safety issues to consider

Once the specialty contractor is on site, a field scale pilot test will be performed. If the pilot test is successful, treatment of the remaining waste will be completed. Other similar waste encountered as the waste removal progresses can be treated using the same process without further pilot testing. If the initial pilot test is unsuccessful or a significantly different waste requiring treatment is encountered, then the pilot test process will be repeated using different treatment techniques/ agents.

The specialty contractor will provide the treatment agent(s), mix ratio and application services. Mixing may be performed by WMWI, by the waste removal contractor, or by the specialty contractor, depending on the waste treatment quantities and material types. Mixing of small quantities of waste or soil with the treatment agent may be done with an excavator or other standard construction equipment. For larger quantities of soil or soil-like waste materials, mixing with treatment agents may be done with a pug mill or other dedicated mixing equipment.

The treatment schedule will depend on the quantity and characteristics of waste and/or soil requiring treatment, the area available for storage and other operational factors. Treatment may be performed in small batches as material requiring treatment is encountered, or material may be stockpiled for a larger, more efficient treatment event at the end of each waste removal phase.

The minimum goal of on-site treatment will be to reduce contaminant concentrations to below the TCLP limits, so that it meets the ORL acceptance limits. For disposal, the RCRA LDR treatment standards will also apply. Based on the site history and known site contaminants, characterization to determine whether the LDR treatment standards are met will be limited to VOCs unless pre-treatment field observations or laboratory results indicate a significant likelihood that other hazardous constituents (metals or semivolatile compounds) could be present at concentrations exceeding the LDR treatment standards.

The applicable LDR treatment standards will depend on the hazardous constituents present and the type of material being evaluated. For contaminated soil, including suspicious waste that is primarily soil, the alternative LDR treatment standards for contaminated soil in s. NR 668.49, Wis. Admin. Code, will apply. These standards generally require that soil be treated to a concentration less than 10 times the universal treatment standard (UTS), unless treatment to remove 90 percent of the contamination results in a higher standard. For example, the UTS for trichloroethene is 6 mg/kg; therefore, the LDR treatment standard cap for soil is 60 mg/kg.

Based on the site history, age of the waste and observations from the waste characterization borings, most material requiring treatment is expected to be contaminated soil or a mixture of soil with other waste materials, and will be subject to the alternative LDR treatment standards described above.

For suspicious wastes that are not primarily soil and are determined or assumed to be hazardous, the LDR treatment standard under s. NR 668.40, Wis. Admin. Code, is the UTS. These standards would apply in the event that an industrial waste was encountered and was not in a mixture that was primarily soil, such as a distinct sludge layer with a solvent odor.

Examples of the applicable treatment standards for characteristic hazardous waste treated for disposal in ORL include the following:

	TCLP Limit	LDR Treatment Standard – Waste (=UTS)	Alternative LDR Treatment Standard – Soil (=10 X UTS, or 90% reduction)
Benzene	0.5 mg/L	10 mg/kg	100 mg/kg or 90% reduction, whichever is higher
Trichloroethene	0.5 mg/L	6 mg/kg	60 mg/kg or 90% reduction, whichever is higher
Lead	5 mg/L	0.75 mg/L TCLP	7.5 mg/L TCLP

For disposal of treated waste or soil in ORL, both the TCLP limit and the applicable LDR treatment standard must be met. Treated waste or soil materials that remain characteristically hazardous or do not meet the applicable LDR treatment standards will not be accepted for disposal in ORL. These materials will either be subjected to additional treatment or disposed of at an off-site facility licensed to accept them.

No treated hazardous waste can be used as daily cover within the landfill. All treated hazardous waste disposed of in ORL will be covered by the end of the operating day.

Soil excavated from BRL that does not exceed TCLP limits may also be treated in order to allow for use of the soil outside of the lined area, as described in the Soil Management Plan in **Section 6.0**. Soil receiving treatment to allow beneficial use could include petroleum-contaminated soil in the grading layer or impacted soil that is excavated below the bottom of the BRL waste to reach the subbase grades for the Eastern Expansion, Southern Unit. Soil encountered within the BRL waste will be managed as waste and will not be treated for beneficial use.

4.3.7 Hazardous Waste Recordkeeping and Reporting

Hazardous waste generator recordkeeping and annual reporting will be completed as required under Ch. NR 662, Wis. Admin, Code, based on the quantity of hazardous waste generated, if any.

Prior to placing treated material into ORL, confirmation sample results documenting that the LDR standards have been met will be submitted to the WDNR.

At the end of each phase of the BRL waste excavation, a documentation report will be prepared and submitted to the WDNR as described in **Section 8.0**. The report will include the following information regarding suspicious and hazardous waste:

- A summary of each type and amount of suspicious material encountered
- Whether or not the suspicious material was determined to be hazardous waste
- The treatment method for each type of material treated
- The post-treatment confirmation sampling results if the material was treated on site
- The disposal method for each type of material (on-site and off-site)

Additional reporting details are outlined in **Section 8.0**.

4.4 LANDFILL GAS COLLECTION SYSTEM OPERATION

The BRL landfill gas collection system will be operated to the extent practicable throughout the multi-year waste removal process, with a primary goal of controlling odor and other emissions. The average landfill gas flow rate at the BRL blower in 2017 through 2019 was approximately 90 cubic feet per minute, at an average methane content of 35 percent.

The blower and flare are located near the southeast corner of BRL, which will allow continued operation as the waste removal is completed in phases from north to south. As the waste removal progresses, gas collection system components within each waste removal phase will be removed. Temporary condensate sumps will be installed as needed and will be moved as additional sections of the header are abandoned. The expected phases of gas collection system dismantling will be shown on the phasing drawings in the POO.

If continued operation of the gas collection system is not practicable earlier in the waste removal process than originally planned, the blower and flare will be shut down. Due to the low gas production volume and methane percentage, the system will likely be operated on an intermittent basis rather than continuously, particularly in the later phases of the project. A vent flare such as the Solar Spark® vent flare (LSC Environmental) may also be evaluated for use for continued odor/emissions control.

After the initial phase of the Eastern Expansion Southern Unit is constructed, an alternative approach for continued operation of the BRL gas collection system may be to connect some or all of the remaining BRL system to the ORL gas collection system. Supplemental temporary wells or laterals in the BRL waste may also be added as warranted for control of odors and emissions during the waste removal process.

4.5 AIR MONITORING

4.5.1 Ambient Air On Site and Off Site

During the project, ambient air will be monitored on and off the ORL/BRL property to assess air quality in areas where the public may be present. The proposed ambient air monitoring plan is outlined below and will be modified as needed based on observed results.

- Parameters: VOCs will be the primary air contaminants of concern. Additional parameters could be added if observations during waste removal or results of soil testing indicate a potential for ambient air impacts.

- Sampling and analysis methods: VOC samples will be collected using a personal air sampling pump. Weather conditions will be recorded for the site or for the closest weather station, including temperature, precipitation, barometric pressure, pressure trend, wind speed and wind direction. Samples will not be collected when the wind speed is greater than 15 mph. The location and day/time of collection of each sample will be recorded.

- Locations: For each sampling event, the sampler will select monitoring locations as follows, based on the wind direction, active waste removal areas and other observations:

  - Upwind – One location upwind of the ORL and BRL facilities.

- On Site – One location in the public access areas of ORL, downwind from the waste removal area if possible; otherwise in a public access area near the waste removal area. For example, if the wind is blowing from the south, the sample could be collected in the scale area. If the wind is blowing from the north, there are no on-site public access areas downwind from the waste removal area, so a nearby upwind or cross-wind location would be used.

- Off Site Downwind – Two locations beyond the BRL/ORL property limits and downwind from the waste removal area at locations chosen considering the wind direction and locations of streets, residences, or other places where people are likely to be present.

- Frequency: Air monitoring will be performed weekly for at least the first 6 weeks of waste excavation. If all results are below ambient air quality standards, the sampling frequency may be decreased to biweekly.

4.5.2 Site Worker Health and Safety

The site safety coordinator for each contractor will designate required air monitoring where their respective personnel are working, according to the requirements of their respective Health and Safety Plans.

4.6 DUST AND ODOR CONTROL MEASURES

To the extent practicable, waste excavation activities will take place during the winter months to help reduce odors and dust; however, the large waste removal volumes may require waste removal beyond the winter months. Additional odor control strategies will include operation of the BRL landfill gas collection system as described in **Section 4.4** and the use of daily and intermediate cover as described in **Section 4.2**. Additional cover materials may be applied if odor problems arise.

If the strategies described above are insufficient to adequately control nuisance odors, WMWI may use odor control misters with masking or neutralizing agents to reduce odors.

For dust control, a water truck is available on site for watering the waste excavation working face, access roads, stockpiles and other areas at which dust may be generated. The site operators are responsible for the maintenance of access roads. The roads will be cleaned as necessary to minimize the risk of dirt, mud and litter carried off site.

4.7 SURFACE WATER MANAGEMENT MEASURES

Surface water controls (e.g., berms, swales and ditches) will be put in place to prevent clean runoff from entering the working face at BRL. The surface water controls will be relocated as needed as waste excavation activities are in progress. Surface water that comes in contact with waste will be collected and managed as leachate.

4.8 CONTACT WATER/LEACHATE COLLECTION

Leachate and/or groundwater that is encountered during excavation of BRL, including contact water that is generated by precipitation falling on the waste, will be collected to the extent possible, and will be discharged to the sanitary sewer or another approved discharge option as discussed in **Section 5.1**.

Within the waste excavation areas, a collection sump consisting of a low excavation will be created to collect leachate. The collection sump in the waste excavation area will be relocated as required so as to remain in those areas where waste excavation activities are occurring. Waste slopes during excavation will be constructed to divert leachate and runoff from the waste to the collection sump. A pump will be placed in the sump to move liquids for proper management.

4.9 COLD WEATHER OPERATIONAL ISSUES

Because substantial portions of the waste removal will be completed in the winter, cold weather operational issues will need to be addressed. Cold weather issues for the waste removal include the same issues that are present for normal landfill operations plus additional issues specific to BRL. The following measures will be taken to address cold weather issues:

- Snow removal may be required to clear access roads.
- A daily cover source will be maintained for cold weather operations.
- Frost breaking or ripping equipment will be made available as needed on site to assist in excavating soil.
- Temporary discharge piping and pumps for dewatering will be protected from freezing.
- Frozen soil will not be used for structural backfilling.

5.0 LEACHATE AND GROUNDWATER MANAGEMENT

5.1 LEACHATE/CONTACT WATER MANAGEMENT

Leachate and/or groundwater that is encountered during excavation of BRL, including contact water that is generated by precipitation falling on the waste, will be managed and collected as described in Section 4.8. Collected leachate, groundwater and contact water will be discharged to the sanitary sewer, consistent with current management of BRL leachate, unless and until one or more alternative leachate discharge options is approved. Alternative discharge options may include:

- Discharge to the storm water management system if the discharge is approved under a general or site-specific WPDES permit and monitoring indicates the water quality meets the discharge standards. The leachate/contact water may be treated prior to discharge, using a passive treatment approach such as aeration in a rock-lined channel or an active approach such as an air stripper.

- Disposal in ORL if approved under the SWMP and RD&D Plan, subject to the conditions of the RD&D Plan and plan approval.

5.2 UNDERDRAIN COLLECTION MANAGEMENT

As described in Section 8.6 of the Eastern Expansion, Southern Unit FR, an underdrain system is proposed to be installed below the base and sidewalls of the liner of the landfill expansion into the BRL footprint. The underdrain system layer (geonet composite) is proposed to be installed across the bottom of the subbase excavation, below the clay component of the liner system, and an additional 4-foot-wide geonet composite strip is proposed to be installed below the proposed leachate collection line locations where flow will be concentrated.

Liquid collected by the underdrain system layer will be collected in subbase underdrain collection sumps. It is expected that, at least in the short term, collected groundwater from the underdrain system will likely show some impacts from the BRL waste. As such, it is anticipated the collected underdrain discharge will initially be handled as contaminated groundwater. In that case, collected groundwater would then be expected to initially be discharged via a forcemain system to the sanitary sewer for treatment by the Milwaukee Metropolitan Sewerage District (MMSD) unless and until one or more alternative underdrain discharge options is approved.

The alternative discharge options for the underdrain may include:

- Discharge to the storm water management system if the discharge is approved under a general or site-specific WPDES permit and monitoring indicates the water quality meets the discharge standards. The underdrain discharge may be treated prior to discharge to surface water, using a passive treatment approach such as aeration in a rock-lined channel or an active approach such as an air stripper.

- Disposal in ORL if approved under the SWMP and RD&D Plan, subject to the conditions of the RD&D Plan and plan approval.

6.0 SOIL MANAGEMENT PLAN

6.1 SOIL CLASSIFICATION SYSTEM AND MANAGEMENT OPTIONS

The primary sources of soil that will be excavated during the exhumation process include:

- Final cover: topsoil, rooting zone and clay
- Grading layer: biosoil and general fill below final cover and above waste
- Native soil underlying the waste

Soil will be segregated by soil type and contaminant levels for beneficial reuse and/or disposal.

Soil removed during the BRL exhumation and the subsequent excavation to the future expansion sub-base grades will be classified for potential reuse based on field observations and analytical testing. Based on the historic investigation results for the BRL site, analytical testing will be limited to VOCs unless field observations indicate a significant likelihood that other contaminants are present. Excavation, sampling and management procedures for soils removed from the BRL cover system and from below the BRL waste are outlined in **Section 6.2** and shown graphically as flow diagrams in **Figures 2** and **3**.

Excavated soils will be classified into types as defined below, based on the contaminant concentrations, with the allowable reuse options defined for each type.

The proposed soil classification types and the associated reuse options are as follows:

- Type 1 soil is not impacted above the residual contaminant levels (RCLs) established under Ch. NR 720, Wis. Admin. Code, and may be used for construction of berms, roads, or other landfill features outside the limits of waste. Type 1 soil may also be used for intermediate cover on exterior slopes, for final cover, or where filling to achieve sub-base grades is necessary following the removal of waste. Soil impacts will be evaluated based on visual and odor observations, field screening (e.g., photo-ionization detector (PID)) and laboratory testing. For the soil in the grading layer or within the waste (**Section 6.2.2**) and soil below the waste (**Section 6.2.3**), classification of Type 1 soil is proposed to be based on laboratory testing. The quantity of soil to be excavated and managed below the waste is large and the logistics allow testing this soil prior to excavation. Laboratory testing parameters for soil to be used outside the limits of waste will be determined based on field observations of the waste and underlying soil and will include:

- Metals: Lead
- VOCs
- PCBs, if field observations of the overlying waste indicate significant quantities of potentially PCB-containing equipment or material.

If the results confirm the soil is not impacted above soil RCLs established under NR 720 or natural background concentrations for metals, then the soil will be used on site without restrictions.

- Type 2 soil is impacted soil that may contain contaminants at concentrations that exceed the Ch. NR 720, Wis. Admin. Code, RCLs or background, but does not exceed the TCLP limits for any constituent and does not contain significant quantities of waste mixed in with the soil. This soil may be used within the lined area of the landfill for purposes such as daily cover or intermediate cover on interior slopes, provided that the soil does not have obvious significant contamination based on field observations (i.e., strong odor or staining). Type 2 soil that does not initially meet the criteria for use as daily or intermediate cover may be treated and retested for use as cover, or may potentially be used for internal berms or other uses that will not result in surface exposure of significantly contaminated soils. This soil may also be disposed of as solid waste in accordance with the WMWI SWMP.

- Type 3 soil is impacted soil that may contain contaminants at concentrations that exceed the Ch. NR 720, Wis. Admin. Code, RCLs for direct contact, but does not present a threat to groundwater quality. VOC-contaminated soil will generally not fall into this category, because the standards for the groundwater migration pathway are generally lower than for the direct contact pathway; however, it is included in the plan to allow flexibility if soil materials meeting these criteria are encountered. Type 3 soils may be used outside the waste limits if they are covered with 2 feet of clean or Type 1 soil. Criteria for classification as Type 3 include concentrations of VOCs and metals, if tested, less than Ch. NR 720, Wis. Admin. Code, generic or site-specific RCLs for groundwater migration or site-specific background. Laboratory testing parameters for Type 3 soil to be used outside the limits of waste will be determined based on field observations of the waste and underlying soil and will include:

  - Metals: Lead
  - VOCs
  - PCBs, if field observations of the overlying waste indicate significant quantities of potentially PCB-containing equipment or material

- Type 4 soil exceeds the TCLP limits for one or more constituents and must be treated prior to use or disposal. Treatment of potentially hazardous waste and/or soil is discussed in **Section 4.3.6.**

6.2 SAMPLING, ANALYSIS AND CLASSIFICATION

6.2.1 BRL Final Cover Soils

The existing final cover over the closed BRL consists of the following layers and average documented thicknesses, from top to bottom, based on the WCIR:

- Topsoil layer, 0.5 feet
- General fill rooting zone layer, 1.5 feet
- Clay cap, 2 feet
- Grading layer, ranging from 2 to 9 feet, including general fill and treated petroleum-contaminated soil

The screening and evaluation process and final use options for final cover soils are discussed below and shown graphically as a flow diagram on **Figure 2**.

Topsoil and the remaining final cover layers will be excavated and stockpiled for future use or hauled directly to other areas where construction activities are taking place, such as perimeter berms, final cover and/or road construction.

Cover soils, including topsoil and rooting zone, will be classified as Type 1 unless they are observed to be in direct contact with waste materials or have obvious odors or staining. The clean Type 1 cover soils will not be tested and will be stockpiled for unrestricted use on the ORL property.

Clay from the final cover more than 0.5 feet above the waste or grading layer and not containing waste will also be assumed to be Type 1 unless obvious odors or staining are present. This soil will not be tested and will be stockpiled for unrestricted use on the ORL property.

The lower 0.5 feet of the clay cap and the grading layer soils, as well as any other cover soils with obvious staining or odors, will be screened and stockpiled separately from clean cover soils. These soils will be managed as described in the following section.

6.2.2 Grading Layer Soil

Based on the soil sampling performed for the WCIR, the BRL grading layer soils will primarily be classified as Type 2 soils. Most samples from the grading layer contained at least one petroleum compound at a concentration exceeding the Ch. NR 720, Wis. Admin. Code, RCL for the groundwater pathway, but none exceeded the Ch. NR 720, Wis. Admin. Code, RCL for the industrial direct contact pathway or the TCLP limit. As described above, Type 2 soil may be used within the lined area of the landfill for purposes such as daily cover or intermediate cover on interior slopes, provided that the soil does not have obvious significant contamination based on field observations (strong odor, staining). Type 2 soil may also be used in the approved alternative final cover system for ORL, for the bottom foot of the 2-foot barrier soil layer below the geosynthetic clay liner (GCL) and geomembrane barrier layer.

Soils mixed with or containing waste will be managed as waste and transported to ORL for disposal.

The screening and evaluation process and final use options for BRL grading layer soils are shown graphically as a flow diagram on **Figure 2**.

Soil within the waste will, in most cases, be encountered mixed with the waste and handled as waste; however, if there are significant berms or other soil masses in the waste that can practicably be separated from the waste, then these soils may be managed separately. WMWI may choose to evaluate these soils to identify whether they meet the criteria for Type 1 or 3, or may default to the Type 2 classification without testing. TCLP testing for possible Type 4 classification is required if a total constituent concentration is more than 20 times the TCLP limit or if the soil meets the criteria for classification as a suspicious waste in **Section 4.3.1** (e.g., obvious odor, work stoppage due to health and safety concerns, other suspicious waste evaluation triggers).

BRL grading layer soils can be assumed to be Type 2 soils based on the WCIR sampling, and used within ORL, but may also be evaluated to see if they meet the more restrictive Type 1 or Type 3 classification for use outside of the landfill. BRL grading layer soils to be evaluated for Type 1 or Type 3 classification will be field screened using a PID and sampled for laboratory analysis as detailed in **Section 6.1**. Screening and/or laboratory analysis for stockpiled soil that has not previously been tested will be at a minimum frequency of one per 500 cubic yards of stockpiled soil for the first 3,000 cubic yards and one per 2,000 cubic yards for additional soil volume, with a minimum of three samples from any stockpile.

If a large berm or other extensive soil mass is encountered within the BRL waste exhumation area, then soil sampling and classification may be performed prior to excavation following the procedures in the following section for soil below the waste.

6.2.3 Soil Between Bottom of BRL Waste and Eastern Expansion, Southern Unit Subbase

Soil will be excavated below the base of the waste in order to reach the subbase grades in many areas of the Eastern Expansion, Southern Unit.

Underlying soil that is not excavated with the waste will be evaluated and sampled prior to excavation to reach subbase grades. Soil that is visually or otherwise noticeably impacted by waste byproducts may be excavated and classified as Type 2 soil without testing, for use within the lined landfill, unless it meets the criteria for classification as a suspicious waste in **Section 4.3.1**.

Sample locations will be selected by dividing the waste removal area into approximate 0.5-acre subareas. Sampling may be performed prior to the start of excavation using borings (e.g., Geoprobe®) or test pits, or may be performed by collecting surface samples as soil removal progresses. Within each 0.5-acre subarea, the sampling locations will be identified using visual and field instrument screening techniques to identify areas of potential contamination at the soil surface. Borings or test pits will extend to the proposed excavation depth (Eastern Expansion Southern Unit subbase grade). A schematic diagram of the proposed sampling approach is shown on **Figure 4.**

For borings or test pits, samples will be screened with a PID at maximum 2.5-foot intervals. Soil samples will be collected from each boring for laboratory analysis at 5-foot intervals. A sample from the bottom of each boring will be collected at all locations, regardless of classification, to document the VOC concentrations that will remain in place following excavation. The shallowest sample collected in each boring will be analyzed for the parameters detailed in **Section 6.1**. Metals and PCB analysis on deeper samples will be performed only if the concentrations in the upper sample exceed RCLs established for the project.

Based on the results of the field screening and testing, the soil to be excavated will be classified as Type 1, Type 2, Type 3, or Type 4. Soil classified as Types 1 through 3 will be used as allowed for the categorical uses by type (see **Section 6.1**) as it is excavated, or placed in stockpiles segregated by type for future use. Soil classified as Type 4 exceeds the TCLP limits for one or more constituents and will be classified as a hazardous waste when it is excavated. Type 4 soil must be treated prior to use or ORL disposal. Treatment of hazardous waste and/or soil is discussed in **Section 4.3.6**.

Soil impacts will be evaluated based on visual and odor observations, field screening (e.g., PID) and laboratory testing. Laboratory testing parameters for soil classification will be determined based on field observations of the waste and underlying soil and will include:

- Metals: Lead
- VOCs
- PCBs, if field observations of the waste indicate any potentially PCB-containing equipment or material

A sample will be collected from the bottom of the excavation (or equivalent elevation in a boring or test pit prior to excavation) in each 0.5-acre subarea, regardless of classification, to document the contaminant concentrations that will remain in place following excavation. These samples may ultimately be used to evaluate the site for closure under Ch. NR 700, Wis. Admin Code. Metals and PCB analysis on deeper samples will be performed only if the concentrations in the upper sample exceed RCLs established for the project.

7.0 POST-EXCAVATION MONITORING

To evaluate groundwater conditions within the footprint following exhumation of the waste removal, temporary monitoring wells will be installed and sampled as the waste removal work proceeds. At the completion of each phase of waste removal operations, there will be an exposed strip of sub-base grade soil between the limits of the new liner and the remaining BRL waste. For each of the six waste removal phases, a shallow temporary monitoring well will be installed in this area to allow collection of groundwater samples below the BRL footprint. A schematic diagram of the proposed groundwater monitoring approach within the BRL footprint is shown on **Figure 4**.

Because the sub-base grades in many locations are at or below the water table, the monitoring wells are expected to be shallow. The well boreholes will not penetrate the “intermediate sand” layer identified in the FR for the Eastern Expansion, Southern Unit. The temporary wells likely will extend no more than 10 feet below the sub-base grades, and will likely be completed with 3 to 5 feet of slotted screen. Proposed well construction details will be provided in the POO. The wells will be constructed in general conformance with the applicable requirements of Ch. NR 141, Wis. Admin. Code, but will likely require a variance from Ch. NR 141, Wis. Admin. Code, due to the shallow desired sampling depth, short screen and/or shortened annular space seal.

Soil samples will be collected continuously during well drilling. At least one soil sample collected from each boring will be analyzed for VOCs and additional parameters if necessary based previous testing of overlying soil. At least two rounds of groundwater samples will be collected from each temporary monitoring well, at least two months apart, with additional monitoring to be conducted semi-annually thereafter until the well is abandoned to make way for the liner construction at this location.

The groundwater samples will be analyzed for the same parameters as the existing BRL monitoring wells. The temporary monitoring wells will be abandoned by over-drilling or excavation prior to the start of the next adjacent phase of waste/soil removal.

8.0 WASTE REMOVAL REPORTING

8.1 WDNR NOTIFICATIONS

The WDNR will be notified under each of the following scenarios during the waste removal project:

- Prior to the start of each waste removal phase.
- When a complete work stoppage for potential worker health and safety concerns occurs (**Section 4.3.5**).
- When a field modification to the approved plan is needed in order to adapt to conditions encountered during waste removal activities. Modifications to this plan may be proposed by WMWI and approved by WDNR as field modifications (**Section 1.1**).

8.2 HAZARDOUS WASTE REPORTING

If hazardous waste is generated as part of the waste removal project, the facility will complete a hazardous waste annual report as required by s. NR 662.041, Wis. Admin. Code.

If hazardous waste is treated on site to remove the hazardous characteristic prior to on-site disposal, then:

- WMWI will submit the proposed treatment approach to the WDNR for concurrence prior to implementation (**Section 4.3.6**).
- Confirmation sample results documenting that the TCLP limits and LDR standards have been met will be submitted to the WDNR prior to disposal (**Section 4.3.7**).

Additional hazardous waste recordkeeping and reporting will be completed as required for compliance with Chs. NR 660-668, Wis. Admin. Code, and the terms of the hazardous waste treatment variance, when approved.

8.3 WASTE REMOVAL DOCUMENTATION REPORTING

At the end of each phase of the BRL waste removal, a report will be prepared and submitted to the WDNR to document the waste removal and characterize the post-removal site conditions. Documentation of the waste removal activities for each phase will include:

- The total estimated volumes of waste and soil materials removed during the phase
- A summary of each type and amount of suspicious material encountered
- Whether or not the suspicious material was determined to be hazardous waste
- The treatment method for each type of material treated
- The post-treatment confirmation sampling results if the material was treated on site
- The disposal method for each type of material (on-site and off-site)

- Analytical results for soil and waste sampling completed during the phase of waste removal

- Soil boring and/or test pit logs for soil sampling conducted below the waste, if sampling is performed using borings or test pits

- Soil boring logs and monitoring well construction and development forms for temporary wells installed during the phase

- Abandonment forms for previously installed temporary wells that were abandoned during the current waste removal phase

- Groundwater sampling analytical results for a least the first round of groundwater samples from newly installed temporary monitoring wells as well as samples collected from previously installed temporary wells since the previous waste removal documentation report was submitted

- Drawings documenting the waste removal activities, including:

  – Existing conditions prior to waste removal, including topography, monitoring points, phase limits, remaining BRL landfill gas and leachate collection infrastructure and storm water management features

  – Conditions following waste removal, including same elements as above plus newly installed monitoring points

  – Sampling locations

The report for each phase will be submitted within 120 days of completion of the waste removal activities, including waste relocation, treatment and collection of the initial groundwater samples from the newly installed temporary wells.

9.0 REFERENCES

SCS Engineers, 2019, Waste Characterization Investigation Work Plan, WMWI Boundary Road Landfill, Menomonee Falls, Wisconsin, February 27, 2019.

SCS Engineers, 2020, Waste Characterization Investigation Report, WMWI Boundary Road Landfill, Menomonee Falls, Wisconsin, May 28, 2020.

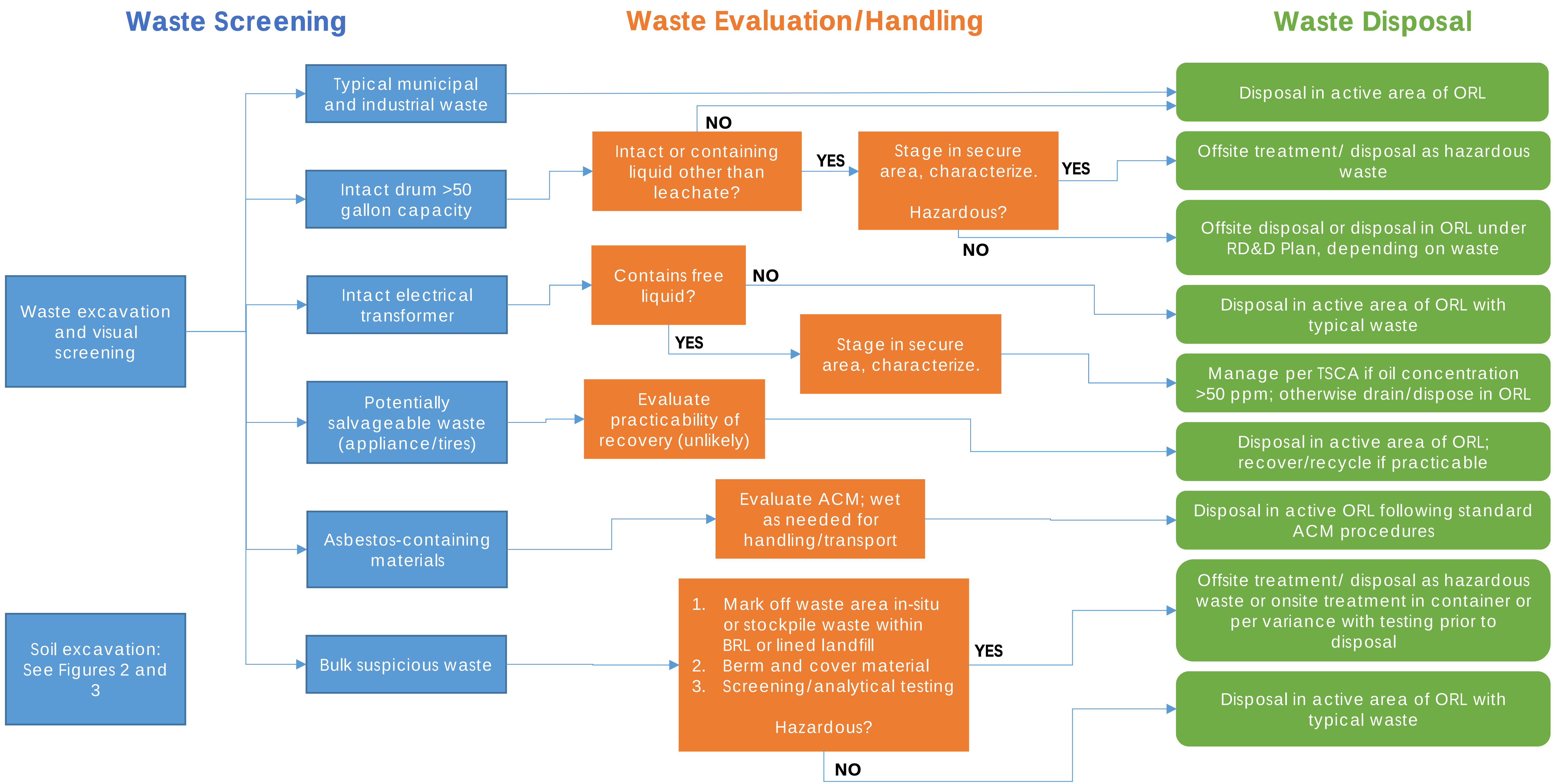
TRC, 2020, Feasibility Report, Orchard Ridge RDF Eastern Expansion, Southern Unit, Village of Menomonee Falls, Waukesha County, Wisconsin, June 2020.

Warzyn, 1993, Remedial Investigation Report, Remedial Investigation/Feasibility Study Boundary Road Landfill Site, Waukesha County, Wisconsin, July 2, 1993.

WDNR, 2014, Guidance for Hazardous Waste Remediation, RR-705, Wisconsin Department of Natural Resources, Bureaus of Remediation and Redevelopment and Waste and Materials Management, January 2014.

Figures

WORKING DRAFT

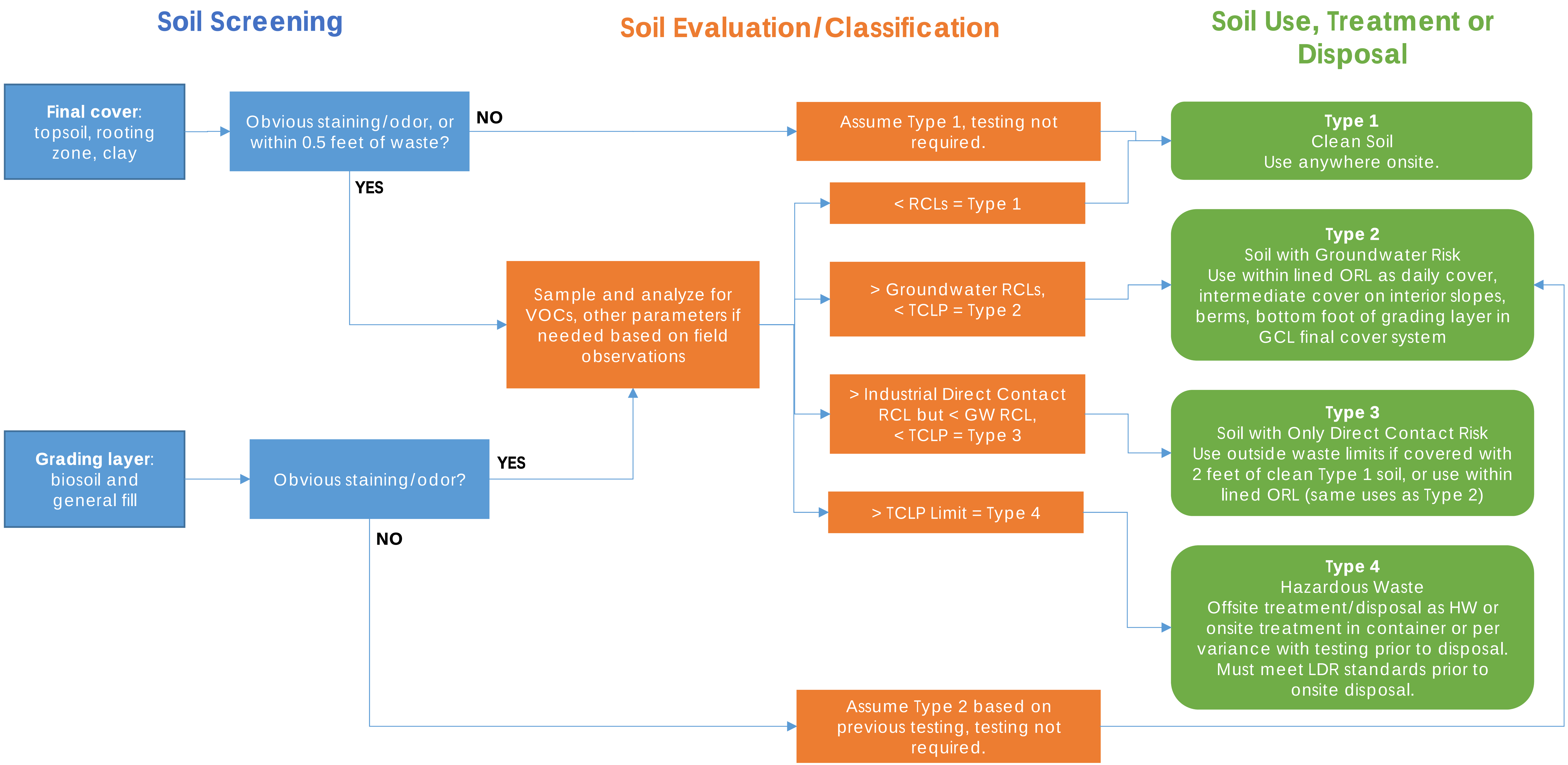


1. See text of BRL Property Redevelopment Plan for additional details regarding screening, evaluation, handling and disposal.

Figure 1
Waste Removal Flow Diagram
Boundary Road Landfill

Project 25218040.01	Rev. 1/8/2021

WORKING DRAFT

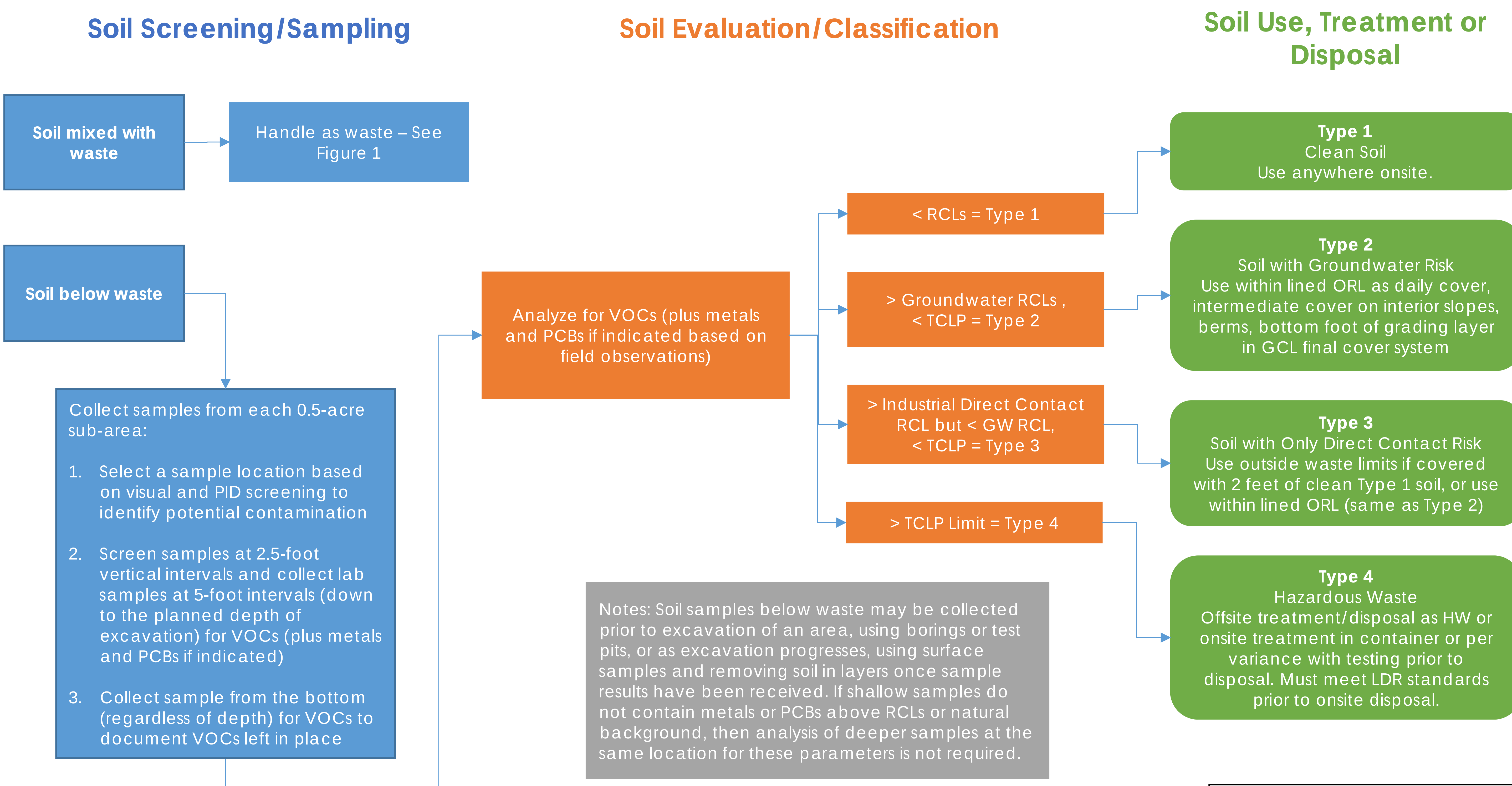


1. See text of BRL Property Redevelopment Plan for additional details regarding screening, evaluation, handling and disposal.

Figure 2
Cover Soil and Grading Layer – Soil Management Flow Diagram
Boundary Road Landfill

Project 25218040.01	Rev. 1/8/2021

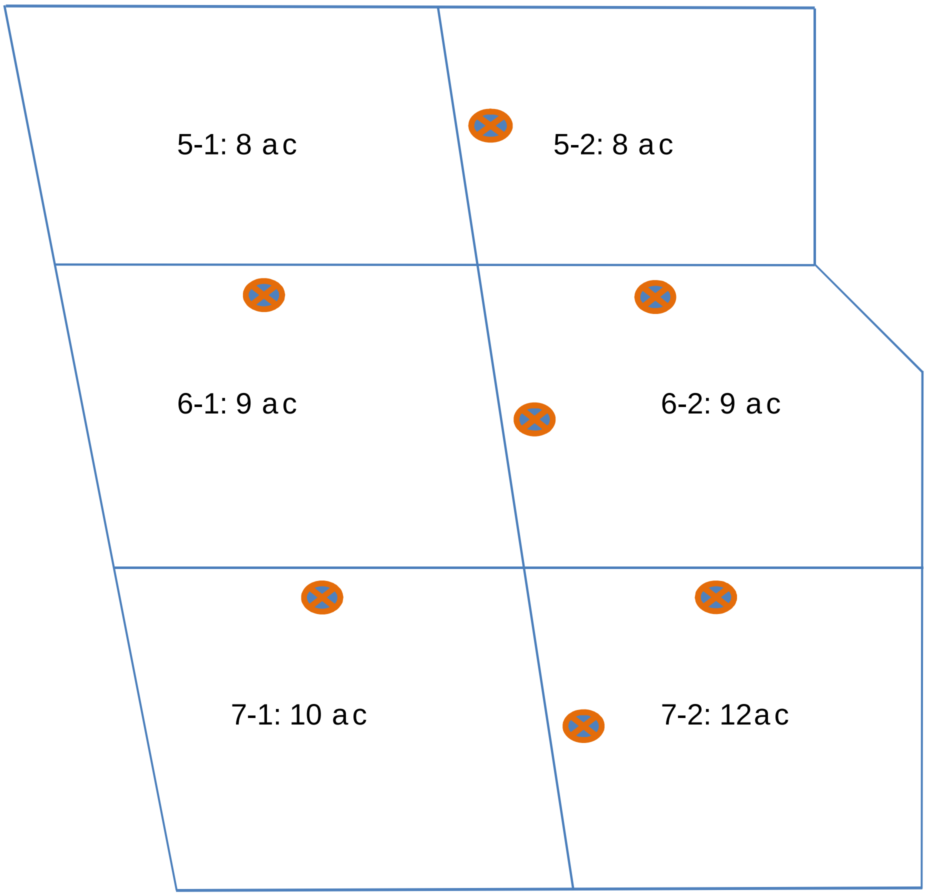
WORKING DRAFT



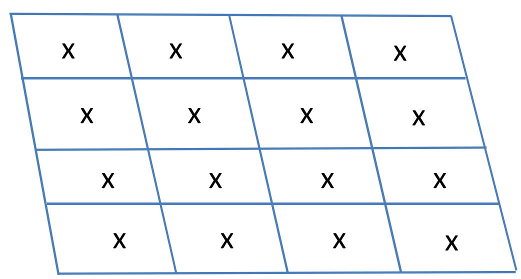
1. See text of BRL Property Redevelopment Plan for additional details regarding screening, evaluation, handling and disposal.

Figure 3
Soil Below Waste –
Soil Management Flow Diagram
Boundary Road Landfill

Project 25218040.01	Rev. 1/8/2021



Example Spacing of Soil Samples in Phase 5-1



Legend

7-1: 10 ac	Phase-Module: Area
	Monitoring Well
x	Soil Sample Location

Note: Not to scale, Areas are approximate.

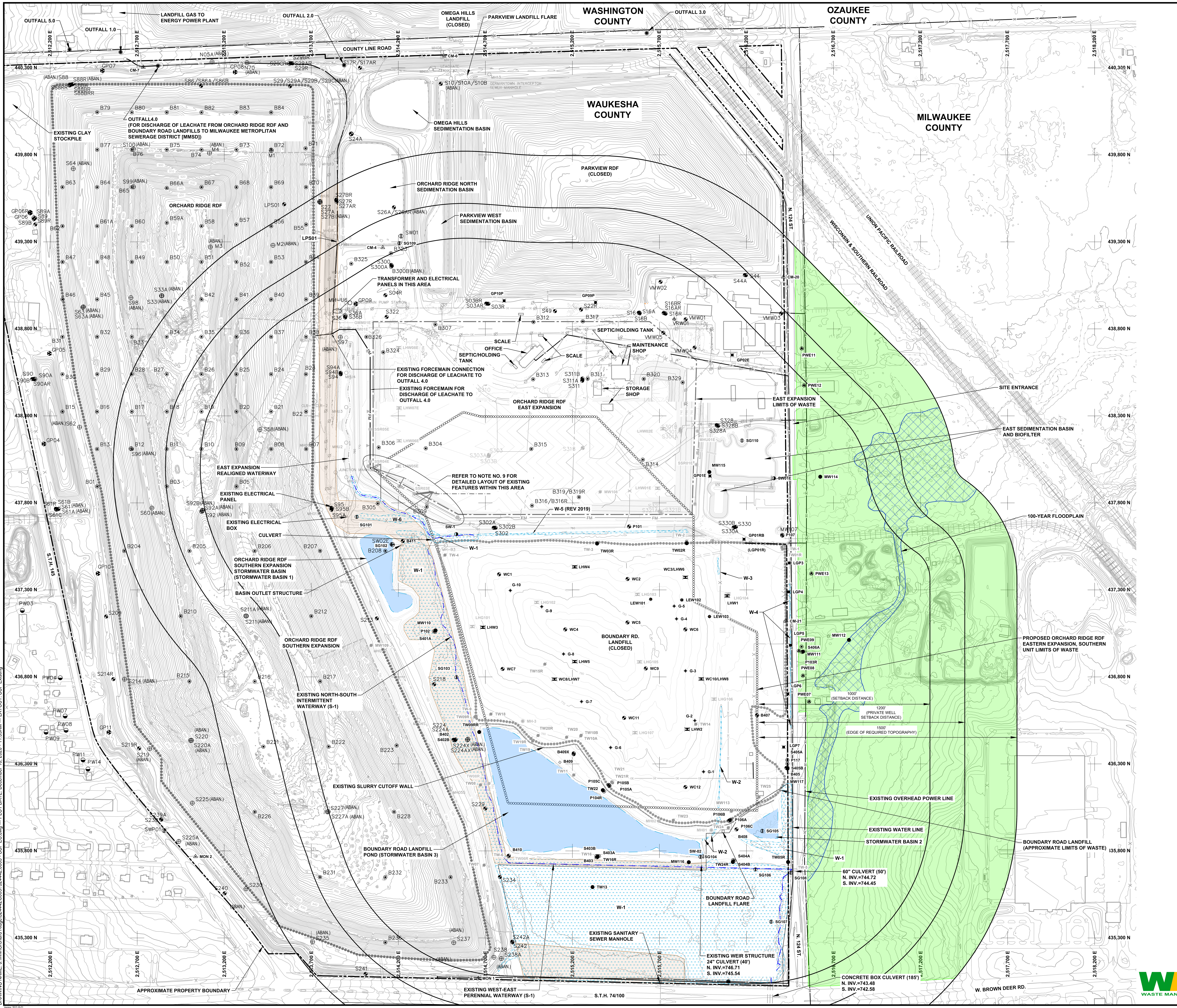
Figure 4
Schematic Layout - Soil and Groundwater Sampling Locations
Boundary Road Landfill

Project: 25218040.01	Date: 1/8/2021

I:\25218040.01\Deliverables\Property Redevelopment Plan\Figures\[4_Sample Location Schematic_r1.xls]GRID

Appendix A

Orchard Ridge Landfill Eastern Expansion, Southern Unit Feasibility Report Drawings (Sheets 3A and 22, December 2020 FR Addendum 1)



NOTES

1. REFER TO PLAN SHEET 2 FOR BASEMAP LEGEND AND GENERAL NOTES.
2. REFER TO PLAN SHEET 2 FOR LOCATIONS AND ELEVATIONS OF EXISTING CONTROL MONUMENTS.
3. FLOOD ZONE INFORMATION OBTAINED FROM FLOOD INSURANCE RATE MAPS (COMMUNITY PANELS 55079C0025E, 55079C0004E, 55078C0012E, 55079C0008E, 55079C0016E, 55079C0009E, AND 55079C0017E, DATED 9/26/08) PUBLISHED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA).
4. LAND USE AREAS PROVIDED BY MENOMONEE FALLS ZONING DISTRICT INFORMATION (WAUKESHA COUNTY), FROM THE VILLAGE OF MENOMONEE FALLS, AND THE MILWAUKEE ZONING DISTRICT INFORMATION (MILWAUKEE COUNTY) FROM THE CITY OF MILWAUKEE GIS SERVER.
5. ACCESS TO THE ORCHARD RIDGE RDF IS CONTROLLED BY A FENCE AND GATE ALONG THE SITE ENTRANCE ROAD AT NORTH 124TH STREET.
6. THE FOLLOWING EAST EXPANSION MONITORING WELLS/PIEZOMETERS HAVE BEEN ABANDONED: S301, S301A, S301B, S303, S303A, S303B, S308, S308A, S308B, S310, S318, S321, S321A, AND S321B. BECAUSE THE SYMBOLS FOR THESE WELLS DO NOT MATCH STANDARD TRC SYMBOLS, A "SLASH" MARK HAS BEEN DRAWN THROUGH EACH SYMBOL AND THE WELL IS NOW SHOWN IN GRAY-TONE FONT TO INDICATE THAT THESE WELLS ARE ABANDONED.
7. THE ABANDONED FEATURES ARE SHOWN ON THIS MAP BECAUSE MOST OF THE LOCATIONS ARE PRESENTED ON THE GEOLOGIC CROSS SECCTIONS (PLAN SHEETS 4-19). THE LOCATIONS OF THE ABANDONED FEATURES WERE PROVIDED BY WMWI.
8. THE LOCATIONS OF UTILITES WERE PROVIDED BY WMWI BASED UPON SURVEYED LOCATIONS, VISUAL OBSERVATIONS, AND SITE HISTORY.
9. EXISTING DESIGN FEATURES WITHIN THE SOUTHWESTERN CORNER OF EAST EXPANSION ARE PRESENTED (AT A LARGER SCALE) ON PLAN SHEET 23A.

NOTE: THESE PLANS ARE ACCOMPANIED BY A REPORT OF THE SAME TITLE. THESE DOCUMENTS ARE INTERRELATED AND ARE INTENDED TO BE USED TOGETHER. THESE DOCUMENTS ARE INTENDED TO BE USED FOR REGULATORY PURPOSES ONLY.

NOT FOR CONSTRUCTION

NO.	BY	DATE	REVISION	APP'D.
				JVS

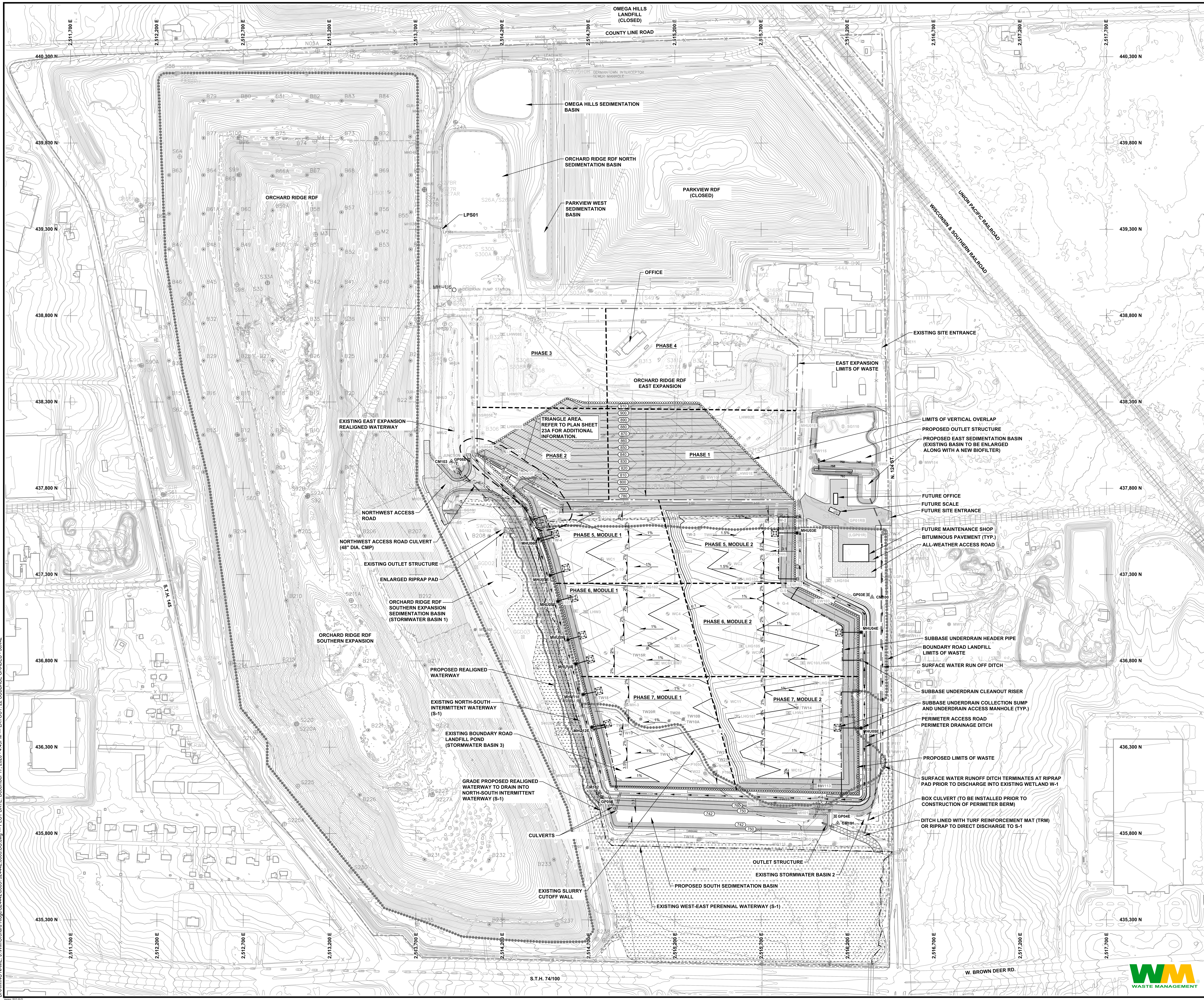
PROJECT: WASTE MANAGEMENT OF WISCONSIN, INC.
FEASIBILITY REPORT - ADDENDUM 1
ORCHARD RIDGE RDF - EASTERN EXPANSION, SOUTHERN UNIT
VILLAGE OF MENOMONEE FALLS, WAUKESHA CO., WI

TITLE: **SUPPLEMENTAL EXISTING CONDITIONS MAP**

DRAWN BY:	T. FIEBRANZ	PROJ. NO.:	324442.0003.0000
CHECKED BY:	T. HALENA	SHEET 3A OF 31	
APPROVED BY:	J. SCHITTONE		
DATE:	DECEMBER 2020		

708 Heartland Trail
Suite 3000
Madison, WI 53717
Phone: 608.826.3600

FILE NO.: 324442.0003 - SUP EC.dwg



NOTES

1. REFER TO PLAN SHEET 2 FOR BASEMAP LEGEND AND GENERAL NOTES.
2. CONTOURS WITHIN THE PROPOSED LIMITS OF WASTE REPRESENT THE BASE OF 4-FOOT THICK COMPOSITE LINER.
3. PROPOSED CONTOURS BEYOND THE PROPOSED LIMITS OF WASTE REPRESENT THE TOP OF TOPSOIL/TOP OF ACCESS ROAD SURFACE.
4. THE PROPOSED DESIGN IS PRELIMINARY AND MAY BE MODIFIED TO ACCOMMODATE ENGINEERED FEATURES AND CONTROLS.
5. THE LOCATION OF THE SUBBASE COLLECTION SUMPS ARE OFFSET FROM THE LOCATION OF THE LEACHATE COLLECTION SUMPS (SHOWN ON PLAN SHEET 23)
6. THE UNDERDRAIN ACCESS MANHOLE WILL BE DESIGNED TO DISCHARGE VIA THE LEACHATE COLLECTION SYSTEM FORCEMAIN TO THE WASTEWATER TREATMENT PLANT OR FOR FUTURE ALTERNATE TREATMENT OR DISCHARGE OPTIONS WHEN PERMITTED.
7. REFER TO PLAN SHEET 23A FOR ADDITIONAL DESIGN INFORMATION.

0 200 400 600 800
SCALE IN FEET

NOTE: THESE PLANS ARE ACCOMPANIED BY A REPORT OF THE SAME TITLE. THESE DOCUMENTS ARE INTERRELATED AND ARE INTENDED TO BE USED TOGETHER. THESE DOCUMENTS ARE INTENDED TO BE USED FOR REGULATORY PURPOSES ONLY.

NOT FOR CONSTRUCTION

NO.	BY	DATE	REVISION	APP'D.
1	TRC	12/20	ADDENDUM 1: REFER TO ACCOMPANYING LETTER	JVS

PROJECT: **WASTE MANAGEMENT OF WISCONSIN, INC.**
FEASIBILITY REPORT - ADDENDUM 1
ORCHARD RIDGE RDF - EASTERN EXPANSION, SOUTHERN UNIT
VILLAGE OF MENOMONEE FALLS, WAUKESHA CO., WI

TITLE:
SUBBASE GRADES

DRAWN BY:	T. FIEBRANZ
CHECKED BY:	T. HALENA
APPROVED BY:	J. SCHITTONE
DATE:	JULY 2020
PROJ. NO.:	324442.0003.0000

SHEET 22 OF 31

708 Heartland Trail
Suite 3000
Madison, WI 53717
Phone: 608.826.3600

FILE NO.: 324442.0003.SG.dwg

Appendix B

Boundary Road Landfill Waste Characterization Investigation Report – Text, Tables and Figures

May 28, 2020
File No. 25218040.01

Mr. Trevor Nobile
Wisconsin Department of Natural Resources
2300 North Dr. Martin Luther King Drive
Milwaukee, WI 53212-3128

Mr. David Buser
Wisconsin Department of Natural Resources
2300 North Dr. Martin Luther King Drive
Milwaukee, WI 53212-3128

Subject: Waste Characterization Investigation Report
WMWI Boundary Road Landfill/Lauer I
Menomonee Falls, Wisconsin

Dear Mr. Nobile and Mr. Buser:

On behalf of Waste Management of Wisconsin, Inc. (WMWI), SCS Engineers (SCS) is submitting the enclosed Waste Characterization Investigation Report for the WMWI Boundary Road Landfill, Menomonee Falls, Wisconsin. The purpose of the investigation described in this report was to characterize the landfill conditions and waste materials as part of the planning process for the proposed exhumation of the Boundary Road Landfill.

If you have any questions about the report, please contact Don Smith by email at dasmith@wm.com or by phone at 262-806-6039.

Sincerely,

Sherren Clark, PE, PG
Project Director
SCS Engineers

Thomas J. Karwoski, PG
Project Manager
SCS Engineers

TK/lmh/SCC

Distribution: Trevor Nobile, WDNR (e-copy only)
David Buser, WDNR (2 hard copies and e-copy)
Sue Fisher, WDNR (hard copy and e-copy)
Judy Fassbender, WDNR (e-copy only)
Natasha Gwidt, WDNR (e-copy only)
Jim Delwiche, WDNR (e-copy only)
Michele Norman, WDNR (e-copy only)
Tom Wentland, WDNR (e-copy only)

Don Smith, WMWI (hard copy and e-copy)
Larry Buechel, WMWI (hard copy and e-copy)
Ryan Baeten, WMWI (hard copy and e-copy)
Brett Coogan, WMWI (e-copy only)
Todd Hartman, WMWI (e-copy only)
Lynn Morgan, WMWI (e-copy only)
Michelle Gale, WMWI (e-copy only)
David Crass, Michael Best & Friederich, LLP (e-copy only)
Stephen Sellwood, TRC (e-copy only)
Joel Schittone, TRC (e-copy only)
Terry Halena, TRC (e-copy only)

Encl. Waste Characterization Investigation Report, WMWI Boundary Road Landfill, May 2020

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Waste Characterization Investigation Report

WMWI Boundary Road Landfill
Menomonee Falls, Wisconsin
WDNR License #11
EPA ID #WID058735994

Prepared for:

Waste Management of Wisconsin, Inc.
W132 N10487 Grant Drive
Germantown, Wisconsin 53022

SCS ENGINEERS

25218040.01 | May 2020

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

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Tables

Figures

Appendices

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EXECUTIVE SUMMARY

The purpose of the investigation described in this report was to generally characterize the wastes that may be encountered during the proposed exhumation of the Boundary Road Landfill (BRL), which is owned by Waste Management of Wisconsin, Inc. (WMWI). The exhumation would be performed as part of the development of new landfill airspace in an area that includes BRL. The investigation was conducted voluntarily and followed the approach outlined in the Waste Characterization Investigation Work Plan (SCS Engineers [SCS], 2019) (Work Plan).

The Work Plan was provided to the Wisconsin Department of Natural Resources (WDNR) on April 17, 2019. Representatives of WMWI and WDNR met on April 22, 2019, to discuss the proposed BRL exhumation and the investigation Work Plan. WDNR concurrence with the Work Plan and authorization to proceed was provided in a letter dated May 29, 2019 (**Appendix A**).

The field activities were completed in July through December 2019 and included the following:

Task	Scope	Schedule
Landfill gas evaluation	Sample 3 gas wells and blower	July 2019
Waste characterization borings	Drill and sample 12 borings using 36-inch bucket auger	August 2019
Leachate evaluation	Install 3 vertical leachate head wells Sample 3 new and 5 existing leachate head wells	August - December 2019

Laboratory analysis of landfill gas, soil, waste, and leachate samples was completed following sample collection.

Findings of the field investigation included the following:

1. Landfill gas sample analytical results appear to be fairly typical for a closed municipal solid waste (MSW) landfill such as BRL.

2. The sequence of materials encountered at each of the 12 borings consisted of soil cover material, a soil grading layer, waste, and underlying native soil.

3. The soil grading layer below the cap, which was known to consist of biologically treated petroleum-contaminated soil (biosoil), contained widespread petroleum compounds, but none were at levels exceeding the NR 720 soil standards based on industrial direct contact.

4. The thickness of the waste material underlying the grading layer ranged from 10.5 feet to 27 feet. Saturated conditions were generally encountered from 2 to 13 feet above the base of waste.

5. The majority of the waste in the borings was consistent with typical municipal solid waste. Varying amounts of construction and demolition debris and plastic sheeting were also encountered. Crushed metal drums and parts of drums were encountered in two borings, and paint waste was encountered in the same two borings (WC-5 and WC-8). Petroleum, paint, and/or solvent-like odors were noted in several borings.

6. Findings from the waste sample analysis (two samples per boring) included the following:
   - The waste samples met the Toxicity Characteristic Leaching Procedure (TCLP) limits with the exceptions of benzene and lead in one sample from WC-5.
   - Polychlorinated biphenyls (PCBs) were detected in all but one of the waste samples, with an average concentration of 13 milligrams per kilogram (mg/kg). Of the 25 waste samples analyzed for PCBs, one exceeded 50 mg/kg, with a result of 60 mg/kg in a sample from WC-6.
   - Petroleum volatile organic compounds (VOCs) were widespread, and were at significantly higher concentrations in samples from WC-3, WC-5, and WC-6.
   - Chlorinated VOCs (CVOCs) were detected in some waste samples, but were generally at much lower concentrations than petroleum VOCs (PVOCs).
7. Soil samples collected below the waste at the bottom of each boring indicated primarily PVOC impacts, with limited CVOC detections. Because the soil samples were collected with a bucket auger and leachate was present in the boreholes, the VOC results are potentially affected by leachate in the borehole and may not represent undisturbed soil conditions below the landfill.
8. Geotechnical testing indicated that most of the soil below the waste is fine-grained, typically lean clay; however, three samples were classified as silty sand or gravel.
9. Analytical results from the leachate head well sampling met the Milwaukee Metropolitan Sewerage District (MMSD) discharge limits, except that samples from new well LHW-7 exceeded limits for lead, mercury, zinc, and total PCBs. The total lead results also exceeded the TCLP limit. High lead at this location appears likely to be due to paint wastes observed during drilling.
10. Review of the last 3 years of routine environmental monitoring data appears to indicate that the BRL waste has impacted groundwater, but that current impacts are limited.

The findings of the waste characterization investigation will be used to evaluate the feasibility of the proposed BRL waste exhumation project, and to plan waste removal activities. The next steps in the process are anticipated to include (i) preparation of a Feasibility Report for the proposed Orchard Ridge Landfill expansion; (ii) development of a Waste Removal Plan for BRL; (iii) preparation of an Explanation of Significant Differences document (ESD) to update the WDNR issued Record of Decision (ROD); and (iv) closeout of WDNR Contract SF-90-01 for BRL.

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of the investigation described in this report is to generally characterize the wastes that may be encountered during the proposed exhumation of the BRL, which is owned by WMWI. The exhumation would be performed as part of the development of new landfill airspace in an area that includes BRL. The investigation was conducted voluntarily and followed the approach outlined in the Work Plan (SCS, 2019).

The Work Plan was provided to the WDNR on April 17, 2019. Representatives of WMWI and WDNR met on April 22, 2019, to discuss the proposed BRL exhumation and the investigation Work Plan. WDNR concurrence with the Work Plan and authorization to proceed was provided in a letter dated May 29, 2019 (**Appendix A**).

The scope of the waste characterization investigation included:

- Collecting landfill gas samples from the existing landfill gas blower and selected landfill gas extraction wells, and analyzing the gas samples for VOCs and sulfur compounds, including hydrogen sulfide.

- Drilling and sampling 12 boreholes through the full thickness of waste material using a bucket auger to investigate the types of materials present, extent of degradation, moisture content, and leachate levels in the boreholes. Selected soil and waste samples were submitted for laboratory analysis.

- Collecting soil samples immediately below the BRL waste from the bucket auger borings, if feasible. The soil samples were collected to investigate impacts, if present, in the soil below the waste because this soil may be excavated to reach proposed base grades as part of redevelopment of the site.

- Installing three new leachate head wells and monitoring the three new wells and five existing leachate head wells to characterize the leachate levels and leachate quality within the landfill.

More detailed information on the investigation methods is presented in **Section 2.0**, and results are discussed in **Section 3.0**. The results section also summarizes and discusses recent environmental monitoring data for BRL, including groundwater, leachate, and gas monitoring data from the last 3 years of monitoring.

Information on the site background, including site history, known waste types, and known contaminants was provided in the Work Plan (SCS, 2019).

1.2 LOCATION AND PROJECT INFORMATION

Facility Name:	Boundary Road Landfill
WDNR Landfill License #:	11
EPA ID #:	WID058735994
Facility Address:	W124 N8925 Boundary Road Menomonee Falls, WI 53051
Facility Manager:	Larry Buechel, PE Waste Management of Wisconsin, Inc. W124 N9355 Boundary Road Menomonee Falls, WI 53051 262-509-5639
Engineering Manager:	Don Smith, PE Waste Management of Wisconsin, Inc. W132 N10487 Grant Dr. Germantown, WI 53022 262-806-6039
Consultant Contact:	Sherren Clark, PE, PG SCS Engineers 2830 Dairy Drive Madison, WI 53718 608-216-7323

2.0 FIELD INVESTIGATION METHODS

The field investigation included the following elements:

- Landfill gas evaluation
- Waste characterization borings
- Leachate evaluation

The field activities at the site were conducted in accordance with SCS's standard field procedures. Field and analytical methods were based on the requirements of NR 507 and NR 716.13, to the extent that these rules are applicable to the site conditions and the specific goals of this investigation.

2.1 LANDFILL GAS EVALUATION

Landfill gas samples were collected by SCS on July 18, 2019. The landfill gas was monitored at the blower to evaluate the concentrations of VOCs and sulfur compounds that may affect health and safety or indicate odor potential for the waste removal. Samples were also collected from 3 of the 12 existing gas extraction wells in different areas of the landfill: G-5, G-7, and G-10. The gas extraction wells are constructed with horizontal screens near the top of the waste and vertical risers extending through the final cover. Each sample was collected with a glass-lined canister for laboratory analysis for VOCs (EPA Method TO-15), sulfur compounds (ASTM Method D5504), and fixed gases (EPA Method 3C). The methane, carbon dioxide, oxygen, and balance gas levels were also measured with a field landfill gas meter at the time of the lab sample collection. The landfill gas laboratory report is included in **Appendix B**.

2.2 WASTE CHARACTERIZATION BORINGS

The waste characterization investigation included the drilling and sampling of 12 borings, extending through the entire thickness of waste material and the upper 1 to 2 feet of the underlying soils. The drilling was performed from August 27 through 30, 2019, by Terra Engineering and Construction with oversight by an SCS geologist. The locations of the 12 borings, WC-1 through WC-12, are shown on **Figure 1**.

2.2.1 Drilling Methods

The boring locations were staked prior to drilling by CQM, Inc. (CQM) based on predetermined survey coordinates. Some of the boring locations were subsequently adjusted by SCS and WMWI as needed to avoid conflicts with landfill gas collection system piping, leachate forcemain, piping, and other utilities or site features. The boring locations and ground surface elevations were resurveyed by CQM after drilling was completed.

The borings from the ground surface through the cap and the waste to the bottom of waste were completed with a track-mounted bucket auger drill. The borehole diameter in waste was approximately 36 inches. The bucket auger was also used to collect samples of the upper 1 to 2 feet of soil directly below the waste.

2.2.2 Soil/Waste Sample Collection and Field Screening

Soil/waste samples from each boring were collected continuously as each boring was advanced through the waste or underlying soil. A portion of recovered material from each augered depth interval was placed in a sealable plastic bag and allowed to equilibrate to ambient temperature for field headspace screening for VOCs using a photoionization detector (PID). Recovered waste materials were photographed at 5-foot intervals, and non-typical waste materials were also photographed. A photographic log is included in **Appendix C**.

Samples for laboratory analysis were selected based on visual observations and field screening. Two waste samples and one underlying native soil sample from each boring were selected for laboratory analysis. A sample of the soil grading layer was also collected from each boring. The “waste” sample was selected from materials within the waste with characteristics suitable for collection and testing (e.g., soil or degraded waste rather than solid wood or metal). Sample analysis is discussed in **Section 2.2.3**.

A boring log was prepared for each borehole, including a description of the waste or soil, soil classification (Unified Soil Classification System [USCS] Visual-Manual Procedure), where appropriate, moisture, odor, and other observations, as well as field headspace readings. Boring logs and boring backfill forms are located in **Appendix D**.

2.2.3 Sample Analysis

Soil and waste samples were submitted to Eurofins TestAmerica, a WDNR-certified laboratory, for analysis. The analytical parameters included VOCs, as proposed in the work plan, plus additional parameters as described below.

Each soil sample was assigned a boring number and sample number, which, when correlated with the boring log, indicates the sampling depth. All samples were labeled with the sample number, date, and time of collection, and chain of custody documentation was prepared.

Soil samples from the grading layer above the waste, which is known to have been constructed using bioremediated petroleum-contaminated soil, were analyzed for VOCs, polynuclear aromatic hydrocarbons (PAHs), gasoline range organics (GRO), and diesel range organics (DRO).

Waste samples were analyzed for VOCs and PCBs. Waste samples were also analyzed for leach test parameters required under WMWI's Special Waste Acceptance Plan for Orchard Ridge, including TCLP metals, VOCs, and semivolatile organic compounds (SVOCs).

Underlying soil samples collected below the waste were analyzed for VOCs. Soil samples were also analyzed by CQM for grain size distribution (sieve only) and Atterberg limits for classification under the USCS. Because the soil samples were collected with a bucket auger and leachate was present in the boreholes, the VOC results are potentially affected by leachate in the borehole and may not represent undisturbed soil conditions below the landfill.

For quality control, one methanol blank was submitted along with soil samples and analyzed for VOCs.

Laboratory analytical reports are included in **Appendix E.**

2.2.4 Borehole Abandonment

Following examination and sampling of the cored waste, the portions of the boreholes below the bottom of waste (typically 1 foot) were backfilled with bentonite. The portions of the boreholes in the waste were backfilled with the excavated waste material and/or granular fill material, except for boreholes WC-3, WC-8, and WC-10, which were converted to leachate head wells as described in **Section 2.3**. Large chunks of debris were not replaced in the borehole. Residual waste was profiled for disposal in the active Orchard Ridge landfill.

The final cover system at the boring was restored to its original thickness and condition following backfilling of the waste, except that bentonite chips were used to replace the compacted clay layer in the final cover system. A safety grate was left in place across the borehole above the bentonite and below the final soil cover, typically 1 foot below the final backfilled grade. Borehole backfill forms are included in **Appendix D2**.

2.3 LEACHATE EVALUATION

To evaluate leachate levels within the waste, liquid level data from the five existing leachate head wells were supplemented with liquid levels from leachate head wells installed in three of the waste characterization borings described in **Section 2.2.** The head well locations are at waste characterization borings WC-3 (LHW-6), WC-8 (LHW-7), and WC-10 (LHW-8).

The three new leachate head wells were constructed similar to the five existing leachate head wells, using 8-inch Schedule 80 PVC with a 0.010-inch slot screen. The screened interval was backfilled with 1-inch clear stone. A bentonite seal was placed above the screened interval. A safety grate was left in place across the borehole below the final soil cover, typically 1 foot below the final backfilled grade. Leachate head well construction forms are included in **Appendix D3**. Logs for the existing leachate head wells (LHW-1 through LHW-5) are provided in **Appendix D4**.

Leachate samples were collected from two of the three new wells and the five existing leachate head wells on September 24, 2019. New leachate head well LHW-6 was dry and no sample was collected. A confirmation sample was collected from new well LHW-7 on December 18, 2019.

In accordance with the Work Plan, samples from the new leachate head wells were analyzed for VOCs, SVOCs, metals, pesticides, PCBs, dioxins and furans, and several other parameters included in the leachate discharge permit issued by MMSD for the WMWI landfill complex. Samples from the five existing leachate head wells were tested for the parameters or parameter groups that were previously detected at more than 10 percent of the MMSD discharge limit.

3.0 INVESTIGATION RESULTS

3.1 LANDFILL GAS SAMPLING

Landfill gas sample analytical results, summarized in **Table 1**, appear to be fairly typical for a closed MSW landfill such as BRL. The samples were analyzed for fixed gases (Method 3C), VOCs (Method TO-15), and sulfur compounds (ASTM D-5504). The landfill gas laboratory report is included in **Appendix B.**

The Method 3C fixed gases analysis indicated that methane content at the blower was 30.1 percent, and methane results for the three gas wells that were sampled ranged from 10.1 percent to 39.9 percent. Oxygen was 1.3 percent at the blower, and ranged from less than 0.2 percent to 2.6 percent at the three wells. There were no detections of carbon monoxide or hydrogen in the Method 3C analysis. These results are typical for a closed landfill with declining landfill gas production.

Several VOCs were detected in Method TO-15 analysis of the gas samples, including petroleum compounds, CVOCs, other solvents, and degradation products. The results show some variability among the four sample locations, but for most parameters the variation is less than an order of magnitude (factor of 10).

The only sulfur compound detected in the ASTM D-5504 analysis of the gas samples was hydrogen sulfide. The detected concentration at the blower was 5.4 parts per million by volume (ppmv), and at the highest well (G-7) was 17.4 ppmv. These concentrations are low compared to those expected at a typical active MSW landfill.

3.2 WASTE AND SOIL SAMPLING

The sequence of materials encountered at each of the 12 borings consisted of soil cover material, a soil grading layer, waste, and underlying native soil. The layer thicknesses are provided in **Table 2** and shown on cross-section **Figures 2** and **3**. Descriptions of the waste and soil materials are provided on the boring logs in **Appendix D1**, and analytical reports are in **Appendix E.**

3.2.1 Final Cover

The landfill cover materials measured during drilling ranged from 4 to 5 feet thick in all 12 of the borings. The cover was designed and installed to be 4 feet thick at all locations. The soil and clay materials identified in the borings were generally consistent with the cap design, which consists of 2 feet of compacted clay overlain by 1.5 feet of rooting zone soil and 6 inches of topsoil.

3.2.2 Grading Layer

The soil grading layer immediately beneath the cap consists of biosoil that was used in the construction of the landfill cover in 1997 and 1998. The biosoil grading layer was added to create a sloped surface on the landfill that promoted improved runoff from precipitation. The measured thickness of the grading layer ranged from 2 feet to 9 feet in the 12 borings.

One grading layer soil sample from each boring was submitted to the analytical laboratory for analysis of VOCs, PAHs, DRO, and GRO. In the VOC analytical results, 10 of the 12 samples had one or more VOC detected at a concentration above an NR 720 Residual Contaminant Level (RCL). In the PAH analytical results, 7 of the 12 samples had one or more PAH compound detected at a concentration above an NR 720 RCL. The analytical results for the grading layer soil are included in **Table 3**.

Findings from the grading layer sample analysis included the following:

- Petroleum compounds were widespread, as expected, with most sample locations having at least one petroleum compound at a concentration exceeding the NR 720 RCL for the groundwater pathway.
- No CVOCs were detected at concentrations exceeding the laboratory's limit of quantitation (LOQ).
- None of the results exceeded the NR 720 industrial direct contact RCLs.
- All DRO results were below 100 mg/kg, and all GRO results were below 500 mg/kg.

Based on these results, at least some of the grading layer soil could potentially be reused in future construction.

3.2.3 Waste

The thickness of the waste material underlying the grading layer ranged from 10.5 feet to 27 feet. Waste descriptions are provided on the logs in **Appendix D1**, and photographs of the waste are in **Appendix C**.

The majority of the waste encountered in each of the borings was generally consistent with typical municipal solid waste. Given the age of the waste, the organic material was highly decayed as expected. Varying amounts of construction and demolition debris were also encountered such as wood, bricks, glass, tile, and insulation. Plastic sheeting was also encountered in several borings. Saturated conditions were generally encountered from 2 to 13 feet above the base of waste. Some material located above the leachate level showed lesser degrees of degradation. In several locations, paper and newsprint was still readable, including dates ranging from the mid-1960s to the early 1970s. Crushed metal drums and parts of drums were encountered in borings WC-5 and WC-8.

Green and yellow paint was observed in boring WC-8. Petroleum, paint, and/or solvent-like odors were noted in several borings.

Two waste samples from each boring were analyzed for PCBs and VOCs, as shown in **Table 4**. Two waste samples from each boring were also analyzed for TCLP metals, VOCs, and SVOCs, as shown in **Table 5**. The waste sample analytical results in **Table 4** were compared to the NR 720 RCLs for the groundwater pathway and the industrial direct contact pathway to identify potential contaminants of concern. The NR 720 RCLs are not applicable to the waste sampling results as compliance limits, and typical municipal and industrial solid waste is expected to have many constituents at levels exceeding RCLs. The comparison to RCLs is intended only for planning and evaluation purposes.

Findings from the waste sample analysis included the following:

- The waste samples met the TCLP limits with the exceptions of benzene and lead in a sample from WC-5.
- PCBs were detected in all but one of the waste samples, with an average concentration of 13 mg/kg. Of the 25 waste samples analyzed for PCBs, one exceeded 50 mg/kg, with a result of 60 mg/kg in a sample from WC-6.
- PVOCs were widespread, and were at significantly higher concentrations in samples from WC-3, WC-5, and WC-6.
- CVOCs were detected in some waste samples, but were generally at much lower concentrations than PVOCs.

Approximately 40 cubic yards of waste material remained after all of the boings were abandoned. To profile the waste for disposal, three samples were collected from the stockpile and analyzed for PCBs and TCLP metals, VOCs, and SVOCs. The results showed that the waste was non-hazardous. Therefore, the remaining waste was profiled for disposal (WM Profile number 132504WI) and disposed of in the Orchard Ridge Landfill. The TCLP analytical results from the temporary stockpile are included in **Appendix E2**.

3.2.4 Soil Below Waste

Soil samples collected below the waste in each borehole were analyzed for VOCs, as shown in **Table 6**. Because the soil samples were collected with a bucket auger and leachate was present in the boreholes, the VOC results are potentially affected by leachate in the borehole and may not represent undisturbed soil conditions below the landfill.

Findings from the soil sample analysis include the following:

- PVOCs were detected in most samples, with many sample locations having at least one petroleum compound at a concentration exceeding the NR 720 RCL for the groundwater pathway.
- CVOCs were not detected or were detected at much lower concentrations than PVOCs, with only one CVOC result exceeding the NR 720 RCL for the groundwater pathway.
- Only one result exceeded the NR 720 industrial direct contact RCL.

Geotechnical testing indicated that most of the samples were classified as fine-grained, typically lean clay; however, three samples were classified as silty sand or gravel. Geotechnical laboratory results are provided in Appendix E3.

3.3 LEACHATE HEAD WELL MONITORING

Leachate levels measured on September 24, 2019, indicated that the leachate elevation across the site was in the range from 751.6 to 753.9 feet above mean sea level (Table 7). These results were very consistent with leachate elevations measured in June 2012 at the then-existing five leachate head wells.

Analytical results from two of the three new leachate head wells and the five existing leachate head wells sampled on September 24, 2019, are summarized in Table 8. New leachate head well LHW-6 was dry. LHW-6 was installed in waste characterization boring WC-3, and the bottom of waste at this location was relatively shallow. The bottom-of-well elevation for LHW-6 (752.1 feet above mean sea level) was similar to the leachate elevations measured at other leachate head wells. Table 8 also includes results from previous sampling at leachate head wells LHW-1 through LHW-5 in May 2013. Leachate levels measured in May 2013 and September 2019 were fairly consistent across the site and consistent between the two events, with all leachate elevation results being within the range from 751.6 to 754.5 feet.

The leachate analytical results are compared in Table 8 to the MMSD discharge limits under the site's wastewater discharge permit, as an indication of potential concerns for leachate management during waste removal. The results were also compared to the NR 140 groundwater enforcement standards (ESs), as an indication of potential to cause groundwater impacts. Neither the MMSD limits nor the NR 140 limits are applicable to the leachate head well sampling results as current compliance limits; the comparison is for planning and evaluation purposes only.

Leachate results exceeding the MMSD discharge limits were limited to samples from new leachate head well LHW-7. Samples collected from LHW-7 in the initial and/or confirmation sampling events exceeded the MMSD discharge limits for lead, mercury, zinc, and total PCBs. The total lead concentrations for the two sampling events (11.3 milligrams per liter [mg/L] and 29.2 mg/L) also exceeded the TCLP limit for lead (5 mg/L). During the second sampling event, a field-filtered sample was also collected from LHW-7 for dissolved lead analysis. The dissolved lead result (0.0231 mg/L) was less than 0.1 percent of the total lead result, indicating the lead is present in suspended solids, potentially from lead paint waste.

The boring log and photographic log for waste boring WC-8, which was converted to leachate head well LHW-7, indicate waste containing green and yellow paint was encountered in this boring (see WC-8 boring log in Appendix D1 and photographs 58 and 59 in Appendix C).

Based on comparison of the LHW-7 sample results with results from the other seven leachate head wells, the results for samples from LHW-7 appear to represent localized conditions that are significantly different than the typical BRL leachate. The leachate discharge to MMSD, which represents a composite of the leachate within the landfill, meets the MMSD discharge standards.

3.4 RECENT ROUTINE ENVIRONMENTAL MONITORING RESULTS

To provide context for the waste characterization investigation results, the routine monitoring data for BRL were reviewed for the last 3 years. The monitoring results were downloaded from the WDNR's Groundwater and Environmental Monitoring System (GEMS) database for the period from 2017 through 2019. The results are summarized in **Tables 9** through **14** and discussed below.

3.4.1 Landfill Gas Monitoring

Routine monitoring results for the landfill gas probes (**Table 9**) indicate that methane migration is not a current concern for BRL. Seven gas probes are monitored quarterly for percent methane, percent oxygen, and soil gas pressure. In the last 3 years, most of the methane results were zero and none exceeded 0.2 percent.

Routine monitoring results for the landfill gas flare (**Table 10**) indicate that gas production and gas quality are typical for an MSW landfill that has been closed for more than 40 years. For the 3-year period, the average landfill gas flow rate was 91 cubic feet per minute (cfm) and average methane content was 35 percent.

3.4.2 Leachate Discharge Monitoring

The leachate collection system at BRL includes the leachate/groundwater collection trench along the landfill's southern boundary and the three vertical leachate extraction wells installed in the northeast portion of the landfill (LEW-101R, 102R, and 103R). Leachate from these systems is discharged to the sanitary sewer under the MMSD discharge permit for the WMWI landfill complex.

The WDNR-approved monitoring plan for BRL includes monitoring the leachate discharge from the site. The leachate discharge monitoring results are compared to the NR 140 groundwater ESs and preventive action limits (PALs) in **Table 11**; however, these limits do not apply to leachate for compliance monitoring purposes. The leachate samples meet the MMSD discharge limits.

Parameters detected in the leachate/groundwater discharge at a concentration above the NR 140 ES included the following:

- Public health parameters
  - Aluminum
  - Benzene
  - Tetrahydrofuran

- Public welfare parameters
  - Chloride
  - Iron

Each of these parameters exceeded the NR 140 ES in the September 2019 sample, but not in the September 2017 or 2018 samples.

3.4.3 Groundwater Monitoring

Routine groundwater monitoring results from the last 3 years (**Table 12**) indicate some groundwater impacts that appear to be related to BRL, but they are fairly limited in degree and extent.

Each parameter detected in groundwater at a concentration above the NR 140 PAL is listed in the table below. The table also identifies whether the parameter exceeded the NR 140 ES in at least one sample, or only exceeded the PAL, and lists potential sources for each parameter. Groundwater monitoring parameters exceeding a PAL and/or ES in the last 3 years of sampling included the following:

Parameter	PAL or ES Exceedance?	Potential Sources
Public Health Parameters		
Boron	ES	Natural background
Fluoride	PAL	Natural background
VOCs		
Benzene	PAL	BRL
Chloroform	ES	Chlorinated water, chlorination
1,2-Dichloroethane	PAL	BRL
Dichloromethane	ES	Lab contamination
Tetrahydrofuran	PAL	BRL
Public Welfare Parameters		
Chloride	ES	Road salt, BRL
Sulfate	ES	Natural background

Based on the recent monitoring data (**Table 12**), one or more VOCs have been detected in several of the monitoring wells, but few VOCs have been detected above the ES.

The chloroform ES was exceeded only in samples from MW-117, located east of BRL, and chloroform was not detected in the most recent sample from that well (September 2019). Chloroform is a common byproduct of chlorination and can be found in chlorinated water supplies at concentrations similar to those detected in the 2017 and 2018 samples from MW-117.

The dichloromethane ES was exceeded only in a single sample from MW-116, and may be due to laboratory contamination, which is a common source for this parameter.

3.4.4 Private Well Monitoring

Private well monitoring results for the last 3 years (**Table 13**) do not show any apparent impacts from BRL. Parameters detected above the NR 140 PAL and/or ES include arsenic, boron, iron, and manganese. The detected concentrations are fairly consistent across the three wells that are sampled, and appear likely to reflect natural background conditions. There were no PAL exceedances for VOCs. The only VOCs detected were acetone (three wells) and carbon disulfide (one well), and the detections occurred only in the 2018 sampling event, not in the 2017 or 2019 event. Acetone is a common laboratory contaminant.

3.4.5 Surface Water Monitoring

Surface water monitoring results for the last 3 years are presented in **Table 14**. Surface water samples are collected annually in the adjacent surface water drainageway locations upstream (SW01) and downstream (SW02) from BRL (see **Figure 1** for locations). The samples are analyzed for field parameters and VOCs. Only acetone was detected in the upstream SW01 sample. Acetone is a common laboratory contaminant. Detected VOCs in the downstream SW02 sample included acetone, dichloromethane, and toluene. Dichloromethane, which is also a common laboratory contaminant, was detected at a low concentration in the 2018 sample (1.9 micrograms per liter [μg/L]), but was not detected in the 2017 or 2019 samples. All acetone and toluene detections were also at very low concentrations (less than 10 μg/L). Although NR 140 groundwater standards do not apply to the surface water samples, the acetone and toluene results are well below the NR 140 PAL. The surface water sample results indicate no impacts to surface water from BRL.

4.0 FINDINGS AND NEXT STEPS

4.1 SUMMARY OF FINDINGS

Findings of the field investigation included the following:

1. Landfill gas sample analytical results appear to be fairly typical for a closed MSW landfill such as BRL.
2. The sequence of materials encountered at each of the 12 borings consisted of soil cover material, a soil grading layer, waste, and underlying native soil.
3. The soil grading layer below the cap, which was known to consist of biosoil, contained widespread petroleum compounds. Several petroleum compounds were detected at concentrations exceeding the NR 720 soil standards based on the groundwater pathway, but none were at levels exceeding the NR 720 soil standards based on industrial direct contact.
4. The thickness of the waste material underlying the grading layer ranged from 10.5 feet to 27 feet. Saturated conditions were generally encountered from 2 to 13 feet above the base of waste.
5. The majority of the waste in the borings was consistent with typical municipal solid waste. Varying amounts of construction and demolition debris and plastic sheeting were also encountered. Crushed metal drums and parts of drums were encountered in two borings, and paint waste was encountered in the same two borings. Petroleum, paint, and/or solvent-like odors were noted in several borings.
6. Findings from the waste sample analysis (two samples per boring) included the following:
    - The waste samples met the TCLP limits with the exceptions of benzene and lead in one sample from WC-5.
    - PCBs were detected in all but one of the waste samples, with an average concentration of 13 mg/kg. Of the 25 waste samples analyzed for PCBs, one exceeded 50 mg/kg, with a result of 60 mg/kg in a sample from WC-6.

- PVOCs were widespread, and were at significantly higher concentrations in samples from WC-3, WC-5, and WC-6.

- CVOCs were detected in some waste samples, but were generally at much lower concentrations than PVOCs.

7. Soil samples collected below the waste at the bottom of each boring indicated primarily PVOC impacts, with limited CVOC detections. Because the soil samples were collected with a bucket auger and leachate was present in the boreholes, the VOC results are potentially affected by leachate in the borehole and may not represent undisturbed soil conditions below the landfill.

8. Geotechnical testing indicated that most of the soil below the waste is fine-grained, typically lean clay; however, three samples were classified as silty sand or gravel.

9. Analytical results from the leachate head well sampling met the MMSD discharge limits, except that samples from new well LHW-7 exceeded limits for lead, mercury, zinc, and total PCBs. The total lead results also exceeded the TCLP limit. High lead at this location appears likely to be due to paint wastes observed during drilling.

10. Review of the last 3 years of routine environmental monitoring data appears to indicate that the BRL waste has impacted groundwater, but that current impacts are limited. In recent groundwater monitoring, one or more VOCs have been detected in several of the monitoring wells, but only two VOCs have been detected above the NR 140 ES. The chloroform ES was exceeded only in samples from MW-117, located east of BRL, and chloroform was not detected in the most recent sample from that well (September 2019). The dichloromethane ES was exceeded only in a single sample from MW-116, and may be due to laboratory contamination, which is a common source for this parameter. Other detected VOCs, at concentrations below the ES, included benzene, chlorobenzene, 1,2-dichloroethane, and tetrahydrofuran.

4.2 NEXT STEPS

The findings of the waste characterization investigation will be used to evaluate the feasibility of the proposed BRL waste exhumation project, and to plan waste removal activities. The next steps in the process are anticipated to include: (i) preparation of a Feasibility Report for the proposed Orchard Ridge Landfill expansion; (ii) development of a Waste Removal Plan for BRL; (iii) preparation of an Explanation of Significant Differences document (ESD) to update the WDNR issued Record of Decision (ROD); and (iv) closeout of WDNR Contract SF-90-01 for BRL.

5.0 REFERENCES

SCS Engineers, 2019, Waste Characterization Investigation Work Plan, WMWI Boundary Road Landfill, Menomonee Falls, Wisconsin, WDNR License #11, EPA ID #WID058735994, February 27, 2019.

USEPA, 1999, Superfund Preliminary Close Out Report, Boundary Road Landfill, Menomonee Falls, Wisconsin, signed September 28, 1999.

Tables

Table 1. Landfill Gas Sampling Analytical Results
WMWI Boundary Road Landfill / SCS Project #25218040.01

Sample ID	Blower	G-5	G-7	G-10
Date Sampled	7/18/2019	7/18/2019	7/18/2019	7/18/2019
Parameter/Analyte	Result	Result	Result	Result
Fixed Gases, EPA 3C (Units: %)				
Methane (CH_4)	**30.1 %**	**10.1 %**	**32.8 %**	**39.9 %**
Carbon dioxide (CO_2)	**25.7 %**	**20.9 %**	**28.1 %**	**29.6 %**
Oxygen (O_2)	**1.3 %**	**2.6 %**	< 0.2 %	**0.4 %**
Nitrogen (N_2)	**42.9 %**	**66.4 %**	**38.9 %**	**30.1 %**
Carbon monoxide (CO)	< 0.3 %	< 0.3 %	< 0.2 %	< 0.2 %
Hydrogen (H_2)	< 2.6 %	< 3.2 %	< 2.5 %	< 2.5 %
Volatile Organic Compounds, TO-15 (Units: ppbV)				
1,1,1-Trichloroethane	<131	<162	<124	<124
1,1,2,2-Tetrachloroethane	<131	<162	<124	<124
1,1,2-Trichloroethane	<131	<162	<124	<124
1,1-Dichloroethane	**922**	**429**	<124	**225**
1,1-Dichloroethene	<131	<162	<124	<124
1,2,4-Trichlorobenzene	<131	<162	<124	<124
1,2,4-Trimethylbenzene	**1,640**	**786**	**1,150**	**1,730**
1,2-Dibromoethane	<131	<162	<124	<124
1,2-Dichlorobenzene	<131	<162	<124	<124
1,2-Dichloroethane	<131	<162	<124	<124
1,2-Dichloropropane	<131	<162	<124	<124
1,3,5-Trimethylbenzene	**744**	**456**	**490**	**699**
1,3-Butadiene	<131	<162	<124	<124
1,3-Dichlorobenzene	<131	<162	<124	<124
1,4-Dichlorobenzene	<131	<162	<124	<124
1,4-Dioxane	<131	<162	<124	<124
2,2,4-Trimethylpentane	**157**	<162	**195**	<124
2-Butanone (MEK)	**1,680**	<323	<248	<248
2-Chlorotoluene	<131	<162	<124	<124
2-Hexanone (MBK)	<131	<162	<124	<124
2-Propanol (IPA)	<524	<647	<496	<496
4-Ethyltoluene	**581**	**271**	**284**	**474**
4-Methyl-2-pentanone (MiBK)	**1,300**	<162	<124	**466**
Acetaldehyde	<524	<647	<496	<496
Acetone	**2,160**	<647	<496	<496
Acrolein	<262	<323	<248	<248
Acrylonitrile	<262	<323	**666**	<248
Allyl Chloride	<131	<162	<124	<124
Benzene	**22,200**	**11,400**	**41,400**	**2,430**
Benzyl Chloride (a-Chlorotoluene)	<131	<162	<124	<124
Bromodichloromethane	<131	<162	<124	<124
Bromoform	<131	<162	<124	<124
Bromomethane	<131	<162	<124	<124
Carbon Disulfide	<131	<162	<124	<124

Table 1. Landfill Gas Sampling Analytical Results
WMWI Boundary Road Landfill / SCS Project #25218040.01

Sample ID	Blower	G-5	G-7	G-10
Date Sampled	7/18/2019	7/18/2019	7/18/2019	7/18/2019
Parameter/Analyte	Result	Result	Result	Result
Carbon Tetrachloride	<131	<162	<124	<124
Chlorobenzene	**217**	<162	**229**	**602**
Chlorodifluoromethane	**1,140**	**223**	**1,140**	**803**
Chloroethane	**1,670**	**631**	**1,040**	**573**
Chloroform	<131	<162	<124	<124
Chloromethane	<131	<162	<124	<124
cis-1,2-Dichloroethene	**3,960**	**417**	<124	**3,110**
cis-1,3-Dichloropropene	<131	<162	<124	<124
Cyclohexane	**1,710**	**1,150**	**1,020**	**1,390**
Dibromochloromethane	<131	<162	<124	<124
Dichlorodifluoromethane	**664**	<162	**437**	**511**
Dichlorofluoromethane	<131	<162	<124	<124
Dichlorotetrafluoroethane	<131	<162	<124	<124
Ethanol	<524	<647	<496	<496
Ethyl Acetate	<131	<162	<124	<124
Ethylbenzene	**26,000**	**16,100**	**12,500**	**25,800**
Heptane	**7,480**	**4,080**	**5,270**	**4,960**
Hexachlorobutadiene	<131	<162	<124	<124
Hexane	**9,340**	**5,900**	**10,200**	**7,250**
Isopropylbenzene (Cumene)	**1,010**	**571**	**553**	**814**
m & p-Xylenes	**86,100**	**65,000**	**43,600**	**88,000**
Methanol	<1,311	<1,617	<1,241	<1,239
Methyl Methacrylate	<131	<162	<124	<124
Methyl Tert Butyl Ether (MTBE)	<131	<162	<124	<124
Methylene Chloride (DCM)	**182**	<162	<124	<124
Naphthalene	<131	<162	<124	<124
o-Xylene	**12,100**	**3,320**	**4,060**	**11,000**
Propene	**4,330**	**1,710**	**3,820**	**2,760**
Styrene	<131	<162	<124	<124
Tert Butanol (TBA)	<262	<323	<248	<248
Tetrachloroethene (PCE)	<131	<162	<124	<124
Tetrahydrofuran	<131	<162	<124	<124
Toluene	**28,800**	**5,740**	**1,360**	**12,100**
trans-1,2-Dichloroethene	<131	<162	<124	<124
trans-1,3-Dichloropropene	<131	<162	<124	<124
Trichloroethene (TCE)	**293**	<162	<124	<124
Trichlorofluoromethane	**158**	<162	<124	<124
Trichlorotrifluoroethane	<131	<162	<124	<124
Vinyl Acetate	<262	<323	<248	<248
Vinyl Bromide	<131	<162	<124	<124
Vinyl Chloride	**3,000**	**870**	<124	**3,650**

Table 1. Landfill Gas Sampling Analytical Results
WMWI Boundary Road Landfill / SCS Project #25218040.01

Sample ID	Blower	G-5	G-7	G-10
Date Sampled	7/18/2019	7/18/2019	7/18/2019	7/18/2019
Parameter/Analyte	Result	Result	Result	Result
Reduced Sulfur Compounds, ASTM D-5504 (Units: ppmV)				
2-Methylthiophene	< 0.131	< 0.162	< 0.124	< 0.124
3-Methylthiophene	< 0.131	< 0.162	< 0.124	< 0.124
Bromothiophene	< 0.131	< 0.162	< 0.124	< 0.124
Carbon Disulfide	< 0.131	< 0.162	< 0.124	< 0.124
COS / SO2	< 0.131	< 0.162	< 0.124	< 0.124
Diethyl Disulfide	< 0.131	< 0.162	< 0.124	< 0.124
Diethyl Sulfide	< 0.131	< 0.162	< 0.124	< 0.124
Dimethyl Disulfide	< 0.131	< 0.162	< 0.124	< 0.124
Dimethyl Sulfide	< 0.131	< 0.162	< 0.124	< 0.124
Ethyl Mercaptan	< 0.131	< 0.162	< 0.124	< 0.124
Hydrogen Sulfide	**5.40**	< 0.162	**17.4**	**5.58**
iso-Butyl Mercaptan	< 0.131	< 0.162	< 0.124	< 0.124
Isopropyl Mercaptan	< 0.131	< 0.162	< 0.124	< 0.124
Methyl Mercaptan	< 0.131	< 0.162	< 0.124	< 0.124
Methylethylsulfide	< 0.131	< 0.162	< 0.124	< 0.124
n-Butyl Mercaptan	< 0.131	< 0.162	< 0.124	< 0.124
n-Propyl Mercaptan	< 0.131	< 0.162	< 0.124	< 0.124
sec-Butyl Mercaptan / Thiophene	< 0.131	< 0.162	< 0.124	< 0.124
tert-Butyl Mercaptan	< 0.131	< 0.162	< 0.124	< 0.124
Tetrahydrothiophene	< 0.131	< 0.162	< 0.124	< 0.124
Thiophenol	< 0.131	< 0.162	< 0.124	< 0.124
Total Reduced Sulfur	**5.40**	< 0.162	**17.4**	**5.58**

Bold values exceed the limit of detection.

Created by: JSN 8/20/19
Checked by: SCC, 11/27/19

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Table 2. Waste Boring Information
WMWI Boundary Road Landfill / SCS Project #25218040.01

Boring Number	Coordinates		Ground Elevation	Depth to Base of Waste (ft)	Bottom of Waste Elevation	Layer Thickness (ft)		
	Northing	Easting				Final Cover	Grading Layer	Waste
WC-1	437,389.12	2,514,778.94	775.32	20.5	755	5	5	10.5
WC-2	437,362.48	2,515,517.11	773.09	27	746	5	3	19
WC-3	437,372.01	2,515,849.34	774.13	23	751	4	4	15
WC-4	437,072.41	2,515,159.18	787.63	40	748	5	9	26
WC-5	437,112.65	2,515,516.83	781.89	39	743	4	9	26
WC-6	437,072.39	2,515,849.15	776.24	26	750	4	4	18
WC-7	436,845.52	2,514,799.38	771.32	27	744	4	6	17
WC-8	436,786.66	2,515,097.03	775.09	33	742	4	9	20
WC-9	436,848.10	2,515,621.86	781.60	33	749	5	7	21
WC-10	436,787.89	2,515,940.64	770.45	21	749	5	2	14
WC-11	436,564.11	2,515,497.26	774.33	37	737	4	6	27
WC-12	436,166.69	2,515,849.53	764.94	29	736	4	4	21
Average					*746*	*4.4*	*6*	*20*

Created by: TK 9/12/19
Revised by: BSS, 9/12/19
Checked by: BSS, 9/12/19; SCC, 9/12/2019

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Table 3. Analytical Results - Grading Layer Soil Samples
Waste Characterization Investigation, Boundary Road Landfill / SCS Engineers Project #25218040.01

Method	Analyte	Unit	WC1S2	WC2S2	WC3S2	WC4S2	WC5S2	WC6S2	WC7S2	WC8S2	WC9S2	WC10S2	WC11S2	WC12S2	NR 720 Groundwater Pathway RCLs with a Wisconsin-Default Dilution Factor of 2	NR 720 Industrial Direct Contact RCLs
Depth			5	6	6	10	6.5	5	6	6	7	5	5	5		
Date			8/27/2019	8/27/2019	8/29/2019	8/27/2019	8/27/2019	8/28/2019	8/28/2019	8/29/2019	8/28/2019	8/29/2019	8/28/2019	8/28/2019	--	--
Volatile Organic Compounds (VOCs)																
8260B	1,1,1,2-Tetrachloroethane	ug/Kg	<60 *	<120	<29	<33 *	<27 *	<32	<57	<29	<29	<34	<28	<30	53.4	12,300
8260B	1,1,1-Trichloroethane	ug/Kg	<50	<96	<24	<27	<22	<27	<47	<24	<24	<28	<23	<24	140	640,000
8260B	1,1,2,2-Tetrachloroethane	ug/Kg	<52	<100	<25	<28	<23	<28	<50	<25	<25	<29	<24	<26	0.20	3,600
8260B	1,1,2-Trichloroethane	ug/Kg	<46 *	<89	<22	<25 *	<20 *	<25	<44	<22	<22	<26	<22	<23	3.2	7,010
8260B	1,1-Dichloroethane	ug/Kg	<54 *	<100	<25	<29 *	<24 *	<29	<51	<26	<25	<30	<25	<26	483	22,200
8260B	1,1-Dichloroethene	ug/Kg	<51	<98	<24	<28	<22	<27	<49	<25	<24	<29	<24	<25	5.0	1,190,000
8260B	1,1-Dichloropropene	ug/Kg	<39	<75	<18	<21	<17	<21	<37	<19	<18	<22	<18	<19	NE	NE
8260B	1,2,3-Trichlorobenzene	ug/Kg	<60	<120	<28	<32	<26	<32 ^c *	<57	<29	<28	<34	<28	<29 ^c *	NE	934,000
8260B	1,2,3-Trichloropropane	ug/Kg	<54 *	<100	<26	<29 *	<24 *	<29	<52	62 J	<26	<30	<25	<27	52	109
8260B	1,2,4-Trichlorobenzene	ug/Kg	<45	<86	<21	<24	<20	<24	<43	<22	<21	<25	<21	<22	408	113,000
8260B	1,2,4-Trimethylbenzene	ug/Kg	78 J *	8,700	75	250 *	64 *	140	9,700	52 J	530	120	840	25 J	1,379 (1)	219,000
8260B	1,2-Dibromo-3-Chloropropane	ug/Kg	<260 *	<500	<120	<140 *	<110 *	<140	<250	<130	<120	<150	<120	<130	0.20	92
8260B	1,2-Dibromoethane	ug/Kg	<51 *	<97	<24	<27 *	<22 *	<27	<48	<24	<24	<28	<24	<25	0.028	221
8260B	1,2-Dichlorobenzene	ug/Kg	<44 *	180 J	<21	<24 *	<19 *	<23	<42	<21	<21	<25	<20	<22	1,168	376,000
8260B	1,2-Dichloroethane	ug/Kg	<51 *	<99	<24	<28 *	<23 *	<27	<49	<25	<24	<29	<24	<25	2.8	2,870
8260B	1,2-Dichloropropane	ug/Kg	<56 *	<110	<27	<30 *	<25 *	<30	<53	<27	<26	<31	<26	<28	3.3	15,000
8260B	1,3,5-Trimethylbenzene	ug/Kg	<50 *	2,800	<24	98 *	<22 *	83	280 *	<24	62 *	74	270 *	<24	1,379 (1)	182,000
8260B	1,3-Dichlorobenzene	ug/Kg	<52	<100	<25	<28	<23	<28	<50	<25	<25	<29	<25	<26	1,153	297,000
8260B	1,3-Dichloropropane	ug/Kg	<47	<91	<22	<26	<21	<25	<45	<23	<22	<27	<22	<23	NE	1,490,000
8260B	1,4-Dichlorobenzene	ug/Kg	<48 *	<92	<23	<26 *	<21 *	<25	<45	<23	<23	<27	<22	<23	144	16,400
8260B	2,2-Dichloropropane	ug/Kg	<58	<110	<28	<31	<26	<31	<55	<28	<27	<33	<27	<29	NE	191,000
8260B	2-Chlorotoluene	ug/Kg	<41 *	<79	<19	<22 *	<18 *	<22	<39	<20	<19	<23	<19	<20	NE	907,000
8260B	4-Chlorotoluene	ug/Kg	<46 *	<88	<22	<25 *	<20 *	<24	<44	<22	<22	<26	<21	<23	NE	253,000
8260B	Benzene	ug/Kg	36 *	1,300	20	170 *	55 *	710	31	11 J	27	700	<8.9	29	5.1	7,070
8260B	Bromobenzene	ug/Kg	<47 *	<90	<22	<25 *	<20 *	<25	<44	<22	<22	<26	<22	<23	NE	679,000
8260B	Bromochloromethane	ug/Kg	<56 *	<110	<27	<30 *	<25 *	<30	<53	<27	<26	<31	<26	<28	NE	906,000
8260B	Bromodichloromethane	ug/Kg	<49 *	<94	<23	<26 *	<21 *	<26	<46	<23	<23	<27	<23	<24	0.30	1,830
8260B	Bromoform	ug/Kg	<63	<120	<30	<34	<28	<34	<60	<31	<30	<36	<30	<31	2.3	113,000
8260B	Bromomethane	ug/Kg	<100	<200	<49	<56	<46	<56	<99	<50	<49	<59	<49	<51	5.1	43,000
8260B	Carbon tetrachloride	ug/Kg	<50	<97	<24	<27	<22	<27	<48	<24	<24	<28	<24	<25	3.9	4,030
8260B	Chlorobenzene	ug/Kg	<51 *	<97	<24	<27 *	<22 *	<27	<48	<24	<24	<28	<24	<25	136	761,000
8260B	Chloroethane	ug/Kg	<66	<130	<31	<36	<29	<35	<63	<32	<31	<37	<31	<32	227	2,120,000
8260B	Chloroform	ug/Kg	<48 *	<93	<23	<26 *	<21 *	<26	<46	<23	<23	<27	<23	<24	3.3	1,980
8260B	Chloromethane	ug/Kg	<42	<81	<20	<23	<18	<22	<40	<20	<20	<24	<20	<21	16	669,000
8260B	cis-1,2-Dichloroethene	ug/Kg	<53	<100	<25	<29	<23	<28	<51	<26	<25	30 J	<25	<26	41	2,340,000
8260B	cis-1,3-Dichloropropene	ug/Kg	<54 *	<100	<26	<29 *	<24 *	<29	<52	<26	<26	<31	<25	<27	NE	1,210,000
8260B	Dibromochloromethane	ug/Kg	<64 *	<120	<30	<34 *	<28 *	<34	<61	<31	<30	<36	<30	<31	32	38,900
8260B	Dibromomethane	ug/Kg	<35 *	<68	<17	<19 *	<16 *	<19	<34	<17	<17	<20	<17	<17	NE	143,000
8260B	Dichlorodifluoromethane	ug/Kg	<88	<170	<42	<48	<39	<47	<84	<43	<42	<50	<41	<43	3,086	530,000
8260B	Ethylbenzene	ug/Kg	250 *	32,000	<11	210 *	62 *	1,800	1,100	47	140	1,000	210	39	1,570	35,400
8260B	Hexachlorobutadiene	ug/Kg	<58	<110	<28	<31	<26	<31	<55	<28	<28	<33	<27	<29	NE	7,190
8260B	Isopropyl ether	ug/Kg	<36	<69	<17	<19	<16	<19	<34	<17	<17	<20	<17	<18	NE	2,260,000
8260B	Isopropylbenzene	ug/Kg	370	1,900	<24	140	<22	120	690	<24	38 J	98	<24	<25	NE	268,000
8260B	Methyl tert-butyl ether	ug/Kg	<52 *	<99	<24	<28 *	<23 *	<27	<49	<25	<24	<29	<24	<25	27	282,000
8260B	Methylene Chloride	ug/Kg	<210	<410	<100	<120	<94	<110	<200	<100	<100	<120	<100	<100	2.6	1,150,000
8260B	Naphthalene	ug/Kg	180 *	1,700	39 J	290 *	68 *	120	2,400	56 J	680	32 J	46 J	<22	658	24,100

Table 3. Analytical Results - Grading Layer Soil Samples
Waste Characterization Investigation, Boundary Road Landfill / SCS Engineers Project #25218040.01

Method	Analyte	Unit	WC1S2	WC2S2	WC3S2	WC4S2	WC5S2	WC6S2	WC7S2	WC8S2	WC9S2	WC10S2	WC11S2	WC12S2	NR 720 Groundwater Pathway RCLs with a Wisconsin-Default Dilution Factor of 2	NR 720 Industrial Direct Contact RCLs
Depth			5	6	6	10	6.5	5	6	6	7	5	5	5		
Date			8/27/2019	8/27/2019	8/29/2019	8/27/2019	8/27/2019	8/28/2019	8/28/2019	8/29/2019	8/28/2019	8/29/2019	8/28/2019	8/28/2019	--	--
8260B	n-Butylbenzene	ug/Kg	<51	<98	<24	<27	<22	<27	3,000	<24	<24	<29	<24	<25	NE	108,000
8260B	N-Propylbenzene	ug/Kg	720	1,800	<26	280	32 J	33 J	3,400	<26	150	<30	28 J	<27	NE	264,000
8260B	p-Isopropyltoluene	ug/Kg	<47	1,300	<22	32 J	<21	<25	390	<23	55 J	<27	26 J	<23	NE	162,000
8260B	sec-Butylbenzene	ug/Kg	410 *	260	<25	130 *	27 J *	<28	860 *	<25	58 J *	<29	<24 *	<26	NE	145,000
8260B	Styrene	ug/Kg	<51 *	<97	<24	<27 *	<22 *	<27	<48	<24	<24	<28	<24	<25	220	867,000
8260B	tert-Butylbenzene	ug/Kg	<52 *	<100	<25	<28 *	<23 *	<28	<50 *	<25	<25 *	<29	<24 *	<26	NE	183,000
8260B	Tetrachloroethene	ug/Kg	<48	<93	<23	<26	<21	<26	<46	<23	<23	<27	<23	<24	4.5	145,000
8260B	Toluene	ug/Kg	19 J	12,000	12 J	64	78	43	32	26	14 J	130	22	<9.5	1,107	818,000
8260B	trans-1,2-Dichloroethene	ug/Kg	<46	<88	<22	<25	<20	<24	<44	<22	<22	<26	<21	<23	63	1,850,000
8260B	trans-1,3-Dichloropropene	ug/Kg	<47 *	<91	<22	<26 *	<21 *	<25	<45	<23	<22	<27	<22	<23	NE	1,510,000
8260B	Trichloroethene	ug/Kg	<21	<41	<10	<12	<9.4	<11	<20	<10	<10	15 J	<10	<11	3.6	8,410
8260B	Trichlorofluoromethane	ug/Kg	<56	<110	<27	<30	<25	<30	<53	<27	<26	<31	<26	<28	4,478	1,230,000
8260B	Vinyl chloride	ug/Kg	<34	<66	<16	<18	<15	<18	<33	<17	<16	<19	<16	<17	0.10	2,080
8260B	Xylenes, Total	ug/Kg	130	140,000	51	430	220	5,100	600	81	170	3,700	820	99	3,960	260,000
VOC Group Totals																
	Total PVOC	ug/Kg	693	198,500	197	1,512	547	7,996	14,143	273	1,623	5,756	2,208	192	--	--
	Total CVOC	ug/Kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	45	ND	ND	--	--
	Total Other VOCs	ug/Kg	1,500	5,440	ND	582	59	153	8,340	62	301	98	54	ND	--	--
	Total VOCs	ug/kg	2,193	203,940	197	2,094	606	8,149	22,483	335	1,924	5,899	2,262	192	--	--
Polynuclear Aromatic Hydrocarbons (PAHs)																
8270D	1-Methylnaphthalene	ug/Kg	1,600	84	<9.4	310	110	24 J	290	14 J	530	<9.9	<9.4	12 J	NE	72,700
8270D	2-Methylnaphthalene	ug/Kg	1,100	130	<7.1	220	56 J	32 J	110	7.5 J	290	<7.5	<7.1	24 J	NE	3,010,000
8270D	Acenaphthene	ug/Kg	900	34 J	<7.0	78	71	62	74	30 J	<6.5	41	<6.9	<6.7	NE	45,200,000
8270D	Acenaphthylene	ug/Kg	<5.0	19 J	<5.1	19 J	<4.8	<5.1	<4.9	<5.1	<4.8	26 J	<5.1 F1	<4.9	NE	NE
8270D	Anthracene	ug/Kg	800	79	<6.5	130	70	110	200	31 J	51	140	<6.4	<6.2	196,949	100,000,000
8270D	Benzo[a]anthracene	ug/Kg	1,200	190	<5.2	290	160	320	570	44	110	500	<5.2	<5.0	NE	20,800
8270D	Benzo[a]pyrene	ug/Kg	1,100	220	<7.5	280	150	300	480	43	110	620	<7.4	<7.2	470	2,110
8270D	Benzo[b]fluoranthene	ug/Kg	1,300	270	<8.3	360	190	400	660	54	100	600	<8.3	<8.0	478	21,100
8270D	Benzo[g,h,i]perylene	ug/Kg	410	110	<12	170	87	120	100	30 J	35 J	230	<12 F1	<12	NE	NE
8270D	Benzo[k]fluoranthene	ug/Kg	420	120	<11	200	12 J	270	350	21 J	150	450	<11	<11	NE	211,000
8270D	Chrysene	ug/Kg	1,300	250	11 J	370	190	330	560	55	120	620	<10	<10	144	2,110,000
8270D	Dibenz(a,h)anthracene	ug/Kg	120	27 J	<7.5	35 J	20 J	32 J	<7.1	8.4 J	<7.0	18 J	<7.4	<7.2	NE	2,110
8270D	Fluoranthene	ug/Kg	2,700	420	<7.2 ^c	700	370	810 ^c	1,300 ^c	120	250 ^c	980	<7.1 ^c	<6.9 ^c	88,878	30,100,000
8270D	Fluorene	ug/Kg	1,000	42	<5.4 ^c	80	68	59	110	38	130	42	<5.4	<5.2	14,830	30,100,000
8270D	Indeno[1,2,3-cd]pyrene	ug/Kg	390	77	<10	140	74	130	180	25 J	45	230	<9.9 F1	<9.6	NE	21,100
8270D	Naphthalene	ug/Kg	150	970	<6.0	130	60	65	70	<5.9	69	15 J	6.3 J	39	658	24,100
8270D	Phenanthrene	ug/Kg	3,200	260	<5.4	370	420	450	740	96	540	470	<5.3	<5.2	NE	NE
8270D	Pyrene	ug/Kg	2,800	360	14 J	570	350	1,800	2,500	110	470	770	<7.6 F1	13 J	54,546	22,600,000
	Total PAHs	ug/kg	20,490	3,662	25	4,452	2,458	5,314	8,294	727	3,000	5,752	6	88	--	--

Table 3. Analytical Results - Grading Layer Soil Samples
Waste Characterization Investigation, Boundary Road Landfill / SCS Engineers Project #25218040.01

Method	Analyte	Unit	WC1S2	WC2S2	WC3S2	WC4S2	WC5S2	WC6S2	WC7S2	WC8S2	WC9S2	WC10S2	WC11S2	WC12S2	NR 720 Groundwater Pathway RCLs with a Wisconsin-Default Dilution Factor of 2	NR 720 Industrial Direct Contact RCLs
Depth			5	6	6	10	6.5	5	6	6	7	5	5	5		
Date			8/27/2019	8/27/2019	8/29/2019	8/27/2019	8/27/2019	8/28/2019	8/28/2019	8/29/2019	8/28/2019	8/29/2019	8/28/2019	8/28/2019	--	--
Petroleum Organics																
WI-DRO	WI Diesel Range Organics	mg/Kg	**1.6 J**	**85**	<1.4	**1.5 J**	<1.3	**3.2 J**	**17**	<1.6	**43**	**2.3 J**	<1.6	<1.3	NE	NE
WI-GRO	WI Gasoline Range Organics	ug/Kg	**220,000**	**380,000**	**1,300 J**	**92,000**	**32,000**	**11,000**	**490,000**	**59,000**	**81,000**	**10,000**	**6,400**	**2,900**	NE	NE
WI-GRO	WI Gasoline Range Organics	mg/kg	**220**	**380**	**1.3 J**	**92**	**32**	**11**	**490**	**59**	**81**	**10**	**6.4**	**2.9**	NE	NE
Physical																
Moisture	Percent Moisture	%	13.8	11.4	14.7	16.5	10.3	16.7	11.6	14.8	11.9	20.1	14.0	12.6	--	--
Moisture	Percent Solids	%	86.2	88.6	85.3	83.5	89.7	83.3	88.4	85.2	88.1	79.9	86.0	87.4	--	--

Laboratory Notes:

- * LCS or LCSD is outside acceptance limits
- ^c CCV Recovery is outside acceptance limits.
- J Reported value was between the limit of detection and the limit of quantitation.
- F1 MS and/or MSD Recovery is outside acceptance limits.

Abbreviations:

mg/kg = milligrams per kilogram or parts per million (ppm)
ug/kg = micrograms per kilogram or parts per billion (ppb)
RCL = Residual Contaminant Level
NE = No Standard Established
-- = Not Applicable

Bold values exceed the limit of detection.

450 Yellow highlighted values exceed NR 720 RCLs for the industrial direct contact pathway and the groundwater pathway (no exceedances for these results)

370 Blue highlighted values exceed NR 720 RCL for the groundwater pathway

Total PVOC includes petroleum VOCs benzene, ethylbenzene, toluene, xylenes, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, naphthalene, and methyl-tert-butyl ether.
Total CVOC includes all chlorinated alkanes and alkenes.
Total Other VOC includes all other compounds, such as additional petroleum-related VOCs, ketones, and other halogenated compounds.

RCL Notes:
NR 720 RCLs updated as of December 2018.
(1) 1,2,4- and 1,3,5-Trimethylbenzenes combined total = 1,378.7

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Table 4. Analytical Results - Waste Sample Total VOC and PCB Analysis
Waste Characterization Investigation, Boundary Road Landfill / SCS Engineers Project #25218040.01

NOTE: The waste sample analytical results in Table 4 were compared to the NR 720 RCLs for the groundwater pathway and the industrial direct contact pathway to identify potential contaminants of concern. The NR 720 RCLs are not applicable to the waste sampling results as compliance limits, and typical municipal and industrial solid waste is expected to have many constituents at levels exceeding RCLs. The comparison to RCLs is intended only for planning and evaluation purposes.

Method	Analyte	Unit	WC1S3	WC1S4	WC2S3	WC2S4	WC3S3	WC3S4	WC4S4	WC4S5	WC5S4	WC5S6	WC5S6S5	WC6S3	WC6S4	WC7S3	WC7S4	WC8S3	WC8S4	WC9S4	WC9S5	WC10S3	WC10S4	WC11S3S4	WC11S4	WC11S5	WC12S3	WC12S4	NR 720 Groundwater Pathway RCLs with Wisconsin-Default Dilution Factor of 2	NR 720 Industrial Direct Contact RCLs
Depth			11	14	15	19	15	20	24	28	18	33	27 - 33	9	15	16	20	15	25	20	26	12	18	20 - 24	24	28	10	15		
Date		--	8/27/19	8/27/19	8/27/19	8/27/19	8/29/19	8/29/19	8/27/19	8/27/19	8/27/19	8/27/19	8/29/19	8/28/19	8/28/19	8/28/19	8/28/19	8/29/19	8/29/19	8/28/19	8/28/19	8/29/19	8/29/19	8/29/19	8/28/19	8/28/19	8/28/19	8/28/19	--	--
Polychlorinated Biphenyls (PCBs)																														
8082A	PCB-1016	ug/Kg	<74	<650	<100	<180	<77	<390	<930	<180	<1700	--	<800	<350	<4100	<310	<350	<69	<170	<150	<160	<420	<410	<1700	--	<200	<90	<75	--	28000
8082A	PCB-1221	ug/Kg	<92	<810	<120	<230	<96	<490	<1200	<230	<2200	--	<990	<440	<5100	<390	<440	<86	<210	<180	<200	<520	<500	<2200	--	<240	<110	<93	--	883
8082A	PCB-1232	ug/Kg	<91	<800	<120	<230	<95	<480	<1100	<220	<2100	--	<980	<440	<5100	<380	<430	<85	<210	<180	<190	<510	<500	<2100	--	<240	<110	<92	--	792
8082A	PCB-1242	ug/Kg	2,800	12,000	490	5,000	550	6,300	16,000	6,200	35,000	--	<740	3,800	<3800	<290	10,000	2,400	3,800	2,800	4,500	5,300	<380	44,000	--	8,800	890	1,000	--	972
8082A	PCB-1248	ug/Kg	<82	<720	<110	<200	<86	<440	<1000	<200	<1900	--	<890	<390	<4600	<350	<390	<77	<190	<160	<170	<460	<450	<1900	--	<220	<100	<84	--	975
8082A	PCB-1254	ug/Kg	1,400	<400	750	2,900	<47	3,500	<570	4,200	<1100	--	20,000	<220	<2500	<190	<220	2,100	2,000	1,700	3,500	3,700	6,200	<1100	--	1,900	310	560	--	988
8082A	PCB-1260	ug/Kg	<100	<900	<140	<250	<110	<550	<1300	<250	<2400	--	<1100	7,500	60,000	<430	<490	<96	<230	<200	<220	<580	<560	<2400	--	<270	<130	<100	--	100
	Total PCBs	ug/Kg	4,200	12,000	1,240	7,900	550	9,800	16,000	10,400	35,000	--	20,000	11,300	60,000	ND	10,000	4,500	5,800	4,500	8,000	9,000	6,200	44,000	--	10,700	1,200	1,560	9.4	967
	Total PCBs	mg/Kg	4.2	12	1.24	7.9	0.55	9.8	16	10.4	35	--	20	11.3	60	ND	10	4.5	5.8	4.5	8	9	6.2	44	--	10.7	1.2	1.56	0.0094	0.967
Volatile Organic Compounds (VOCs)																														
8260B	1,1,1,2-Tetrachloroethane	ug/Kg	<22 *	<87 *	<450 *	<440 *	<160	<150	<23 *	<23 *	<2700 *	<2400 *	--	<460	<4100	<78	<140	<31	<170	<310	<310	<83	<810	--	<54	<54	<31	<34	53	12,300
8260B	1,1,1-Trichloroethane	ug/Kg	<18	<71	<370	<360	<130	<130	35 J	<19	<2200	<2000	--	<380	<3300	<64	<120	<26	<140	<260	<260	<68	<670	--	<44	<45	<26	<28	140	640,000
8260B	1,1,2,2-Tetrachloroethane	ug/Kg	<19	<75	<390	<380	<140	<130	<20	<20	<2300	<2100	--	<400	<3500	<67	<120	<27	<150	<270	<270	<71	<700	--	<46	<47	<27	<29	0.20	3,600
8260B	1,1,2-Trichloroethane	ug/Kg	<17 *	<66 *	<350 *	<340 *	<120	<120	<17 *	<18 *	<2000 *	<1800 *	--	<350	<3100	<60	<110	<24	<130	<240	<240	<63	<620	--	<41	<41	<24	<26	3.2	7,010
8260B	1,1-Dichloroethane	ug/Kg	<20 *	<77 *	670 J *	<390 *	<140	<140	<20 *	<21 *	<2400 *	<2100 *	--	<410	<3600	<69	<130	<28	<160	<280	<280	<74	<720	--	230	200	<28	89	483	22,200
8260B	1,1-Dichloroethene	ug/Kg	<19	<73	<380	<370	<140	<130	<19	<20	<2200	<2000	--	<390	<3400	<66	<120	<27	<150	<260	<260	<70	<680	--	<45	<46	<27	<29	5.0	1,190,000
8260B	1,1-Dichloropropene	ug/Kg	<14	<56	<290	<280	<100	<98	<15	<15	<1700	<1600	--	<300	<2600	<50	<92	<20	<110	<200	<200	<53	<520	--	<35	<35	<20	<22	NE	NE
8260B	1,2,3-Trichlorobenzene	ug/Kg	<22	<86	<450	<440	<160	<150	<23	<23	<2600	<2400	--	<460 ^c *	<4000	<77 ^c *	<140 ^c *	<31	<170	<310	<310	<82 ^c *	<800 ^c *	--	<53	<54	<31	<34	NE	934,000
8260B	1,2,3-Trichloropropane	ug/Kg	<20 *	<78 *	<410 *	<390 *	<140	<140	<21 *	<21 *	<2400 *	<2200 *	--	<410	7,100 J	<70	<130	<28	<160	<280	<280	<74	4,900	--	<48	<49	<28	<30	52	109
8260B	1,2,4-Trichlorobenzene	ug/Kg	<16	<64	<340	<330	<120	<110	83	<17	<2000	<1800	--	2,100	20,000	<58	<110	<23	<130	350 J	<230	<61	<600	--	57 J	40 J	<23	<25	408	113,000
8260B	1,2,4-Trimethylbenzene	ug/Kg	5,400 *	8,500 *	29,000 *	58,000 *	1,400,000	270,000	2,900 *	6,800 *	66,000 *	460,000 *	--	35,000	590,000	12,000	15,000	1,200	120,000	29,000	38,000	31,000	1,200,000	--	7,000	5,600	8,900	380	1,378.7 (1)	219,000
8260B	1,2-Dibromo-3-Chloropropane	ug/Kg	<95 *	<370 *	<2000 *	<1900 *	<690	<660	<99 *	<100 *	<11000 *	<10000 *	--	<2000	<17000	<340	<620	<140	<750	<1400	<1300	<360	<3500	--	<230	<230	<140	<150	0.20	92
8260B	1,2-Dibromoethane	ug/Kg	<18 *	<73 *	<380 *	<370 *	<130	<130	<19 *	<19 *	<2200 *	<2000 *	--	<390	<3400	<65	<120	<26	<150	<260	<260	<69	<680	--	<45	<45	<26	<28	0.028	221
8260B	1,2-Dichlorobenzene	ug/Kg	<16 *	110 J *	1100 *	1,000 *	<120	<110	100 *	43 J *	<1900 *	<1700 *	--	<330	<2900	<57	<100	<23	<130	<230	<230	<60	<590	--	<39	<39	<23	<25	1,168	376,000
8260B	1,2-Dichloroethane	ug/Kg	<19 *	<74 *	<380 *	<370 *	<140	<130	<19 *	<20 *	<2300 *	<2000 *	--	<390	<3400	<66	<120	<27	<150	<270	<260	<70	<690	--	<46	<46	<27	<29	2.8	2,870
8260B	1,2-Dichloropropane	ug/Kg	<20 *	<80 *	<420 *	<410 *	<150	<140	<21 *	<21 *	<2500 *	<2200 *	--	<430	<3800	<72	<130	<29	<160	<290	<290	<77	<750	--	<50	<50	<29	<32	3.3	15,000
8260B	1,3,5-Trimethylbenzene	ug/Kg	1,300 *	2,300 *	8,600 *	16,000 *	300,000	55,000	810 *	970 *	21,000 *	140,000 *	--	13,000	150,000	3,700	1,700	350	19,000	9,600 *	12,000 *	9,900	270,000	--	1,900 *	1,500 *	2,100 *	95 *	1,378.7 (1)	182,000
8260B	1,3-Dichlorobenzene	ug/Kg	<19	<75	<390	<380	<140	<130	<20	<20	<2300	<2100	--	<400	<3500	<68	<120	<27	<150	<270	<270	<72	<700	--	<47	<47	<27	<29	1,153	297,000
8260B	1,3-Dichloropropane	ug/Kg	<17	<68	<360	<340	<130	<120	<18	<18	<2100	<1900	--	<360	<3200	<61	<110	<25	<140	<250	<240	<65	<630	--	<42	<42	<25	<27	NE	1,490,000
8260B	1,4-Dichlorobenzene	ug/Kg	20,000 *	1,100 *	<360 *	<350 *	3,200	2,000	1300 *	580 *	<2100 *	<1900 *	--	3,200	<3200	2,500	710	200	4,000	<250	1,300	1,100	<640	--	2,300	1,000	1,100	48 J	144	16,400
8260B	2,2-Dichloropropane	ug/Kg	<21	<83	<440	<420	<160	<150	<22	<22	<2600	<2300	--	<440	<3900	<75	<140	<30	<170	<300	<300	<80	<780	--	<52	<52	<30	<33	NE	191,000
8260B	2-Chlorotoluene	ug/Kg	<15 *	<59 *	<310 *	<300 *	<110	<100	<16 *	<16 *	<1800 *	<1600 *	--	<310	<2800	<53	<97	<21	<120	<210	<210	<56	<550	--	<37	<37	<21	<23	NE	907,000
8260B	4-Chlorotoluene	ug/Kg	<17 *	<66 *	<340 *	<330 *	<120	<120	<17 *	<18 *	<2000 *	<1800 *	--	<350	<3100	<59	<110	<24	<130	<240	<240	<63	<610	--	<41	<41	<24	<26	NE	253,000
8260B	Benzene	ug/Kg	89 *	200 *	7,800 *	25,000 *	46,000	7,100	180 *	380 *	9,900 *	22,000 *	--	<150	32,000	140	90	67	240	23,000	32,000	8,300	3,800	--	<17	340	22	580	5.1	7,070
8260B	Bromobenzene	ug/Kg	<17 *	<67 *	<350 *	<340 *	<120	<120	<18 *	<18 *	<2100 *	<1900 *	--	<360	<3100	<60	<110	<24	<130	<240	<240	<64	<620	--	<41	<42	<24	<26	NE	679,000
8260B	Bromochloromethane	ug/Kg	<20 *	<80 *	<420 *	<410 *	<150	<140	<21 *	<21 *	<2500 *	<2200 *	--	<430	<3800	<72	<130	<29	<160	<290	<290	<77	<750	--	<50	<50	<29	<32	NE	906,000
8260B	Bromodichloromethane	ug/Kg	<18 *	<70 *	<360 *	<350 *	<130	<120	<18 *	<19 *	<2100 *	<1900 *	--	<370	<3300	<63	<120	<25	<140	<250	260 J	<67	<650	--	<43	<44	<25	<27	0.30	1,830
8260B	Bromoform	ug/Kg	<23	<91	<470	<460	<170	<160	<24	<24	<2800	<2500	--	<480	<4300	<82	<150	<33	<180	<330	<330	<87	<850	--	<56	<57	<33	<36	2.3	113,000
8260B	Bromomethane	ug/Kg	<38	<150	<780	<760	<280	<260	<39	<40	<4600	<4200	--	<790	<7000	<130	<250	<54	<300	<540	<540	<140	<1400	--	<93	<93	<54	<59	5.1	43,000
8260B	Carbon tetrachloride	ug/Kg	<18	<72	<380	<370	<130	<130	<19	<19	<2200	<2000	--	<380	<3400	<65	<120	<26	<150	<260	<260	<69	<670	--	<45	<45	<26	<28	3.9	4,030
8260B	Chlorobenzene	ug/Kg	110 *	320 *	<380 *	<370 *	1,100	370	1,400 *	69 *	<2200 *	<2000 *	--	<390	<3400	200	<120	57 J	240 J	410 J	410 J	210	<680	--	57 J	360	62 J	<28	136	761,000
8260B	Chloroethane	ug/Kg	<24	<95	<490	<480	<180	<170	<25	<25	<2900	<2600	--	<500	<4400	<85	<160	<34	<190	<340	<340	<90	<880	--	<59	71 J	<34	360	227	2,120,000
8260B	Chloroform	ug/Kg	<18 *	<70 *	<360 *	<350 *	<130	<120	<18 *	<19 *	<2100 *	<1900 *	--	<370	<3300	<63	<110	<25	<140	<250	330 J	<66	<650	--	<43	<43	<25	29 J	3.3	1,980
8260B	Chloromethane	ug/Kg	<15	<60	<310	<300	<110	<110	<16	<16	<1800	<1700	--	<320	<2800	<54	<99	<22	<120	<220	<220	<57	<560	--	<37	<38	<22	<24	16	669,000
8260B	cis-1,2-Dichloroethene	ug/Kg	<19	<77	<400	470 J	55,000	1,900	21 J	<20	<2400	6,800	--	1,200	17,000	<69	<130	<28	<150	<280	<280	420	<720	--	480	920	<28	48 J	41	2,340,000
8260B	cis-1,3-Dichloropropene	ug/Kg	<20 *	<78 *	<410 *	<400 *	<150	<140	<21 *	<21 *	<2400 *	<2200 *	--	<410	<3700	<70	<130	<28	<160	<280	<280	<75	<730	--	<48	<49	<28	<31	NE	1,210,000
8260B	Dibromochloromethane	ug/Kg	<23 *	<92 *	<480 *	<460 *	<170	<160	<24 *	<24 *	<2800 *	<2500 *	--	<490	<4300	<83	<150	<33	<180	<330	<330	<88	<860	--	<57	<57	<33	<36	32	38,900
8260B	Dibromomethane	ug/Kg	<13 *	<51 *	<260 *	<260 *	<94	<89	<13 *	<14 *	<1600 *	<1400 *	--	<270	<2400	<46	<84	<18	<100	<180	<180	<48	<470	--	<31	<32	<18	<20	NE	143,000
8260B	Dichlorodifluoromethane	ug/Kg	<32	<130	<660	<640	<240	<220	<33	<34	<3900	<3500	--	<670	<5900	<110	<210	<46	<260	<460	<460	<120	<1200	--	<78	<79	<46	<50	3,086	530,000
8260B	Ethylbenzene	ug/Kg	3,700 *	21,000 *	96,000 *	130,000 *	1,000,000	150,000	3,800 *	12,000 *	320,000 *	950,000 *	--	<180	1,100,000	18,000	1,300	2,700	95,000	83,000	140,000	56,000	320,000	--	5,000	3,800	1,400	180	1,570	35,400
8260B	Hexachlorobutadiene	ug/Kg	<21	<84	<440	<420	<160	<150	<22	<22	<2600	<2300	--	<440	<3900	<75	<140	<30	<170	<300	<300	<80	<780	--	<52	<52	<30	<33	NE	7,190
8260B	Isopropyl ether	ug/Kg	<13	<52	<270	<260	340 J	96 J	<14	<14	<1600	<1400	--	<280	<2400	<47	<86	<19	<100	<190	<190	<49	<480	--	<32	<32	<19	89	NE	2,260,000
8260B	Isopropylbenzene	ug/Kg	670	1,500	5,400	12,000	71,000	17,000	500	1,000	15,000	120,000	--	14,000	110,000	3,000	1,700	290	16,000	6,500	8,800	7,000	67,000	--	1,100	840	470	75	NE	268,000
8260B	Methyl tert-butyl ether	ug/Kg	<19 *	<74 *	<390 *	<380 *	<140	<130	<20 *	<20 *	<2300 *	<2100 *	--	<390	<3500	<67	<120	<27	<150	<270	<270	<71	<690	--	<46	<46	<27	<29	27	282,000
8260B	Methylene Chloride	ug/Kg	<78	<310	<1600	<1600	<570	<540	<81	<82	<9400	<8500	--	<1600	<14000	<280	<510	<110	<620	<1100	<1100	<290	<2900	--	<190	350 J	<110	<120	2.6	1,150,000
8260B	Naphthalene	ug/Kg	2,100 *	15,000 *	56,000 *	61,000 *	450,000	75,000	1,600 *	2700 *	15,000 *	160,000 *	--	5,200	170,000	24,000	6,200	140	92,000	7,000	10,000	6,600	<5900	--	4,700	3,300	2,300	790	658	24,100
8260B	n-Butylbenzene	ug/Kg	1,600	3,500	5,900	18,000	190,000	37,000	410	610	6,400	74,000	--	2,900	60,000	3,300	<120	210	<150	4,700	5,000	3,600	310,000	--	850	<46	1,200	85	NE	108,000
8260B	N-Propylbenzene	ug/Kg	900	1,500	4,900	9,900	160,000	35,000	580	1,400	18,000	100,000	--	11,000	120,000	2,100	2,000	320	15,000	5,100	7,900	6,200	280,000	--	1,300	950	960	72 J	NE	264,000
8260B	p-Isopropyltoluene	ug/Kg	700	1,300	2,000	3,300	41,000	9,500	370	870	2,900 J	14,000	--	1,500	13,000	2,200	3,300	470	7,600	1,600	2,100	2,800	60,000	--	1,000	1,200	3,400	78	NE	162,000
8260B	sec-Butylbenzene	ug/Kg	390 *	510 *	860 J *	2,000 *	62,000	12,000	220 *	490 *	2,500 J *	19,000 *	--	1,400	18,000	970	1,900	110	6,000	1,100 *	1,400 *	1,800	76,000	--	460 *	510 *	470 *	42 J *	NE	145,000
8260B	Styrene	ug/Kg	<18 *	<73 *	<380 *	<370 *	<130	<130	<19 *	<19 *	<2200 *	<2000 *	--	<390	<3400	<65	<120	<26	<150	<260	<260	<69	<680	--	<45	<45	<26	<28	220	867,000
8260B	tert-Butylbenzene	ug/Kg	<19 *	<75 *	<390 *	<380 *	1,900	430	24 J *	54 *	<2300 *	<2100 *	--	<400	<3500	<67	<120	<27	750	<270 *	<270 *	<71	3,700	--	69 J *	58 J *	<27 *	<29 *	NE	183,000
8260B	Tetrachloroethene	ug/Kg	<18	1,100	<360	<350	270 J	<120	20 J	<19	2,700 J	26,000	--	<370	50,000	<63	<110	<25	<140	<250	<250	77 J	<650	--	<43	<43	<25	<27	4.5	145,000

Table 4. Analytical Results - Waste Sample Total VOC and PCB Analysis
Waste Characterization Investigation, Boundary Road Landfill / SCS Engineers Project #25218040.01

NOTE: The waste sample analytical results in Table 4 were compared to the NR 720 RCLs for the groundwater pathway and the industrial direct contact pathway to identify potential contaminants of concern. The NR 720 RCLs are not applicable to the waste sampling results as compliance limits, and typical municipal and industrial solid waste is expected to have many constituents at levels exceeding RCLs. The comparison to RCLs is intended only for planning and evaluation purposes.

Method	Analyte	Unit	WC1S3	WC1S4	WC2S3	WC2S4	WC3S3	WC3S4	WC4S4	WC4S5	WC5S4	WC5S6	WC5S6S5	WC6S3	WC6S4	WC7S3	WC7S4	WC8S3	WC8S4	WC9S4	WC9S5	WC10S3	WC10S4	WC11S3S4	WC11S4	WC11S5	WC12S3	WC12S4	NR 720 Groundwater Pathway RCLs with Wisconsin-Default Dilution Factor of 2	NR 720 Industrial Direct Contact RCLs
Depth			11	14	15	19	15	20	24	28	18	33	27 - 33	9	15	16	20	15	25	20	26	12	18	20 - 24	24	28	10	15		
Date		--	8/27/19	8/27/19	8/27/19	8/27/19	8/29/19	8/29/19	8/27/19	8/27/19	8/27/19	8/27/19	8/29/19	8/28/19	8/28/19	8/28/19	8/28/19	8/29/19	8/29/19	8/28/19	8/28/19	8/29/19	8/29/19	8/29/19	8/28/19	8/28/19	8/28/19	8/28/19	--	--
8260B	Toluene	ug/Kg	**80**	**2,400**	**42,000**	**35,000**	**4,600,000**	**370,000**	**900**	**100**	**110,000**	**1,700,000**	--	**170,000**	**2,500,000**	**420**	**270**	**670**	**3,700**	**4,500**	**3,200**	**3,000**	**670,000**	--	**1,200**	**780**	**720**	**340**	1,107	818,000
8260B	trans-1,2-Dichloroethene	ug/Kg	<17	<66	<340	<330	**1,100**	**170 J**	<17	<18	<2000	<1800	--	<350	<3100	<59	<110	<24	<130	<240	<240	**110 J**	<610	--	<41	<41	<24	<26	63	1,850,000
8260B	trans-1,3-Dichloropropene	ug/Kg	<17 *	<68 *	<360 *	<340 *	<130	<120	<18 *	<18 *	<2100 *	<1900 *	--	<360	<3200	<61	<110	<25	<140	<250	<240	<65	<630	--	<42	<42	<25	<27	NE	1,510,000
8260B	Trichloroethene	ug/Kg	<7.8	**360**	<160	<160	**26,000**	**8,200**	**72**	**24 J**	**18,000**	**31,000**	--	<160	**62,000**	**45 J**	<51	**12 J**	**92 J**	**210 J**	<110	**270**	<290	--	**180**	**140**	**29 J**	**120**	3.6	8,410
8260B	Trichlorofluoromethane	ug/Kg	<20	<80	<420	<410	<150	<140	<21	**83**	<2500	<2200	--	<430	<3800	<72	<130	<29	<160	<290	<290	<77	<750	--	<50	<50	<29	<32	4,478	1,230,000
8260B	Vinyl chloride	ug/Kg	<12	<49	<260	<250	**290 J**	<87	<13	<13	<1500	<1400	--	<260	<2300	<44	<81	<18	<99	<180	<180	<47	<460	--	<31	**49 J**	<18	<19	0.10	2,080
8260B	Xylenes, Total	ug/Kg	**12,000**	**69,000**	**500,000**	**590,000**	**8,500,000**	**1,100,000**	**10,000**	**12,000**	**2,000,000**	**5,400,000**	--	**510,000**	**5,600,000**	**190,000**	**10,000**	**9,400**	**300,000**	**480,000**	**660,000**	**220,000**	**1,300,000**	--	**37,000**	**16,000**	**7,000**	**810**	3,960	260,000
VOC Group Totals																														
	Total PVOC	ug/Kg	24,669	118,400	739,400	915,000	16,296,000	2,027,100	20,190	34,950	2,541,900	8,832,000	--	733,200	10,142,000	248,260	34,560	14,527	629,940	636,100	895,200	334,800	3,763,800	--	56,800	31,320	22,442	3,175	--	--
	Total CVOC	ug/Kg		360	670	470	82,390	10,270	128	24	18,000	37,800	--	1,200	79,000	45		12	92	210	330	800		--	890	1,730	29	646	--	--
	Total Other VOCs	ug/Kg	24,370	10,940	20,160	46,200	530,810	113,396	5,007	5,199	47,500	353,000	--	36,100	398,100	14,270	9,610	1,657	49,590	19,760	27,170	22,787	801,600	--	7,193	4,958	7,662	489	--	--
	Total VOCs	ug/kg	49,039	129,700	760,230	961,670	16,909,200	2,150,766	25,325	40,173	2,607,400	9,222,800	--	770,500	10,619,100	262,575	44,170	16,196	679,622	656,070	922,700	358,387	4,565,400	--	64,883	38,008	30,133	4,310	--	--
Physical																														
Moisture	Percent Moisture	%	30.6	51.3	43.1	25.7	25	26.6	27.1	20.6	47.1	32.3	26.9	32.2	27	26.9	25.1	15.8	30.1	15.9	17.2	30.1	29.3	32.8	39.9	39.5	17.6	19.6	--	--
Moisture	Percent Solids	%	69.4	48.7	56.9	74.3	75	73.4	72.9	79.4	52.9	67.7	73.1	67.8	73	73.1	74.9	84.2	69.9	84.1	82.8	69.9	70.7	67.2	60.1	60.5	82.4	80.4	--	--

Laboratory Notes:
- * LCS or LCSD is outside acceptance limits
- ^c CCV Recovery is outside acceptance limits.
- J Reported value was between the limit of detection and the limit of quantitation.

Abbreviations:

mg/kg = milligrams per kilogram or parts per million (ppm) RCL = Residual Contaminant Level -- = Not Applicable
ug/kg = micrograms per kilogram or parts per billion (ppb) NE = No Standard Established

Bold values exceed the limit of detection.

450 Yellow highlighted values exceed NR 720 RCLs for the industrial direct contact pathway and groundwater pathway

370 Blue highlighted values exceed NR 720 RCL for the groundwater pathway

Total PVOC includes petroleum VOCs benzene, ethylbenzene, toluene, xylenes, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, naphthalene, and methyl-tert-butyl ether.
Total CVOC includes all chlorinated alkanes and alkenes.
Total Other VOC includes all other compounds, such as additional petroleum-related VOCs, ketones, and other halogenated compounds.

RCL Notes:
Background threshold values are non-outlier trace element maximum levels in Wisconsin surface soils from the USGS Report at: http://pubs.usgs.gov/sir/2011/5202,
as listed in the WDNR RR Program's RCL spreadsheet at: http://dnr.wi.gov/topic/Brownfields/professionals.html.
(1) 1,2,4- and 1,3,5-Trimethylbenzenes combined total = 1,378.7

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Table 5. Analytical Results - Waste Sample TCLP Analysis
Waste Characterization Investigation, Boundary Road Landfill / SCS Project #25218040.01

Method	Analyte	Unit	WC1S3	WC1S4	WC2S3	WC2S4	WC3S3	WC3S4	WC4S4	WC4S5	WC5S4	WC5S6S5	WC6S3	WC6S4	WC7S3	WC7S4	WC8S3	WC8S4	WC9S4	WC9S5	WC10S3	WC10S4	WC11S3S4	WC11S5	WC12S3	WC12S4	TCLP Limit
Depth			11	14	15	19	15	20	24	28	18	27 - 33	9	15	16	20	15	25	20	26	12	18	20 - 24	28	10	15	
Date			8/27/2019	8/27/2019	8/27/2019	8/27/2019	8/29/2019	8/29/2019	8/27/2019	8/27/2019	8/27/2019	8/29/2019	8/29/2019	8/29/2019	8/29/2019	8/29/2019	8/29/2019	8/29/2019	8/29/2019	8/29/2019	8/29/2019	8/29/2019	8/29/2019	8/29/2019	8/29/2019	8/29/2019	
Metals																											
6010C	Arsenic	mg/L	<0.010	<0.010	**0.054**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	**0.017**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	5
6010C	Barium	mg/L	**0.28**	**0.86**	**0.15**	**0.46**	**1.1**	**0.59**	<0.050	**0.45**	**0.69**	**0.44**	**0.22**	**0.51**	**0.44**	**0.45**	**0.29**	**0.23**	**68**	**2.8**	**1.4**	**2.7**	**0.6**	**0.063**	**0.14**	**1.5**	100
6010C	Cadmium	mg/L	<0.0020	**0.0047**	<0.0020	**0.0025**	**0.0021**	**0.013**	**0.002**	**0.005**	**0.0069**	**0.062**	**0.02**	**0.082**	<0.0020	<0.0020	<0.0020	<0.0020	<0.020	**0.014**	**0.032**	<0.0020	**0.0057**	**0.0033**	<0.0020	<0.0020	1
6010C	Chromium	mg/L	<0.010	**0.011**	**0.028**	<0.010	<0.010	<0.010	<0.010	**0.055**	<0.010	**0.12**	<0.010	**0.016**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	**0.01**	<0.010	<0.010	<0.010	<0.010	<0.010	5
6010C	Lead	mg/L	<0.0075	**3.8**	**0.0098**	**0.041**	**0.013**	**0.043**	**0.022**	**0.013**	**0.5**	**6.4**	**0.41**	**1**	**0.22**	**0.32**	**0.04**	**0.11**	**0.022**	**0.16**	**0.35**	**0.032**	**0.039**	**0.1**	<0.0075	**0.036**	5
7470A	Mercury	mg/L	<0.00020	**0.00021**	**0.00025**	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.2
6010C	Selenium	mg/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	**0.024**	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	1
6010C	Silver	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	5
Volatile Organic Compounds (VOCs)																											
8260B	1,1-Dichloroethene	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	700
8260B	1,2-Dichloroethane	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	**86**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	500
8260B	Benzene	ug/L	<10	<10	**110**	**96**	**190**	**230**	<10	<10	**25**	**650**	<10	**79**	<10	<10	<10	**11**	**20**	<10	**51**	**41**	<10	<10	<10	<10	500
8260B	Carbon tetrachloride	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	500
8260B	Chlorobenzene	ug/L	<10	<10	<10	<10	<10	<10	**12**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	100,000
8260B	Chloroform	ug/L	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	6,000
8260B	Methyl Ethyl Ketone	ug/L	<50	**110**	<50	<50	<50	<50	**54**	<50	**730**	**7100**	**340**	**1300**	<50	<50	<50	**470**	<50	<50	<50	<50	<50	**170**	<50	<50	200,000
8260B	Tetrachloroethene	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	**20**	**120**	<10	**61**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	700
8260B	Trichloroethene	ug/L	<10	<10	<10	<10	**70**	**64**	<10	<10	**31**	**440**	<10	**110**	<10	<10	<10	**15**	<10	<10	<10	<10	<10	<10	<10	<10	500
8260B	Vinyl chloride	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	200
Semivolatile Organic Compounds (SVOCs)																											
8270D	1,4-Dichlorobenzene	mg/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	7.5
8270D	2,4,5-Trichlorophenol	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	400
8270D	2,4,6-Trichlorophenol	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	2
8270D	2,4-Dinitrotoluene	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.13
8270D	2-Methylphenol	mg/L	<0.020	<0.020	**0.051**	<0.020	<0.020	<0.020	<0.020	<0.020	**0.097**	**0.073**	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	200
8270D	3 & 4 Methylphenol	mg/L	<0.020	**0.066**	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	**0.56**	**0.18**	**0.027**	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	**0.11**	<0.020	<0.020	200
8270D	Hexachlorobenzene	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.13
8270D	Hexachlorobutadiene	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.5
8270D	Hexachloroethane	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	3
8270D	Nitrobenzene	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	**0.24**	<0.010	**0.24**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	2
8270D	Pentachlorophenol	mg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	100
8270D	Pyridine	mg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	5

Abbreviations:
mg/L = milligrams per liter or parts per million (ppm)
ug/L = micrograms per liter or parts per billion (ppb)
TCLP = Toxicity Characteristic Leaching Procedure

Bold value indicates analyte was detected.

6.4 Highlighted cell indicates result exceeds TCLP Limit.

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Table 6. Analytical Results - Soil Samples Below Waste
Waste Characterization Investigation, Boundary Road Landfill / SCS Engineers Project #25218040.01

Method	Analyte	Unit	WC1S9	WC2S6	WC3S5	WC4S6	WC5S7	WC6S6	WC7S5	WC8S5	WC9S6	WC10S5	WC11S6	WC12S5	NR 720 Groundwater Pathway RCLs with a Wisconsin-Default Dilution Factor of 2	NR 720 Industrial Direct Contact RCLs
Depth			24	27	24	40	39	27	27	33	33	21	38	22		
Date			8/27/2019	8/27/2019	8/29/2019	8/27/2019	8/27/2019	8/28/2019	8/28/2019	8/29/2019	8/28/2019	8/29/2019	8/28/2019	8/28/2019	--	--
Volatile Organic Compounds (VOCs)																
8260B	1,1,1,2-Tetrachloroethane	ug/Kg	<23 *	<23 *	<31	<21 *	<23 *	<33	<29	<31	<31	<34	<28	<31	53	12,300
8260B	1,1,1-Trichloroethane	ug/Kg	<19	<19	<25	<17	<19	<27	<24	<25	<25	<28	<23	<25	140	640,000
8260B	1,1,2,2-Tetrachloroethane	ug/Kg	<20	<20	<27	<18	<20	<29	<25	<26	<27	<29	<24	<26	0.20	3,600
8260B	1,1,2-Trichloroethane	ug/Kg	<18 *	<18 *	<24	<16 *	<17 *	<25	<22	<23	<24	<26	<22	<23	3.2	7,010
8260B	1,1-Dichloroethane	ug/Kg	<20 *	<20 *	<27	<19 *	<20 *	**42 J**	<26	<27	<28	<30	<25	**87**	483	22,200
8260B	1,1-Dichloroethene	ug/Kg	<19	<19	<26	<18	<19	<28	<25	<26	<26	<29	<24	<26	5.0	1,190,000
8260B	1,1-Dichloropropene	ug/Kg	<15	<15	<20	<14	<15	<21	<19	<20	<20	<22	<18	<20	NE	NE
8260B	1,2,3-Trichlorobenzene	ug/Kg	<23	<23	<31	<21	<23	<33	<29	<30	<31	<34 ^c * F1	<28	<30 ^c *	NE	934,000
8260B	1,2,3-Trichloropropane	ug/Kg	<21 *	<21 *	<28	<19 *	<21 *	<30	<26	<27	<28	<30	<25	<28	52	109
8260B	1,2,4-Trichlorobenzene	ug/Kg	<17	<17	<23	<16	<17	<25	<22	<23	<23	<25	<21	<23	408	113,000
8260B	1,2,4-Trimethylbenzene	ug/Kg	**38 J ***	<18 *	**5,800**	**25 J ***	**2,700 ***	**52,000**	**180**	**100**	**29 J**	**5,000**	**82**	**240**	1,378.7 (1)	219,000
8260B	1,2-Dibromo-3-Chloropropane	ug/Kg	<99 *	<99 *	<130	<91 *	<99 *	<140	<130	<130	<130	<150 F1	<120	<130	0.20	92
8260B	1,2-Dibromoethane	ug/Kg	<19 *	<19 *	<26	<18 *	<19 *	<28	<24	<26	<26	<28	<24	<26	0.028	221
8260B	1,2-Dichlorobenzene	ug/Kg	<17 *	<17 *	<22	<15 *	<17 *	<24	<21	<22	<22	<25	<21	<22	1,168	376,000
8260B	1,2-Dichloroethane	ug/Kg	<20 *	<19 *	<26	<18 *	<19 *	<28	<25	<26	<26	<29	<24	<26	2.8	2,870
8260B	1,2-Dichloropropane	ug/Kg	<21 *	<21 *	<29	<20 *	<21 *	<31	<27	<28	<29	<31	<26	<28	3.3	15,000
8260B	1,3,5-Trimethylbenzene	ug/Kg	<19 *	<19 *	<25	<17 *	**170 ***	**9,300 ***	**31 J ***	<25	<25 *	**1,100**	<23 *	**73**	1,378.7 (1)	182,000
8260B	1,3-Dichlorobenzene	ug/Kg	<20	<20	<27	<18	<20	<29	<25	<26	<27	<29	<25	<27	1,153	297,000
8260B	1,3-Dichloropropane	ug/Kg	<18	<18	<24	<17	<18	<26	<23	<24	<24	<27	<22	<24	NE	1,490,000
8260B	1,4-Dichlorobenzene	ug/Kg	**44 J ***	<18 *	<24	<17 *	**75 ***	<26	<23	<24	**140**	<27	<22	<24	144	16,400
8260B	2,2-Dichloropropane	ug/Kg	<22	<22	<30	<20	<22	<32	<28	<29	<30	<33	<27	<30	NE	191,000
8260B	2-Chlorotoluene	ug/Kg	<16 *	<16 *	<21	<14 *	<16 *	<23	<20	<21	<21	<23 F1	<19	<21	NE	907,000
8260B	4-Chlorotoluene	ug/Kg	<17 *	<17 *	<23	<16 *	<17 *	<25	<22	<23	<23	<26	<22	<23	NE	253,000
8260B	Benzene	ug/Kg	<7.3 *	**29 ***	**250**	**23 ***	**47 ***	**54**	<9.3	<9.7	**91**	**120**	**90**	**1,300**	5.1	7,070
8260B	Bromobenzene	ug/Kg	<18 *	<18 *	<24	<16 *	<18 *	<26	<23	<24	<24	<26	<22	<24	NE	679,000
8260B	Bromochloromethane	ug/Kg	<21 *	<21 *	<29	<20 *	<21 *	<31	<27	<28	<29	<31	<26	<28	NE	906,000
8260B	Bromodichloromethane	ug/Kg	<19 *	<19 *	<25	<17 *	<18 *	<27	<24	<25	<25	<27	<23	<25	0.30	1,830
8260B	Bromoform	ug/Kg	<24	<24	<32	<22	<24	<35	<31	<32	<32	<36	<30	<32	2.3	113,000
8260B	Bromomethane	ug/Kg	<40	<40	<53	<37	<39	<57	<51	<53	<53	<58	<49	<53	5.1	43,000
8260B	Carbon tetrachloride	ug/Kg	<19	<19	<26	<18	<19	<28	<24	<25	<26	<28	<24	<26	3.9	4,030
8260B	Chlorobenzene	ug/Kg	<19 *	<19 *	<26	**52 ***	**30 J ***	<28	<24	<26	**140**	<28	<24	**38 J**	136	761,000
8260B	Chloroethane	ug/Kg	<25	<25	<34	<23	<25	<36	<32	<33	<34	<37	<31	**320**	227	2,120,000
8260B	Chloroform	ug/Kg	<18 *	<18 *	<25	<17 *	<18 *	<27	<23	<24	<25	<27	<23	**29 J**	3.3	1,980

Table 6. Analytical Results - Soil Samples Below Waste
Waste Characterization Investigation, Boundary Road Landfill / SCS Engineers Project #25218040.01

Method	Analyte	Unit	WC1S9	WC2S6	WC3S5	WC4S6	WC5S7	WC6S6	WC7S5	WC8S5	WC9S6	WC10S5	WC11S6	WC12S5	NR 720 Groundwater Pathway RCLs with a Wisconsin-Default Dilution Factor of 2	NR 720 Industrial Direct Contact RCLs
Depth			24	27	24	40	39	27	27	33	33	21	38	22		
Date			8/27/2019	8/27/2019	8/29/2019	8/27/2019	8/27/2019	8/28/2019	8/28/2019	8/29/2019	8/28/2019	8/29/2019	8/28/2019	8/28/2019	--	--
8260B	Chloromethane	ug/Kg	<16	<16	<21	<15	<16	<23	<20	<21	<21	<23	<20	<21	16	669,000
8260B	cis-1,2-Dichloroethene	ug/Kg	<20	<20	<27	<19	<20	<29	<26	<27	<27	<30	<25	**48 J**	41	2,340,000
8260B	cis-1,3-Dichloropropene	ug/Kg	<21 *	<21 *	<28	<19 *	<21 *	<30	<26	<28	<28	<31	<26	<28	NE	1,210,000
8260B	Dibromochloromethane	ug/Kg	<24 *	<24 *	<33	<22 *	<24 *	<35	<31	<32	<33	<36	<30	<32	32	38,900
8260B	Dibromomethane	ug/Kg	<13 *	<13 *	<18	<12 *	<13 *	<19	<17	<18	<18	<20	<17	<18	NE	143,000
8260B	Dichlorodifluoromethane	ug/Kg	<34	<34	<45	<31	<33	<48	<43	<45	<45	<49	<41	<45	3,086	530,000
8260B	Ethylbenzene	ug/Kg	**56 ***	**14 ***	**12,000**	**14 ***	**1,100 ***	**14,000**	**120**	**150**	**20**	**760**	<11	**330**	1,570	35,400
8260B	Hexachlorobutadiene	ug/Kg	<22	<22	<30	<20	<22	<32	<28	<29	<30	<33	<27	<30	NE	7,190
8260B	Isopropyl ether	ug/Kg	<14	<14	<18	<13	<14	<20	<18	<18	<19	<20	<17	**100**	NE	2,260,000
8260B	Isopropylbenzene	ug/Kg	<19	**37 J**	**1,200**	<18	**170**	**1,400**	**41 J**	**29 J**	**210**	**2,000**	**33 J**	**89**	NE	268,000
8260B	Methyl tert-butyl ether	ug/Kg	<20 *	<20 *	<26	<18 *	<20 *	<28	<25	<26	<26	<29	<24	<26	27	282,000
8260B	Methylene Chloride	ug/Kg	<81	<81	<110	<75	<81	<120	<100	<110	<110	<120	<100	<110	2.6	1,150,000
8260B	Naphthalene	ug/Kg	**31 J ***	**22 J ***	**140**	<15 *	**810 ***	**43,000**	**170**	**81**	**70**	**13,000 F1**	**44 J**	**130**	658	24,100
8260B	n-Butylbenzene	ug/Kg	<19	<19	<26	<18	<19	**3,000**	**100**	**47 J**	<26	**1,600**	<24	<26	NE	108,000
8260B	N-Propylbenzene	ug/Kg	<21	<21	**890**	<19	**460**	**6,900**	**36 J**	<27	**200**	**6,200**	<25	**56 J**	NE	264,000
8260B	p-Isopropyltoluene	ug/Kg	<18	<18	**47 J**	<17	**75**	**630**	**78**	<24	<24	**240**	<22	**72**	NE	162,000
8260B	sec-Butylbenzene	ug/Kg	<20 *	<20 *	**54 J**	<18 *	**100 ***	**780 ***	<25 *	<26	**30 J ***	**470**	<24 *	<26	NE	145,000
8260B	Styrene	ug/Kg	<19 *	<19 *	<26	<18 *	<19 *	<28	<24	<26	<26	<28	<24	<26	220	867,000
8260B	tert-Butylbenzene	ug/Kg	<20 *	<20 *	<27	<18 *	<20 *	<29 *	<25 *	<26	<27 *	<29	<24 *	<26	NE	183,000
8260B	Tetrachloroethene	ug/Kg	<18	<18	<25	<17	<18	<27	<23	<24	<25	<27	<23	<25	4.5	145,000
8260B	Toluene	ug/Kg	<7.3	<7.3	**70**	<6.7	**570**	**12,000**	**44**	**95**	<9.9	**900**	<9.0	**440**	1,107	818,000
8260B	trans-1,2-Dichloroethene	ug/Kg	<17	<17	<23	<16	<17	<25	<22	<23	<23	<26	<22	<23	63	1,850,000
8260B	trans-1,3-Dichloropropene	ug/Kg	<18 *	<18 *	<24	<17 *	<18 *	<26	<23	<24	<24	<27	<22	<24	NE	1,510,000
8260B	Trichloroethene	ug/Kg	<8.2	<8.2	<11	<7.5	**49**	<12	<10	<11	<11	<12	<10	**160**	3.6	8,410
8260B	Trichlorofluoromethane	ug/Kg	<21	<21	<29	<20	<21	<31	<27	<28	<29	<31	<26	<28	4,478	1,230,000
8260B	Vinyl chloride	ug/Kg	<13	<13	<18	<12	<13	<19	<17	<17	<18	<19	<16	<17	0.10	2,080
8260B	Xylenes, Total	ug/Kg	**230**	**90**	**14,000**	**24**	**3,600**	**65,000**	**860**	**440**	**100**	**3,500**	**72**	**1,400**	3,960	260,000
VOC Group Totals																
	Total PVOC	ug/Kg	355	155	32,260	86	8,997	195,354	1,405	866	310	24,380	288	3,913	--	--
	Total CVOC	ug/Kg	ND	ND	ND	ND	49	42	ND	ND	ND	ND	ND	644	--	--
	Total Other VOCs	ug/Kg	44	37	2,191	52	910	12,710	255	76	720	10,510	33	355	--	--
	Total VOCs	ug/kg	399	192	34,451	138	9,956	208,106	1,660	942	1,030	34,890	321	4,912	--	--

Table 6. Analytical Results - Soil Samples Below Waste
Waste Characterization Investigation, Boundary Road Landfill / SCS Engineers Project #25218040.01

Method	Analyte	Unit	WC1S9	WC2S6	WC3S5	WC4S6	WC5S7	WC6S6	WC7S5	WC8S5	WC9S6	WC10S5	WC11S6	WC12S5	NR 720 Groundwater Pathway RCLs with a Wisconsin-Default Dilution Factor of 2	NR 720 Industrial Direct Contact RCLs
Depth			24	27	24	40	39	27	27	33	33	21	38	22		
Date			8/27/2019	8/27/2019	8/29/2019	8/27/2019	8/27/2019	8/28/2019	8/28/2019	8/29/2019	8/28/2019	8/29/2019	8/28/2019	8/28/2019	--	--
Physical																
Moisture	Percent Moisture	%	**14.7**	**16.3**	**18.3**	**13.3**	**11.8**	**18.8**	**15.4**	**13.9**	**13.6**	**21.4**	**12.6**	**16.9**	--	--
Moisture	Percent Solids	%	**85.3**	**83.7**	**81.7**	**86.7**	**88.2**	**81.2**	**84.6**	**86.1**	**86.4**	**78.6**	**87.4**	**83.1**	--	--

Laboratory Notes:
- * LCS or LCSD is outside acceptance limits
- ^c CCV Recovery is outside acceptance limits.
- J Reported value was between the limit of detection and the limit of quantitation.
- F1 MS and/or MSD Recovery is outside acceptance limits.

Abbreviations:
mg/kg - milligrams per kilogram or parts per million (ppm)
ug/kg = micrograms per liter or parts per billion (ppb)
RCLs = Residual Contaminant Levels
NE = No Standard Established
-- = Not Applicable

Bold values exceed the limit of detection.

450 Yellow highlighted values exceed NR 720 RCLs for the industrial direct contact pathway and the groundwater pathway

370 Blue highlighted values exceed NR 720 RCL for the groundwater pathway

Total PVOC includes petroleum VOCs benzene, ethylbenzene, toluene, xylenes, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, naphthalene, and methyl-tert-butyl ether.
Total CVOC includes all chlorinated alkanes and alkenes.
Total Other VOC includes all other compounds, such as additional petroleum-related VOCs, ketones, and other halogenated compounds.

RCL Notes:
NR 720 RCLs updated as of December 2018.
(1) 1,2,4- and 1,3,5-Trimethylbenzenes combined total = 1,378.7

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Table 7. Leachate Head Well Elevations
Waste Characterization Investigation, Boundary Road Landfill / SCS Engineers Project #25218040.01

	LHW-1	LHW-2	LHW-3	LHW-4	LHW-5	LHW-6	LHW-7	LHW-8
Well Elevations								
TOC Elevation	765.4	778.0	774.0	777.1	785.8	777.4	778.6	774.3
Ground Surface Elevation	763.4	773.9	770.1	771.8	782.2	774.1	775.1	770.5
Bottom of Well Elevation	747.4	743.9	739.1	744.3	746.2	752.1	743.1	750.5
Depth to Leachate								
6/22/2012	10.9	26.4	22.0	21.9	32.2	--	--	--
9/24/2019	11.5	26.4	21.95	24.7	32.2	Dry	26.9	20.83
Leachate Elevation								
6/22/2012	754.5	751.6	752.0	755.2	753.6	--	--	--
9/24/2019	753.9	751.6	752.1	752.4	753.6	Dry	751.7	753.5
Leachate Head Above Bottom of Well								
6/22/2012	7.1	7.7	12.9	10.9	7.4	--	--	--
9/24/2019	6.5	7.7	13.0	8.1	7.4	Dry	8.6	3.0

Updated by: BSS, 11/27/19
Checked by: SCC, 11/27/19

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Table 8. Analytical Results - Leachate Head Well Samples
Waste Characterization Investigation, Boundary Road Landfill / SCS Engineers Project #25218040.01

Method	Analyte	Units	Existing Wells										New Wells			MMSD Discharge Limit	NR 140 ES
			LHW1		LHW2		LHW3		LHW4		LHW5		LHW7		LHW8		
			5/14/2013	9/24/2019	5/14/2013	9/24/2019	5/14/2013	9/24/2019	5/14/2013	9/24/2019	5/14/2013	9/24/2019	9/24/2019	12/18/2019	9/24/2019		
350.1	Ammonia (as N)	mg/L	20	43	182	295	103	53	37	37	2.1	54	136	133	52	--	10
100.1	Asbestos	Million Fibers	<347	--	<347	--	<347	--	<347	--	<34.7	--	--	<1.0	--	--	7
SM 5210B	Biochemical Oxygen Demand (BOD)	mg/L	14	--	28	--	17	--	20	--	17.7	--	505	476	213	--	--
335.4	Cyanide, Total	mg/L	<0.01	--	0.0052	--	<0.01	--	<0.01	--	<0.01	--	1.4	0.13	<0.0050	5	200
1664B	Oil & Grease (HEM)	mg/L	<5	--	<5	--	<5	--	<5	--	<5	--	8.6	8.8	1.3	300	--
SM 2540D	Total Suspended Solids	mg/L	44	--	47	--	75	--	62	--	39.2	--	16.8	48.1	28	--	--
Metals																	
200.8	Antimony	ug/L	0.55	--	1.5	--	1.5	--	0.65	--	1.0	--	230	599	3.6	--	6.0
200.8	Arsenic	ug/L	9.4	--	27	--	6.5	--	3.1	--	3.3	--	60	42.3	12	600	10
200.8	Beryllium	ug/L	0.048	--	0.053	--	<0.4	--	<0.4	--	0.048	--	0.21	0.40	1.5	--	4.0
200.8	Cadmium	ug/L	<0.2	--	<0.4	--	0.34	--	1.7	--	0.14	--	4.9	13.7	0.86	1,500	5.0
200.7 Rev 4.4	Chromium	ug/L	5.4	--	18.7	--	7.2	--	30.5	--	9.8	--	4,930	13,500	36.3	64,000	100
200.7 Rev 4.4	Copper	ug/L	9.1	--	5.3	--	8.3	--	5.2	--	5.8	--	67.7	179	63.2	6,000	1300
200.8	Lead	ug/L	6.6	--	9.3	--	19.2	--	6.6	--	5.8	--	11,300	29,200	110	2,000	15
200.8	Lead, Dissolved	ug/L	--	--	--	--	--	--	--	--	--	--	--	23.1	--	2,000	15
939-M	Lead, Total Organic	ug/L	<12.5	--	<12.5	--	<12.5	--	<12.5	--	<12.5	--	0.64	--	<0.63	13	--
245.1	Mercury	ug/L	<0.2	--	<0.2	--	<0.2	--	<0.2	--	0.24	--	3.6	6.1	0.33	2.6	2.0
200.7 Rev 4.4	Molybdenum	ug/L	<10	--	<10	--	<10	--	<10	--	<10	--	187	133	26.2	12,000	40
200.7 Rev 4.4	Nickel	ug/L	11.2	--	70.2	--	10.9	--	29.1	--	25.3	--	350	344	72	4,000	100
200.8	Selenium	ug/L	<1	--	<2	--	<2	--	<1	--	<1	--	3.6	16.6	0.78	--	50
200.7 Rev 4.4	Silver	ug/L	<10	--	<10	--	<10	--	<10	--	<10	--	3.0	10.9	<1.7	5,800	50
200.8	Thallium	ug/L	0.012	--	<0.4	--	<0.4	--	<0.4	--	0.012	--	0.12	0.22	0.17	--	2.0
200.7 Rev 4.4	Zinc	ug/L	46.2	--	27	--	17.6	--	58	--	54.3	--	6,400	12,300	271	8,000	5000
Pesticides																	
8081B	4,4'-DDD	ug/L	<0.24	--	<0.047	--	<0.047	--	<0.047	--	<0.047	--	0.18	<0.046	<0.010	--	--
8081B	4,4'-DDE	ug/L	<0.24	--	0.018	--	0.024	--	0.016	--	<0.047	--	0.17	<0.058	<0.013	--	--
8081B	4,4'-DDT	ug/L	<0.24	0.031	<0.047	0.068	0.018	<0.037	0.012	<0.011	<0.047	0.028	<0.055	<0.055	<0.012	1.3	--
8081B	Aldrin	ug/L	<0.24	--	0.013	--	0.029	--	<0.047	--	<0.047	--	<0.041	<0.041	0.015	--	--
8081B	alpha-BHC	ug/L	0.054	--	0.013	--	0.04	--	0.0096	--	0.013	--	0.14	0.071	<0.0084	--	--
8081B	beta-BHC	ug/L	<0.24	--	0.046	--	<0.047	--	<0.047	--	<0.047	--	0.5	<0.12	<0.027	--	--
8081B	Chlordane	ug/L	<2.4	--	<0.47	--	<0.47	--	<0.47	--	<0.47	--	<1.5	<1.5	<0.32	1.3	2.0
8081B	delta-BHC	ug/L	<0.24	--	<0.047	--	<0.047	--	<0.047	--	<0.047	--	0.47	<0.050	<0.011	--	--
8081B	Dieldrin	ug/L	<0.24	--	0.016	--	0.011	--	0.0094	--	<0.047	--	0.18	<0.049	<0.011	0.65	--
8081B	Endosulfan I	ug/L	<0.24	--	<0.047	--	<0.047	--	<0.047	--	<0.047	--	<0.055	<0.055	<0.12	1.3	--
8081B	Endosulfan II	ug/L	<0.24	--	<0.047	--	0.042	--	<0.047	--	<0.047	--	<0.060	<0.060	<0.13	1.3	--
8081B	Endosulfan sulfate	ug/L	<0.24	--	<0.047	--	<0.047	--	<0.047	--	<0.047	--	<0.079	<0.079	0.034	--	--
8081B	Endrin	ug/L	<0.24	--	0.014	--	<0.047	--	<0.047	--	<0.047	--	<0.069	<0.069	<0.015	1.3	2.0
8081B	Endrin aldehyde	ug/L	<0.24	--	<0.047	--	<0.047	--	<0.047	--	<0.047	--	0.32	<0.082	<0.018	--	--
8081B	gamma-BHC (Lindane)	ug/L	0.035	0.036	<0.047	<0.027	0.028	<0.027	0.0097	<0.0080	0.014	<0.0080	0.24	<0.040	<0.0087	0.65	0.2
8081B	Heptachlor	ug/L	<0.24	--	0.0087	--	0.009	--	<0.047	--	<0.047	--	0.20	0.14	<0.0092	0.65	0.4
8081B	Heptachlor epoxide	ug/L	<0.24	--	<0.047	--	<0.047	--	<0.047	--	<0.047	--	0.057	<0.037	<0.0080	--	0.2
8081B	Mirex	ug/L	<0.24	--	<0.047	--	<0.047	--	<0.047	--	<0.047	--	<0.048	<0.048	<0.010	260	--
8081B	Toxaphene	ug/L	<4.7	--	<0.94	--	<0.94	--	<0.95	--	<0.94	--	<0.60	<0.60	<0.13	26	3.0
Polychlorinated Biphenyls (PCBs)																	
8082A	Aroclor 1016	ug/L	<0.47	<0.18	<0.47	<0.18	<0.47	<0.18	<0.47	<0.18	<0.47	<0.18	<0.88	<0.88	<0.18	--	--
8082A	Aroclor 1221	ug/L	<0.47	<0.18	<0.47	<0.18	<0.47	<0.18	<0.47	<0.18	<0.47	<0.18	<0.88	<0.88	<0.18	--	--
8082A	Aroclor 1232	ug/L	<0.47	<0.18	<0.47	<0.18	<0.47	<0.18	<0.47	<0.18	<0.47	<0.18	<0.88	<0.88	<0.18	--	--
8082A	Aroclor 1242	ug/L	<0.47	<0.18	0.66	0.57	0.65	0.43	0.49	0.43	0.61	2.6	5.7	9.8	<0.18	--	--
8082A	Aroclor 1248	ug/L	<0.47	<0.18	<0.47	<0.18	<0.47	<0.18	<0.47	<0.18	<0.47	<0.18	<0.88	<0.88	<0.18	--	--
8082A	Aroclor 1254	ug/L	<0.47	<0.25	0.24	<0.25	<0.47	<0.25	0.31	<0.25	<0.47	<0.25	1.3	2.5	<0.26	--	--
8082A	Aroclor 1260	ug/L	<0.47	<0.25	<0.47	<0.25	<0.47	<0.25	<0.47	<0.25	<0.47	<0.25	<1.3	<1.3	<0.26	--	--
	Total PCBs	ug/L	0	0	0.90	0.57	0.65	0.43	0.80	0.43	0.61	2.6	7.0	12.3	0	5.0	0.03

Table 8. Analytical Results - Leachate Head Well Samples
Waste Characterization Investigation, Boundary Road Landfill / SCS Engineers Project #25218040.01

			Existing Wells										New Wells			MMSD	
			LHW1		LHW2		LHW3		LHW4		LHW5		LHW7		LHW8	Discharge	NR 140
Method	Analyte	Units	5/14/2013	9/24/2019	5/14/2013	9/24/2019	5/14/2013	9/24/2019	5/14/2013	9/24/2019	5/14/2013	9/24/2019	9/24/2019	12/18/2019	9/24/2019	Limit	ES
Volatile Organic Compounds (VOCs)																	
8260C	1,1,1-Trichloroethane	ug/L	<4	--	<10	--	<10	--	<10	--	<1	--	<66	<66	<0.16	--	200
8260C	1,1,2,2-Tetrachloroethane	ug/L	<4	--	<10	--	<10	--	<10	--	<1	--	<17	<17	<4.2	--	0.2
8260C	1,1,2-Trichloroethane	ug/L	<4	--	<10	--	<10	--	<10	--	<1	--	<18	<18	<4.6	--	5
8260C	1,1-Dichloroethane	ug/L	<4	--	<10	--	<10	--	<10	--	**1.4**	--	<30	<30	<7.6	--	850
8260C	1,1-Dichloroethene	ug/L	<4	--	<10	--	<10	--	<10	--	<1	--	<23	<23	<5.8	--	7
8260C	1,2,4-Trichlorobenzene	ug/L	<4	--	<10	--	<10	--	<10	--	<1	--	<33	<33	<8.2	--	70
8260C	1,2-Dichlorobenzene	ug/L	<4	--	<10	--	<10	--	<10	--	**1.4**	--	<63	<63	<16	--	600
8260C	1,2-Dichloroethane	ug/L	<4	--	<10	--	<10	--	<10	--	<1	--	<17	<17	<4.2	--	5
8260C	1,2-Dichloropropane	ug/L	<4	--	<10	--	<10	--	<10	--	<1	--	<58	<58	<14	--	5
8260C	1,3-Dichlorobenzene	ug/L	<4	--	<10	--	<10	--	<10	--	<1	--	<62	<62	<16	--	--
8260C	1,3-Dichloropropene	ug/L	<8	--	<20	--	<20	--	<20	--	<2	--	<58	<58	<14	--	0.4
8260C	1,4-Dichlorobenzene	ug/L	<4	--	<10	--	**19**	--	**26**	--	**28**	--	**78**	<67	<17	--	75
8260C	2-Chloroethyl vinyl ether	ug/L	<20	--	<50	--	<50	--	<50	--	<5	--	<77	<77	<19	--	--
8260C	Acrolein	ug/L	<80	--	<200	--	<200	--	<200	--	<20	--	<73	<73	<18	390	--
8260C	Acrylonitrile	ug/L	<20	--	<50	--	<50	--	<50	--	<5	--	<66	<66	<17	--	--
8260C	Benzene	ug/L	**44**	--	**160**	--	**35**	--	**40**	--	**1200**	--	**68**	**44**	**190**	--	5
8260C	Bromodichloromethane	ug/L	<4	--	<10	--	<10	--	<10	--	<1	--	<31	<31	<7.8	--	0.6
8260C	Bromoform	ug/L	<4	--	<10	--	<10	--	<10	--	<1	--	<21	<21	<5.2	--	4.4
8260C	Bromomethane	ug/L	<4	--	<10	--	<10	--	<10	--	<1	--	<55	<55	<14	--	10
8260C	Carbon tetrachloride	ug/L	<4	--	<10	--	<10	--	<10	--	<1	--	<22	<22	<5.4	--	5
8260C	Chlorobenzene	ug/L	<4	--	**11**	--	**17**	--	**150**	--	**10**	--	<60	<60	<15	--	--
8260C	Chloroethane	ug/L	<4	--	<10	--	**41**	--	**24**	--	**18**	--	<26	<26	<6.4	--	400
8260C	Chloroform	ug/L	<4	--	<10	--	<10	--	<10	--	<1	--	<27	<27	<6.8	--	6
8260C	Chloromethane	ug/L	<4	--	<10	--	<10	--	<10	--	<1	--	<28	<28	<7.0	--	30
8260C	Dibromochloromethane	ug/L	<4	--	<10	--	<10	--	<10	--	<1	--	<26	<26	<6.4	--	60
8260C	Ethylbenzene	ug/L	<4	--	**36**	--	**8.7**	--	**19**	--	**410**	--	**2300**	**1300**	**600**	--	700
8260C	Methylene Chloride	ug/L	<4	--	<10	--	<10	--	<10	--	<1	--	<35	<35	<8.8	--	5
8260C	Tetrachloroethene	ug/L	<4	--	<10	--	<10	--	<10	--	<1	--	<29	<29	<7.2	--	5
8260C	Toluene	ug/L	<4	--	**6.8**	--	<10	--	<10	--	**27**	--	**3300**	**1300**	**1200**	--	800
8260C	Trans-1,2-Dichloroethene	ug/L	<4	--	<10	--	<10	--	<10	--	<1	--	<72	<72	<18	--	100
8260C	Trichloroethene	ug/L	<4	--	<10	--	<10	--	<10	--	<1	--	<37	<37	<9.2	--	5
8260C	Vinyl chloride	ug/L	<4	--	<10	--	<10	--	<10	--	<1	--	<72	<72	<18	--	0.2
Semivolatile Organic Compounds (SVOCs)																	
8270D	1,2-Diphenylhydrazine	ug/L	<94	--	<190	--	<95	--	<94	--	<48	--	<35	<8.8	<7.6	--	--
8270D	2,4,6-Trichlorophenol	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<61	<15	<13	130	--
8270D	2,4-Dichlorophenol	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<51	<13	<11	--	--
8270D	2,4-Dimethylphenol	ug/L	<47	--	<95	--	**18**	--	**6**	--	**29**	--	**180**	**200**	<11	--	--
8270D	2,4-Dinitrophenol	ug/L	<94	--	<190	--	<95	--	<94	--	<48	--	<220	<56	<48	--	--
8270D	2,4-Dinitrotoluene	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<45	<11	<9.7	--	0.05
8270D	2,6-Dinitrotoluene	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<40	<10	<8.7	--	0.05
8270D	2-Chloronaphthalene	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<46	<12	<10	--	--
8270D	2-Chlorophenol	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<53	<13	<12	--	--
8270D	2-Nitrophenol	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<48	<12	<10	--	--
8270D	3,3'-Dichlorobenzidine	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<40	<10	<8.7	260	--
8270D	4,6-Dinitro-2-methylphenol	ug/L	<94	--	<190	--	<95	--	<94	--	<48	--	<220	<55	<48	--	--
8270D	4-Bromophenyl phenyl ether	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<45	<11	<9.8	--	--
8270D	4-Chloro-3-methylphenol	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<45	<11	<9.8	--	--
8270D	4-Chlorophenyl phenyl ether	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<35	<8.8	<7.6	--	--
8270D	4-Nitrophenol	ug/L	**16**	--	**33**	--	<95	--	<94	--	<48	--	<150	<38	<33	--	--
8270D	Acenaphthene	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<41	<10	<8.9	--	--
8270D	Acenaphthylene	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<38	<9.5	<8.3	--	--
8270D	Anthracene	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<28	<7.0	<6.1	--	3000
8270D	Benzidine	ug/L	<760	--	<1500	--	<760	--	<750	--	<380	--	<220	<55	<48	--	--
8270D	Benzo(a)anthracene	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<36	<9.0	<7.8	--	--
8270D	Benzo(a)pyrene	ug/L	<47	--	<95	--	**5.4**	--	<47	--	<24	--	<47	<12	<10	130	0.2

Table 8. Analytical Results - Leachate Head Well Samples
Waste Characterization Investigation, Boundary Road Landfill / SCS Engineers Project #25218040.01

Method	Analyte	Units	Existing Wells										New Wells			MMSD Discharge Limit	NR 140 ES
			LHW1		LHW2		LHW3		LHW4		LHW5		LHW7		LHW8		
			5/14/2013	9/24/2019	5/14/2013	9/24/2019	5/14/2013	9/24/2019	5/14/2013	9/24/2019	5/14/2013	9/24/2019	9/24/2019	12/18/2019	9/24/2019		
8270D	Benzo(b)fluoranthene	ug/L	**12**	--	**21**	--	**7.9**	--	<47	--	<24	--	<34	<8.5	<7.4	--	0.2
8270D	Benzo(ghi)perylene	ug/L	<47	--	<95	--	**9.1**	--	<47	--	<24	--	<35	<8.8	<7.6	--	--
8270D	Benzo(k)fluoranthene	ug/L	**13**	--	**22**	--	**9.1**	--	<47	--	<24	--	<73	<18	<16	--	--
8270D	Bis(2-chloroisopropyl) ether	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<52	<13	<11	--	--
8270D	Bis(2-chloroethoxy)methane	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<35	<8.8	<7.6	--	--
8270D	Bis(2-chloroethyl)ether	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<40	<10	<8.7	--	--
8270D	Bis(2-ethylhexyl) phthalate	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<220	**95**	<48	--	--
8270D	Butyl benzyl phthalate	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<100	<25	<22	--	--
8270D	Chrysene	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<33	<8.3	<7.2	--	0.2
8270D	Dibenzo(a,h)anthracene	ug/L	**29**	--	<95	--	**28**	--	**28**	--	<24	--	<42	<11	<9.1	--	--
8270D	Diethyl phthalate	ug/L	<47	--	<95	--	<47	--	**4.1**	--	<24	--	<22	**6.8**	**350**	--	--
8270D	Dimethyl phthalate	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<36	<9.0	<7.8	--	--
8270D	Di-n-butyl phthalate	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<31	<7.8	<6.7	--	--
8270D	Di-n-octyl phthalate	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<47	<12	<10	--	--
8270D	Fluoranthene	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<40	<10	<8.7	130	400
8270D	Fluorene	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<36	<9.0	<7.8	--	400
8270D	Hexachlorobenzene	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<51	<13	<11	260	1
8270D	Hexachlorobutadiene	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<68	<17	<15	--	--
8270D	Hexachlorocyclopentadiene	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<59	<15	<13	--	--
8270D	Hexachloroethane	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<59	<15	<13	--	--
8270D	Indeno(1,2,3-cd)pyrene	ug/L	**26**	--	<95	--	**24**	--	<47	--	<24	--	<17	<12	<10	--	--
8270D	Isophorone	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<43	<11	<9.3	--	--
8270D	m-Cresol	ug/L	<94	--	<190	--	<95	--	<94	--	<48	--	**230**	**560**	<8.7	--	--
8270D	Naphthalene	ug/L	<47	--	<95	--	**20**	--	**43**	--	**10**	--	**340**	**220**	**250**	--	100
8270D	Nitrobenzene	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<29	<7.3	<6.3	--	--
8270D	N-Nitrosodimethylamine	ug/L	<94	--	<190	--	<95	--	<94	--	<48	--	<220	<55	<48	--	--
8270D	N-Nitrosodi-n-propylamine	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<54	<14	<12	--	--
8270D	N-Nitrosodiphenylamine	ug/L	<47	--	<95	--	**5.4**	--	**12**	--	<24	--	<51	<13	<11	--	7
8270D	o-Cresol	ug/L	**3.9**	--	**8.7**	--	<47	--	<47	--	<24	--	<40	**18**	<8.7	--	--
8270D	p-Cresol	ug/L	<94	--	<190	--	<95	--	<94	--	<48	--	**230**	**560**	<7.8	--	--
8270D	Pentachlorobenzene	ug/L	<94	--	<190	--	<95	--	<94	--	<48	--	<53	<13	<12	260	--
8270D	Pentachlorophenol	ug/L	<94	--	<190	--	<95	--	<94	--	<48	--	<220	<55	<48	--	1
8270D	Phenanthrene	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<44	<11	<9.6	--	--
8270D	Phenol	ug/L	<47	--	**8.7**	--	<47	--	<47	--	<24	--	**250**	**230**	**91**	--	2000
8270D	Pyrene	ug/L	<47	--	<95	--	<47	--	<47	--	<24	--	<34	<8.5	<7.4	--	250
Dioxins and Furans																	
1613B	1,2,3,4,6,7,8-HpCDD	ng/L	<12	--	<12	--	<12	--	<12	--	<12	--	**3.5**	**1.6**	**0.22**	--	--
1613B	1,2,3,4,7,8-HxCDD	ng/L	<12	--	<12	--	<12	--	<12	--	<12	--	<0.0028	<0.0077	**0.0042**	--	--
1613B	1,2,3,6,7,8-HxCDD	ng/L	<12	--	<12	--	<12	--	<12	--	<12	--	**0.15**	**0.09**	**0.0096**	--	--
1613B	1,2,3,7,8,9-HxCDD	ng/L	<12	--	<12	--	<12	--	<12	--	<12	--	**0.1**	**0.09**	**0.012**	--	--
1613B	1,2,3,7,8-PeCDD	ng/L	<12	--	<12	--	<12	--	<12	--	<12	--	**0.042**	<0.053	**0.0056**	--	--
1613B	2,3,7,8-TCDD	ng/L	<4.9	--	<4.8	--	<4.9	--	<4.9	--	<4.9	--	**0.012**	<0.0092	**0.0014**	--	0.03
1613B	OCDD	ng/L	<25	--	**1.3**	--	**2.5**	--	**2.7**	--	**0.41**	--	**48**	**21**	**2.7**	--	--
1613B	Total HpCDD	ng/L	0	--	0	--	0	--	0	--	0	--	**9.6**	**4**	**0.51**	--	--
1613B	Total HxCDD	ng/L	0	--	0	--	0	--	0	--	0	--	**2.2**	**1.2**	**0.13**	--	--
1613B	Total PeCDD	ng/L	0	--	0	--	0	--	0	--	0	--	**0.47**	**0.07**	**0.034**	--	--
1613B	Total TCDD	ng/L	0	--	0	--	0	--	0	--	0	--	**0.18**	**0.044**	**0.033**	--	--
	Total Dioxin	ng/L	0	--	**1.3**	--	**2.5**	--	**2.7**	--	**0.41**	--	**60**	**28.094**	**3.4**	26,000	--
1613B	1,2,3,4,6,7,8-HpCDF	ng/L	<12	--	<12	--	<12	--	<12	--	<12	--	**0.26**	**0.14**	**0.11**	--	--
1613B	1,2,3,4,7,8,9-HpCDF	ng/L	<12	--	<12	--	<12	--	<12	--	<12	--	**0.044**	<0.025	**0.0053**	--	--
1613B	1,2,3,4,7,8-HxCDF	ng/L	<12	--	<12	--	<12	--	<12	--	<12	--	**0.063**	**0.051**	**0.044**	--	--
1613B	1,2,3,6,7,8-HxCDF	ng/L	<12	--	<12	--	<12	--	<12	--	<12	--	**0.15**	**0.49**	**0.017**	--	--
1613B	1,2,3,7,8,9-HxCDF	ng/L	<12	--	<12	--	<12	--	<12	--	<12	--	<0.0009	<0.025	<0.0019	--	--
1613B	1,2,3,7,8-PeCDF	ng/L	<12	--	<12	--	<12	--	<12	--	<12	--	<0.0056	<0.042	**0.0078**	--	--
1613B	2,3,4,6,7,8-HxCDF	ng/L	<12	--	<12	--	<12	--	<12	--	<12	--	<0.0077	<0.019	**0.021**	--	--
1613B	2,3,4,7,8-PeCDF	ng/L	<12	--	<12	--	<12	--	<12	--	<12	--	<0.0054	<0.042	**0.023**	--	--

Table 8. Analytical Results - Leachate Head Well Samples
Waste Characterization Investigation, Boundary Road Landfill / SCS Engineers Project #25218040.01

Method	Analyte	Units	Existing Wells										New Wells			MMSD Discharge Limit	NR 140 ES
			LHW1		LHW2		LHW3		LHW4		LHW5		LHW7		LHW8		
			5/14/2013	9/24/2019	5/14/2013	9/24/2019	5/14/2013	9/24/2019	5/14/2013	9/24/2019	5/14/2013	9/24/2019	9/24/2019	12/18/2019	9/24/2019		
1613B	2,3,7,8-TCDF	ng/L	<4.9	--	<4.8	--	<4.9	--	<4.9	--	<4.9	--	**0.048**	<0.045	**0.013**	--	--
1613B	OCDF	ng/L	<25	--	**3**	--	**0.29**	--	**0.47**	--	<25	--	**0.6**	**0.34**	**0.087**	--	--
1613B	Total HpCDF	ng/L	0	--	0	--	0	--	0	--	0	--	**0.99**	**0.48**	**0.19**	--	--
1613B	Total HxCDF	ng/L	0	--	0	--	0	--	0	--	0	--	**2.8**	**4.9**	**0.18**	--	--
1613B	Total PeCDF	ng/L	0	--	0	--	0	--	0	--	0	--	**8.7**	**20**	**0.26**	--	--
1613B	Total TCDF	ng/L	0	--	0	--	0	--	0	--	0	--	**19**	**41**	**0.4**	--	--
	Total Furan	ng/L	0	--	**3**	--	**0.29**	--	**0.47**	--	0	--	**32**	**67.401**	**1.1**	26,000	--
PBD Ethers																	
	2,2',3,4,4',5',6-HEPTABROMODIPHENYL ETHER	ng/L	<0.136	--	<0.136	--	<0.137	--	<0.136	--	<0.135	--	--	--	--	--	--
	2,2',3,4,4',5-HEXABROMODIPHENYL ETHER	ng/L	<0.0765	--	<0.0765	--	<0.0771	--	<0.0766	--	<0.0765	--	--	--	--	--	--
	2,2',3,4,4'-PENTABROMODIPHENYL ETHER	ng/L	<0.0969	--	<0.0968	--	<0.0976	--	<0.0969	--	<0.0968	--	--	--	--	--	--
	2,2',4,4',5',6-HEXABROMODIPHENYL ETHER	ng/L	<0.116	--	<0.116	--	<0.117	--	<0.116	--	<0.116	--	--	--	--	--	--
	2,2',4,4',5,5'-HEXABROMODIPHENYL ETHER	ng/L	**0.15**	--	<0.116	--	<0.117	--	<0.116	--	<0.116	--	--	--	--	--	--
	2,2',4,4',5-PENTABROMODIPHENYL ETHER	ng/L	<0.591	--	<0.591	--	<0.595	--	<0.591	--	<0.59	--	--	--	--	--	--
	2,2',4,4',6-PENTABROMODIPHENYL ETHER	ng/L	<0.145	--	<0.145	--	<0.146	--	<0.145	--	<0.145	--	--	--	--	--	--
	2,2',4,4'-TETRABROMODIPHENYL ETHER	ng/L	<0.969	--	<0.968	--	<0.976	--	<0.969	--	<0.968	--	--	--	--	--	--
	2,3',4,4'-TETRABROMODIPHENYL ETHER	ng/L	<0.0484	--	<0.0484	--	<0.0488	--	<0.0485	--	<0.0484	--	--	--	--	--	--
	2,4,4'-TRIBROMODIPHENYL ETHER	ng/L	<0.0969	--	<0.0968	--	<0.0976	--	<0.0969	--	<0.0968	--	--	--	--	--	--
	DECABROMODIPHENYL ETHER	ng/L	**6.36**	--	**5.36**	--	<4.88	--	<4.85	--	<4.84	--	--	--	--	--	--
	PBD Ethers (Total)	ng/L	**6.51**	--	**5.36**	--	0	--	0	--	0	--	--	--	--	1,000	--

3.6 Orange highlighted cell indicates result exceeds MMSD discharge limit.

187 Yellow highlighted cell indicates result exceeds NR 140 groundwater enforcement standard.

187 Bold value indicates constituent was detected.

mg/L = milligrams per liter (parts per million) ug/L = micrograms per liter (parts per billion) ng/L = nanograms per liter (parts per trillion) MMSD = Milwaukee Metropolitan Sewerage District

Prepared by: SCC, TK 12/31/19, SCC 1/21/2020, AJR 1/22/2020, LMH 1/23/2020
Checked by: LMH 1/23/2020

I:\25218040.01\Deliverables\Waste Invest Report\Tables\[Table 8_Leachate_MMSD_r1.xlsx]Leachate Results

Table 9. Gas Probe Monitoring Data: 2017 - 2019
WMWI Boundary Road Landfill / SCS Project #25218040.01

Point Name	Sample Date	Methane (% vol)	Oxygen (% vol)	Soil Gas Pressure (inches of water)
GP-1 (LPG01)	3/21/2017	0.0	11.1	0.55
	6/23/2017	0.0	15.4	0.59
	9/13/2017	0.0	19.0	0.23
	12/18/2017	0.1	20.4	-4.89
	3/21/2018	0.2	17.2	-0.97
	6/13/2018	0.0	16.8	0.04
	9/17/2018	0.0	21.6	0.05
	12/7/2018	0.1	22.1	0.82
GP01RB (LPG01R)	3/19/2019	0.2	11.7	0.00
	6/6/2019	0.0	22.8	-0.01
	9/5/2019	0.0	19.6	0.62
	12/9/2019	0.1	14.9	-0.01
GP-3 (LPG3)	3/21/2017	0.0	11.1	0.65
	6/23/2017	0.0	18.8	-0.64
	9/13/2017	0.0	18.6	0.22
	12/18/2017	0.1	20.0	0.01
	3/21/2018	0.1	21.0	0.40
	6/13/2018	0.0	16.5	0.04
	9/17/2018	0.0	21.7	0.04
	12/7/2018	0.0	16.3	0.81
	3/19/2019	0.0	10.3	-0.01
	6/6/2019	0.0	22.8	0.00
	9/5/2019	0.0	15.8	0.63
	12/9/2019	0.0	14.9	-0.01
GP-4 (LPG4)	3/21/2017	0.0	11.1	1.99
	6/23/2017	0.0	19.3	-0.47
	9/13/2017	0.0	18.4	-1.14
	12/18/2017	0.0	19.9	0.01
	3/21/2018	0.0	4.0	0.41
	6/13/2018	0.0	16.3	0.04
	9/17/2018	0.0	21.8	0.05
	12/7/2018	0.0	14.8	0.85
	3/19/2019	0.0	10.2	0.00
	6/6/2019	0.0	22.7	0.00
	9/5/2019	0.0	15.0	0.62
	12/9/2019	0.0	15.0	0.01

Table 9. Gas Probe Monitoring Data: 2017 - 2019
WMWI Boundary Road Landfill / SCS Project #25218040.01

Point Name	Sample Date	Methane (% vol)	Oxygen (% vol)	Soil Gas Pressure (inches of water)
GP-5 (LPG5)	3/21/2017	0.0	11.1	-1.76
	6/23/2017	0.0	19.3	-4.29
	9/13/2017	0.0	16.2	0.23
	12/18/2017	0.0	20.0	0.00
	3/21/2018	0.2	16.5	0.42
	6/13/2018	0.0	20.4	0.05
	9/17/2018	0.0	21.8	0.05
	12/7/2018	0.0	13.4	0.86
	3/19/2019	0.2	10.1	0.00
	6/6/2019	0.0	22.7	0.00
	9/5/2019	0.0	13.7	0.63
	12/9/2019	0.0	15.0	0.00
GP-6 (LPG6)	3/21/2017	0.0	11.1	1.02
	6/23/2017	0.0	19.3	-2.69
	9/13/2017	0.0	19.5	0.23
	12/18/2017	0.0	20.0	0.00
	3/21/2018	0.2	16.4	-0.72
	6/13/2018	0.0	20.7	0.02
	9/17/2018	0.0	21.6	0.05
	12/7/2018	0.0	12.6	0.86
	3/19/2019	0.0	10.1	0.00
	6/6/2019	0.0	22.7	0.00
	9/5/2019	0.0	12.4	0.63
	12/9/2019	0.0	15.7	0.00
GP-7 (LPG7)	3/21/2017	0.0	11.2	1.99
	6/23/2017	0.0	19.4	-2.26
	9/13/2017	0.0	19.4	0.24
	12/18/2017	0.2	20.0	0.00
	3/21/2018	0.2	17.4	-0.64
	6/13/2018	0.0	20.8	0.01
	9/17/2018	0.0	21.7	0.05
	12/7/2018	0.2	12.4	0.86
	3/19/2019	0.2	10.1	0.00
	6/6/2019	0.0	22.5	0.00
	9/8/2019	0.0	11.7	0.62
	12/9/2019	0.0	14.4	0.00

Note: Routine monitoring data downloaded from WDNR Groundwater and Environmental Monitoring System online database on 1/29/2020. Q4 2019 data provided by WMWI.

Created by: SCC, 1/30/2020
Rev by: LMH, 3/20/2020
Checked by: TK, 2/5/2020; SCC, 3/20/2020

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Table 10. Landfill Gas Flare Monitoring Data: 2017 - 2019
WMWI Boundary Road Landfill / SCS Project #25218040.01

Point Name	Sample Date	Gas Flow Rate (cfm)	Methane (% vol)	Oxygen (% vol)
Flare	1/2/2017	78	48.4	0.5
	2/21/2017	22	22.5	3.2
	3/6/2017	118	46.1	0.9
	4/3/2017	114	32.0	0.7
	5/2/2017	105	32.0	2.0
	6/1/2017	109	25.5	2.3
	7/6/2017	112	25.4	1.9
	8/1/2017	119	50.2	0.5
	9/1/2017	119	48.8	0.7
	10/2/2017	115	25.3	2.7
	11/2/2017	115	32.3	3.0
	12/4/2017	110	37.1	1.6
	1/2/2018	80	48.8	0.4
	2/13/2018	116	39.8	1.6
	3/1/2018	111	34.6	2.6
	4/2/2018	112	45.7	0.9
	5/8/2018	112	33.1	2.1
	6/1/2018	108	26.1	3.2
	7/2/2018	112	40.1	1.0
	8/8/2018	108	24.3	2.1
	9/10/2018	113	37.5	1.3
	10/2/2018	106	27.2	1.5
	11/1/2018	105	28.7	1.4
	12/3/2018	110	27.4	1.7
	1/16/2019	65	31.0	2.2
	2/27/2019	71	42.5	1.1
	3/6/2019	74	47.5	1.5
	4/1/2019	70	28.0	1.6
	5/31/2019	28	47.7	0.6
	6/19/2019	0	29.3	1.3
	7/31/2019	0	25.5	1.9
	8/30/2019	63	22.5	2.9
	9/27/2019	65	28.3	1.7
	10/31/2019	116	43.2	0.3
	11/22/2019	104	41.8	1.2
	12/30/2019	106	48.4	0.8
	Average	91	35.4	1.6

Note: Routine monitoring data downloaded from WDNR Groundwater and Environmental Monitoring System online database on 1/29/2020. Q4 2019 data provided by WMWI.

Created by: SCC, 1/30/2020
Rev. by: LMH, 3/20/2020
Checked by: TK, 2/5/2020; SCC, 3/20/2020

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Table 11. Leachate/Groundwater Collection Trench Discharge Data: 2017 - 2019
WMWI Boundary Road Landfill / SCS Project #25218040.01

Point Name	Parameter Description	Sample Date 9/1/2017	9/4/2018	9/3/2019	MMSD Discharge Limit	NR 140 ES	NR 140 PAL
Manhole	pH, Field (Standard Units)	6.25	6.72	6.86	--	--	--
MH03	Specific Conductance, Field (umho/cm @ 25C)	818	552	3440	--	--	--
(LMP01)	Temperature (degrees C)	14.2	19.6	17.5	--	--	--
	Alkalinity, Total (mg/L as CaCO3)	331	307	1500	--	--	--
	Chloride (mg/L Cl)	25.6	8.5	**847**	--	250	125
	Fluoride, Total (mg/L F)	0.16	ND	ND	--	4	0.8
	Hardness, Total (mg/L as CaCO3)	310	296	204	--	--	--
	Sulfate, Total (mg/L)	17.9	8.1	30.7	--	250	125
	Aluminum, Total (ug/L)	ND	**163**	**411**	--	200	40
	Antimony, Total (ug/L)	ND	0.87	0.77	--	6	1.2
	Arsenic, Total (ug/L)	0.67	0.9	**5.5**	600	10	1.0
	Barium, Total (ug/L)	133	71.6	71.2	--	2000	400
	Boron, Total (mg/L)	0.14	0.053	0.09	--	1	0.2
	Cadmium, Total (ug/L)	ND	ND	ND	1500	5	0.5
	Chromium, Total (ug/L)	ND	ND	ND	64000	100	10
	Iron, Total (mg/L)	**0.2**	**0.28**	**0.39**	--	0.3	0.15
	Manganese, Total (ug/L)	15.6	**46.6**	14.1	--	50	25
	Selenium, Total (ug/L)	ND	ND	0.45	--	50	10
	Sodium, Total (mg/L)	20.8	6.4	7.4	--	--	--
	Detected Volatile Organic Compounds						
	Acetone (ug/L)	ND	5.3	12	--	9000	1800
	Benzene (ug/L)	ND	ND	**30**	--	5	0.5
	Chlorobenzene (ug/L)	ND	ND	19	--	--	--
	Chloroethane (ug/L)	14	3.3	37	--	400	80
	Dichloromethane (ug/L)	ND	ND	**4.4**	--	5	0.5
	m-Dichlorobenzene (ug/L)	ND	ND	3.1	--	600	120
	Tetrahydrofuran (ug/L)	ND	ND	**57**	--	50	10
	Xylene (ug/L)	ND	ND	5.2	--	2000	400

mg/L = milligrams per liter
ug/L = micrograms per liter
ND = Not detected

PAL = Preventive Action Limit
ES = Enforcement Standard
-- = No standard or limit established

3.4 Orange highlighted cell indicates result exceeds MMSD limit (no exceedances for these results)

1.1 Yellow highlighted cell indicates result exceeds NR 140 ES

0.99 Blue highlighted cell indicates result exceeds NR 140 PAL

Note: Routine monitoring data downloaded from WDNR Groundwater and Environmental Monitoring System online database on 1/29/2020. Samples are collected from Manhole 3 where leachate/groundwater from the collection trench enters the forcemain to be discharged to Milwaukee Metropolitan Sewerage District (MMSD).

Created by: SCC, 1/30/2020
Checked by: TK, 2/5/2020

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Table 12. Groundwater Monitoring Data: 2017 - 2019
WMWI Boundary Road Landfill / SCS Project #25218040.01

Point Name	Analysis Method	Parameter	3/1/2017	9/5/2017	3/1/2018	9/4/2018	3/4/2019	9/3/2019	NR 140 PAL	NR 140 ES
TW5R	300	Fluoride, dissolved (mg/L)	<1.3	0.34	<0.26	0.3	0.39	0.38	0.8	4.0
	310.2	Alkalinity, total filtered (mg/L)	576	508	535	612	607	544	--	--
	4110B	Chloride, dissolved (mg/L)	**667**	**700**	**693**	**683**	**638**	**705**	125	250
	4110B	Sulfate, dissolved (mg/L)	112	124	**131**	119	92.8	78.9	125	250
	6010B	Hardness, total filtered (mg/L)	977	852	804	880	826	978	--	--
	6010C	Boron, dissolved (mg/L)	**0.54**	**0.58**	**0.52**	**0.58**	**0.5**	**0.59**	0.2	1.0
	6010C	Sodium, dissolved (mg/L)	360	312	294	315	272	342	--	--
		Detected VOCs								
	8260C	Dichloromethane (ug/L)	NA	<0.44	NA	<2.2	NA	**2.6**	0.5	5.0
TW-9RR	300	Fluoride, dissolved (mg/L)	0.13	0.23	0.43	0.44	0.31	<0.13	0.8	4.0
	310.2	Alkalinity, total filtered (mg/L)	630	860	849	654	870	843	--	--
	4110B	Chloride, dissolved (mg/L)	57.4	**130**	**153**	84.8	**151**	**211**	125	250
	4110B	Sulfate, dissolved (mg/L)	**352**	13.2	<1.7	7.9	<1.7	<1.7	125	250
	6010B	Hardness, total filtered (mg/L)	871	565	562	419	591	715	--	--
	6010C	Boron, dissolved (mg/L)	**0.3**	**0.78**	**0.78**	**0.5**	**0.8**	**1.2**	0.2	1.0
	6010C	Sodium, dissolved (mg/L)	67.1	126	145	83.4	135	189	--	--
		Detected VOCs								
	8260C	Carbon Disulfide (ug/L)	NA	<0.95	NA	1.1	NA	<0.95	200	1000
	8260C	Tetrahydrofuran (ug/L)	NA	<6.3	NA	<6.3	NA	7.5	10	50
TW-16R	300	Fluoride, dissolved (mg/L)	0.14	0.22	0.15	0.24	0.13	0.21	0.8	4.0
	310.2	Alkalinity, total filtered (mg/L)	190	346	148	200	229	229	--	--
	4110B	Chloride, dissolved (mg/L)	25.1	24.5	16.8	16.4	18.8	17	125	250
	4110B	Sulfate, dissolved (mg/L)	8.4	1.9	4.9	4.6	5.1	0.49	125	250
	6010B	Hardness, total filtered (mg/L)	183	327	146	178	211	248	--	--
	6010C	Boron, dissolved (mg/L)	0.053	0.12	0.046	0.12	0.033	0.1	0.2	1.0
	6010C	Sodium, dissolved (mg/L)	16.8	23.7	14.5	13.8	15	17.1	--	--
		Detected VOCs								
	8260C	Dichloromethane (ug/L)	NA	0.49	NA	<0.44	NA	<0.44	0.5	5.0

Table 12. Groundwater Monitoring Data: 2017 - 2019
WMWI Boundary Road Landfill / SCS Project #25218040.01

Point Name	Analysis Method	Parameter	3/1/2017	9/5/2017	3/1/2018	9/4/2018	3/4/2019	9/3/2019	NR 140 PAL	NR 140 ES
TW-24R	300	Fluoride, dissolved (mg/L)	0.25	0.31	<0.26	0.3	0.52	<0.26	0.8	4.0
	310.2	Alkalinity, total filtered (mg/L)	918	1160	910	954	1050	998	--	--
	4110B	Chloride, dissolved (mg/L)	**432**	**449**	**462**	**403**	**446**	**290**	125	250
	4110B	Sulfate, dissolved (mg/L)	16.2	18.2	**169**	68.4	11.5	17.3	125	250
	6010B	Hardness, total filtered (mg/L)	623	686	707	646	695	667	--	--
	6010C	Boron, dissolved (mg/L)	**1.4**	**2**	**1.9**	**1.5**	**1.7**	**1.8**	0.2	1.0
	6010C	Sodium, dissolved (mg/L)	323	400	396	330	382	354	--	--
		Detected VOCs								
	8260C	Benzene (ug/L)	NA	**2.5**	NA	<2.1	NA	<2.1	0.5	5.0
	8260C	Chloroethane (ug/L)	NA	2.5	NA	<1.6	NA	<1.6	80	400
P101	300	Fluoride, dissolved (mg/L)	0.64	0.72	0.66	0.7	0.7	0.72	0.8	4.0
	310.2	Alkalinity, total filtered (mg/L)	133	126	133	129	139	127	--	--
	4110B	Chloride, dissolved (mg/L)	4.7	1.3	1.3	1.5	1.4	1.5	125	250
	4110B	Sulfate, dissolved (mg/L)	12.2	12	10.6	12.3	12.4	13	125	250
	6010B	Hardness, total filtered (mg/L)	84.5	87.2	80.5	80.7	85.9	92.7	--	--
	6010C	Boron, dissolved (mg/L)	0.16	0.16	0.15	0.15	0.16	0.16	0.2	1.0
	6010C	Sodium, dissolved (mg/L)	27.5	27.2	25.2	24	25.8	25.9	--	--
		Detected VOCs								
		None								
P102	300	Fluoride, dissolved (mg/L)	0.29	0.32	0.28	0.29	0.25	0.35	0.8	4.0
	310.2	Alkalinity, total filtered (mg/L)	253	254	249	243	246	217	--	--
	4110B	Chloride, dissolved (mg/L)	30.7	28.4	26.7	28.3	30.9	21.9	125	250
	4110B	Sulfate, dissolved (mg/L)	61.8	58.8	56.4	57.5	54.3	51.7	125	250
	6010B	Hardness, total filtered (mg/L)	284	297	281	284	275	285	--	--
	6010C	Boron, dissolved (mg/L)	0.06	0.07	0.067	0.072	0.088	0.078	0.2	1.0
	6010C	Sodium, dissolved (mg/L)	14.6	16	16.3	16.4	18	17.1	--	--
		Detected VOCs								
	8260C	Acetone (ug/L)	NA	3.2	NA	<3	NA	<3	1800	9000

Table 12. Groundwater Monitoring Data: 2017 - 2019
WMWI Boundary Road Landfill / SCS Project #25218040.01

Point Name	Analysis Method	Parameter	3/1/2017	9/5/2017	3/1/2018	9/4/2018	3/4/2019	9/3/2019	NR 140 PAL	NR 140 ES
P103R	300	Fluoride, dissolved (mg/L)	0.73	0.77	**0.9**	0.73	**0.96**	**1.1**	0.8	4.0
	310.2	Alkalinity, total filtered (mg/L)	479	478	534	567	553	512	--	--
	4110B	Chloride, dissolved (mg/L)	**569**	**537**	**576**	**617**	**579**	**605**	125	250
	4110B	Sulfate, dissolved (mg/L)	<1.7	<3.5	<1.7	<3.5	<3.5	<3.5	125	250
	6010B	Hardness, total filtered (mg/L)	343	331	358	397	385	427	--	--
	6010C	Boron, dissolved (mg/L)	**1.8**	**1.8**	**1.9**	**1.9**	**1.9**	**2.2**	0.2	1.0
	6010C	Sodium, dissolved (mg/L)	381	366	400	418	397	443	--	--
		Detected VOCs								
	8260C	Tetrahydrofuran (ug/L)	NA	**20**	NA	**20**	NA	**24**	10	50
P104R	300	Fluoride, dissolved (mg/L)	**0.89**	**0.94**	**0.89**	**0.93**	**0.91**	**0.96**	0.8	4.0
	310.2	Alkalinity, total filtered (mg/L)	113	111	103	117	120	104	--	--
	4110B	Chloride, dissolved (mg/L)	1.8	1.4	1.5	1.7	1.5	1.4	125	250
	4110B	Sulfate, dissolved (mg/L)	5.1	3.3	2.9	3.7	3.2	3.7	125	250
	6010B	Hardness, total filtered (mg/L)	46	37.8	37.8	39.4	36.9	38.3	--	--
	6010C	Boron, dissolved (mg/L)	**0.21**	**0.22**	**0.21**	**0.21**	**0.21**	**0.23**	0.2	1.0
	6010C	Sodium, dissolved (mg/L)	36.5	36.7	36.7	36	36.2	36.4	--	--
		Detected VOCs								
		None								
MW 107	300	Fluoride, dissolved (mg/L)	0.096	0.17	0.092	0.14	<0.13	<0.13	0.8	4.0
	310.2	Alkalinity, total filtered (mg/L)	340	423	317	288	383	394	--	--
	4110B	Chloride, dissolved (mg/L)	99.2	76.3	**144**	27.7	**380**	**221**	125	250
	4110B	Sulfate, dissolved (mg/L)	18.7	20.5	25.7	15	44.2	110	125	250
	6010B	Hardness, total filtered (mg/L)	319	342	383	264	456	551	--	--
	6010C	Boron, dissolved (mg/L)	0.12	**0.31**	0.094	0.1	0.07	0.16	0.2	1.0
	6010C	Sodium, dissolved (mg/L)	49.4	66.8	57.4	20.4	202	139	--	--
		Detected VOCs								
	8260C	Chlorobenzene (ug/L)	NA	1.5	NA	<0.75	NA	<0.75	--	--
	8260C	Tetrahydrofuran (ug/L)	NA	1.4	NA	<1.3	NA	<1.3	10	50

Table 12. Groundwater Monitoring Data: 2017 - 2019
WMWI Boundary Road Landfill / SCS Project #25218040.01

Point Name	Analysis Method	Parameter	3/1/2017	9/5/2017	3/1/2018	9/4/2018	3/4/2019	9/3/2019	NR 140 PAL	NR 140 ES
P107	300	Fluoride, dissolved (mg/L)	0.7	0.78	0.79	0.77	0.72	0.78	0.8	4.0
	310.2	Alkalinity, total filtered (mg/L)	494	522	481	412	445	397	--	--
	4110B	Chloride, dissolved (mg/L)	61.3	60	59.6	63.5	64.1	63.8	125	250
	4110B	Sulfate, dissolved (mg/L)	0.71	0.52	<0.35	<0.35	<0.7	<1.7	125	250
	6010B	Hardness, total filtered (mg/L)	292	293	262	251	252	257	--	--
	6010C	Boron, dissolved (mg/L)	**0.92**	**0.95**	**0.9**	**0.9**	**0.96**	**1**	0.2	1.0
	6010C	Sodium, dissolved (mg/L)	86.9	90.3	86.4	89.5	95.6	99.2	--	--
		Detected VOCs								
	8260C	Dichloromethane (ug/L)	NA	**0.63**	NA	<0.44	NA	<1.8	0.5	5.0
	8260C	Tetrahydrofuran (ug/L)	NA	7.8	NA	7.2	NA	7.2	10	50
MW110	300	Fluoride, dissolved (mg/L)	<0.13	0.13	<0.13	0.16	<0.13	<0.13	0.8	4.0
	310.2	Alkalinity, total filtered (mg/L)	388	382	381	372	359	365	--	--
	4110B	Chloride, dissolved (mg/L)	**147**	**147**	**152**	**156**	**155**	**158**	125	250
	4110B	Sulfate, dissolved (mg/L)	**166**	**167**	**180**	**168**	**174**	**189**	125	250
	6010B	Hardness, total filtered (mg/L)	541	560	526	526	537	608	--	--
	6010C	Boron, dissolved (mg/L)	0.14	0.17	0.16	0.16	0.16	0.18	0.2	1.0
	6010C	Sodium, dissolved (mg/L)	82.1	93.8	88.2	85.9	88.8	100	--	--
		Detected VOCs								
	8260C	Chloroethane (ug/L)	NA	0.67	NA	<0.32	NA	<0.32	80	400
MW111	300	Fluoride, dissolved (mg/L)	<0.26	<0.26	<0.52	<0.26	<0.26	<0.52	0.8	4.0
	310.2	Alkalinity, total filtered (mg/L)	776	683	774	673	734	655	--	--
	4110B	Chloride, dissolved (mg/L)	**637**	**736**	**636**	**848**	**550**	**794**	125	250
	4110B	Sulfate, dissolved (mg/L)	122	**167**	**189**	101	115	109	125	250
	6010B	Hardness, total filtered (mg/L)	730	728	706	675	660	830	--	--
	6010C	Boron, dissolved (mg/L)	**0.97**	**0.97**	**1.1**	**0.99**	**0.93**	**1.1**	0.2	1.0
	6010C	Sodium, dissolved (mg/L)	411	454	425	475	366	474	--	--
		Detected VOCs								
	8260C	Chlorobenzene (ug/L)	NA	4.3	NA	3.5	NA	3.3	--	--
	8260C	Dichloromethane (ug/L)	NA	**3**	NA	<1.8	NA	<1.8	0.5	5.0
	8260C	Tetrahydrofuran (ug/L)	NA	**13**	NA	**16**	NA	**18**	10	50

Table 12. Groundwater Monitoring Data: 2017 - 2019
WMWI Boundary Road Landfill / SCS Project #25218040.01

Point Name	Analysis Method	Parameter	3/1/2017	9/5/2017	3/1/2018	9/4/2018	3/4/2019	9/3/2019	NR 140 PAL	NR 140 ES
MW-116	300	Fluoride, dissolved (mg/L)	0.16	0.2	<0.13	0.24	0.15	<0.13	0.8	4.0
	310.2	Alkalinity, total filtered (mg/L)	439	428	432	435	513	334	--	--
	4110B	Chloride, dissolved (mg/L)	**211**	**154**	**145**	**127**	**163**	**163**	125	250
	4110B	Sulfate, dissolved (mg/L)	**203**	**138**	**155**	103	109	61.2	125	250
	6010B	Hardness, total filtered (mg/L)	703	549	526	514	629	464	--	--
	6010C	Boron, dissolved (mg/L)	0.076	0.083	0.087	0.11	0.066	0.13	0.2	1.0
	6010C	Sodium, dissolved (mg/L)	102	91.6	81.9	77.3	94.2	86.8	--	--
		Detected VOCs								
	8260C	Dichloromethane (ug/L)	NA	**5.3**	NA	<1.8	NA	<1.8	0.5	5.0
MW-117 (note 2)	300	Fluoride, dissolved (mg/L)	0.2	<1.3	**1**	**1.1**	<1.3	<1.3	0.8	4.0
	310.2	Alkalinity, total filtered (mg/L)	453	459	119	571	493	495	--	--
	4110B	Chloride, dissolved (mg/L)	**1160**	**4270**	1.9	**312**	**3460**	**3910**	125	250
	4110B	Sulfate, dissolved (mg/L)	90.1	117	8.2	118	76.9	71.4	125	250
	6010B	Hardness, total filtered (mg/L)	1010	2260	43.2	218	1150	1740	--	--
	6010C	Boron, dissolved (mg/L)	0.18	**0.46**	0.19	0.16	0.12	**0.41**	0.2	1.0
	6010C	Sodium, dissolved (mg/L)	911	1910	39.4	376	1810	1920	--	--
		Detected VOCs								
	8260C	1,1,1-Trichloroethane (ug/L)	NA	13	NA	<6.6	NA	<6.6	40	200
	8260C	1,1-Dichloroethane (ug/L)	NA	60	NA	<3	NA	31	85	850
	8260C	1,1-Dichloroethene (ug/L)	NA	0.66	NA	<2.3	NA	<2.3	0.7	7.0
	8260C	1,2-Dichloroethane (ug/L)	NA	**2**	NA	<1.7	NA	<1.7	0.5	5.0
	8260C	Benzene (ug/L)	NA	**1.1**	NA	<3.3	NA	<3.3	0.5	5.0
	8260C	Chloroform (ug/L)	NA	**6.6**	NA	**17**	NA	<2.7	0.6	6.0
	8260C	cis-1,2-Dichloroethene (ug/L)	NA	3.8	NA	<6.5	NA	<6.5	7	70
	8260C	Dichloromethane (ug/L)	NA	**1.9**	NA	**4.3**	NA	<3.5	0.5	5.0

Table 12. Groundwater Monitoring Data: 2017 - 2019
WMWI Boundary Road Landfill / SCS Project #25218040.01

Point Name	Analysis Method	Parameter	3/1/2017	9/5/2017	3/1/2018	9/4/2018	3/4/2019	9/3/2019	NR 140 PAL	NR 140 ES
P117 (note 2)	300	Fluoride, dissolved (mg/L)	**0.99**	**1.1**	<2.6	**1.0**	**1.0**	**1.0**	0.8	4.0
	310.2	Alkalinity, total filtered (mg/L)	120	121	471	122	115	104	--	--
	4110B	Chloride, dissolved (mg/L)	1.4	1.3	**5140**	1.4	1.6	1.3	125	250
	4110B	Sulfate, dissolved (mg/L)	7.8	8.1	115	8.6	8	8.9	125	250
	6010B	Hardness, total filtered (mg/L)	41.4	44.2	2170	40.8	45.6	47.5	--	--
	6010C	Boron, dissolved (mg/L)	0.17	0.19	**0.31**	0.17	0.19	**0.2**	0.2	1.0
	6010C	Sodium, dissolved (mg/L)	35.7	38	1880	35.2	39.2	37.9	--	--
		Detected VOCs								
		None								

VOC = Volatile organic compound
-- = No NR 140 standard established
NA = Not analyzed

PAL = Preventive Action Limit
mg/L = milligrams per liter

ES = Enforcement Standard
ug/L = micrograms per liter

1.1	Yellow highlighted cell indicates result exceeds NR 140 ES
0.99	Blue highlighted cell indicates result exceeds NR 140 PAL

Note:
1. Routine monitoring data downloaded from WDNR Groundwater and Environmental Monitoring System online database on 1/29/2020.
2. Results for MW-117 and P117 for March 2018 appear to have been switched during sampling, analysis, or reporting.

Created by: SCC, 1/30/2020
Checked by: TK, 2/5/2020

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Table 13. Private Well Monitoring Data: 2017 - 2019
WMWI Boundary Road Landfill / SCS Project #25218040.01

Point Name	Analysis Method	Parameter	9/6/2017	9/12/2018	9/6/2019	NR 140 PAL	NR 140 ES
PW-7	300	Fluoride, total (mg/L)	0.65	0.6	0.55	0.8	4.0
	310.2	Alkalinity, total (mg/L)	183	184	176	--	--
	4110B	Chloride, total (mg/L)	34.8	32.8	35.9	125	250
	4110B	Sulfate, total (mg/L)	105	78.7	102	125	250
	6010B	Hardness, total (mg/L)	249	226	240	--	--
	6010C	Aluminum, total (ug/L)	<60	<60	<60	40	200
	6010C	Barium, total (ug/L)	32	25.7	30.5	400	2000
	6010C	Boron, total (mg/L)	**0.26**	**0.23**	**0.24**	0.2	1.0
	6010C	Chromium, total (ug/L)	<1	<1	<1	10	100.0
	6010C	Iron, total (mg/L)	**1.4**	**1**	**2.3**	0.15	0.3
	6010C	Manganese, total (ug/L))	18.7	**27.6**	17.2	25	50
	6010C	Sodium, total (mg/L)	32.6	31.7	29.1	--	--
	6020A	Antimony, total (ug/L)	<0.35	<0.4	<0.35	1.2	6.0
	6020A	Arsenic, total (ug/L)	**6.4**	**7.4**	**8.5**	1.0	10
	6020A	Cadmium, total (ug/L)	<0.071	<0.27	0.12	0.5	5.0
	6020A	Selenium, total (ug/L)	<0.44	<0.7	<0.44	10	50
		Detected VOCs					
	8260C	Acetone (ug/L)	<3	3.2	<3	1800	9000
	8260C	Carbon disulfide (ug/L)	<0.19	0.61	<0.19	200	1000
PW-8	300	Fluoride, total (mg/L)	0.74	0.66	0.64	0.8	4.0
	310.2	Alkalinity, total (mg/L)	166	178	159	--	--
	4110B	Chloride, total (mg/L)	27	27.7	25.4	125	250
	4110B	Sulfate, total (mg/L)	95.5	90.9	86.8	125	250
	6010B	Hardness, total (mg/L)	211	222	194	--	--
	6010C	Aluminum, total (ug/L)	<60	<60	<60	40	200
	6010C	Barium, total (ug/L)	42.6	42.6	49.4	400	2000
	6010C	Boron, total (mg/L)	**0.28**	**0.26**	**0.27**	0.2	1.0
	6010C	Chromium, total (ug/L)	<1	<1	<1	10	100.0
	6010C	Iron, total (mg/L)	**1.2**	**0.97**	**7.4**	0.15	0.3
	6010C	Manganese, total (ug/L))	19.1	20.3	22.6	25	50
	6010C	Sodium, total (mg/L)	36.8	34.1	34.2	--	--
	6020A	Antimony, total (ug/L)	<0.35	<0.4	<0.35	1.2	6.0
	6020A	Arsenic, total (ug/L)	**7.7**	**6.2**	**31**	1.0	10
	6020A	Cadmium, total (ug/L)	<0.071	<0.27	<0.071	0.5	5.0
	6020A	Selenium, total (ug/L)	<0.44	<0.7	<0.44	10	50
		Detected VOCs					
	8260C	Acetone (ug/L)	<3	5.2	<3	1800	9000

Table 13. Private Well Monitoring Data: 2017 - 2019
WMWI Boundary Road Landfill / SCS Project #25218040.01

Point Name	Analysis Method	Parameter	9/6/2017	9/12/2018	9/6/2019	NR 140 PAL	NR 140 ES
PW-9	300	Fluoride, total (mg/L)	0.74	0.7	0.61	0.8	4.0
	310.2	Alkalinity, total (mg/L)	171	184	174	--	--
	4110B	Chloride, total (mg/L)	27.6	30.5	32.2	125	250
	4110B	Sulfate, total (mg/L)	62.2	72.5	82.7	125	250
	6010B	Hardness, total (mg/L)	186	206	207	--	--
	6010C	Aluminum, total (ug/L)	<60	<60	<60	40	200
	6010C	Barium, total (ug/L)	30	29.4	31.4	400	2000
	6010C	Boron, total (mg/L)	**0.22**	**0.22**	**0.23**	0.2	1.0
	6010C	Chromium, total (ug/L)	<1	<1	<1	10	100.0
	6010C	Iron, total (mg/L)	**1**	**0.83**	**1.2**	0.15	0.3
	6010C	Manganese, total (ug/L))	16.8	9.3	13.5	25	50
	6010C	Sodium, total (mg/L)	36.7	35.3	32.2	--	--
	6020A	Antimony, total (ug/L)	<0.35	<0.4	<0.35	1.2	6.0
	6020A	Arsenic, total (ug/L)	**8.3**	**8.3**	**8.5**	1.0	10
	6020A	Cadmium, total (ug/L)	<0.071	<0.27	<0.071	0.5	5.0
	6020A	Selenium, total (ug/L)	<0.44	<0.7	<0.44	10	50
		Detected VOCs					
	8260C	Acetone (ug/L)	<3	3.3	<3	1800	9000

VOC = Volatile organic compound
-- = No NR 140 standards established
mg/L = milligrams per liter

PAL = Preventive Action Limit
ES = Enforcement standard
ug/L = micrograms per liter

1.1 Yellow highlighted cell indicates result exceeds NR 140 ES

0.99 Blue highlighted cell indicates result exceeds NR 140 PAL

Note: Routine monitoring data downloaded from WDNR Groundwater and Environmental Monitoring System online database on 1/29/2020.

Created by: SCC, 1/30/2020
Checked by: TK, 2/5/2020

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Table 14. Surface Water Monitoring Data: 2017 - 2019
WMWI Boundary Road Landfill / SCS Project #25218040.01

Point Name	Parameter Description	Units	Sample Date		
			9/1/2017	9/4/2018	9/3/2019
SW01, Upstream (WDNR ID 27)	pH, Field	Std Units	7.59	7.82	8.17
	Specific Conductance, Field	umho/cm	1316	740	1120
	Temperature	Degrees C	14.1	23.5	19
	Detected VOCS				
	Acetone	ug/L	ND	3.9	3.9
SW02, Downstream (WDNR ID 40)	pH, Field	Std Units	7.72	7.9	7.22
	Specific Conductance, Field	umho/cm	440	529	1860
	Temperature	Degrees C	15.5	22.4	21
	Detected VOCS				
	Acetone	ug/L	4.4	ND	7.2
	Dichloromethane	ug/L	ND	1.9	ND
	Toluene	ug/L	1.2	ND	ND

ND = Not detected

Note: Routine monitoring data downloaded from WDNR Groundwater and Environmental Monitoring System online database on 1/29/2020.

Created by: SCC, 1/30/2020
Checked by: TK, 2/5/2020

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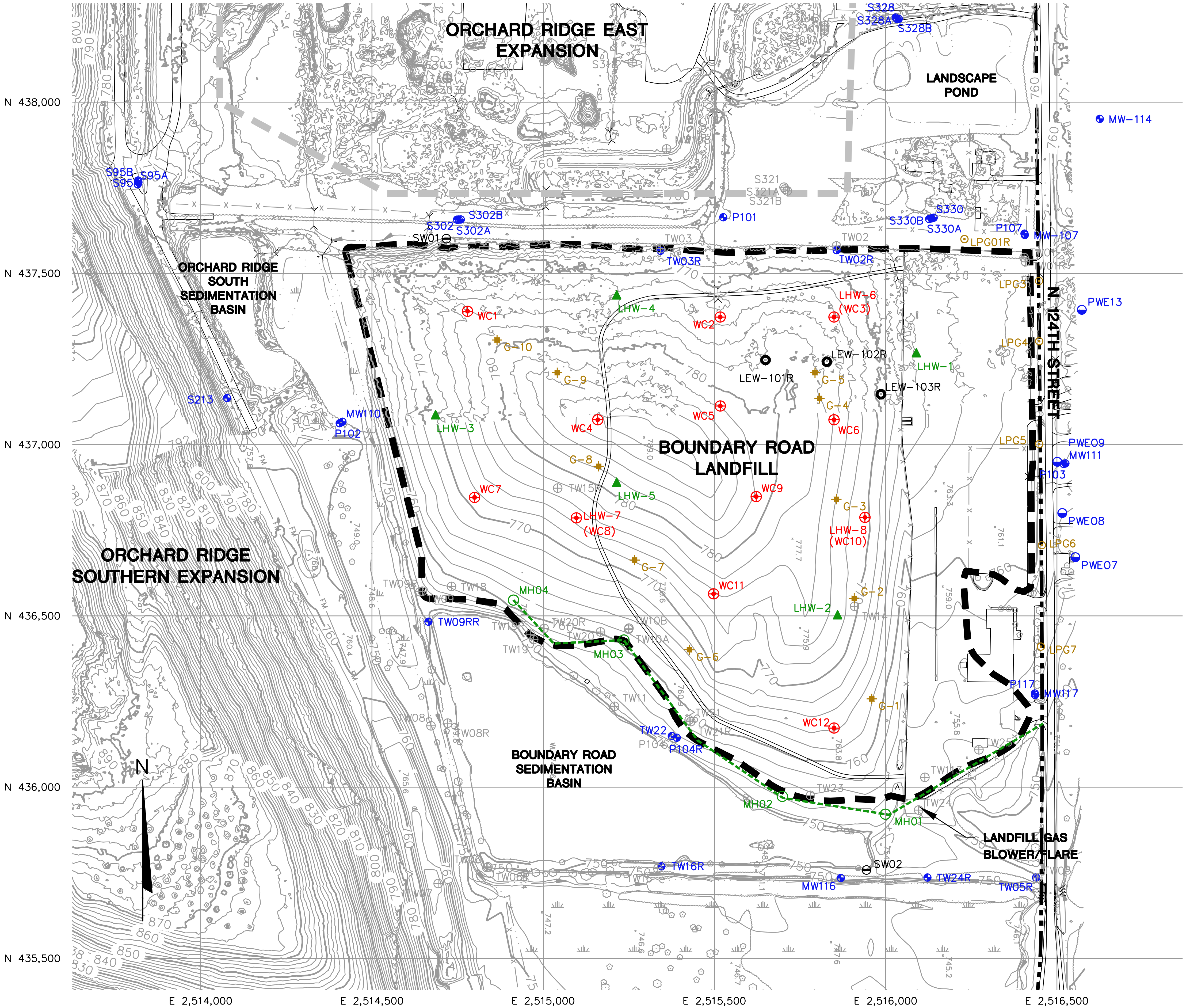
Figures



LEGEND

	PROPERTY LINE (WMWI)
	APPROXIMATE BOUNDARY ROAD LANDFILL LIMITS OF WASTE
	EXISTING CONTOUR (2' INTERVAL)
	EXISTING CONTOUR (10' INTERVAL)
803.5	EXISTING SPOT ELEVATION
	EXISTING TREE/TREELINE
— x — x — x —	EXISTING FENCE
	EXISTING EDGE OF WATER/CREEK
	APPROXIMATE WETLAND LOCATION
	EXISTING CULVERT
— FM —	EXISTING LEACHATE FORCEMAIN
	EXISTING LEACHATE COLLECTION TRENCH/SLURRY WALL
S213	EXISTING MONITORING WELL
TW18	ABANDONED MONITORING WELL
MH02	EXISTING MANHOLE
LHW-1	EXISTING LEACHATE HEADWELL
LEW-103R	EXISTING LEACHATE EXTRACTION WELL
G-6	EXISTING GAS EXTRACTION WELL
LPG5	EXISTING GAS PROBE
PW11E	EXISTING PRIVATE WATER SUPPLY WELL
SW01	EXISTING SURFACE WATER MONITORING POINT
WC1	WASTE CHARACTERIZATION BORING/NEW LEACHATE HEADWELL
	APPROVED EAST EXPANSION LIMITS OF WASTE

NOTES

1. BASE MAP DEVELOPED FROM AN AERIAL SURVEY PREPARED BY SURDEX CORPORATION, ST. LOUIS, MISSOURI DATED MARCH 3, 2006.
2. BASE MAP IN THE AREA AROUND THE PROPOSED ORCHARD RIDGE EAST EXPANSION UPDATED WITH DRONE SURVEY DATA FROM CQM, INC. DATED MAY 17, 2018 AND AUGUST 22, 2018.
3. APPROXIMATE WETLAND LOCATIONS DEVELOPED FROM FIGURE 2, WETLAND LOCATION MAP, PREPARED BY REDWING ECOLOGICAL SERVICES, INC., DATED MAY 3, 2002, AND REVISED IN OCTOBER 2002.
4. TOPOGRAPHIC CONTOUR INTERVAL IS TWO FEET.
5. ELEVATIONS ARE BASED ON U.S.G.S. MEAN SEA LEVEL DATUM.
6. GRID BASED ON WISCONSIN STATE PLANE COORDINATE SYSTEM, SOUTH ZONE (NAD27).
7. APPROXIMATE GAS PROBE AND GAS WELL LOCATIONS FROM FIGURE 2, EXISTING CONDITIONS, FOURTH 5-YEAR REVIEW REPORT, 09/2017.

300 0 300

SCALE: 1" = 300'

SITE LAYOUT

WASTE CHARACTERIZATION INVESTIGATION REPORT
BOUNDARY ROAD LANDFILL
WAUKESHA COUNTY, WISCONSIN

SITE

SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

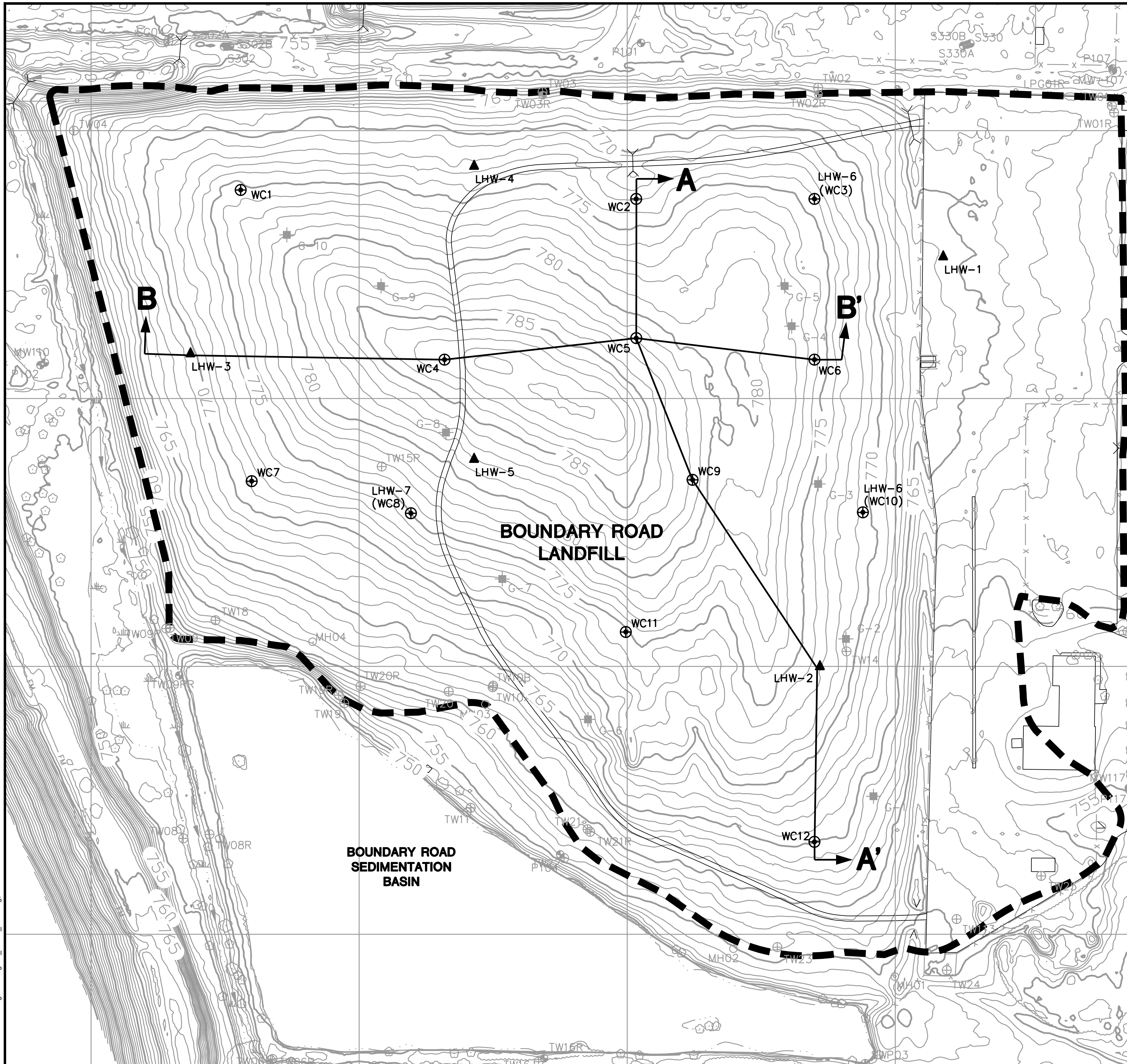
ENGINEER

WASTE MANAGEMENT OF WISCONSIN, INC.

CLIENT

PROJECT NO.	25218040.01	DRAWN BY:	KP
DRAWN:	12/17/2018	CHECKED BY:	SC
REVISED:	02/14/2020	APPROVED BY:	SCC 02/17/2020

FIGURE 1



LEGEND

	PROPERTY LINE (WMWI)
	APPROXIMATE BOUNDARY ROAD LANDFILL LIMITS OF WASTE
	EXISTING CONTOUR (2' INTERVAL)
	EXISTING CONTOUR (10' INTERVAL)
	EXISTING TREE/TREELINE
	EXISTING FENCE
	EXISTING CULVERT
	EXISTING EDGE OF WATER/CREEK
S213	EXISTING MONITORING WELL
TW18	ABANDONED MONITORING WELL
MH02	EXISTING MANHOLE
LEW-103R	EXISTING LEACHATE EXTRACTION WELL
LHG104	EXISTING GAS EXTRACTION WELL
LPG5	EXISTING GAS PROBE
PW11E	EXISTING PRIVATE WATER SUPPLY WELL
LHW-1	EXISTING LEACHATE HEADWELL
WC1	WASTE CHARACTERIZATION BORING/NEW LEACHATE HEADWELL

NOTES

1. BASE MAP DEVELOPED FROM AN AERIAL SURVEY PREPARED BY SURDEX CORPORATION, ST. LOUIS, MISSOURI DATED MARCH 3, 2006.
2. TOPOGRAPHIC SURFACE BASED ON LIDAR SURVEY BY TRC, 2015.
3. TOPOGRAPHIC CONTOUR INTERVAL IS TWO FEET.
4. ELEVATIONS ARE BASED ON U.S.G.S. MEAN SEA LEVEL DATUM.
5. GRID BASED ON WISCONSIN STATE PLANE COORDINATE SYSTEM, SOUTH ZONE (NAD27).

N

200 0 200

SCALE: 1" = 200'

CLIENT: WASTE MANAGEMENT OF WISCONSIN, INC. W132 N10487 GRANT DRIVE GERMANTOWN, WI 53022

SITE: WASTE CHARACTERIZATION INVESTIGATION REPORT BOUNDARY ROAD LANDFILL MENOMONEE FALLS, WISCONSIN

CROSS SECTION LOCATION MAP

PROJECT NO.	25218040.01	DRAWN BY:	KP
DRAWN:	11/06/2019	CHECKED BY:	TK
REVISED:	01/08/2020	APPROVED BY:	SCC 02/17/2020

ENGINEER: SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830

FIGURE 2

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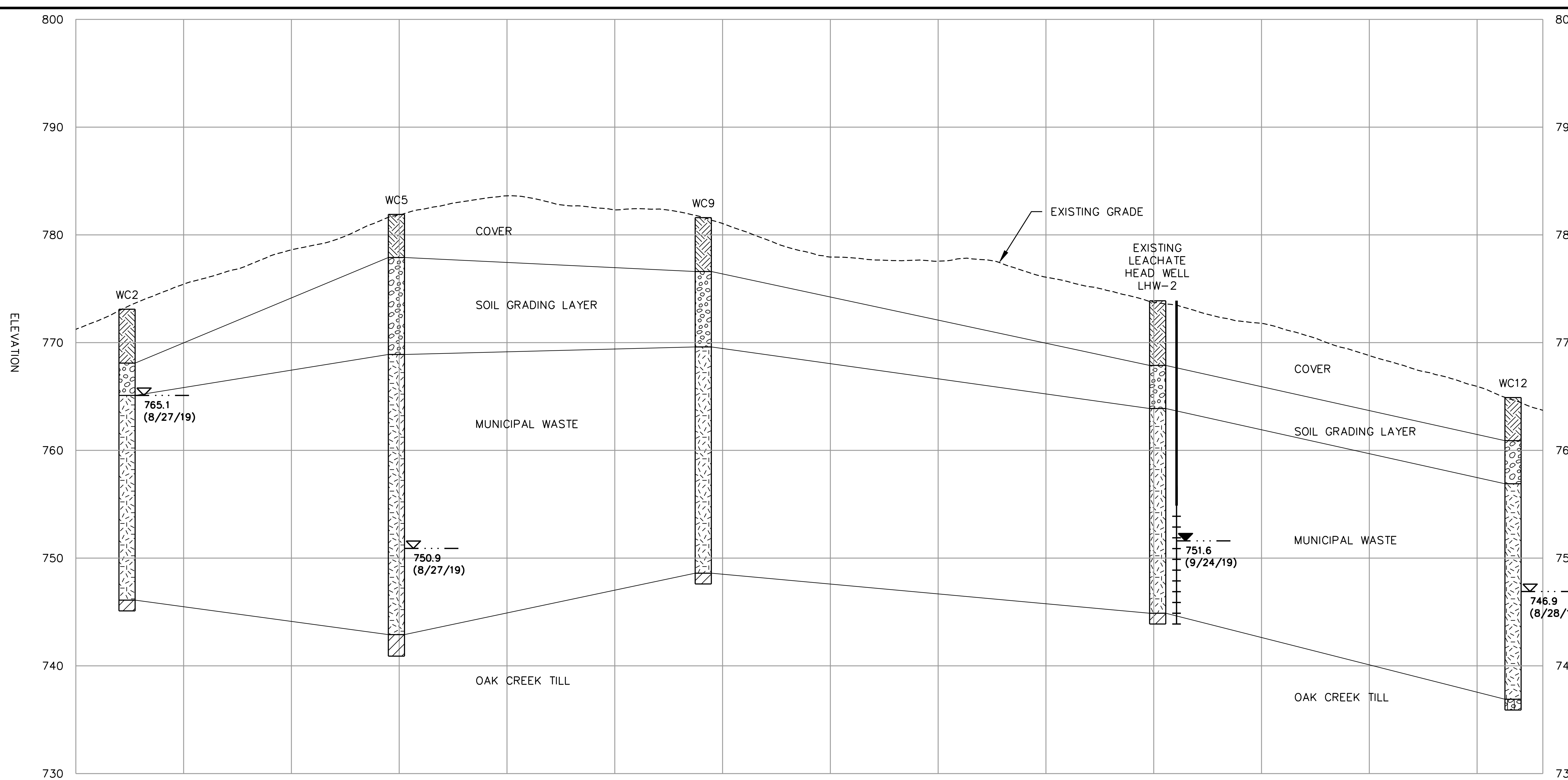


SECTION A-A'

LEGEND

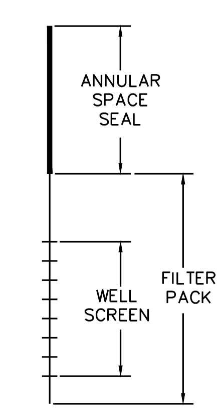
- SOIL COVER DESIGN THICKNESS: 6" TOPSOIL, 1.5' ROOTING ZONE, 2.0' CLAY CAP
- SOIL GRADING LAYER
- MUNICIPAL WASTE
- LEAN CLAY (CL)
- SILTY GRAVEL (GM)
- 750.9 (8/27/19) — LEACHATE ELEVATION AT LEACHATE HEADWELL AND MEASUREMENT DATE
- 749.6 (8/27/19) — ESTIMATED LEACHATE ELEVATION IN BORING AND MEASUREMENT DATE

NOTES

1. THE STRATUM LINES ARE BASED ON INTERPOLATION BETWEEN BORINGS AND MAY NOT REPRESENT ACTUAL SUBSURFACE CONDITIONS.
2. FOR THE PURPOSE OF ILLUSTRATING SUBSURFACE CONDITIONS ON THE CROSS SECTIONS, SOME OF THE BORING LOGS HAVE BEEN SIMPLIFIED. FOR A DETAILED DESCRIPTION OF SUBSURFACE CONDITIONS AT INDIVIDUAL BORINGS AND COMPLETE LEACHATE HEADWELL INSTALLATION DETAILS, REFER TO WASTE BORING LOGS, APPENDIX C AND F OF TEXT.
3. EXISTING GROUND SURFACE WAS TAKEN FROM FIGURE 2.
4. ELEVATIONS ARE SHOWN IN REFERENCE TO U.S.G.S. DATUM.

0 100

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 10'
VERTICAL EXAGGERATION = 10X



WELL DETAIL

CLIENT: WASTE MANAGEMENT OF WISCONSIN, INC. W132 N10487 GRANT DRIVE GERMANTOWN, WI 53022

SITE: WASTE CHARACTERIZATION INVESTIGATION REPORT BOUNDARY ROAD LANDFILL MENOMONEE FALLS, WISCONSIN

CROSS SECTION AA

ENGINEER: SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830

PROJECT NO. 25218040.01	DRAWN BY: KP		
DRAWN: 11/06/2019	CHECKED BY: TK		
REVISED: 01/08/2020	APPROVED BY: SCC 02/17/2020		

FIGURE 3

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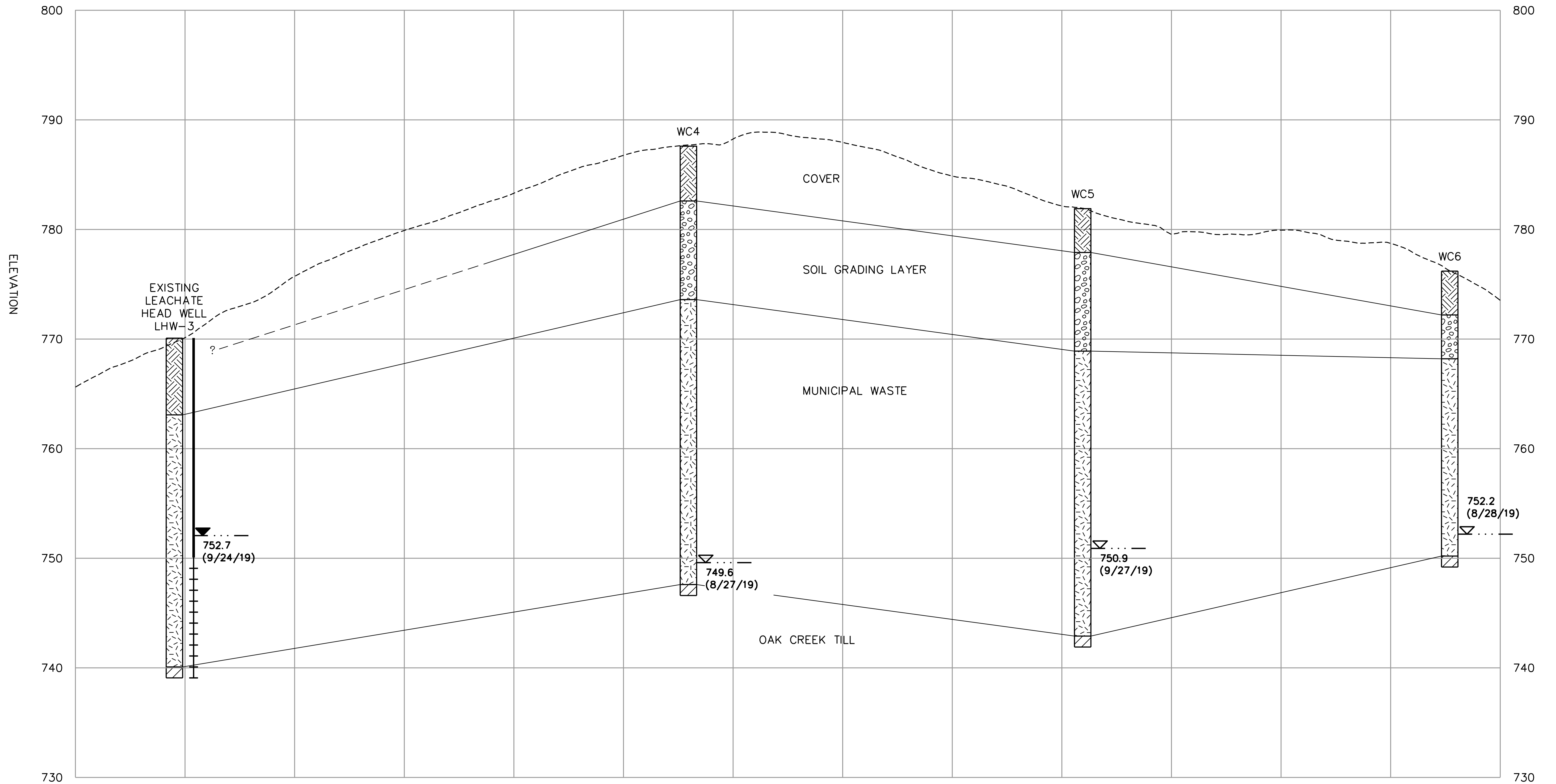


CROSS SECTION B-B'

LEGEND

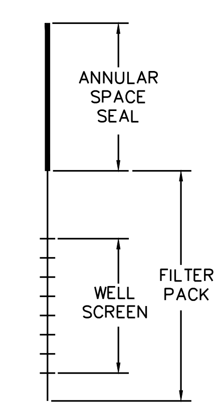
- SOIL COVER DESIGN THICKNESS: 6" TOPSOIL, 1.5' ROOTING ZONE, 2.0' CLAY CAP
- SOIL GRADING LAYER
- MUNICIPAL WASTE
- LEAN CLAY (CL)
- 750.9 (8/27/19) — LEACHATE ELEVATION AT LEACHATE HEADWELL AND MEASUREMENT DATE
- 749.6 (8/27/19) — ESTIMATED LEACHATE ELEVATION IN BORING AND MEASUREMENT DATE

NOTES

1. THE STRATUM LINES ARE BASED ON INTERPOLATION BETWEEN BORINGS AND MAY NOT REPRESENT ACTUAL SUBSURFACE CONDITIONS.
2. FOR THE PURPOSE OF ILLUSTRATING SUBSURFACE CONDITIONS ON THE CROSS SECTIONS, SOME OF THE BORING LOGS HAVE BEEN SIMPLIFIED. FOR A DETAILED DESCRIPTION OF SUBSURFACE CONDITIONS AT INDIVIDUAL BORINGS AND COMPLETE LEACHATE HEADWELL INSTALLATION DETAILS, REFER TO WASTE BORING LOGS, APPENDIX C AND F OF TEXT.
3. EXISTING GROUND SURFACE WAS TAKEN FROM FIGURE 2.
4. ELEVATIONS ARE SHOWN IN REFERENCE TO U.S.G.S. DATUM.

0 100

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 10'
VERTICAL EXAGGERATION = 10X



WELL DETAIL

CROSS SECTION BB

WASTE CHARACTERIZATION INVESTIGATION REPORT
BOUNDARY ROAD LANDFILL
MENOMONEE FALLS, WISCONSIN

SITE

CLIENT

WASTE MANAGEMENT OF WISCONSIN, INC.
W132 N10487 GRANT DRIVE
GERMANTOWN, WI 53022

WASTE MANAGEMENT

FIGURE 4

SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

ENGINEER

PROJECT NO.	25218040.01	DRAWN BY:	KP
DRAWN:	11/06/2019	CHECKED BY:	TK
REVISED:	01/08/2020	APPROVED BY:	SCC 02/17/2020

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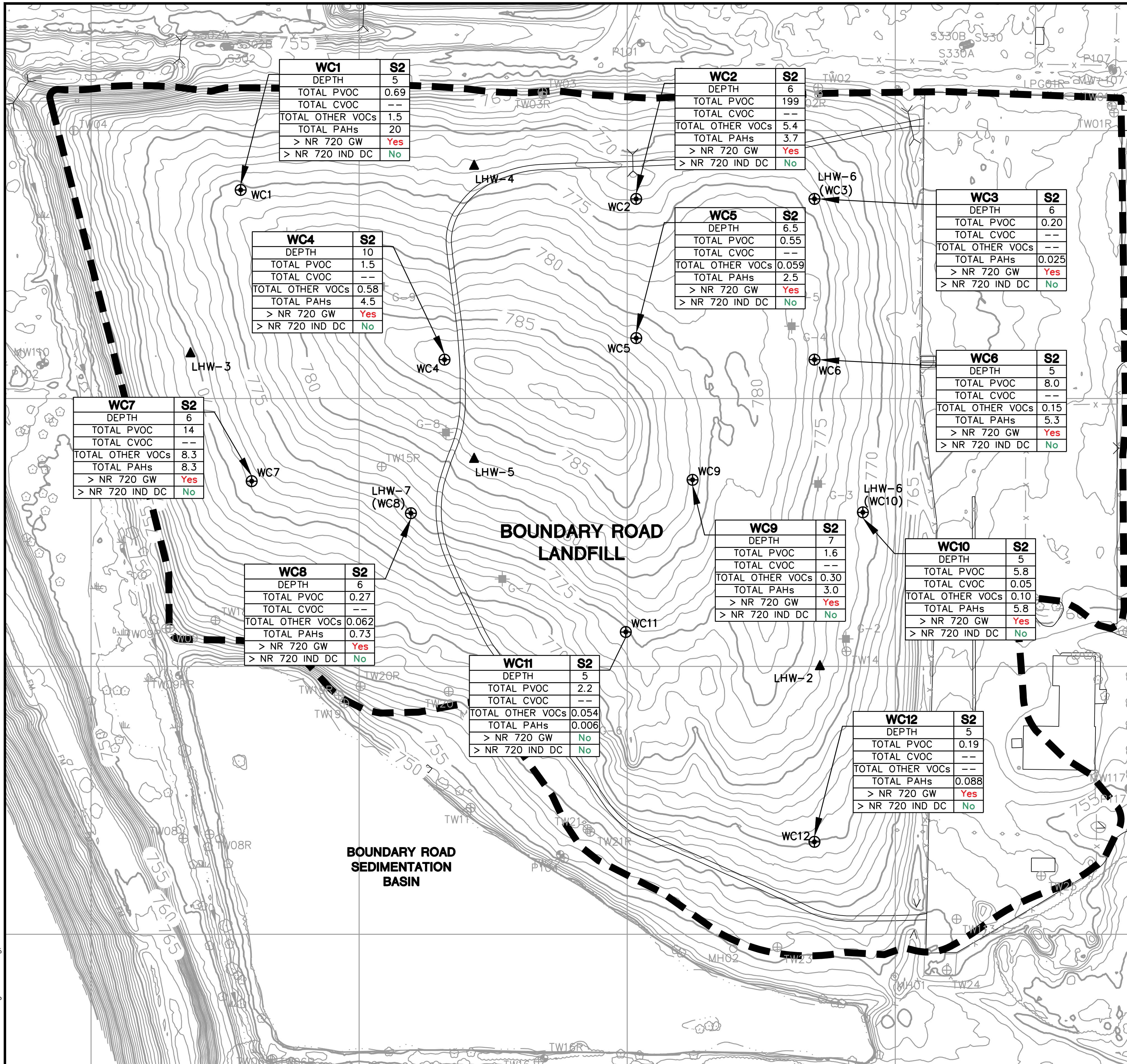

	WC1	WC2	WC3	WC4	WC5	WC6	WC7	WC8	WC9	WC10	WC11	WC12
	S2	S2	S2	S2	S2	S2	S2	S2	S2	S2	S2	S2
DEPTH	5	6	6	10	6.5	5	6	6	7	5	5	5
TOTAL PVOC	0.69	199	0.20	1.5	0.55	8.0	14	0.27	1.6	5.8	2.2	0.19
TOTAL CVOC	--	--	--	--	--	--	--	--	--	0.05	--	--
TOTAL OTHER VOCs	1.5	5.4	--	0.58	0.059	0.15	8.3	0.062	0.30	0.10	0.054	--
TOTAL PAHs	20	3.7	0.025	4.5	2.5	5.3	8.3	0.73	3.0	5.8	0.006	0.088
> NR 720 GW	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
> NR 720 IND DC	No	No	No	No	No	No	No	No	No	No	No	No

LEGEND

- PROPERTY LINE (WMWI)
- APPROXIMATE BOUNDARY ROAD LANDFILL LIMITS OF WASTE
- EXISTING CONTOUR (2' INTERVAL)
- EXISTING CONTOUR (10' INTERVAL)
- EXISTING TREE/TREELINE
- EXISTING FENCE
- EXISTING CULVERT
- EXISTING EDGE OF WATER/CREEK
- S213 — EXISTING MONITORING WELL
- TW18 — ABANDONED MONITORING WELL
- MH02 — EXISTING MANHOLE
- LEW-103R — EXISTING LEACHATE EXTRACTION WELL
- LHG104 — EXISTING GAS EXTRACTION WELL
- LPG5 — EXISTING GAS PROBE
- PW11E — EXISTING PRIVATE WATER SUPPLY WELL
- LHW-1 — EXISTING LEACHATE HEADWELL
- WC1 — WASTE CHARACTERIZATION BORING/NEW LEACHATE HEADWELL

GRADING LAYER RESULTS

WC1	S2	UNITS
DEPTH	5	FEET
TOTAL PVOC	0.69	mg/kg
TOTAL CVOC	--	mg/kg
TOTAL OTHER VOCs	1.5	mg/kg
TOTAL PAHs	20	mg/kg
> NR 720 GW	Yes	
> NR 720 IND DC	No	

> NR 720 GW = EXCEEDS NR 720 RESIDUAL CONTAMINANT LEVEL BASED ON THE GROUNDWATER PATHWAY.

> NR 720 IND DC = EXCEEDS NR 720 RESIDUAL CONTAMINANT LEVEL BASED ON THE INDUSTRIAL DIRECT CONTACT PATHWAY.

SEE COMPLETE RESULTS TABLE FOR LIST OF PARAMETERS INCLUDED IN TOTALS AND FOR INDIVIDUAL COMPOUND RESULTS.

NOTES

1. BASE MAP DEVELOPED FROM AN AERIAL SURVEY PREPARED BY SURDEX CORPORATION, ST. LOUIS, MISSOURI DATED MARCH 3, 2006.
2. TOPOGRAPHIC SURFACE BASED ON LIDAR SURVEY BY TRC, 2015.
3. TOPOGRAPHIC CONTOUR INTERVAL IS TWO FEET.
4. ELEVATIONS ARE BASED ON U.S.G.S. MEAN SEA LEVEL DATUM.
5. GRID BASED ON WISCONSIN STATE PLANE COORDINATE SYSTEM, SOUTH ZONE (NAD27).

200 0 200

SCALE: 1" = 200'

ANALYTICAL RESULTS MAP
GRADING LAYER

FIGURE 5

SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

ENGINEER

WASTE CHARACTERIZATION INVESTIGATION REPORT
BOUNDARY ROAD LANDFILL
MENOMONEE FALLS, WISCONSIN

SITE

DRAWN BY: KP
CHECKED BY: TK
APPROVED BY: SCC 02/17/2020

WASTE MANAGEMENT OF WISCONSIN, INC.
W132 N10487 GRANT DRIVE
GERMANTOWN, WI 53022

CLIENT

PROJECT NO. 25218040.01
DRAWN: 11/06/2019
REVISED: 02/14/2020

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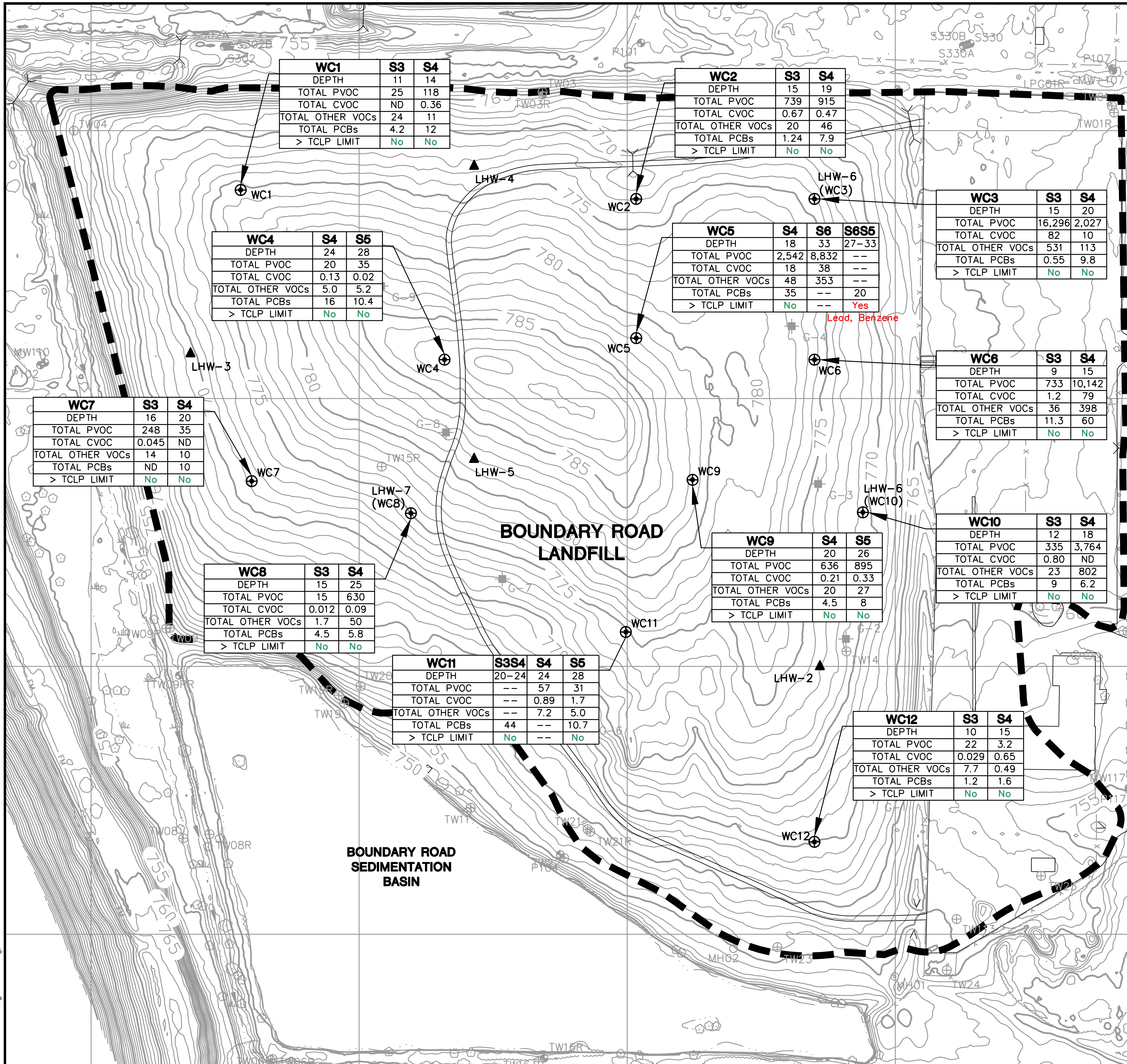

WC1	S3	S4
DEPTH	11	14
TOTAL PVOC	25	118
TOTAL CVOC	ND	0.36
TOTAL OTHER VOCs	24	11
TOTAL PCBs	4.2	12
> TCLP LIMIT	No	No

WC2	S3	S4
DEPTH	15	19
TOTAL PVOC	739	915
TOTAL CVOC	0.67	0.47
TOTAL OTHER VOCs	20	46
TOTAL PCBs	1.24	7.9
> TCLP LIMIT	No	No

WC3	S3	S4
DEPTH	15	20
TOTAL PVOC	16,296	2,027
TOTAL CVOC	82	10
TOTAL OTHER VOCs	531	113
TOTAL PCBs	0.55	9.8
> TCLP LIMIT	No	No

WC4	S4	S5
DEPTH	24	28
TOTAL PVOC	20	35
TOTAL CVOC	0.13	0.02
TOTAL OTHER VOCs	5.0	5.2
TOTAL PCBs	16	10.4
> TCLP LIMIT	No	No

WC5	S4	S6	S6S5
DEPTH	18	33	27–33
TOTAL PVOC	2,542	8,832	--
TOTAL CVOC	18	38	--
TOTAL OTHER VOCs	48	353	--
TOTAL PCBs	35	--	20
> TCLP LIMIT	No	--	Yes

Lead, Benzene

WC6	S3	S4
DEPTH	9	15
TOTAL PVOC	733	10,142
TOTAL CVOC	1.2	79
TOTAL OTHER VOCs	36	398
TOTAL PCBs	11.3	60
> TCLP LIMIT	No	No

WC7	S3	S4
DEPTH	16	20
TOTAL PVOC	248	35
TOTAL CVOC	0.045	ND
TOTAL OTHER VOCs	14	10
TOTAL PCBs	ND	10
> TCLP LIMIT	No	No

WC8	S3	S4
DEPTH	15	25
TOTAL PVOC	15	630
TOTAL CVOC	0.012	0.09
TOTAL OTHER VOCs	1.7	50
TOTAL PCBs	4.5	5.8
> TCLP LIMIT	No	No

WC9	S4	S5
DEPTH	20	26
TOTAL PVOC	636	895
TOTAL CVOC	0.21	0.33
TOTAL OTHER VOCs	20	27
TOTAL PCBs	4.5	8
> TCLP LIMIT	No	No

WC10	S3	S4
DEPTH	12	18
TOTAL PVOC	335	3,764
TOTAL CVOC	0.80	ND
TOTAL OTHER VOCs	23	802
TOTAL PCBs	9	6.2
> TCLP LIMIT	No	No

WC11	S3S4	S4	S5
DEPTH	20–24	24	28
TOTAL PVOC	--	57	31
TOTAL CVOC	--	0.89	1.7
TOTAL OTHER VOCs	--	7.2	5.0
TOTAL PCBs	44	--	10.7
> TCLP LIMIT	No	--	No

WC12	S3	S4
DEPTH	10	15
TOTAL PVOC	22	3.2
TOTAL CVOC	0.029	0.65
TOTAL OTHER VOCs	7.7	0.49
TOTAL PCBs	1.2	1.6
> TCLP LIMIT	No	No

LEGEND

- PROPERTY LINE (WMWI)
- APPROXIMATE BOUNDARY ROAD LANDFILL LIMITS OF WASTE
- EXISTING CONTOUR (2' INTERVAL)
- EXISTING CONTOUR (10' INTERVAL)
- EXISTING TREE/TREELINE
- EXISTING FENCE
- EXISTING CULVERT
- EXISTING EDGE OF WATER/CREEK
- S213 EXISTING MONITORING WELL
- TW18 ABANDONED MONITORING WELL
- MH02 EXISTING MANHOLE
- LEW-103R EXISTING LEACHATE EXTRACTION WELL
- LHG104 EXISTING GAS EXTRACTION WELL
- LPG5 EXISTING GAS PROBE
- PW11E EXISTING PRIVATE WATER SUPPLY WELL
- LHW-1 EXISTING LEACHATE HEADWELL
- WC1 WASTE CHARACTERIZATION BORING/NEW LEACHATE HEADWELL

WASTE SAMPLE RESULTS

WC1	S3	S4	UNITS
DEPTH	11	14	FEET
TOTAL PVOC	25	118	mg/kg
TOTAL CVOC	ND	0.36	mg/kg
TOTAL OTHER VOCs	24	11	mg/kg
TOTAL PCBs	4.2	12	mg/kg
> TCLP LIMIT	No	No	

SEE COMPLETE RESULTS TABLE FOR LIST OF PARAMETERS INCLUDED IN TOTALS AND FOR INDIVIDUAL COMPOUND RESULTS.

NOTES

1. BASE MAP DEVELOPED FROM AN AERIAL SURVEY PREPARED BY SURDEX CORPORATION, ST. LOUIS, MISSOURI DATED MARCH 3, 2006.
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5. GRID BASED ON WISCONSIN STATE PLANE COORDINATE SYSTEM, SOUTH ZONE (NAD27).

200 0 200

SCALE: 1" = 200'

FIGURE 6

ANALYTICAL RESULTS MAP WASTE

SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

SITE: WASTE CHARACTERIZATION INVESTIGATION REPORT
BOUNDARY ROAD LANDFILL
MENOMONEE FALLS, WISCONSIN

CLIENT: WASTE MANAGEMENT OF WISCONSIN, INC.
W132 N10487 GRANT DRIVE
GERMANTOWN, WI 53022

PROJECT NO.	25218040.01	DRAWN BY:	KP
DRAWN:	11/06/2019	CHECKED BY:	TK
REVISED:	02/14/2020	APPROVED BY:	SCC 02/17/2020

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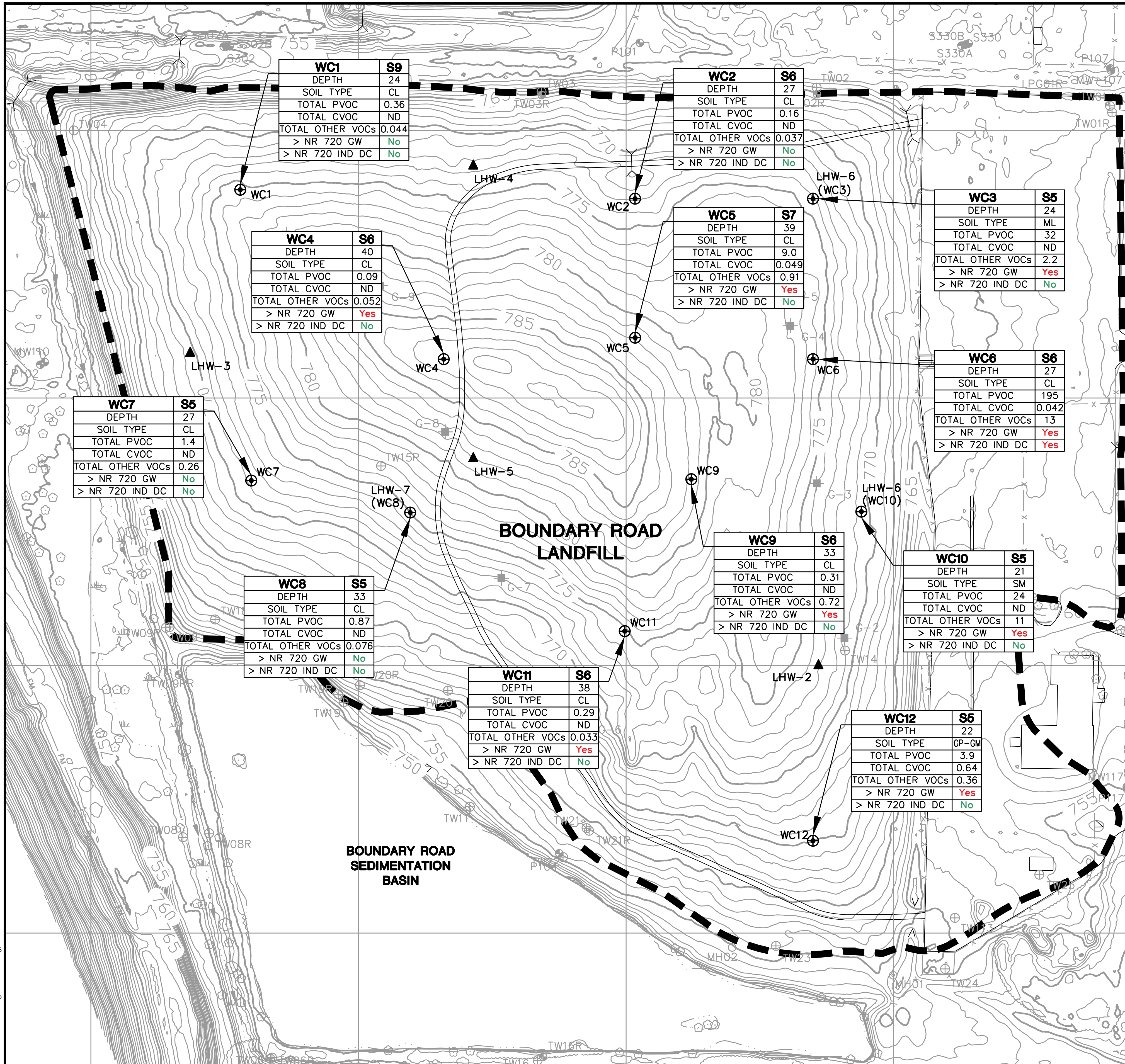

WC1	S9
DEPTH	24
SOIL TYPE	CL
TOTAL PVOC	0.36
TOTAL CVOC	ND
TOTAL OTHER VOCs	0.044
> NR 720 GW	No
> NR 720 IND DC	No

WC2	S6
DEPTH	27
SOIL TYPE	CL
TOTAL PVOC	0.16
TOTAL CVOC	ND
TOTAL OTHER VOCs	0.037
> NR 720 GW	No
> NR 720 IND DC	No

WC3	S5
DEPTH	24
SOIL TYPE	ML
TOTAL PVOC	32
TOTAL CVOC	ND
TOTAL OTHER VOCs	2.2
> NR 720 GW	Yes
> NR 720 IND DC	No

WC4	S6
DEPTH	40
SOIL TYPE	CL
TOTAL PVOC	0.09
TOTAL CVOC	ND
TOTAL OTHER VOCs	0.052
> NR 720 GW	Yes
> NR 720 IND DC	No

WC5	S7
DEPTH	39
SOIL TYPE	CL
TOTAL PVOC	9.0
TOTAL CVOC	0.049
TOTAL OTHER VOCs	0.91
> NR 720 GW	Yes
> NR 720 IND DC	No

WC6	S6
DEPTH	27
SOIL TYPE	CL
TOTAL PVOC	195
TOTAL CVOC	0.042
TOTAL OTHER VOCs	13
> NR 720 GW	Yes
> NR 720 IND DC	Yes

WC7	S5
DEPTH	27
SOIL TYPE	CL
TOTAL PVOC	1.4
TOTAL CVOC	ND
TOTAL OTHER VOCs	0.26
> NR 720 GW	No
> NR 720 IND DC	No

WC8	S5
DEPTH	33
SOIL TYPE	CL
TOTAL PVOC	0.87
TOTAL CVOC	ND
TOTAL OTHER VOCs	0.076
> NR 720 GW	No
> NR 720 IND DC	No

WC9	S6
DEPTH	33
SOIL TYPE	CL
TOTAL PVOC	0.31
TOTAL CVOC	ND
TOTAL OTHER VOCs	0.72
> NR 720 GW	Yes
> NR 720 IND DC	No

WC10	S5
DEPTH	21
SOIL TYPE	SM
TOTAL PVOC	24
TOTAL CVOC	ND
TOTAL OTHER VOCs	11
> NR 720 GW	Yes
> NR 720 IND DC	No

WC11	S6
DEPTH	38
SOIL TYPE	CL
TOTAL PVOC	0.29
TOTAL CVOC	ND
TOTAL OTHER VOCs	0.033
> NR 720 GW	Yes
> NR 720 IND DC	No

WC12	S5
DEPTH	22
SOIL TYPE	GP-GM
TOTAL PVOC	3.9
TOTAL CVOC	0.64
TOTAL OTHER VOCs	0.36
> NR 720 GW	Yes
> NR 720 IND DC	No

LEGEND

- PROPERTY LINE (WMWI)
- APPROXIMATE BOUNDARY ROAD LANDFILL LIMITS OF WASTE
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- LPG5 — EXISTING GAS PROBE
- PW11E — EXISTING PRIVATE WATER SUPPLY WELL
- LHW-1 — EXISTING LEACHATE HEADWELL
- WC1 — WASTE CHARACTERIZATION BORING/NEW LEACHATE HEADWELL

SOIL BELOW WASTE RESULTS

WC1	S9	UNITS
DEPTH	24	FEET
SOIL TYPE	CL	
TOTAL PVOC	0.36	mg/kg
TOTAL CVOC	ND	mg/kg
TOTAL OTHER VOCs	0.044	mg/kg
> NR 720 GW	No	
> NR 720 IND DC	No	

> NR 720 GW = EXCEEDS NR 720 RESIDUAL CONTAMINANT LEVEL BASED ON THE GROUNDWATER PATHWAY.

> NR 720 IND DC = EXCEEDS NR 720 RESIDUAL CONTAMINANT LEVEL BASED ON THE INDUSTRIAL DIRECT CONTACT PATHWAY.

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5. GRID BASED ON WISCONSIN STATE PLANE COORDINATE SYSTEM, SOUTH ZONE (NAD27).

200 0 200

SCALE: 1" = 200'

ANALYTICAL RESULTS MAP
SOIL BELOW WASTE

FIGURE 7

SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

ENGINEER

SITE: WASTE CHARACTERIZATION INVESTIGATION REPORT
BOUNDARY ROAD LANDFILL
MENOMONEE FALLS, WISCONSIN

DRAWN BY: KP
CHECKED BY: TK
APPROVED BY: SCC 02/17/2020

CLIENT: WASTE MANAGEMENT OF WISCONSIN, INC.
W132 N10487 GRANT DRIVE
GERMANTOWN, WI 53022

PROJECT NO. 25218040.01
DRAWN: 11/06/2019
REVISED: 02/14/2020

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