



Division of Public Works .
1000 South Houser St.
Muscatine, IA 52761

Recycling Center and Transfer Station

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MEMORANDUM

To: Mayor and City Council Members

Cc: Gregg Mandsager, City Administrator

From: Laura Liegois, Solid Waste Manager

Date: March 14, 2016

Recycling Center
Transfer Station
Landfill Operations
Refuse Collection

Re: Muscatine County Landfill Master Plan – Future Development Options

Introduction:

At the February In-depth council meeting, Tim Buelow of Barker Lemar Engineering gave an update on the Muscatine County Landfill and where we are at with the Ground Water Remediation Plan. At the In-Depth meeting, the future development of the next two landfill cells and the Master Plan concept were discussed as future projects.

Background:

Iowa Department of Natural Resources (Iowa DNR), requires that future development and plans be put in place for the Phase Five and Six landfill cells for our future use. In the fiscal year 2017-2018, Phase Five landfill cell will be constructed. Plans need to begin now on the design work and planning for the future landfill cells to get approval from Iowa DNR before we can bid out this project for next year.

Barker Lemar will follow the criteria of the Iowa DNR check list of items in cell design and planning for the Master Plan document. This plan will also investigate leachate storage and determine if we need to change from our current tank system to a lagoon system.

Staff did receive two options from Barker Lemar, which included Option A - design and planning for Phase Five and Six landfill cells or Option B- planning for Phase Five and Six landfill cells, which also expands over Ravine Five and Six (older landfill cells) The expansion of new lined landfill cells over the older ravine cells would allow for more air space for waste and could be a remediation plan for the Ground Water Remediation Plan. The cost of Option A is \$130,340.00 and Option B is \$199,960.00.

Recommendation for Master Plan for the Muscatine County Landfill:

Staff recommends at this time to move forward with Barker Lemar Engineering to do the Master Plan for the Muscatine County Landfill with Option A for \$130,340.00. Even though Option B has some benefits for our facility, we currently at this time do not know for certain our outcome for the Ground Water Remediation Plan. In the future, if we would like to address this area, we could do so, once we know our final plans for remediation and future landfill use.

**"I remember Muscatine for its sunsets. I have never seen any
on either side of the ocean that equaled them" — Mark Twain**



February 12, 2016

Ms. Laura J. Liegois, Solid Waste Manager
Muscatine Recycling Center and Transfer Station
1000 South Houser Street
Muscatine, Iowa 52761

**Re: Master Plan – Future Development Options
Muscatine County Sanitary Landfill
Permit No. 70-SDP-02-75P
Proposal No. 164102 (Revision 1)**

Dear Laura:

BARKER LEMAR ENGINEERING CONSULTANTS (BARKER LEMAR) appreciates the opportunity to provide permitting and engineering services to the Muscatine County Solid Waste Management Agency (Client) described as Master Plan – Future Development Options for the Muscatine County Sanitary Landfill (Landfill). The Client is considering one of two options for future landfill development: Option A includes development of the remaining Phases 5 and 6 only; and Option B includes development of Phases 5 and 6 as well as expansion into the area to the east, generally identified as Ravines 5 and 6.

1.0 PROJECT UNDERSTANDING

Recent communications with the Iowa Department of Natural Resources (DNR) regarding permitting, landfill development, financial assurance, and other criteria for the Landfill have been related to development of future Phases 5 and 6 cells (Option A). BARKER LEMAR believes additional benefits could be realized by expansion to the east during the development of Phases 5 and 6 (Option B).

Not only would Option B provide additional design capacity, which could decrease future financial assurance payments, but there are also economies of scale for the design that would be recognized. Further, there may be less tangible benefits that would be realized with the placement of a liner system over the existing Ravines 5 and 6.

Preliminary estimates indicate that the additional available airspace realized by implementation of Option B (beyond that available from Option A) will be approximately 793,167 cubic yards. Using a projected density of 1,100 lb/cy and projected usage rate of 38,655 tons per year (see September 2015 Airspace Report), the resulting additional tonnage is approximately 436,292 tons and landfill life would be extended by approximately 11.3 years. At the current fee of \$60 per ton, the total additional revenue would be approximately \$26,177,520.

DNR Meetings and Correspondence

On January 22, 2016, the DNR approved a proposed compliance schedule for submittal of a Master Plan for Phase 5 and 6 cells and a request for allowing use of the remaining capacity of Phases 5 and 6 for financial assurance until approval of the Master Plan.

The DNR has recently indicated that, in order for the Client to include the remaining landfill life based on the capacity of Phases 5 and 6 in its financial assurance documentation, a plan that meets all Chapter 113 criteria for building these cells must be submitted to and approved by the DNR. A plan that meets all Chapter 113 criteria is referred to as a Master Plan. The initial purpose of this proposal is to prepare a Master Plan for DNR to review with the anticipation of approval, so that the capacity of Phases 5 and 6 can be included in the financial assurance documents and so that Phases 5 and 6 can be constructed when needed.

A review of file information indicated that Phases 5 and 6 had been considered part of the facility since prior to the mid 1990's; however, since construction of these cells was years away, and the landfill rules had changed over time, detailed design and construction documents (i.e. Master Plan) had not been prepared. Now that DNR is requiring a Master Plan, it was important to identify which sections of Chapter 113 are considered approved and which still need to be addressed.

Consequently, on November 5, 2015, DNR and BARKER LEMAR met for the purpose of inventorying the existing file documents and identifying the documentation that required submittal. To prepare for this meeting, BARKER LEMAR compiled and reviewed historical documents, which were presented at the meeting for discussion. During the meeting, DNR staff handed out a document, Municipal Solid Waste Landfill Unit Construction Request, referred to as the Construction Checklist, to identify documentation necessary for its review. It should be noted that the Construction Checklist was developed by the DNR as a means to verify that all Chapter 113.7 and portions of Chapters 113.6, 113.8, 113.9, 113.10, and 113.12 criteria are met prior to issuing approval to construct a new cell. During the meeting, the DNR made it clear that, in order to include future cells (i.e., Phases 5 and 6) as remaining permitted capacity (RPC) for financial assurance, these cells must be approved for construction. In other words, the criteria in the Checklist and other Chapter 113 criteria, including items discussed during the meeting, must be submitted and approved by the DNR. Therefore, the Master Plan must address both the criteria in the Construction Checklist and the items identified and discussed during the November 5, 2015 meeting with DNR, which include the following:

- Checklist Information: According to the DNR, information identified in the Construction Checklist is to be submitted for all requests for approval to construct new cells. Checklist criteria that have already been approved can be referenced. For Phases 5 and 6, the following Checklist items have not been approved and must be addressed in the master plan, including:
 - Cell size, cell capacity, expected construction dates
 - Certain clearance updates (Note: See Meeting Information section below for further discussion.)
 - Cell design criteria:
 - Specifications and materials
 - Settlement calculations
 - Slope stability analysis

- Quality control and assurance criteria
- Operating requirements - (Note: the development and operations plan (DOPs) and the Emergency Response and Remedial Action Plan (ERRAP), etc. were addressed in the recent Permit Renewal Application so these can be referenced without re-submittal.)
- Air Quality and Landfill Gas (verification of Title 5 qualification)

A blank Construction Checklist is attached to this proposal (See Attachment A).

➤ Meeting Information: Additional Items identified during the November 5, 2015 meeting that must be addressed in the Master Plan include:

- Selected clearances (for which DNR is requiring additional information)
 - Wetlands: Check the National Wetlands Database for evidence of wetlands in the development area.
 - Threatened or endangered species: Compile documents for submittal to the DNR Environmental Review Program.
 - Separation from groundwater: Although this item is considered a clearance, it is discussed below in the design portion of the Master Plan.
- 7-day leachate storage:
 - For the existing leachate storage system, the Client is in the process of installing a flow monitoring system. Although both east and west underground leachate storage tanks are equipped with high level alarms, the DNR is requiring a means to alert the operator based on remaining time until the tanks are full (which requires a flow meter and an algorithm) to provide additional assurance of overflow prevention.
 - For future cells Phases 5 and 6, the DNR is requiring demonstration of compliance with the 7-day leachate storage requirement (113.7(5)"b"(11)). DNR is basing the 7-day storage requirement on the volume of leachate/storm water captured into a newly-constructed, empty cell generated by a design storm event shortly after filling of solid waste commences. Based on this volume requirement, siting, construction, and operation of a leachate storage lagoon will likely be required.
 - A task to address additional leachate management options, such as placement of plastic film over the leachate collection system, will be included in the Master Plan.
- Exposed liner and leachate collection layer: Repair or replacement and recertification of the exposed liner and leachate collection layers must be addressed.
 - BARKER LEMAR believes that reconstruction of this area during construction of the Phase 5 cell is the most cost-effective option. Alternatively, the effort required to delineate the area, obtain approval of a testing/quality assurance program, conduct the testing, submit the results and obtain DNR approval, is likely greater than the proposed reconstruction when considering the possibility that a repaired liner may not meet quality assurance criteria and may require reconstruction anyway.
- DNR placed an emphasis on demonstration that groundwater separation is being maintained or a design showing separation will be maintained. Groundwater separation is addressed below.

- Development of the current Phases 5 and 6 cell boundaries would not require changes to the HMSP, as Phases 5 and 6 are on the upgradient side of existing waste.

The meeting notes from the November 5, 2015 meeting with DNR have been attached to this proposal (See Attachment B).

Master Plan Highlights

Phase 5 and 6 Boundaries

In addition to the above items, BARKER LEMAR believes that under Option A, additional airspace may be available adjacent to the east side of the Phase 5 and 6 boundaries. This area (approximately 1.2 acres), similar to other portions of the Phase 5 and 6 cells, is underlain by existing waste, thus, it is unlikely that additional clearances or other site-related criteria would be required. Preliminary estimates indicate that up to 3 additional years of life at the current effective density and waste acceptance rates could be added to Phases 5 and 6. At the Client's discretion, the evaluation and inclusion of this area has been included in this proposal. Further investigation into this possibility may require a meeting with the DNR to confirm feasibility. This meeting is not part of the Option A portion of this proposal.

Groundwater Separation

Based on a review of the construction certification reports, design plans for Phases 1 through 4, and groundwater levels reported in the annual water quality reports, additional efforts to lower the groundwater levels to maintain separation of groundwater and the waste layer are likely not required. However, further investigation will be conducted during preparation of documentation to the DNR demonstrating that separation is being maintained.

According to Chapter 113.6(2)"i", the high water table must be used in the determination of groundwater separation. Instead of using an artificial water table consisting of the high water levels in each individual well, which is not representative of natural conditions, a statistical approach is proposed. BARKER LEMAR is proposing to use the 90th percentile static groundwater elevations from each well and match these elevations to the best-fit actual measurement event, based on available data. This method has previously been approved by the DNR for the purpose of determining the historic high water table. The 90th percentile value of the groundwater elevations for each applicable well will be calculated and the measurement event with the smallest average value will be selected as the representative event. It should be noted that although a groundwater measurement point (GU-401) has been designated to determine groundwater separation, limited data from this point is available. Nevertheless, establishment of the high water table would still be required.

Closure of Remaining Undocumented Areas

During an on-site meeting (September 17, 2015) with the Client, DNR, and BARKER LEMAR, the DNR indicated that it could not locate documentation sufficient to demonstrate that certain areas at the site, labeled as closed, had been properly closed. The DNR added a requirement in the operating permit, dated October 16, 2015, for the Client to conduct confirmatory soil thickness measurements of the identified areas on a 100-foot grid and to submit the results to the DNR by May 30, 2016. (See Special Provision X.10.a of permit). However, as discussed with the Client, this work is not included in this scope of services.

Survey Control and Topographical Surface Update

It is assumed that survey control will be updated to state plane coordinates and an updated topographical map is available prior to beginning cell and related designs. (Note: a separate proposal has been presented to the Client for this work.)

Future Phases

Although the approximate boundaries of Phases 5 and 6 have previously been established, these boundaries will be reevaluated for efficiency and design as discussed in the Phase 5 and 6 Boundaries Section above. In addition, the phasing and layout for the proposed cells over Ravines 5 and 6 (Option B) will be determined. Detailed individual designs will be developed for each phase. BARKER LEMAR proposes to address the design items listed below, which have been discussed with the DNR for Phases 5 and 6.

- Prior to operation, or concurrent with construction, operational controls (See 7-Day Leachate Storage Section above) and/or a leachate lagoon or other structure will need to be constructed to contain the maximum 7-day storage of leachate as required by 567 IAC 113.7(5)"I". The location and design of a leachate lagoon is included in the scope of work along with operational controls.
- A grading plan for the proposed cells will be prepared and will include a leachate collection system.
- An airspace summary will be prepared to provide approximate life of each cell and the soil material needed for construction and operation based on a predetermined density, usage rate, estimated shrink/swell percentage and current topographical information.
- According to the Air Quality Construction Permit for the landfill (Permit 11-A-072), the Client previously requested a limit 2,078,900 MG. Even with the additional capacity realized by implementation of Option B, the total capacity of the landfill should be less than the threshold level of 2.5×10^6 megagrams (MG) for triggering compliance with the New Source Performance Standards (NSPS). However, to account for a revised total capacity resulting from this proposed Master Plan design, preparation of an updated Design Capacity Report and application for a revised Air Quality Construction Permit are included as part of this scope. The deliverables in this scope item will not be prepared or submitted until after DNR approval of the Master Plan.
- Interim storm water management will be developed as part of the design of each phase progression. It is assumed that the existing, constructed storm water management system is adequate.
- The location restrictions (i.e., clearance requirements, 567 IAC 113.6(2)) were discussed with DNR during the November 5, 2015 meeting and it was agreed that only wetlands and threatened or endangered flora and fauna clearances need to be addressed. Since the expansion into Phases 5 and 6 are no closer than the previously permitted areas, no action is required for the remaining clearances. This scope of work assumes that no wetlands or threatened or endangered flora and fauna are present and limits the effort to the initial submittal of information to make this determination (See Selected Clearances Section, above). The scope of services does not include conducting studies, requests for approvals, findings of no significant impact, or other related documents.

- The permit renewal for the Landfill was approved on October 16, 2015 and included updated ERRAP and DOPS; therefore, further updating of these documents is not required and is not included in this scope of work.
- Although a Quality Control and Assurance (QC&A) Program for New Cell Construction was approved as part of the October 16, 2015 permit renewal, the program will be reviewed and updated to address other requirements in the Master Plan. A QC&A Program for Final Cover Construction will be prepared and included as part of the Master Plan.
- The DNR requires calculations to demonstrate that the leachate collection system will continue to function in the long term. According to standard practice, soil borings and settlement calculations by a geotechnical engineer will be required and are included as part of this scope.
- Selected slopes from the interim and closure configurations will be evaluated for slope stability.

Closure Plan

According to the DNR letter dated January 17, 2013 (DocDNA #75725) the closure plan submitted by HLW Engineering was approved in Permit Amendment #4 to the permit issued September 27, 2010. However, in light of the DNR's requests from the November 5, 2015 meeting, proposed changes in the cell geometry, and the fact that provisions for subsurface drainage and passive gas relief systems need to be included in the design, an updated closure plan will be prepared.

Areas of the landfill that have or will have received waste after the effective date of the current rules (December 10, 2007), fall under the current Chapter 113 rules for closure requirements. Pursuant to 567 IAC 113.12(1), any portion of a landfill that receives waste after the effective date of the rules must be closed with a final cover designed to:

- Have a permeability less than or equal to the permeability of any bottom liner system or 1×10^{-7} cm/sec, whatever is less,
- Include an infiltration layer component consisting of an 18-inch thick layer of compacted soil material,
- Include an erosion layer component consisting of a 24-inch thick layer of soil material capable of supporting native plant growth,
- Ensure that the infiltration and erosion layers have a combined minimum thickness of 42 inches,
- Have slopes between 5 percent and 25 percent.

It should be noted that management of storm water from the current and proposed unclosed areas (Phases 1-6) may necessitate construction of storm water structures within the downstream areas that are currently closed.

The closure plan for the landfill involves two different types of final caps based on the type of bottom liners, and are identified by the following:

- A. Closure Area A: The area to receive a final cover that includes an FML will be identified as Closure Area A. This area includes Phases 2, Phase 2 Abutment, Phases 3, 4, and future phases.

- B. Closure Area B: The area to receive a final cover without an FML component will be identified as Closure Area B. This area includes Phase 1 and Phase 1 Abutment. According to the final cover design documents (DocDNA #55064), the compacted clay component of the final cover must be compacted to a permeability of 4.7×10^{-8} cm/sec or less. In addition, the approved final cover design includes a geonet having a hydraulic conductivity of 33 cm/sec. Since standard reduction factors to represent field conditions were not applied to the geonet design, the DNR will require a modified design to achieve equivalency with the approved design. Historically, the DNR has approved the unit gradient method of demonstrating equivalency, which is proposed; however, in the event that DNR does not approve this method, the Client will be notified and recommendation(s) will be made.

Closure Areas A and B will require the following:

- Surface drainage (storm water) management system: the surface drainage system will be designed to safely remove storm water runoff from the areas undergoing closure, while directing storm water drainage away from the current active area.
- Seeding Plan: Establishment of a good stand of vegetation is necessary to reduce erosion of the newly constructed final cover. In addition, established vegetation intercepts precipitation, removes infiltrating water, and provides stability by the roots of the vegetation, all of which protect the final cover from unstable conditions. A program to sample the surface soils, disk, fertilize, seed, and mulch, will be prepared and included in the closure plan.

Closure Area A will require a final cover system that includes a geomembrane component. Utilization of a geomembrane requires consideration and application of the following systems:

- Landfill Gas Venting System: A geomembrane in the final cover will trap landfill gas produced during biodegradation of the solid waste in the landfill. One purpose of a landfill gas venting system is to reduce potential uplift of the final cover caused by the pressure of the trapped landfill gas beneath the geomembrane component of the final cover system. The uplifting pressure reduces the resistance to sliding friction resulting in conditions favorable for slope failure. The final cover design will include a gas venting system designed to reduce potential build-up of landfill gas pressure.
- Subsurface Drainage System: Because the geomembrane component of the final cover system is relatively close to the surface of the landfill, the potential for rapid build-up of water over the geomembrane due to precipitation events must be considered in the final cover design. Build-up of water over the geomembrane reduces the resistance to sliding friction, which reduces the stability of the overlying erosion layer component of the final cover, creating unstable slope conditions. The final cover design will include a subsurface drainage system designed to remove infiltrating precipitation to reduce potential build-up of water over the geomembrane.
- Slope Stability Analysis: Although each component of the final cover will be designed to accomplish its intended purpose (e.g., gas venting layer to remove gas, subsurface drainage system to remove water) the overall final cover design must demonstrate stability. Although any final cover design should include a slope stability analysis, incorporation of a geomembrane component (e.g. FML) in the final cover system makes slope stability a critical part of the design. A static slope stability analysis will be conducted for the final cover for the conditions in which

the individual components were designed. A dynamic slope stability analysis will be conducted for the conditions during construction and maintenance of the final cover.

The closure plan will include identification of the source, volume, and characteristics of cover material, an estimate of the largest area of landfill requiring a final cover, and an estimate of the maximum inventory of wastes on site over the life of the landfill facility.

2.0 SCOPE OF SERVICES

The scope of services includes the following tasks:

1. Selected Clearances
2. Future Cell Design
 - a. Cell grading and layout design
 - b. Cell phasing (configuration and volumes)
 - c. Groundwater underdrain design (if needed)
 - d. Leachate collection system design
 - e. (Groundwater and) leachate collection system piping
 - f. Abutment gas collection system design
 - g. Interim storm water management
 - h. Top of waste grades (phasing and final)
 - i. Siting and design of a leachate lagoon
 - j. Revised design capacity report and application for Air Quality Construction Permit
3. Quality Control and Assurance (QC&A) Program
 - a. New Cell
 - b. Final cover
4. Settlement Calculations
5. Slope Stability Calculations
6. Closure Plan
 - a. Final cover
 - b. Storm water management plan
 - c. Subsurface drainage (geocomposite drainage layer, collection pipes, outlets, etc.)
 - d. Passive landfill gas venting system design
 - e. Phased closure plan (coordinate with cell phasing)
 - f. Closure plan requirements (soil material, ultimate capacity, etc.)
 - g. Seeding plan
7. Post closure plan
8. Construction Approval Request (Construction Checklist)
9. Request for Permit Amendment and Approval to Construct
10. Meet with DNR (Option B)

Each task is discussed in greater detail below.

Task 1 – Selected Clearances

This task requires the following actions:

- A. Check the National Wetlands Database for evidence of wetlands within the development area.
- B. Compile documentation for submittal to the DNR Environmental Review Program for verification of the presence of threatened or endangered species (TES) of flora or fauna within the development area.

Notes:

1. *Task 1A assumes that the National Wetlands Database will indicate no evidence of wetlands within the development area. If evidence of wetlands is indicated within the development area, and if a state or federal agency requests submittal of information, the Client will be notified, recommendation(s) made, and a change order for the extra work prepared.*
2. *Task 1B assumes that the DNR Environmental Review Program will determine that there is no evidence of TES within the development area. If TES is determined to be present, or if additional information is required, the Client will be notified, recommendation(s) made, and a change order for the extra work prepared.*
3. *Task 1B does not include surveys for Indiana Bat and Northern Long-Eared Bat habitat. If habitat for either Indiana Bats and/or Northern Long-Eared Bats is present, a presence/probable absence survey will be required, which is not part of this scope. In such case, the Client will be notified, recommendation(s) made, and a change order for the extra work prepared.*

Task 2 – Future Cell Design

Design of Future Cells, includes:

- Cell grading, layout, and orientation (footprint to be determined)
- Cell development phasing
- Groundwater separation documentation
- Leachate collection system design
- Leachate piping: layout and orientation of pipes in each cell
- Geogrid design
- Storm water (interim, for final, see closure): storm water plan for each cell
- Top of waste grades: top of waste contours for each cell phase and final for overall facility
- Slope stability analysis for interim (prior to closure) slopes; slope stability for closure (top of waste) slopes
- Details of the following:
 - location of valves, cleanouts, leachate and groundwater piezometers
 - leachate system details
 - liner, storm water, and final cover details
 - phasing details showing connection to adjacent cells and perimeter details
- Siting and design of a leachate lagoon for 7-day storage
- Operational controls for leachate generation

Deliverables:

List of Plan Sheets

- Cover sheet with vicinity map and table of contents
- Site Map (based on updated survey control)
- Legend
- Proposed revised liner grades – show extended liner and pipes

- Liner and leachate collection details (liner, anchor trench)
- Detail showing removal/replacement limits of the exposed liner
- Other details as needed
- Leachate collection system design (show extended pipes, flowline elevations, valves, manholes, etc. for extended cells)
- Leachate collection system details (trench, pipe perforations, piezometers, etc.)
- Abutment liner gas relief system
- Abutment liner gas relief system details
- Phasing details (cell to cell construction)
- Phasing details (cell to cell construction)
- Leachate lagoon design
- Leachate lagoon design details
- Cell development progression for Phase 5
- Cell development progression for Phase 6
- Final top of waste contours
- Airspace Summary

Notes:

1. *The area identified as "exposed liner and leachate collection layer" will be shown on a plan sheet and will be included in the Phase 5 liner and leachate collection system construction.*
2. *Plan sheets for major calculations or demonstrations, including settlement analysis and slope stability calculations, will be provided in the respective appendices.*
3. *For Option B, the plan sheets will vary from the list above. It is expected that future cells beyond Phases 5 and 6 will be grouped into no more than 4 cell development progressions.*

List of Calculations

- Leachate Collection System Design (head over liner and recirculation):
BARKER LEMAR will use the Hydrologic Evaluation of Landfill Performance (HELP) Model to calculate the depth of leachate head over the liner design using historic average monthly precipitation and temperature data from a local weather station. The HELP Model will also be used to determine whether leachate can be recirculated in the future cells while maintaining less than one foot of leachate over the liner in general accordance with IAC 567-113.7(5)"b"(4).
- Leachate Lagoon:
Based on the 7-day storage requirement, the design of a leachate lagoon or other additional mechanism will be required. Costs are included for a leachate lagoon based on the 7-day storage requirement (567 IAC 113.7(5)"b"(11).
- Storm Water Management:
Calculations for interim storm water controls (ditches, culverts, and diversion terraces) will be conducted.
- Pipe Capacity:
The required capacity for leachate pipes will be based on the leachate impingement rate calculated by the HELP Model. The required capacity will be compared to the ultimate capacity of the pipe for design.

- **Pipe Strength:**
The required strength of HDPE pipe will be based on the maximum design loading and manufacturer-recommended limits.
- **Settlement Analysis:**
The bottom liner and leachate collection system components of the future Phase 5 and 6 cells will be analyzed for performance after applying calculated total settlements. See Task 4. Note that a geogrid is proposed within the proposed abutment areas; therefore, a refrigerator calculation for local settlement is not required.
- **Slope Stability Analysis:**
Selected slopes occurring during interim and closure configurations of Phases 5 and 6 will be evaluated for slope stability. See Task 5.
- **Abutment Gas Collection System Design:**
A passive gas collection system will be required to alleviate potential build-up of landfill gas pressure beneath overlying geomembrane abutment liners.

Other Documentation

- **Design Capacity Report:**
The total capacity of the landfill will be calculated to include the Master Plan design. Submittal to the DNR will occur upon DNR approval of the request for permit amendment.
- **Air Construction Permit:**
Since the total capacity of the landfill will be adjusted, the Air Construction Permit must be updated to reflect the change. A request for updated Air Construction Permit will be prepared and submitted to the DNR upon approval of the request for permit amendment.

A narrative discussion will be provided for the above calculations.

Note:

1. For permanent storm water design following final cover design, see Task 6 Closure Plan.

Task 3 – Quality Control and Assurance Program

BARKER LEMAR will review the QC&A Program for New Cell Construction submitted as part of the landfill permit application, which was approved in the landfill permit issued October 16, 2015. If any updates to the QC&A Program are needed, an update will be included with the Master Plan. In addition, since the Master Plan will include an updated closure plan, a QC&A plan for final cover construction will be prepared.

Deliverables:

- QC&A Program for New Cell Construction
 - Standard composite liner
 - Composite abutment liner over existing waste
- QC&A Program for Final Cover Construction
 - Final cover over alternatively lined areas
 - Final cover with geomembrane component (FML)

Task 4 – Settlement Calculations

BARKER LEMAR will provide information in general accordance with 567 IAC 113.7(4)“b” and “c”, which requires calculations to demonstrate that the material beneath the landfill has sufficient strength to support the weight of the landfill and that the loading and total settlement will not cause failure of the liner and leachate collection system.

The liner and leachate collection system components of the future cells will be analyzed for performance after applying calculated total settlements.

Historic data and information from a subsurface investigation (drilling) will be used to characterize subsurface soils and to calculate settlements. On-site drilling, laboratory soil testing, strength analysis of selected strata, and boring logs, will be completed by a geotechnical engineer subconsultant.

Calculated settlements will be applied at selected points (up to 10 for Option A and 22 for Option B) in the leachate collection system and a determination of the long-term function of the liner and leachate collection system of the future expansion area will be assessed. Calculations will include the post-settlement liner strain and pipe slopes, and results will be submitted to the DNR.

Refrigerator calculation will not be needed as a geogrid will be installed.

Notes:

- 1. If the settlement calculations indicate unsuitable conditions, the findings will be submitted to the Client with a recommendation(s) along with a change order to evaluate design modifications to achieve stable foundation conditions.*
- 2. If, as recommended by the geotechnical engineer, additional settlement point analyses are required, the Client will be billed at a per-point fee of \$120.00.*

Deliverables:

- Geotechnical Report (Subconsultant)
- Settlement Calculations
 - Estimated effect on pipe and liner slopes
 - Estimated liner strain
- Settlement Narrative
 - Settlement Report
 - Plan sheet showing the location of the analyzed settlement points
 - Plan sheet showing cross-sections for the settlement points.
 - BARKER LEMAR interpretation and recommendation

Task 5 – Slope Stability Calculations

BARKER LEMAR will provide slope stability analyses in general accordance with 567 IAC 113.7(7), which requires calculations to demonstrate that the MSWLF unit will not cause slope failures.

Global (or circular) static slope stability analysis will be conducted to analyze a slope for the potential of a local, deep-seated or global failure. This can happen when the build-up of waste exerts stress on the underlying soil such that the conditions for a rotational failure can occur. A block analysis will be conducted to analyze a slope that contains a known weak layer. Such conditions generally exist when

geomembrane liners and other geosynthetic components are proposed along a slope and represent a potential failure surface.

Analysis will be conducted on selected interim slopes for static global and block stability. For Option A, it is anticipated that up to two interim slopes along alignments from Phase 5 at top of waste and Phase 6 at base grades will be analyzed. This represents the worst case scenario for Phases 5 and 6. Note that the top of waste for Phase 6 represents final top of waste at landfill closure. Analysis will be conducted on slopes at closure grades for both global and block stability. It is anticipated that up to three locations will be selected for global and block analyses.

For Option B, it is anticipated that up to three interim slopes and three slopes at closure grades will be analyzed. Analysis will be conducted on the slopes for both global and block stability.

The global analysis of the closure condition cover will likely require extension of the alignment outside the permitted area to allow for complete analysis. In the event that an analyzed interim slope indicates instability, a total of two iterations will be analyzed. Iterations of general design or operational measures will be attempted to obtain stability, including, reducing the upslope thickness, enlarging a buttress, or reducing the proposed depth of an adjacent cell. If, after the iterations, stability is not indicated, the actions in Note 1 below will be taken.

Slope stability analyses will be conducted based on factors affecting slope stability, including current and future landfill slopes and adjacent excavations for borrow areas, drainage, or other known factors. Also, the slope stability-related material properties and groundwater information must be known or estimated. The material properties for in-situ soils, soils used for landfill construction and groundwater information will be based on currently available historic data. The slope stability characteristics of proposed geomembranes, geotextiles, engineered clay liners, and other engineered layer materials will be based on information from the subsurface exploration (drilling) data from Task 4, and from laboratory data from other landfill facilities and incorporated into the analyses.

The slope stability program SLIDE, by Rocscience, will be used for analysis.

In addition, a dynamic slope stability analysis will be conducted for conditions when heavy equipment is operating on a slope. Slopes will be analyzed for the conditions of filling operations and for construction of the final cover. Up to three combinations of construction equipment likely to be used during operations and to construct the final cover will be selected; the combination with the estimated greater potential to cause unstable slope conditions will be analyzed. Identification of the equipment analyzed and the results of the dynamic slope stability analyses with interpretation of the results will be included in the report.

Slope stability calculations for the final cover integrity will be performed using the factor of safety equation presented by Richard Thiel in "Design Methodology for a Gas Pressure Relief Layer Below a Geomembrane Landfill Cover to Improve Slope Stability", Geosynthetic International, 1998. The equation will be utilized to determine minimum acceptable values for cohesion/adhesion and interface friction angles based on a factor of safety value of 1.5.

Because the final cover includes an FML, landfill gas can build up beneath the FML creating an uplift pressure on the final cap. A veneer analysis, using the Thiel Equation, will be conducted to determine the allowable pressure build-up beneath the final cover based on a minimum factor of safety of 1.5. The results will determine the allowable gas pressure beneath the FML, which will be incorporated into the design of the passive gas venting system for the final cover.

Notes:

1. *The proposed slope stability analysis does not include implementation of designs or measures to achieve stability other than those described above. In the event that slope stability analysis indicates that areas indicate potential instability, the findings will be submitted to the Client with a recommendation(s) along with a change order for design modifications to achieve stability.*

Deliverables:

- Up to three plan sheets to identify the location of the interim and closure slope alignments.
- SLIDE analysis and summary output files.
- Slope stability narrative.

Task 6 – Closure Plan

BARKER LEMAR will provide a closure plan in general accordance with 567 IAC 113.12. As explained in Section 1.0, Closure Area A will require a geomembrane component as part of the final cover, and Closure Area B will require a soil final cover. The closure plan will address final cover design and other closure criteria for each of the two closure areas.

- Final cover design and configuration
 - Final cover with geomembrane component
 - Subsurface drainage system
 - Subsurface drainage layer design
 - Subsurface drainage collection and discharge system
 - Passive gas relief system
 - Passive gas layer design
 - Passive gas collection (trench) and vent design
 - Final cover over soil lined area
- Storm water management
 - Location, capacity, and design of terraces, letdowns, ditches, culverts, or other storm water control structures
 - Scour protection (erosion control) for storm water structures
- Seeding Plan

Deliverables:**List of Plan Sheets.**

- Final Cover (two designs: Area A – geomembrane component; Area B – alternative liner specs)
- Final Cover details (two designs)
- Subsurface drainage system
- Subsurface drainage system details
- Storm water controls
- Storm water controls details
- Landfill gas venting system
- Landfill gas venting system details

Note:

1. *The plan sheets may vary from the list above.*

List of Calculations:

- Subsurface drainage system – Area A:
Drainage structures and appurtenances will be designed to maintain a maximum flow depth over the final cover geomembrane. The subsurface drainage system will consist of a drainage layer, collector pipes, and discharge pipes.
- Passive gas venting system – Area A:
The passive venting system will consist of a venting layer, collection trenches, and discharge vents in the Area A closure area. The design criteria are based on reduction of potential pressure build-up on the overlying final cover.
- Identification of the source, volume, and characteristics of cover material – Areas A and B:
The volume of soil material needed to construct the cells and final cover will be calculated. The available borrow from cell excavation and the borrow areas will be calculated to estimate the soil balance for each cell construction phase.
- The storm water control system to be in place at closure and during the post-closure period will be designed based on a 100-year, 24-hour storm and will include the use of terraces and letdowns to safely convey storm water drainage off the final cover – Areas A and B. Culverts and other appurtenances will be designed to allow maintenance. Permanent measures will be designed to protect the final cover.
- An estimate of the largest area of the MSWLF unit requiring a final cover – Areas A and B.
- An estimate of the maximum inventory of wastes on site over the life of the landfill facility – Areas A and B and closed areas: The maximum inventory of waste on site over the active life of the landfill will be calculated based on volume and tonnage. This estimated total inventory will be based, in part, on the current Design Capacity Report, if available.

A narrative discussion will be provided that addresses the criteria of 567 IAC 113.12 and that addresses each of the above calculations.

Task 7 – Postclosure Plan

BARKER LEMAR will provide a postclosure plan in general accordance with 567 IAC 113.13. The postclosure plan will address the following areas: maintaining the integrity and effectiveness of the final cover; maintaining and operating the leachate collection system; monitoring the groundwater; and maintaining and operating the gas monitoring system.

Deliverables:

- Postclosure maintenance and monitoring schedule
- Facility contact information

Task 8 – Construction Approval Request (Construction Checklist)

BARKER LEMAR will prepare for submittal to the DNR, a request for approval to construct and a DNR Municipal Solid Waste Unit Construction Request (construction checklist). This task addresses the criteria described in Section 1.0 Project understanding.

Deliverables:

- Construction approval request checklist

Task 9 – Request for Permit Amendment and Approval to Construct

BARKER LEMAR will prepare for submittal to the DNR, a request for permit amendment for the purpose of obtaining approval of the Master Plan comprised of the documentation included in this scope of services. The submittal will also include a request to construct future cells. These requests will include a cover letter, a summary of the Master Plan, and appendices containing the deliverables in each task, and the associated report.

Deliverables:

- Cover letter containing a request for approval of a permit amendment that includes a request for approval to construct.
- General Master Plan summary
- Appendices containing the deliverables under each task and associated report.

Task 10 – Meet with DNR (Option B)

BARKER LEMAR will prepare for and lead a meeting with the DNR, as recommended pursuant to 567 IAC 113.7(1) with regard to new designs and as required on the Construction Approval Checklist. The purpose of this meeting is to discuss design and submittal requirements for Option B, which have not been previously discussed with the DNR. Following the meeting, a summary memo will be prepared and submitted to the Client and the DNR.

Deliverables:

- Summary memo.

4.0 SCHEDULE

BARKER LEMAR will begin these services upon receiving the signed Confirmation of Notice to Proceed, or the Client's verbal authorization followed by the signed Notice to Proceed. Barring circumstances beyond BARKER LEMAR'S control, including but not limited to Client review times and Client/DNR availability for meetings, BARKER LEMAR anticipates completing the scope of services by November 1, 2016 if authorization from Client is received by March 15, 2016.

5.0 COMPENSATION

The compensation for the proposed scope of services is located in Table 1 and is valid for 60 days following the date of this proposal. Although fees are shown by task, the compensation for individual tasks are not independent of each other, and elimination of any task or part of a task shall justify a review and potential adjustment of the compensation for the remaining scope of services. Our invoices will be submitted monthly and will reflect the percentage complete of each task as of the date of the invoice.

6.0 HEALTH AND SAFETY

This proposal assumes that Level D safety precautions are adequate. Level D safety attire generally consists of a normal work uniform including safety shoes, hard-hat where required, and appropriate eye protection. A health and safety plan will be developed for the site. The costs will be adjusted accordingly if site specific conditions require more stringent health and safety procedures. BARKER LEMAR staff will adhere to the BARKER LEMAR Companies' Confined Space Program in all circumstances which may require worker entry into confined spaces and permit-required confined spaces to perform routine tasks associated with the performance of contracted services for the Client. This Program is designed to provide the minimum safety requirements in accordance with the Occupational Safety and Health Administration's (OSHA) Confined Space Standard, 1910.146.

7.0 CONDITIONS

Items to be provided by the Client include the right-of-entry for BARKER LEMAR and/or its subconsultants to conduct site reconnaissance, inspections, sampling operations, or other on-site activities requested by the Client. The Client is responsible for making BARKER LEMAR aware of any restrictions or special requirements regarding the site and its required activities prior to the commencement of the fieldwork. Items to be provided by Client include access to information pertinent to the reviews and reports discussed herein. The tasks in this Proposal are based on the assumption that the majority of this information is currently available. We have enclosed our Terms and Conditions that should be considered part of this proposal.

CONFIRMATION OF NOTICE TO PROCEED

Proposal No. 164102 (Rev. 1)

The above proposal and attached Terms and Conditions are understood and accepted.

BARKER LEMAR ENGINEERING CONSULTANTS (BARKER LEMAR) agrees to perform and complete the following Services for the Client at its facility located at Muscatine, Iowa.

The Scope of Services is described as Master Plan – Future Development Options and will include other technical and/or administrative services as outlined in this Proposal.

BARKER LEMAR agrees to perform the above scope of services for a total compensation of the following (Please check one):

- \$130,340.00 for Option A as shown on Table 1, or
- \$199,960.00 for Option B, as shown on Table 1.

The Client will be invoiced for the percent of project completed at the time of the invoice. The compensation for the proposed Scope of Services is valid for 60 days following the date of this proposal.

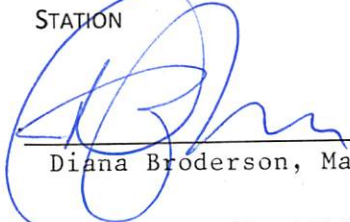
If this Proposal meets with your approval, sign two originals of this Confirmation of Notice to Proceed, retain one original for Client files, and return one original or copy via email, fax to 515.256.0572, or U.S. mail to BARKER LEMAR Engineering Consultants, 1801 Industrial Circle, West Des Moines, IA 50265.

If you have questions regarding any of the information above, please contact one of the authorized signers below at 515.256.8814 or 800.707.4248.

FOR BARKER LEMAR ENGINEERING CONSULTANTS

FOR MUSCATINE RECYCLING CENTER AND TRANSFER STATION





David G. Phillips, P.E.
Project Engineer
Date: February 12, 2016
dphillips@barkerlemar.com

Diana Broderson, Mayor
Date: March 17, 2016
Email: dbroderson@muscatineiowa.gov



Brian L. Rath, P.E.
Project Manager
Date: February 12, 2016
brath@barkerlemar.com

Copies: Addressee (2)
File

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**TABLE 1
COST SUMMARY
MASTER PLAN – FUTURE DEVELOPMENT OPTIONS
MUSCATINE COUNTY SOLID WASTE MANAGEMENT AGENCY
PROPOSAL NO. 164102**

TASK	SCOPE ITEM	OPTION A TOTAL COST (\$)	OPTION B TOTAL COST (\$)
1	<i>Selected Clearances</i>	\$1,440	\$1,440
2	<i>Future Cell Design</i>	\$49,910	\$85,000
3	<i>Quality Control and Assurance (QC&A) Program</i>	\$2,830	\$2,830
4	<i>Settlement Calculations</i>	\$16,930	\$24,200
5	<i>Slope Stability Calculations</i>	\$13,700	\$16,800
6	<i>Closure Plan</i>	\$38,180	\$58,900
7	<i>Postclosure Plan</i>	\$1,090	\$1,090
8	<i>Construction Approval (Checklist)</i>	\$1,570	\$1,570
9	<i>Request for Permit Amendment and Approval to Construct</i>	\$4,690	\$5,630
10	<i>Meet with DNR</i>	NA	\$2,500
	TOTAL POTENTIAL SCOPE:	\$130,340	\$199,960

Attachment A

Construction Checklist

Iowa Department of Natural Resources Municipal Solid Waste Unit Construction Request

Submittal Date:

Sanitary Disposal Project:	Engineer:
Permit Number:	Engineering Firm:
Contact Person:	Firm Address:
Address:	Firm Telephone:
Telephone:	Email:
Email:	

		Check Box for Source →	√	√
Construction Request Status	Yes/No/NA	Comment, Value and/or Date	Owner	Eng.
1. Has the cell design been previously approved via permit or amendment? Date.			<input type="checkbox"/>	<input type="checkbox"/>
2. Has this project been through public notice? Date.			<input type="checkbox"/>	<input type="checkbox"/>
3. Provide cell name to be constructed and estimated lifespan.			<input type="checkbox"/>	<input type="checkbox"/>
4. Has the overall MSWLF Unit design been approved, which includes the proposed cell? Date.			<input type="checkbox"/>	<input type="checkbox"/>
5. Expected Construction Start Date (month/year)			<input type="checkbox"/>	<input type="checkbox"/>
6. Expected Construction Finish Date (month/year)			<input type="checkbox"/>	<input type="checkbox"/>
7. Remaining Capacity in Existing Constructed Cells (CuYd)			<input type="checkbox"/>	<input type="checkbox"/>
8. Proposed Cell Area (acres)			<input type="checkbox"/>	<input type="checkbox"/>
9. Proposed Cell Waste Fill Volume (CuYd)			<input type="checkbox"/>	<input type="checkbox"/>
Siting	Yes/No/NA	Comment, Value and/or Date	Owner	Eng.
1. List date of siting approval:			<input type="checkbox"/>	<input type="checkbox"/>
2. Each construction request triggers an update of:				
a. 113.6(2) "a" Airports			<input type="checkbox"/>	<input type="checkbox"/>
b. 113.6(2) "b" Floodplains			<input type="checkbox"/>	<input type="checkbox"/>
c. 113.6(2) "f" Unstable Areas			<input type="checkbox"/>	<input type="checkbox"/>
d. 113.6(2) "i" Separation from Groundwater			<input type="checkbox"/>	<input type="checkbox"/>

		Check Box for Source →	√	√
Design Content Template	Yes/No/NA	Location in Design Report or Value or Date	Owner	Eng.
1. 113.7(1) Pre-design Meeting			<input type="checkbox"/>	<input type="checkbox"/>
2. 113.7(2) "a" Plans and Specifications			<input type="checkbox"/>	<input type="checkbox"/>
3. 113.7(3) General Site Design - Any changes?			<input type="checkbox"/>	<input type="checkbox"/>
4. 113.7(4) Subgrade				
a. Field Observations – Addressed in quality control and assurance plan?			<input type="checkbox"/>	<input type="checkbox"/>
b. Strength of Materials – List minimum factor of safety for slope stability.			<input type="checkbox"/>	<input type="checkbox"/>
c. Settlement or Swell Calculations			<input type="checkbox"/>	<input type="checkbox"/>
d. Subgrade Removal – Addressed in quality control and assurance plan?			<input type="checkbox"/>	<input type="checkbox"/>
e. Frozen Materials - Addressed in quality control and assurance plan?			<input type="checkbox"/>	<input type="checkbox"/>
f. Details of Groundwater Control, if used:			<input type="checkbox"/>	<input type="checkbox"/>
1. Type of System			<input type="checkbox"/>	<input type="checkbox"/>
2. Thickness			<input type="checkbox"/>	<input type="checkbox"/>
3. Material(s)			<input type="checkbox"/>	<input type="checkbox"/>
4. Piezometer			<input type="checkbox"/>	<input type="checkbox"/>
5. Name of Outfall (to be added to HMSF)			<input type="checkbox"/>	<input type="checkbox"/>
6. Drainage Area per Outfall (acres)			<input type="checkbox"/>	<input type="checkbox"/>
7. Modeling or Calculations that Separation will be Attained under Entire Cell			<input type="checkbox"/>	<input type="checkbox"/>
5. 113.7(5) MSWLF Unit Liners and Leachate Collection Systems.				
a. Alternative liner design – list date of approved design			<input type="checkbox"/>	<input type="checkbox"/>
b. Any soil amendments proposed?			<input type="checkbox"/>	<input type="checkbox"/>
1. If yes, submit method of placement and include in quality control and quality assurance plan			<input type="checkbox"/>	<input type="checkbox"/>
c. Recompact Clay Liner				
1. Source of Soil			<input type="checkbox"/>	<input type="checkbox"/>
2. Proposed Number and Location of In Situ Hydraulic Conductivity Tests and Statistical Significance of Testing			<input type="checkbox"/>	<input type="checkbox"/>
3. List Required Hydraulic Conductivity			<input type="checkbox"/>	<input type="checkbox"/>
4. Proposed Number and Location of Moisture/Density tests and Statistical Significance of Testing			<input type="checkbox"/>	<input type="checkbox"/>
5. Thickness of Liner			<input type="checkbox"/>	<input type="checkbox"/>

Design Content Template	Yes/No/NA	Check Box for Source → Location in Design Report or Value or Date	√	√
			Owner	Eng.
6. Maximum Liner Slope			<input type="checkbox"/>	<input type="checkbox"/>
7. Minimum Liner Slope			<input type="checkbox"/>	<input type="checkbox"/>
d. Flexible Membrane Liner				
1. Material and Thickness			<input type="checkbox"/>	<input type="checkbox"/>
2. Texture			<input type="checkbox"/>	<input type="checkbox"/>
3. Smoothness of Subgrade			<input type="checkbox"/>	<input type="checkbox"/>
4. Location and Frequency of Destructive Testing			<input type="checkbox"/>	<input type="checkbox"/>
e. If proposing a geonet/drainage media system include specifications:				
1. List Geonet Transmissivity.			<input type="checkbox"/>	<input type="checkbox"/>
2. Provide Evaluation of Geonet Performance under Field Conditions			<input type="checkbox"/>	<input type="checkbox"/>
3. Overlying Drainage Media			<input type="checkbox"/>	<input type="checkbox"/>
a. Thickness			<input type="checkbox"/>	<input type="checkbox"/>
b. Hydraulic Conductivity			<input type="checkbox"/>	<input type="checkbox"/>
f. Drainage Material other than Non-calcareous Sand or Gravel			<input type="checkbox"/>	<input type="checkbox"/>
1. If tire chips are proposed, provide detailed material quality control and assurance plan.			<input type="checkbox"/>	<input type="checkbox"/>
2. If auto shredder residue is proposed, provide plan to demonstrate that material is non-hazardous.			<input type="checkbox"/>	<input type="checkbox"/>
g. Granular Drainage Media				
1. Size			<input type="checkbox"/>	<input type="checkbox"/>
2. Hydraulic Conductivity			<input type="checkbox"/>	<input type="checkbox"/>
3. Maximum Fines Content (Passing #200 Sieve)			<input type="checkbox"/>	<input type="checkbox"/>
4. Is geotextile needed? If yes, list geotextile specification. If no, provide an evaluation of the impact of the granular drainage media on the liner (113.7(5)"b"(7)1).			<input type="checkbox"/>	<input type="checkbox"/>
h. Any proposed manholes placed on liner or in new cell for access to leachate lines for cleaning or inspection?			<input type="checkbox"/>	<input type="checkbox"/>
1. If yes, submit design that considers the effect of stresses on manhole and liners below manhole.			<input type="checkbox"/>	<input type="checkbox"/>
i. Any plans to do leachate recirculation or bioreactor operations? If yes, submit plans or list date of approved plans.			<input type="checkbox"/>	<input type="checkbox"/>

j. Piping				
1. Provide method to clean and inspect leachate collection pipe.			<input type="checkbox"/>	<input type="checkbox"/>
2. List pipe size and minimum slope.			<input type="checkbox"/>	<input type="checkbox"/>
3. Provide pipe strength calculations.			<input type="checkbox"/>	<input type="checkbox"/>
4. Provide filter design to impede fines migration into pipe perforations.			<input type="checkbox"/>	<input type="checkbox"/>
k. Include proposed leachate head measurement(s) devices, locations and methods.			<input type="checkbox"/>	<input type="checkbox"/>
l. Has seven day storage requirement been met and approved with additional capacity for new proposed cell?			<input type="checkbox"/>	<input type="checkbox"/>
m. Any increases in leachate storage or additional conveyances needed outside of the MSWLF unit and submitted? If yes:			<input type="checkbox"/>	<input type="checkbox"/>
1. Describe Containment and Countermeasures.			<input type="checkbox"/>	<input type="checkbox"/>
2. Does containment meet or exceed cell liner performance?			<input type="checkbox"/>	<input type="checkbox"/>
n. What is anticipated leachate generation rate and how will leachate be treated?			<input type="checkbox"/>	<input type="checkbox"/>
1. Include evaluation that estimates increase in leachate.			<input type="checkbox"/>	<input type="checkbox"/>
a. Pre-Construction Model Results Compared to Actual Leachate Generation – Test of Model Calibration			<input type="checkbox"/>	<input type="checkbox"/>
b. Post-Construction Model Results			<input type="checkbox"/>	<input type="checkbox"/>
6. 113.7(6) Quality Control and Assurance Program.				
a. Name of QC&A Officer			<input type="checkbox"/>	<input type="checkbox"/>
b. Name of Delegated Persons, if any.			<input type="checkbox"/>	<input type="checkbox"/>
c. Date of Approved QC&A plan			<input type="checkbox"/>	<input type="checkbox"/>
d. Statistical Significance of All Testing			<input type="checkbox"/>	<input type="checkbox"/>
7. 113.7(7) Vertical and Horizontal Expansions of MSWLF Units.				
a. Analyze Slope Stability. What is minimum factor of safety?			<input type="checkbox"/>	<input type="checkbox"/>
b. For vertical expansions perform a lines-of-sight analysis.			<input type="checkbox"/>	<input type="checkbox"/>
8. 113.7(8) Run-on and Runoff Control Systems. Review impact of new construction. Include allowance for siltation in channels, if used.			<input type="checkbox"/>	<input type="checkbox"/>

		Check Box for Source →	√	√
Operating Requirements (update as needed)	Yes/No/NA	Comment, Value and/or Date	Owner	Eng.
1. 113.8(2)"b" First Lift, Plan for Achieving Compliance.			<input type="checkbox"/>	<input type="checkbox"/>
2. 113.8(2) "c" Fill Sequencing – impact of new construction			<input type="checkbox"/>	<input type="checkbox"/>
3. 113.8(2)"g" Disposal Operations and Activities. If construction is adjacent to existing waste how will leachate seeps be controlled and or captured?			<input type="checkbox"/>	<input type="checkbox"/>
4. 113.8(4) Development and Operations Plan (DOPs). Update if necessary.			<input type="checkbox"/>	<input type="checkbox"/>
5. 113.8(5) Emergency Response and Remedial Action Plan (ERRAP). Update if necessary.			<input type="checkbox"/>	<input type="checkbox"/>
Air Quality and Landfill Gas	Yes/No/NA	Comment, Value and/or Date	Owner	Eng.
1. 113.9(1) Air Criteria. Check compliance with air quality bureau of DNR.			<input type="checkbox"/>	<input type="checkbox"/>
2. 113.9(2) Landfill gas. Update gas monitoring plan if necessary.			<input type="checkbox"/>	<input type="checkbox"/>
Groundwater Monitoring	Yes/No/NA	Comment, Value and/or Date	Owner	Eng.
113.10(1)"b" - A new MSWLF unit must be in compliance with the groundwater monitoring requirements specified in subrules 113.10(2), 113.10(4), 113.10(5) and 113.10(6) before waste can be placed in the unit.			<input type="checkbox"/>	<input type="checkbox"/>
113.10(2)"a" and "b" – New monitoring points approved and installed?			<input type="checkbox"/>	<input type="checkbox"/>
113.10(2)"d" - Properly abandon monitoring wells that are in the new cell area and submit documentation to DNR.			<input type="checkbox"/>	<input type="checkbox"/>
113.10(2)"e" - Provide an updated HMSP if necessary including the addition of any sampling points from an underdrain used to maintain 5-foot separation.			<input type="checkbox"/>	<input type="checkbox"/>
113.10(4) – Groundwater Sampling and Analysis Requirements – fully implemented?			<input type="checkbox"/>	<input type="checkbox"/>
113.10(5) – Detection Monitoring Program – fully implemented?			<input type="checkbox"/>	<input type="checkbox"/>
113.10(6) – Assessment Monitoring Program – fully implemented or not applicable?			<input type="checkbox"/>	<input type="checkbox"/>
Closure and Post-Closure Plans	Yes/No/NA	Comment, Value and/or Date	Owner	Eng.
1. 113.12(3) Updates to Closure Plan a. Final Grades b. Storm Water System c. Update Soil Balance through Closure			<input type="checkbox"/>	<input type="checkbox"/>
2. 113.13(3) Updated Post-closure Plan, if necessary			<input type="checkbox"/>	<input type="checkbox"/>

Facility Name:

Contact Signature:

Date:

Typed:

This document is intended solely as guidance, and does not contain any mandatory requirements except where requirements found in statute or administrative rule are referenced. This guidance does not establish or affect legal rights or obligations and is not finally determinative of any of the issues addressed. This guidance does not create any rights enforceable by any party in litigation with the State of Iowa or the Department of Natural Resources. Any regulatory decisions made by the Department of Natural Resources in any matter addressed by this guidance will be made by applying the governing statutes and administrative rules to the relevant facts.

Attachment B

Meeting Notes (November 5, 2015 Meeting)

**COMMENTS FROM IDNR – MUSCATINE COUNTY SANITARY LANDFILL
MEETING PARTICIPANTS: MIKE SMITH, DNR AND DAVID PHILLIPS, BARKER LEMAR**

IAC Reference	Description	Comments
	Overall Comments	<ul style="list-style-type: none"> • Mike stated that to receive approval to include Phases 5 and 6 as remaining permitted capacity, the same documentation as required to obtain approval to construct is required. • I told him that I thought part of the reason to get RPC approval was to prevent encroachment of clearance items (e.g., installation of a well) that would limit the planned expansion of a landfill. Also, that limited info (base grades, TOW grades, leachate collection system layout, etc.) would be needed—that a full design plan was not needed. He disagreed. We then went through the Construction Checklist, which Mike said should be (effectively) fully filled out (he indicated that the Checklist isn't actually a requirement). Some of the items Mike called attention to were: <ul style="list-style-type: none"> • Public notice will be required • Cell volumes, etc. • For 7-day storage: need safety measure to avoid increasing capacity. Need flow meter with program to calculate the time remaining to reach capacity (not just volume remaining). Also, how will surge be handled when new cell is built, but no waste to dampen the leachate generation? • How to re-certify exposed liner and leachate collection system –put in QC&A plan.
	Compliance schedule	<ul style="list-style-type: none"> • Regarding submittal date for the compliance schedule (currently due Nov 15th). Mike said that we could have more time if needed. • Regarding the schedule for compliance. I told Mike that we wouldn't be able to prepare a full master plan by April 1st – the FA due date—could we get some sort of temporary approval for FA. He said that we should submit a schedule and they would review it (didn't indicate that after April 1st schedule would be a problem).

TERMS AND CONDITIONS

PAYMENT TERMS

Payment is due upon receipt of our invoice. If payment is not received within 30 days from the invoice date, Client agrees to pay a finance charge on the principal amount of the past due account of 1 ½% per month. If 1 ½% per month exceeds the maximum allowed by law; the charge shall automatically be reduced to the maximum legally allowable. In the event the Client requests termination of the services prior to completion, a termination charge in an amount not to exceed 30% of all charges incurred through the date services are stopped plus any shutdown costs may, at the discretion of Barker, Lemar & Associates, Inc., be made. If during the execution of the services, Barker, Lemar & Associates, Inc., is required to stop operations as a result of changes in the scope of services such as requested by the Client or requirements of third parties, additional charges will be applicable. Client is responsible for all cost of the collection of unpaid accounts, including reasonable attorney fees.

INSURANCE

Barker, Lemar & Associates, Inc. maintains Workers' Compensation and Employers Liability Insurance in conformance with applicable state law. In addition, we maintain Commercial General Liability Insurance with combined Single Bodily Injury and property damage limits of \$1,000,000 and Automobile Liability Insurance with combined Single Bodily Injury and property damage limits of \$1,000,000. A certificate of insurance can be supplied evidencing such coverage, which contains a clause providing that 10 days written notice be given prior to cancellation. Cost of the above coverage is included in our quoted fees. If additional coverage or increased limits of liability are required, Barker, Lemar & Associates, Inc. will endeavor to obtain the requested insurance and charge separately for costs associated with additional coverage or increased limits.

LIMITATION OF LIABILITY

In recognition of the relative risks and benefits of the Project to both the Client and Barker, Lemar & Associates, Inc., the risks have been allocated such that the Client agrees, to the fullest extent permitted by law, to limit the liability of Barker, Lemar & Associates, Inc. and Barker, Lemar & Associates, Inc.'s officers, directors, partners, employees, shareholders, owners and sub consultants for any and all claims, losses, costs, damages of any nature whatsoever or claims expenses from any cause or causes, including attorney's fees and costs and expert-witness fees and costs, so that the total aggregate liability of Barker, Lemar & Associates, Inc. and Barker, Lemar & Associates, Inc.'s officers, directors, partners, employees, shareholders, owners and sub consultants shall not exceed the applicable insurance coverage available at the time of settlement or judgment. It is intended that this limitation apply to any and all liability or cause of action however alleged or arising, unless otherwise prohibited by law.

Client agrees that Barker, Lemar & Associates, Inc.'s liability for any damage on account of any error, omission, or other professional negligence by Barker, Lemar & Associates, Inc. will be limited to a sum not to exceed \$50,000 or the amount presently due Barker, Lemar & Associates, Inc. for services rendered hereunder, whichever is greater.

Notwithstanding any other provision of this Agreement, and to the fullest extent permitted by law, neither the Client nor Barker, Lemar & Associates, Inc., their respective officers, directors, partners, employees, contractor or sub consultants shall be liable to the other or shall make any claim for any incidental, indirect or consequential damages arising out of or connected in any way to the Project or to this Agreement. The mutual waiver of consequential damages shall include, but is not limited to, loss of use, loss of profit, loss of business, loss of income, loss of reputation and any other consequential damages that either party may have incurred from any cause of action including negligence, strict liability, breach of contract and breach of strict or implied warranty. Both the Client and Barker, Lemar & Associates, Inc. shall require similar waivers of consequential damages protecting all the entities or persons named herein in all contracts and sub contracts with others involved in this project. Barker, Lemar & Associates, Inc. is not liable for consequential damages.

Barker, Lemar & Associates, Inc. shall not be responsible for any acts or omissions of the Contractor, any sub contractor, any entity performing any portions of the Work or any agents or employees of any of them. Barker, Lemar & Associates, Inc. does not guarantee the performance of the Contractor and shall not be responsible for the Contractor's failure to perform its Work in accordance with the Contract Documents or any applicable laws, codes, rules or regulations.

POLLUTION CLAIMS

Client hereby understands and agrees that Barker, Lemar & Associates, Inc. has not created nor contributed to the creation or existence of any or all types of hazardous or toxic wastes, materials, chemical compounds, or substances, or any other type of environmental hazard or pollution, whether latent or patent, at Client's premises, or in connection with or related to this project with respect to which Barker, Lemar & Associates, Inc. has been retained to provide professional engineering services. Barker, Lemar & Associates, Inc.'s total liability to Client resulting from any release or threatened release of any hazardous waste, substance, pollutant or contaminant, whether or not directly or indirectly generated by Barker, Lemar & Associates, Inc.'s performance of the work hereunder (including any injury to persons or property or death resulting therefrom), shall not exceed the amount due Barker, Lemar & Associates, Inc. for services rendered hereunder. This limitation applies to all liabilities, including indemnification liabilities, whether based on contract, tort (including negligence), and strict liability or otherwise. This limitation of liability does not in any way limit or affect Client's obligations to indemnify and hold Barker, Lemar & Associates, Inc., its owners, officers, directors, and employees harmless. This limitation of liability shall not apply to the extent it is held that the loss or damage arose from Barker, Lemar & Associates, Inc.'s gross negligence or intentional misconduct. In addition, Client agrees to limit Barker, Lemar & Associates, Inc.'s liability to the same extent that Client's liability is limited pursuant to its contract with its client (if one exists).

DOCUMENTS

Barker, Lemar & Associates, Inc.'s liability to Owner for any computer programs, software products, or related data furnished hereunder is limited solely to the correction of residual errors, minor maintenance, or update(s) as agreed. Barker, Lemar & Associates, Inc. makes no warranties of any kind, including any implied warranty of merchantability or of fitness for any particular purpose, or against infringement, with respect to computer programs, software products, related data, technical information, or technical assistance provided by Barker, Lemar & Associates, Inc. under this Agreement. In no event shall Barker, Lemar & Associates, Inc., its officers, agents, or employees be liable under or in connection with this Agreement under any theory of tort, contract, strict liability, negligence, or other legal or equitable theory for incidental or consequential damages relating to any computer programs, software products, or related data furnished hereunder.

STANDARD OF CARE

In providing services under this Agreement, Barker, Lemar & Associates, Inc. shall perform in a manner consistent with that degree of care and skill ordinarily exercised by members of the same profession currently practicing under similar circumstances at the same or similar locality. Barker, Lemar & Associates, Inc. makes no warranty, express or implied, as to its professional services rendered under this Agreement.

RIGHT-OF-ENTRY

Unless otherwise agreed, Client will furnish right-of-entry on the property for Barker, Lemar & Associates Inc. to make the planned borings, surveys, tests, and/or explorations. Barker, Lemar & Associates Inc. will take reasonable precautions to limit damage to the property caused by our operations, but we have not included in our fee the cost of restoration of damage that may result. If Client desires Barker, Lemar & Associates Inc. to restore the property to its former condition, we will accomplish this, to the extent reasonably possible, and add the cost to the proposed fee.

SITE VISITS

Barker, Lemar & Associates, Inc. shall visit the site at intervals appropriate to the stage of construction, or as otherwise agreed to in writing by the Client and Barker, Lemar & Associates, Inc., in order to observe the progress and quality of the Work completed by the Contractor. Such visits and observation are not intended to be an exhaustive check or a detailed inspection of Barker, Lemar & Associates, Inc.'s work but rather are to allow the Consultant to become generally familiar with the Work in progress and to determine, in general, if the Work is proceeding in accordance with the Contract Documents. Based on this general observation, Barker, Lemar & Associates, Inc. shall keep the Client informed about the progress of the Work and shall advise the Client about observed deficiencies in the Work.

If the Client desires more extensive project observation or full-time project representation, the Client shall request that such services be provided by Barker, Lemar & Associates, Inc. as Additional Services in accordance with the terms of this Agreement.

Barker, Lemar & Associates, Inc. shall not supervise, direct or have control over the Contractor's work nor have any responsibility for the construction means, methods, techniques, sequences or procedures selected neither by the Contractor nor for the Contractor's safety precautions or programs in connection with the Work. These rights and responsibilities are solely those of the Contractor in accordance with the Contract Documents.

SAMPLING OR TESTING OF LOCATION

The fees do not include costs associated with surveying of the site or the accurate horizontal and vertical locations of tests, unless otherwise specifically agreed to by the parties. Field test or boring locations described in Barker, Lemar & Associates, Inc.'s report contemplated by these Terms and Conditions or shown on sketches are based on specific information furnished by others or estimates made in the field by our technicians. Such dimensions, depths, or elevations should be considered as approximations unless otherwise stated in the reports contemplated by these Terms and Conditions.

The Client shall furnish, at the Client's expense, all information, requirements, reports, data, surveys and instructions required by this Agreement. Barker, Lemar & Associates, Inc. may use such information, requirements, reports, data, surveys and instructions in performing its services and is entitled to rely upon the accuracy and completeness thereof. Barker, Lemar & Associates, Inc. shall not be held responsible for any errors or omissions that may arise as a result of erroneous or incomplete information provided by the Client and/or the Client's consultants and contractors.

SAMPLE DISPOSAL AGREEMENT

Unless otherwise requested, test specimens or samples will be disposed of immediately upon completion of tests unless otherwise regulatory required. Upon written request, Barker, Lemar & Associates, Inc. will retain test specimens or drilling samples for mutually acceptable storage charge and period of time.

DAMAGE TO EXISTING MAN-MADE OBJECTS

It shall be the responsibility of the Client or his duly authorized representative to disclose the presence and accurate location of all hidden or obscure man-made objects and underground utilities relative to field tests or boring locations. Barker, Lemar & Associates, Inc.'s field personnel are trained to recognize clearly identifiable stakes or markings in the field and without special written instruction to initiate field testing drilling and/or sampling within a reasonable distance of each designated location. If Barker, Lemar & Associates, Inc. is cautioned, advised, or given data in writing that reveal the presence or potential presence of underground or over ground obstructions, such as utilities, Barker, Lemar & Associates, Inc. will give special instructions to its field personnel. As evidenced by Client's acceptance of this proposal, Client agrees to indemnify and save harmless from all claims, suits, losses, personal injuries, death, and property liability resulting from unusual subsurface conditions or damages to subsurface structures, including utility lines, owned by Client or third parties, occurring in the performance of the proposed services, whose presence and, exact locations were not revealed to Barker, Lemar, & Associates, Inc. in writing, and to reimburse Barker, Lemar & Associates, Inc. for expenses in connection with any such claims or suits, including reasonable attorney fees.

DISPOSAL

Barker, Lemar & Associates, Inc. is not, and has no authority to act as, a handler, generator, operator, treated, storer, transporter or disposer of hazardous waste, substances, pollutants or contaminants found or identified at the site. Barker, Lemar & Associates, Inc. shall have no responsibility for the transportation, storage, treatment or disposition of contaminated or potentially contaminated waste materials of any kind, which are directly or indirectly generated from Barker, Lemar & Associates, Inc.'s performance of the work in accordance with these Terms and Conditions. Client shall be responsible for the disposal of any such waste materials.

SAFETY

Should Barker, Lemar & Associates, Inc. provide periodic observations or monitoring services at the job site during construction, Client agrees that in accordance with generally-accepted construction practices, the contractor will be solely and completely responsible for working conditions on the job site, including safety of all persons and property during the performance of the work and compliance with OSHA regulations, and that these requirements will apply continuously and not be limited to normal working hours. Any monitoring of the contractor's procedures conducted by Barker, Lemar & Associates, Inc. is not intended to include review of the adequacy of the contractor's safety measures in, on, adjacent to, or near the construction site.

CONSTRUCTION COST OPINIONS

Opinions of probable cost for the facilities considered and designed under this Agreement are prepared by Barker, Lemar & Associates, Inc. through exercise of its experience and judgment in applying presently available cost data, but it is recognized that Barker, Lemar & Associates, Inc. has no control over costs of labor and materials, or over the construction contractor's methods of determining prices, or over competitive bidding procedures, market conditions, and unknown field conditions so that Barker, Lemar & Associates, Inc. cannot and does not guarantee that proposals, bids, or the project construction costs will not vary from Barker, Lemar & Associates, Inc.'s opinion of probable construction costs.

OWNERSHIP OF DOCUMENTS

All documents, including, but not limited to, drawings, specifications, reports, boring logs, field notes, laboratory test data, calculations, and estimates, prepared by Barker, Lemar & Associates, Inc., are instruments of service pursuant to these Terms and Conditions and shall be the sole property of Barker, Lemar & Associates, Inc. Client agrees that all documents of any nature furnished to Client or Client's agents or designees, if not paid for, will be returned to Barker, Lemar & Associates Inc. upon demand and will not be used by Client for any purpose whatsoever. Client further agrees that under no circumstances shall any documents produced by Barker, Lemar & Associates Inc., pursuant to these Terms and Conditions, be used at any location or for any project not expressly provided for in these Terms and Conditions without the written permission of Barker, Lemar & Associates, Inc. At the request and expense of Client, Barker, Lemar & Associates, Inc. will provide Client with copies of documents created in the performance of the work for a period not exceeding five years following submission of the report contemplated by these Terms and Conditions.

SUCCESSORS AND ASSIGNS

All of the terms, conditions, and provisions hereof shall inure to the benefit of and are binding upon the parties hereto and their respective successors and assigns, provided, however, that no assignment of this Agreement shall be made without written consent of the parties of this Agreement.

SEVERABILITY

If any provision of this Agreement is declared invalid, illegal, or incapable of being enforced by any court of competent jurisdiction, all of the remaining provisions of this Agreement shall nevertheless continue in full force and effect, and no provision shall be deemed dependent upon any other provision unless so expressed herein.

WAIVER

Barker, Lemar & Associates, Inc.'s waiver of any term, condition, or breach of any term, condition, covenant, shall not constitute a waiver of any other term, condition, or covenant, or the breach thereof.

GOVERNING LAW

These Terms and Conditions shall be governed in all respects by the laws of the State of Iowa. Any litigation to be filed by either party to the contract shall be filed in Polk County, Iowa District Court or Federal Court for the Southern District of Iowa.

ENTIRE AGREEMENT

This Agreement, and its attachments, contains the entire understanding between Owner and Barker, Lemar & Associates, Inc. relating to professional engineering services. Any prior or contemporaneous agreements, promises, negotiations, or representations not expressly set forth herein are of no effect. Subsequent modifications or amendments to this Agreement shall be in writing and signed by the parties to this Agreement.