



April 20, 2023

Hillary Young, PE
Chief Engineer
Land Protection Division
Oklahoma Department of Environmental Quality
P.O. Box 1677
Oklahoma City, Oklahoma 73101

Re: Notice of Deficiencies
Solid Waste Permit No.: None (Previously in 3533005)
Altus Municipal Landfill
Jackson County

Dear Ms. Young:

On February 14, 2023, we received a Notice of Deficiency from the Department of Environmental Quality ("DEQ") noting comments on the submitted technical memorandum and permit modification for the Altus Municipal Landfill. Per the letter, we are submitting additional information to address the comments, which are reproduced and addressed below:

1. *In accordance with OAC 252:515-3-34(a)(2), permit applications must contain a certification, by affidavit, that the applicant owns the real property, has a current lease or easement which is given to accomplish the permitted purpose, or has provided legal notice to the landowner.*

The Application did not include a certification of legal right to property. Please provide a certification of legal right to property to ensure compliance with OAC 252:515-3-34(a)(2).

Please see attached the ownership documents from Appendix M - 1989 Permit Application.

2. *In accordance with OAC 252:515-3-35(b), all maps and drawings included in the application shall be stamped or sealed in accordance with the requirements of the State Board of Registration for Professional Engineers and Land Surveyors.*

The Title Sheet for the maps and drawings included in the Application is the only page with a professional engineer's stamp or seal. Please provide revised maps and drawings with the professional engineer's stamp or seal included on all maps and drawings.

The stamp and seal on the Technical Memorandum and Title Sheet signifies approval of all appendices including maps and drawings.

3. *In accordance with OAC 252:515-3-36(a)(5), Permit applications for new solid waste disposal facilities shall include the latitude and longitude of all corners of the permit boundary and facility entrance.*

Please provide the latitude and longitude for all corners of the C&D permit boundary and facility entrance.

| | NW Corner | NE Corner | SE Corner | SW Corner | Facility Entrance |
|-----------|---------------|---------------|---------------|---------------|-------------------|
| Latitude | N34°39'53.35" | N34°39'50.68" | N34°39'42.70" | N34°39'42.47" | N34°39'34.33" |
| Longitude | W99°28'45.87" | W99°28'27.34" | W99°28'27.34" | W99°28'45.67" | W99°28'27.59" |

4. *Please provide a description of all processing, storage, and disposal operations and units in accordance with OAC 252:515-3-36(a)(7).*

Please see the attached Operational Plan.

5. *Please provide a description of the anticipated waste streams and amount received per day in accordance with OAC 252:515-3-36(a)(8).*

Materials included in the C&D cell are from construction, renovation and demolition activities for buildings, roads and bridges including but not limited to steel, wood products, drywall and plaster, brick and clay tile, asphalt shingles, concrete, and asphalt concrete. Approximately 255 tons per day.

6. *Please provide the types of road construction materials to be used to ensure that all access roads within the site are passable during inclement weather by normal vehicular traffic in accordance with OAC 252:515-3-36(a)(11).*

Please see the attached Operational Plan.

7. *Please provide a list of all anticipated heavy equipment to be used in the construction and operation of the site in accordance with OAC 252:515-3-36(a)(12).*

Please see the attached Operational Plan.

8. *In accordance with OAC 252:515-3-36(a)(9)&(10), the names of municipalities and/or counties included in the service area and the estimated population served shall be provided.*

The Application included a population growth and usage trend analysis based on the last census data for the City of Altus. Please confirm that the City of Altus is the only municipality included in the service area.

| City | 2020 Population |
|--|-----------------|
| City of Altus (including the Altus Air Force Base) | 19,729 |
| Hollis | 1,795 |
| Duke | 395 |
| Eldorado | 317 |
| Total Population Served: | 22,236 |

9. *The Application included an economic life of site calculation in Appendix D of the Technical Memorandum. However, the life of site was only calculated for the existing municipal solid waste landfill (Solid Waste Permit No. 3533005).*

Please provide an estimated economic life of site calculation for the new C&D cell in accordance with OAC 252:515-27-8(a)(2). Please include the source for all parameters use in the calculation.

See Appendix E – C&D Cell Life Calculations. Based on historical data, 40% of the incoming waste was categorized as C&D.

10. *Please address all location restrictions for the new permit boundary in accordance with the OAC 252:515-5-31, OAC 252:515-5-32, and OAC 252:515-5-52.*

The new permit boundary does not conflict with the restrictions listed in OAC 252:515-5-31, OAC 252:515-5-32, or OAC 252:515-5-52.

11. *In accordance with OAC 252:515-9-31(2), C&D landfills shall, at a minimum, be monitored for the following water quality constituents: pH, chemical oxygen demand, and specific conductivity.*

The Groundwater Sampling and Analysis Plan included in the Application includes a list of the background/detection monitoring parameters in Table 1. Please revise the Groundwater Sampling and Analysis Plan to include pH and specific conductivity in the background/detection monitoring parameters in Table 1.

Please refer to Section 2.4.7 Field Measurements of the Groundwater Sampling and Analysis Plan stating that pH and specific conductivity monitoring is required.

12. *The Groundwater Sampling and Analysis Plan includes references to Title 252 Oklahoma Administrative Code Chapter 510. This Chapter of the Oklahoma Administrative Code has been revoked.*

Please revise the Groundwater Sampling and Analysis Plan to include references to Title 252 Oklahoma Administrative Code Chapter 515 Management of Solid Waste.

See the attached pages 9 and 15-17 from the revised Groundwater Sampling and Analysis Plan.

13. *In accordance with OAC 252:515-11-33(7), after the soil is compacted, the minimum density of the soil shall be greater than or equal to 95% of the standard proctor test or 90% of the modified proctor test.*

In Section 31 35 26.13, Part 3.5 of the Contract Documents and Technical Specifications included in the Application did not include the standard or modified proctor test in the list of minimum performance standards required of recompacted liner material. Please revise the list of minimum performance standards to include either ASTM D698 or ASTM D1557.

See revised Section 31 35 26.13, Part 3.5

14. *In accordance with OAC 252:515-11-4(a)(I), the quality assurance/quality control plan shall contain the information on pages 1 through 173, inclusive, of EPA Technical Guidance Document: Quality Assurance and Quality Control for Waste Containment Facilities (EPa/600/R-93/I 82), September, 1993. Section 1.5 of the EPA Technical Guidance Document includes requirements for daily inspection reports, daily summary reports, inspection and testing reports, and problem identification and corrective measures reports.*

Please revise Section 01 78 39 of the Contract Documents and Technical Specifications included in the Application to include the requirements from Section 1.5 of EPA Technical Guidance Document in accordance with OAC 252:515-11-4(a)(1).

See revised Section 01 78 39, Part 1.3-B-2

15. *In Section 31 35 26.13, Part 3.6 of the Contract Documents and Technical Specifications states other verification test methods may be used if approved in advance by the engineer and/or the owner.*

Please revise Section 31 35 26.13, Part 3.6 of the Contract Documents and Technical Specifications included in the Application to clarify that other verification test methods may be used if approved in advance by the DEQ in accordance with OAC 252:515-1 1- 37(c)(2)(c).

See revised Section 31 35 26.13, Part 3.6.

16. *In accordance with OAC 252:515-11-38, all repairs shall be certified by the Quality Assurance officer and documented in the liner installation and testing report.*

Please revise Section 31 35 26.13, Part 3.7 of the Contract Documents and Technical Specifications included in the Application to include that all repairs will be certified by the Quality Assurance officer and will be documented in the liner installation and testing report in accordance with OAC 252:515-11-38.

See revised Section 31 35 26.13, Part 3.7.

17. *The Application did not include a gas monitoring plan. Please either provide a gas monitoring plan or demonstrate that the facility will not cause a hazard to safety or health from explosive gasses in accordance with OAC 252:515-15-I(a)(2).*

Please see attached Gas Monitoring Plan.

18. *The Application did not include an operational plan. Please provide an operational plan addressing the operational standards in accordance with OAC 252:515-3-36 and OAC 252:515-3-38.*

Please see attached Operational Plan.

19. *The Application did not include information regarding stormwater management. Please provide a run-on/run-off control system plan for stormwater management in accordance with the requirements outlined in OAC 252:515-17.*

Please see attached Operational Plan.

20. *The Application did not include a closure and post-closure plan. Please provide a closure and post-closure plan in accordance with the requirements in OAC 252:515-25 and OAC 252:515-27.*

Please see attached Closure and Post-Closure Plan.

We believe the revisions made to the revised report and exhibits satisfactorily address the comments raised in the Notice of Deficiency letter. If you have any questions or comments, please contact me at 405-463-3369 or by email at michael@cowangroup.co.

Sincerely,

Cowan Group Engineering, LLC

A handwritten signature in blue ink that reads "Michael Taylor". The signature is fluid and cursive, with the first name "Michael" and the last name "Taylor" clearly distinguishable.

Michael Taylor, PE
Managing Member

Enclosures: Ownership Documents
 Operational Plan
 Gas Monitoring Plan
 Closure and Post-Closure Plan
 Revised Specification Section 01 78 39
 Revised Specification Section 31 35 26.13
 Revised Groundwater Sampling and Analysis Plan Pages

WARRANTY DEED

KNOW ALL MEN BY THESE PRESENTS:

That ABBIE HEIDEBRECHT and ALVIN HEIDEBRECHT, her husband;
DOROTHY ABBOTT and JOE ABBOTT, her husband; AGNES WHITTINGTON
and DUFFIE WHITTINGTON, her husband; MADGE BILLS and GEORGE E.
BILLS, her husband; JOE BOALDIN and BETTY BOALDIN, his wife; A.C.
BOALDIN, JR. and OLETA BOALDIN, his wife; LEALAND BOALDIN and PYRENE
BOALDIN, his wife; WILMER BOALDIN and BARBARA BOALDIN, his wife;
and ROBERT BOALDIN, a single man, of Jackson County, State of
Oklahoma, parties of the first part, in consideration of the sum
of Ten and more Dollars in hand paid, the receipt of which is
hereby acknowledged, do hereby Grant, Bargain, Sell and Convey unto
ALTUS MUNICIPAL AUTHORITY, a Municipal Trust of Jackson County,
State of Oklahoma, party of the second part, the following described
real property and premises situate in Jackson County, State of
Oklahoma, to-wit:

All that part of Section Eleven (11) in Township Two (2)
North of Range Twenty-two (22) West of the I.M. lying South
of the right-of-way of Hollis & Eastern Railway Company,
containing 469.5 acres, more or less;

together with all the improvements thereon and the appurtenances there
unto belonging, and warrant the title to the same.

TO HAVE AND TO HOLD said described premises unto the said
party of the second part, its successors and assigns forever, free,
clear and discharged of and from all former grants, charges, taxes,
judgments, mortgages and other liens and incumbrances of whatsoever
nature.

Signed and delivered this 11th day of May, 1981

Alvin Heidebrecht
ALVIN HEIDEBRECHT

Abbie Heidebrecht
ABBIE HEIDEBRECHT

Joe Abbott
JOE ABBOTT

Dorothy Abbott
DOROTHY ABBOTT

George E. Bills
GEORGE E. BILLS

Madge Bills
MADGE BILLS

Joe Boaldin
JOE BOALDIN

Betty Boaldin
BETTY BOALDIN

A.C. Boaldin, Jr.
A.C. BOALDIN, JR.

Oleta Boaldin
OLETA BOALDIN

Lealand Boaldin
LEALAND BOALDIN

Pyrene Boaldin
PYRENE BOALDIN

Wilmer Boaldin
WILMER BOALDIN

Barbara Boaldin
BARBARA BOALDIN

Agnes Whittington
AGNES WHITTINGTON

Robert Boaldin
ROBERT BOALDIN

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STATE OF OKLAHOMA, COUNTY OF JACKSON, SS
This instrument was filed for record on the 22 day of May, 1981 at 4:20 clock P.M. and
duly recorded in Book 480 on Page 248 of the records of this office. Fees \$ 9.00 in advance.
By Paul Long County Clerk Deputy


DUFFIE WHITTINGTON

STATE OF OKLAHOMA)
COUNTY OF JACKSON) : SS.

Before me the undersigned, a Notary Public in and for said County and State on this 11th day of May, 1981, personally appeared ABBIE HEIDEBRECHT and ALVIN HEIDEBRECHT, husband and wife, DOROTHY ABBOTT and JOE ABBOTT, husband and wife, MADGE BILLS and GEORGE E. BILLS, husband and wife, JOE BOALDIN and BETTY BOALDIN, husband and wife, A.C. BOALDIN, JR. and OLETA BOALDIN, husband and wife, LEALAND BOALDIN and PYRENE BOALDIN, husband and wife, WILMER BOALDIN and BARBARA BOALDIN, husband and wife, and ROBERT BOALDIN, a single man, to me known to be the identical persons who executed the within and foregoing instrument and acknowledged to me that they executed the same as their free and voluntary act and deed for the uses and purposes therein set forth.

Given under my hand and seal the day and year last above written.

My commission expires
August 28, 1984



ROBERT B. HARBISON
Notary Public

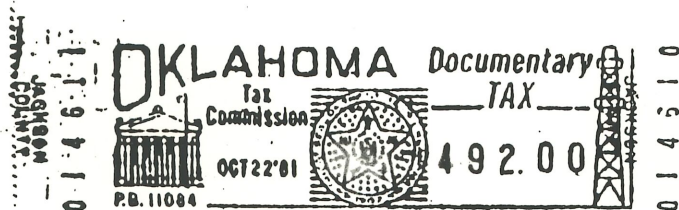
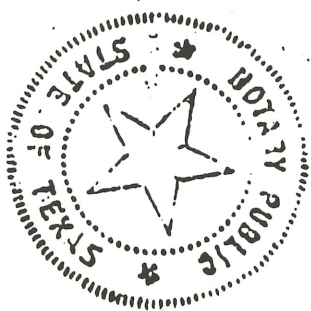
STATE OF TEXAS)
COUNTY OF HARRIS) : SS.

Before me the undersigned, a Notary Public, in and for said County and State, on this 15th day of May, 1981, personally appeared AGNES WHITTINGTON and DUFFIE WHITTINGTON, her husband, to me known to be the identical persons who executed the within and foregoing instrument and acknowledged to me that they executed the same as their free and voluntary act and deed for the uses and purposes therein set forth.

Given under my hand and seal the day and year last above written.

My commission expires
APRIL 13, 1985


LISA V. GILBREATH
NOTARY PUBLIC



**ALTUS MUNICIPAL LANDFILL
2022 CONSTRUCTION/DEMOLITION CELL
OPERATIONAL PLAN**

FOR

THE CITY OF ALTUS, OKLAHOMA

APRIL 2023

CITY OF ALTUS, OKLAHOMA
ALTUS MUNICIPAL LANDFILL
2022 CONSTRUCTION/DEMOLITION CELL
OPERATIONAL PLAN

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I. GENERAL INFORMATION

This Operations Plan (Plan) is intended to assist the operators of the C&D Cell in operating the facility in accordance with the solid waste permit documents and Oklahoma Administrative Code (OAC) Rules and Regulations as promulgated by the Oklahoma Department of Environmental Quality (ODEQ). The Altus Municipal Landfill is an active municipal solid waste landfill owned and operated by the city of Altus under solid waste permit number 3533005. The Altus Municipal Landfill is located in the southwest quarter of Section 13 Township 2 South, Range 22 West of the Indian Meridian, Jackson County, Oklahoma, approximately 8 miles west of Altus, Oklahoma. The C&D Cell is located in the northern portion of the Altus Municipal Landfill. Any reference to "operator" in this Plan shall mean the individual responsible for the facility on any given day or shift. The individual in responsible charge may assign operational tasks to various personnel. In addition, this Operations Plan shall be available to employees for reference to operations of the facility. It is the responsibility of the C&D Cell to keep this information current. If changes to this Plan are to be made affecting the operations of the facility, then the Altus Municipal Landfill shall notify the DEQ within 5 working days prior to the change implementation.

A. Operating Hours

It is anticipated that the C&D Cell will be open from 7:30 a.m. to 4:00 p.m. Monday through Friday and Saturday from 8:00 a.m. to 11:30 p.m. The daily operation of equipment necessary for compaction and covering waste will normally cease within one hour after the daily closing time.

B. Personnel

The operation of the C&D Cell will be under the direction of a certified solid waste operator. The typical staffing level is listed below:

- Landfill Manager/Operator
- Equipment Operator
- Scalehouse Attendant
- General Maintenance Person
- Truck Drivers

Staff will be modified as necessary to accommodate changes to operations or to meet increased waste flows, as necessary. A properly trained equipment operator or other landfill employee will be present at the working face of the landfill to observe the unloading of waste and to perform and document random inspections of the waste.

C. Access Control

The C&D Cell is located approximately 8 miles west of Altus, Oklahoma on U.S. Highway 62. The site is accessed from N 1960 Road. The entrance to the landfill is on the east side of the property. Per OAC 252:515-19-32, artificial and/or natural barriers shall be used to discourage unauthorized traffic and uncontrolled dumping. Access to the landfill is controlled by a lockable entrance gate. Landfill personnel have appropriately placed signs directing waste hauling vehicles to the working face of the landfill. Scalehouse and operating personnel shall prohibit any unauthorized access and shall record all incidences of unauthorized access. At

the conclusion of each operating day, the entrance gate shall be locked to prohibit vehicle access.

1. Off Site Access Roads

Off site access roads are typically asphaltic construction. These roads were constructed and are maintained by Jackson County.

2. On Site Access Roads

On site access roads include a asphaltic type construction entrance road that runs from the scales to the employee shelter. As the C&D cell is constructed an access road will be constructed of coarse sand and gravel materials excavated from disposal areas from the entrance road to the C&D Cell. The roads are and will remain passable during inclement weather by normal vehicular traffic.

II. SOLID WASTE ACCEPTED/EXCLUDED

This section outlines accepted and excluded wastes, waste screening procedures, waste measuring requirements, and quantity limitation requirements which are applicable to the C&D Cell under OAC 252:515.

A. Waste Acceptance and Exclusion

The C&D Cell is allowed to accept construction and demolition waste. The disposal of any quantity of hazardous, radioactive, friable asbestos, regulated untreated infectious biomedical waste, or regulated polychlorinated biphenyl (PCB) waste is prohibited at the C&D Cell.

Waste should be visually screened at the scale to determine if the shipment contains acceptable waste. Shipments received at the facility shall be rejected if the waste is not deemed acceptable. Shipments of waste entering the State of Oklahoma that are subsequently rejected shall be removed from the State by those persons who transported the waste into the State.

Additional information such as sources of waste, amount received, transporters used, and any special handling or management practices to be employed shall be recorded at the scalehouse and filed within the site's operating record.

B. Waste Screening

The scalehouse attendant will be responsible for screening incoming waste to ensure that prohibited wastes are identified and handled properly. If the scalehouse attendant or other landfill staff refuses such wastes, they will inform customers of the proper disposal alternatives, such as directing them to local facilities that would accept those wastes. This practice is intended to avoid illegal dumping of refused wastes.

Personnel at the site shall conduct routine procedures for the screening and removal of wastes which are not acceptable for receipt at the landfill for disposal. These procedures consist of both routine load screening procedures and random load inspections. Routine load screening procedures include:

- Identifying incoming vehicles by company and vehicle number. Any placards will be noted. Review of paperwork included with incoming

wastes by the scalehouse attendant.

- Visually inspecting each load as it is pushed into the working face by operators trained to recognize regulated hazardous waste.
- Notifying the ODEQ if unacceptable waste is discovered at the site by the end of the next working day. The site's current Waste Exclusion Plan should be referenced for information to include with the notification.

Random load inspections will consist of:

- Conducting random inspections of incoming loads for unacceptable wastes. Inspection of vehicles which contain uncompacted or open top loads will primarily occur at the scalehouse. Enclosed vehicles, such as commercial refuse vehicles, will be inspected at the working face. Loads will be visually observed for unacceptable waste when deposited at the toe of the working face by a landfill employee.
- Ensuring records are maintained on all random inspections which are performed. The information maintained in the records should include, at a minimum, the company or person delivering the waste, type of vehicle, rate and time, type of waste delivered, and person performing the inspection. These records shall be maintained in the operating record of the facility.

Should a particular hauler or refuse from a particular waste generator be suspected of being a source of prohibited waste, routine or planned inspections will be made of the suspected waste at a pull-off area near the truck scale.

C. Waste Measuring

The scale at the C&D Cell is located on the site's access road at the east entrance. All waste delivered to and disposed of at the C&D Cell is weighed on a certified scale. The scale is tested and certified annually in accordance with the requirements of the Oklahoma Department of Agriculture, Food, and Forestry (ODAFF) per OAC 252:515-19-33(a)(2). The SORD should request the ODAFF to test the weighing and measuring of the scale on an annual basis.

If the scale is inoperative, tonnage shall be estimated on a volume basis where one cubic yard of waste shall be calculated to weigh one-third (1/3) ton. Solid waste disposal fees shall be collected and remitted to the ODEQ, except for solid waste received from emergencies or other special events, with prior approval from the ODEQ. Monthly reports shall be filed in the operating record and submitted to the ODEQ no later than the 15th of the month following the reporting period.

D. Limitations on Waste Received

The C&D Cell accepts approximately 255 tons per day of waste. Therefore, the facility is required to prepare a Vegetative Cover Plan under OAC 252:515-19-54. However, the C&D Cell does not need to prepare a Disposal Plan as required under OAC 252-515-19-34(d) because the waste comes from locations less than 50 miles away from the facility.

III. **SURVEY CONTROL**

Horizontal and vertical control must be maintained at the landfill in order to construct the landfill according to the approved permit documents. All boundary markers, benchmarks, horizontal control stations, and construction stakes will be clearly marked and identified.

Permanent monuments designating horizontal and vertical control are already in place at the landfill in the form of monuments with surveyed, permanently stamped information. Evidence of permanent monuments and boundary markers placed by a registered land surveyor are shown on the approved Permit Documents maintained in the facility's operating record.

Permanent vertical control has been established by a registered surveyor on the property. In the event a control monument is damaged or destroyed, a registered land surveyor shall re-establish the monument. The permanent monuments at the property corners are established with markers embedded in concrete or other similar type permanent structures. Boundary markers have been established designating the entire permitted acreage.

Construction staking will be used to mark individual cells where waste is to be placed. Staking will be utilized during landfilling operations to maintain slopes and check filling elevations, as necessary. Stakes will generally be made of wood or some other suitable material for use on a landfill. Construction stakes and temporary benchmarks will be replaced during the landfill operations, as needed.

If established benchmark or horizontal control monuments are disturbed over the life of the facility, these monuments shall be replaced or re-established by or under the supervision of a registered land surveyor.

IV. WET WEATHER MANAGEMENT

Wet weather should not adversely impact landfill operations due to all-weather access roads. Throughout the landfill operation, adequate temporary landfill roads will be constructed to ensure access to the working face of the landfill during all weather conditions.

In order to meet daily cover requirements during wet weather, the landfill will have two options available. An alternative daily cover can be used to limit vectors, blowing litter, and infiltration, and soil material will be available from the borrow area for daily cover. With both options for cover available, landfill operations should not be hindered by wet weather.

V. LINER SYSTEM

The liner system at the C&D Cell will be specified in the Quality Assurance/Quality Control (QA/QC) Plan for Liner System Installation and Testing. Liner system material conformance testing, general construction procedures and testing requirements are presented in the QA/QC Plan prior to construction. Each portion of the liner must be constructed under the supervision of a professional engineer licensed in the state of Oklahoma. Before waste can be placed in any newly constructed cell, approval of a Liner Installation and Testing Report must be obtained from the ODEQ.

VI. LEACHATE COLLECTION AND STORAGE

The C&D Cell will not add to the existing leachate retention pond on the southwest corner of the Altus Municipal Landfill per OAC 252:515-13-1(d).

VII. LANDFILLING PROCEDURES

A. Landfill Progression and Sequence of Fill

Refuse trucks will deposit waste in the area identified as the working face. The working face is a sloped surface upon which the waste is compacted in layers. The waste is compacted by the landfill compactor as it is spread. The slope of the working face will be no more than four feet horizontal to one foot vertical (4:1). The compactor will make multiple passes over the waste layer until the waste rebounds the same amount that it was depressed by the compactor. The height of waste will generally not exceed fifteen (15) feet in height and is referred to as a lift. The width of the working face will be kept as small as practical. The waste will be spread and compacted as it is received.

Under the area fill method, waste is placed next to the previous day's waste until an established row length is reached. Another row is then started parallel to the previously constructed row. As the rows form lifts over each area, the top of each landfill lift should slope in such a manner to allow surface runoff to drain away from the working face. After a number of rows have been constructed (creating a lift), a second lift is constructed over the first lift. Waste placement will alternate between various lifts of waste and will allow landfill traffic to discharge waste at various levels. This method will allow the earthmoving equipment to stockpile daily cover at the top of the day's waste, if necessary.

When the last load of refuse for the day has been spread and compacted, the application of 6 inches of daily cover soil or an alternative daily cover (ADC) will begin (see Section VIII.A). Waste will not be placed in areas where the presence of water would prohibit proper spreading of the waste or promote a mosquito problem.

1. Placement of Initial Layer of Waste

Upon completion of cell construction and receipt of approval from the ODEQ, the landfill may begin placing waste in a new disposal cell. Filling should begin at the lowest elevations of each cell and work toward higher elevations to prevent excess leachate generation. The initial lift of waste placed in a cell should be comprised of "select" waste that will not damage the composite liner system and will provide an additional protective layer against freeze/thaw effects. This lift of select waste should be comprised of waste which does not contain long, sharp objects, or bulky material. When placing this select waste lift, a compactor should not be used until a minimum of five feet of waste has been placed over the drainage/protective cover layer. A track dozer can be used to spread waste into the cell while operating on already-placed waste.

2. Placement of Bulky Solid Waste

Bulky waste should be crushed on the ground surface and then pushed onto the working face near the bottom of the fill area. Bulky waste that cannot be crushed should be placed near the bottom of the cell, though not in the first lift of waste.

3. Proper Disposal of Dead Animals

Dead animals accepted for disposal should be covered with solid waste or cover soil immediately upon placement at the open face.

4. Storm Water Management

Per OAC 252:515-19-38(a), solid waste shall not be placed or allowed to enter, accidentally or otherwise, waters that communicate with waters of the state located outside the permit boundary. Storm water that accumulates in or near the active landfill area will be managed to minimize contact with the working face or other exposed waste. Temporary berms will be constructed along the perimeter of each disposal cell to direct potential storm water run-on to the appropriate storm water ditches or structures and to prevent storm water run-off from the working face of the landfill from intermingling with "clean" storm water. In addition, temporary storm water diversion berms or "rain flaps" may be constructed to minimize storm water that enters the leachate collection system. The construction of such berms or "rain flaps" will be dependent on the rate and location of waste placement within each cell.

B. Equipment

The equipment to be used on the site will include but not necessarily be limited to the following (or equivalent):

- Dozer;
- Heavy excavator;
- Haul truck;
- Pan scraper; and
- Water truck

Available equipment will be modified as necessary to accommodate changes in operations or waste flows. All equipment will receive mechanical service on a routine basis. Fire extinguishers will be provided on all landfill equipment.

The manufacturer's recommendations on equipment maintenance will be followed for each piece of landfill equipment. Regularly scheduled equipment maintenance is essential if the landfill equipment is to be dependable. In addition, at the end of each operating day, the equipment operator will remove trash that may be lodged in the operating portion of the equipment tracks or the compaction equipment.

VIII. COVER AND BORROW SOIL

A. Daily Cover

Daily soil cover or an alternative daily cover (ADC) will be applied at the end of each operating day, regardless of weather, as required by ODEQ, to deter disease vectors, fires, odors, and blowing litter. The daily soil cover material should consist of nominally compacted earthen material free of garbage, trash, or other unsuitable material. The minimum thickness of the daily soil cover will be six inches. The frequency of daily cover application may need to be increased in order to provide adequate control of disease vectors, fires, odors, blowing litter, or scavenging.

As an alternative to daily soil cover, the C&D Cell is permitted to use foundry sand or posi-shell. The ADC shall not be used for more than six consecutive days without placing six inches of earthen cover on the seventh day. Six inches of earthen material must be used instead of any ADC if the working face fill remains unused for more than 24 hours. ODEQ approval for the ADC should be maintained in the site's operating record.

B. Intermediate Cover

Intermediate cover shall be applied to inactive areas of the landfill that are not protected by final cover. The intermediate cover shall consist of 12-inches of nominally compacted earthen material free of garbage, trash, or other unsuitable materials.

The C&D Cell may submit a permit modification to the ODEQ to approve the use of an alternative intermediate cover, demonstrating the alternative is capable of controlling disease vectors, fires, odors, and blowing litter without presenting a threat to human health or the environment. If an alternative intermediate cover is approved by the ODEQ for use at the C&D Cell this Plan should be revised to discuss the use of the approved alternate intermediate cover

C. Final Cover

When the C&D Cell has been filled to final waste elevations, the final landfill cap will be constructed. Terraces and storm water management structures will be constructed at the same time that the landfill cap is installed. The final cover at C&D Cell will be constructed in accordance with the approved Closure and Post-Closure Plan and QA/QC Plan. Cover system material conformance testing, general construction procedures, and testing requirements are presented in the QA/QC Plan.

The final cover will be an evapotranspiration cover system. The cover system will consist of a 12-inch thickness of intermediate cover, a 24-inch vegetation support layer, and a 12-inch vegetation layer (topsoil). Each layer will be constructed to support vegetative growth.

Final cover vegetation must be effective, long-lasting, and capable of self-regeneration and plant succession. Vegetation shall consist of species that are equal or superior to native vegetation during each season of the year. Permanent or interim vegetation shall be established in areas that have been undisturbed for 90 days or more.

| Table 1: Typical Seeding Mixtures | | |
|---|---|---|
| Spring/Summer Planting Season (Optimal Time for Planting — April 1 through May 30) | | |
| Seed Mixture | Minimum Percent Pure Live Seed Required | Pounds Per Live Seeds Required Per Acre |
| Common Bermuda Grass | 85 | 12 |
| Blue Stem | 65 | 4 |
| Side Oats Grama | 65 | 6 |
| Rye | 85 | 4 |
| Total: | | 26 |
| Fall/Winter Planting Season (Optimal Time for Planting — September 1 through February 15) | | |
| Seed Mixture | Minimum Percent Pure Live Seed Required | Pounds Per Live Seeds Required Per Acre |
| Winter Wheat | 75 | 40 |
| Fescue or Rye | 85 | 15 |
| Total: | | 55 |

The Typical Seeding Mixtures table shown above lists typical seeding mixtures that will be used for the site during each season and is only provided as a reference. It is understood that a variety of application rates and types of seed mixtures will produce adequate vegetative cover. The seed may be applied to the landfill slopes by various typical application methods such as hydro mulch or seed drilling.

Fertilizer will be applied to the seeded area as needed. The following typical application method should be used:

- Additional soil will be added to the side slopes, as needed, and the soil will be processed using a disk to prepare the soil for seeding.
- Fertilizer will be applied using a commercial spreader at a rate of approximately 150 pounds per acre (lb/acre), and the soil will be simultaneously disked using a disk-harrow. The fertilizer rate may vary. However, an initial rate of 10 (nitrogen) - 20 (phosphate) -10 (potassium) may be used.
- The seed mixture will then be applied using a commercial spreader and the area simultaneously disked using a disk harrow.
- After disking the seeded area, hay will be mulched at a rate of approximately 3 bales (700 to 1,000 lbs each) per acre. To further minimize erosion potential and facilitate moisture retention, the hay will then be "crimped" using a roller to integrate the hay into the soil.

For future areas that will receive final cover, the initial seeding event will occur as follows:

- For final cover that is constructed in the winter, the initial seeding event will consist of a Fall/Winter seed mix, followed by permanent vegetation using a Spring/Summer seeding mixture.
- For final cover that is constructed in the spring, the initial seeding event will consist of a Spring/Summer seed mix, followed by permanent vegetation using a Fall/Winter seeding mixture.

Vegetation will be established during the first possible growing season. Maintenance of the permanent vegetation will typically consist of protection, replanting, maintaining existing grades, repair of erosion damage, and mowing. After the seeds have sprouted, the site will inspect the slopes for areas with no grass or with thin grass. These areas will be reseeded, watered, and fertilized to establish an acceptable permanent vegetation layer. If there are areas where establishing vegetation is unsuccessful, an alternative plan will be developed.

To prevent ponding, the final cover gradient on top of the fill (as measured from the center of the fill area to the break in slope between the top and sides of the fill) shall be four (4) percent, unless otherwise approved by the ODEQ. The final side slope gradient shall not exceed twentyfive (25) percent. Final cover surface contours shall prevent ponding water and erosion of fill areas.

The ODEQ shall be notified in writing prior to the beginning of final closure of the facility or closure of a disposal cell. Closure activities shall begin no later than 90 days after final receipt of wastes at the facility or final receipt of wastes into a disposal cell, as applicable. Closure activities shall be completed within 180 days after closure activities are initiated. Extensions of the closure period may be granted by the ODEQ if the C&D Cell demonstrates that closure will, of necessity, take longer than 180 days and that all steps have been taken, and will continue to be taken, to prevent threats to human health or the environment from the cell or facility.

Upon closing the facility, the C&D Cell shall have a licensed surveyor's plat of the site prepared. The survey plat and detailed description will show, at a minimum, the final contours of the entire site; the permit boundary and boundaries of the disposal areas; the location of gas monitoring wells and extraction systems; the location of groundwater monitoring wells; the location of leachate management systems or surface impoundments; the location of permanent surface drainage structures; aesthetic enhancements; and other relevant information. The site's approved Closure and Post-Closure Plan should be referenced for additional information required for a Certification of Final Closure submittal.

D. Borrow Source

Borrow area for the C&D Cell is located within the permitted waste boundary. Borrow areas which are no longer active shall be reshaped and re-vegetated or otherwise reclaimed to blend with surrounding terrain within 180 days of the date the area ceased being used. Borrow areas shall be maintained as outlined in the site's current Storm Water Pollution Prevention Plan (SWP3).

IX. VECTOR AND AESTHETICS

A. Vectors

In general, vectors will not find suitable harborage in the landfill due to the compaction and covering of the waste. However, if a vector problem should arise, an assessment of the operating conditions will be made and necessary corrective actions will be taken. If the vector problem persists after initial corrective action, a professional exterminator will be hired to mitigate the problem.

B. Litter Control

The C&D Cell will be receiving heavy waste such as concrete, rock, and metal that will prevent wind dispersal. Portable litter fences are used around the active disposal area. Additionally, signage is posted to advise customers to adequately cover their loads to prevent blowing litter and temporary labor used to pick up litter as needed. The site and approach roadways of the C&D Cell shall be cleaned of litter.

C. Special Covering

Waste that is received at the site that may cause a nuisance with blowing litter, dust, or odors will be covered immediately rather than waiting for cover at the end of the day.

X. ENVIRONMENTAL MONITORING

A. Surface Water Monitoring

Surface water will be monitored in accordance with the site's current SWP3. Utilizing sheet drainage as much as practicable and protecting the working face by temporary drainage structures to divert surface runoff from entering or crossing the face as needed. Runoff originating in the working face will be retained. The completed disposal area will be protected from erosion by drainage diversion. A copy of the SWP3 should be maintained within the site's operating record.

B. Storm Water Structure Maintenance

Storm water drainage control structures including diversion ditches and construction of temporary retention ponds will be used at the landfill. Routine maintenance must be conducted on these structures to ensure proper operation. These drainage structures will be inspected in accordance with the facility's SWP3. If erosion damage has occurred to a drainage structure, it will be repaired as soon as possible.

Temporary surface run-on and run-off control will be implemented as operationally necessary to reduce the amount of run-on and run-off coming into contact with the active refuse face of the landfill or to reduce erosion from disturbed areas of the site.

C. Groundwater Monitoring

Groundwater will be monitored in accordance with the approved Groundwater Monitoring Plan for the site, which is maintained in the facility's operating record.

D. Gas Monitoring

Landfill gas will be monitored in accordance with the approved Explosive Gas Monitoring Plan for the site, which is maintained in the facility's operating record.

E. Leachate Monitoring

Leachate monitoring will be conducted as required for recirculation, irrigation, or by the receiving facility when leachate is hauled offsite for disposal. Results of leachate monitoring will be retained in the operating records of the facility.

XI. AIR QUALITY

A. Dust Control

The C&D Cell shall be operated to prevent the discharge of visible fugitive dust emissions beyond the property boundaries. Fugitive dust emissions shall not damage or interfere with the use of adjacent properties or cause air quality standards to be exceeded. The C&D Cell should spray haul roads using a water truck, as needed, when the facility is in operation. Additionally, open burning of solid waste at the C&D Cell is prohibited.

XII. SAFETY

A. Fires

Protection against fires shall include providing fire extinguishers on all landfill equipment and proper maintenance and cleaning of the equipment to remove trash that may be ignited by equipment exhaust.

Landfill personnel will be on alert for indication that an arriving load of solid waste may be smoldering or have the potential to ignite. If a smoking or smoldering load is observed, the solid waste will immediately be pushed or directed away from the active working face and spread out as much as possible. A thick layer of soil will then be spread over the solid waste and compacted to effectively smother the fire. The sealed solid waste will be observed for several days, and if signs of smoke appear, more soil will be spread and compacted over the solid waste. It may be necessary to leave the "hot" solid waste sealed for an extended period of time before incorporating it into the active working face.

If an area of the daily cell should ignite or show signs of smoldering, the area will be excavated to ensure that all of the hot material is segregated from the active face. The excavated solid waste will be pushed as far as possible from the working face and sealed as described above.

B. Emergency Contacts

In the event of an emergency at the C&D Cell, personnel will dial 911 in order to direct the appropriate assistance to the site. Fire, police, and ambulance assistance is available to the site by dialing 911.

C. Communication Equipment

All vehicles, including the compactor, will have a two-way radio capable of communicating with the landfill office. Telephone service is available at the landfill office and can be used for calling emergency equipment (fire, police, or

ambulance) in the event of an accident or other emergency. Additional emergency telephone numbers will be clearly posted near the telephone.

D. Traffic Signs

In addition to the entrance sign described in Section I.C of this report, additional signs will be posted as necessary. These signs may include:

- Directions to active face of landfill,
- Speed limits, and
- Cautionary signs.

XIII. RECORDKEEPING AND REPORTING

The C&D Cell shall maintain operating records at the facility containing records concerning the planning, construction, operation, monitoring, closing, and post-closure monitoring of the facility. Such records shall be maintained until the post-closure monitoring period is terminated. A list of recordkeeping and reporting that should be completed by the C&D Cell is included in the ODEQ Guidance on Recordkeeping and Reporting.

**ALTUS MUNICIPAL LANDFILL
2022 CONSTRUCTION/DEMOLITION CELL
GAS MONITORING PLAN**

FOR

THE CITY OF ALTUS, OKLAHOMA

APRIL 2023

**CITY OF ALTUS, OKLAHOMA
ALTUS MUNICIPAL LANDFILL
2022 CONSTRUCTION/DEMOLITION CELL
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I. INTRODUCTION

A. Site Location

The Altus Municipal Landfill is an active municipal solid waste landfill owned and operated by the city of Altus. The C&D Cell is a portion of the Altus Municipal Landfill located in the southwest quarter of Section 13 Township 2 South, Range 22 West of the Indian Meridian, Jackson County, Oklahoma, approximately 8 miles west of Altus, Oklahoma.

B. Facility Background

The Altus Municipal Landfill was issued Permit No. 3510007 by the Oklahoma Department of Environmental Quality (ODEQ). The permit boundary contains approximately 140 acres. The C&D Cell is approximately 10 acres located on the northern portion of the existing landfill.

C. Site Geology

Information regarding the site geology and the site hydrogeology can be found in the Subsurface Exploration Report and Groundwater Elevation Report.

D. Purpose

This plan is intended to provide guidance for explosive gas monitoring at the C&D Cell to avoid adverse gas-related environmental impact and potential hazards to public health and safety. The plan has been prepared in general accordance with the Oklahoma Administrative Code (OAC)

II. EXPLOSIVE GAS OVERVIEW

The decomposition of encapsulated solid waste within a landfill is known to produce landfill gas (LFG), typically consisting of approximately 50% methane (CH₄) and 50% carbon dioxide (CO₂). Trace amounts of non-methane organic compounds (NMOCs), oxygen, hydrogen sulfide, and reactive organic gases are also present (Engineering and Design Landfill off-Gas Collection and Treatment Systems, U.S. Army Corps of Engineers, 1995).

As LFG is generated, pressure within the landfill builds until equilibrium is reached between the quantity of LFG being generated and the quantity leaving the landfill. The increased pressure within the landfill provides the main source of energy for LFG migration along pressure gradients through preferential pathways.

LFG can present several problems or hazards, including the potential for explosion or fire, odor, toxic trace gases, vegetation stress, and asphyxiation. Of these, the main hazard associated with LFG is the potential for fire or explosion. Explosive gas monitoring is performed to protect lives and property from the hazards associated with LFG migration.

III. REGULATORY FRAMEWORK

OAC 252:515-15 requires that the C&D Cell submit an Explosive Gas Monitoring Plan to be approved by the ODEQ. The plan should detail how the C&D Cell plans to maintain compliance with the methane concentration limit set in OAC 252:515-15-2.

Per OAC 252:515-15-2, the concentration of methane gas generated by the facility shall not exceed twenty-five percent (25%) of the lower explosive limit (LEL) for methane in all

structures within the permit boundary (excluding gas control or recovery system components) or exceed the LEL for methane at the permit boundary. The LEL is defined as the lowest percent by volume of a mixture of explosive gases in air that will propagate a flame at 25 °C and atmospheric pressure. The LEL for methane is 5% by volume in air. The allowable percentages of LEL and the equivalent explosive gas level concentrations are listed in the following table:

| Table 1: Maximum Allowable Explosive Gas Concentrations | | |
|--|-------------------------------|--|
| Location | Maximum Allowable % of LEL | Equivalent Methane Concentration in Air (% vol) |
| Facility Structures | 25 | 1.25 |
| Property Boundary | 100 | 5.0 |

At the C&D Cell, routine sampling of gas monitoring probes is conducted on a quarterly basis in accordance with OAC 252:515-15-3(c). The monitoring frequency may increase if deemed necessary by the Altus Municipal Landfill or ODEQ.

IV. EXPLOSIVE GAS MONITORING

An explosive gas monitoring program has been implemented in order to comply with ODEQ regulations. The routine monitoring program includes monitoring of the gas monitoring probes and the structures within the permit boundary. The following sections outline the explosive gas monitoring program, including the gas monitoring probe network, monitoring equipment, monitoring procedures, the monitoring of structures, gas monitoring probe inspection and maintenance, and recordkeeping.

A. Explosive Gas Monitoring Probe Network

The existing monitoring system at the Altus Municipal Landfill consists of fourteen gas monitoring probes. Upon approval of the proposed C&D Cell, existing gas monitoring probes will remain in place, and six additional gas probes (O-1, P-1, Q-1, R-1, S-1, T-1) will be installed. Gas monitoring probes will be installed in accordance with the Oklahoma Water Resources Board (OWRB) requirements detailed in OAC 785:35. Within 90 days of installation, as-built drawings of new probes shall be submitted to the ODEQ to demonstrate the probes were installed in accordance with OAC 252:515-15-4. New gas monitoring probes shall be constructed in general accordance with the permit detail drawings.

The locations of existing and proposed gas monitoring probes are shown in the Gas Probe Map.

B. Monitoring Equipment

A Landtec GEM-2000 is used to measure the concentration of methane in the gas monitoring probes and structures within the permit boundary. The instrument is capable of sampling in an oxygen-deficient atmosphere. This type of instrument employs a meter calibrated to methane and is capable of measuring oxygen, methane, carbon dioxide, and balance gas. The instrument is operated and calibrated according to the manufacturer's instructions. Equivalent equipment may be used in place of the Landtec GEM-2000 and will be used in accordance with manufacturer's recommendations.

C. Monitoring Procedures

Sampling of the gas monitoring probes and structures within the permit boundary are conducted in accordance with ODEQ regulations. A properly calibrated Landtec GEM-2000 (or equivalent) is used during quarterly monitoring events to sample each perimeter gas probe and structures within the permit boundary. The equipment is connected to the sampling port and a sample is continuously collected until the composition of the gas sample stabilizes. Once the gas composition stabilizes, the reading will be recorded. The C&D Cell records the methane concentration at each gas monitoring probe and structure within the permit boundary and files the results within the site's operating record.

D. Gas Monitoring Probe Inspection and Maintenance

During each explosive gas monitoring event, the integrity of the gas monitoring probes will be evaluated. Each gas monitoring probe will be inspected for the following:

- Probe number clearly labeled and permanently affixed to outer casing;
- Protective casing intact, straight, and not excessively corroded;
- Concrete pad intact;
- Functional padlock; and
- Inner casing is intact and properly capped

If damage or excessive wear to a gas monitoring probe is observed during routine inspection and maintenance, an attempt will be made to mitigate or repair that probe in a timely fashion. If necessary, the damaged gas monitoring probe will be decommissioned and replaced with a new monitoring probe. Gas monitoring probes will be decommissioned in accordance with OWRB requirements detailed in OAC 785:35.

E. Recordkeeping

Results of quarterly sampling events shall be maintained in the site's operating record. If gas levels exceed the regulatory limits, the C&D Cell shall implement the steps outlined in Section V.

V. CONTINGENCY PLAN

If methane gas levels exceed regulatory limits, the C&D Cell will implement a contingency plan to control off-site migration or to prevent continued migration into on-site structures. This will be conducted in accordance with ODEQ rules and regulations.

A. Immediate Actions

Upon initial detection of methane gas concentrations exceeding the regulatory limit in the soil at the property boundary, the ODEQ will be notified immediately and the C&D Cell staff will immediately take the necessary steps to ensure protection of public health and safety.

Upon completion of the required activities and no later than seven days from initial detection, a report describing the steps taken to protect public health and safety will be submitted to the ODEQ.

B. Corrective Action

After the immediate safety issues have been addressed as described above, the C&D Cell personnel will begin focusing on corrective action to address a long-term remedy to control methane migration. This action will be taken in accordance with ODEQ consultation, rules, and regulations. Within 30 days of detection, a remediation plan describing the nature and extent of the problem and the proposed remedy will be submitted to the ODEQ.

The approved remediation plan shall be implemented within 60 days of the initial detection. An alternate schedule for corrective actions may be acceptable if approved by the ODEQ.

**ALTUS MUNICIPAL LANDFILL
2022 CONSTRUCTION/DEMOLITION CELL
CLOSURE AND POST-CLOSURE PLAN**

FOR

THE CITY OF ALTUS, OKLAHOMA

APRIL 2023

CITY OF ALTUS, OKLAHOMA
ALTUS MUNICIPAL LANDFILL
2022 CONSTRUCTION/DEMOLITION CELL
CLOSURE AND POST-CLOSURE PLAN

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I. INTRODUCTION

This Closure and Post-Closure Plan provides the criteria necessary to properly close and maintain the C&D Cell area of the Altus Municipal Landfill.

The Closure Plan includes the necessary actions to be completed at the site before the facility can be certified closed and sets forth the maintenance and monitoring during the post-closure period.

The Post-Closure Plan will be in effect for a minimum 30-year period to ensure that the closed landfill facility will retain its integrity and will not pose a threat to human health or the environment.

II. REGULATIONS

This Closure and Post-Closure Plan has been prepared pursuant to OAC 252:515, as promulgated by the Oklahoma Department of Environmental Quality (ODEQ).

A. Closure Requirements

OAC 252:515 requires that all disposal facilities install a final cover system that is designed to minimize infiltration and erosion. The final cover system will consist of an erosion layer/vegetation layer underlain by an infiltration/vegetation support layer. The facility will be closed in accordance with the provisions included in this Closure Plan and in a manner that minimizes the need for further maintenance and controls and minimizes post-closure escape of waste and waste constituents into the environment.

Prior to beginning final closure of the landfill, the owner/operator is required to give notice of intent to close the site. ODEQ regulations require closure to begin a minimum of 90 days after final receipt of waste at the facility or for the disposal area, as applicable. ODEQ requires completion of all closure activities within 180 days following the beginning of closure unless otherwise approved.

ODEQ requires a Certification of Final Closure be prepared and sealed by an independent professional engineer licensed in the State of Oklahoma and signed by the site owner/operator.

ODEQ requires that upon approval of final closure, a notice shall be recorded in the property deed stating that the land has been used as a solid waste disposal facility. The notice shall specify the type, location, and quantity of wastes disposed of at the facility. In addition, the notice shall state that a survey plat and a record of disposal area locations and elevations has been filed with the ODEQ and with an identified city or county, and future uses may be restricted per OAC 252:515-25-57. A file stamped copy of the notice shall be provided to the ODEQ.

ODEQ also requires Closure/Post-Closure cost estimates to be updated if additional active areas are constructed, if final cover is constructed, or the landfill gas collection and control system (GCCS) is expanded. The cost estimates will be updated annually consistent with OAC 252:515- 27-34.

B. Post-Closure Requirements

For current active landfills, OAC 252:515-25-51 requires a 30-year post-closure maintenance period including maintenance of the integrity and effectiveness of the final cover, maintaining and operating the leachate collection system, monitoring

groundwater, and maintaining any gas venting, collection, or monitoring systems.

The ODEQ requires that a Certification of Post-Closure Performance be prepared and sealed by an independent professional engineer licensed in the State of Oklahoma.

III. FINAL COVER SYSTEM

A. Cover System Design

The final cover system for the C&D Cell consists of an Evapotranspiration (ET) alternative earthen final cover system. The components of the ET final cover system from top to bottom are listed below.

- A minimum 12-inch vegetation layer of earthen material capable of sustaining plant growth.
- A minimum 24-inch vegetation support layer of earthen material.
- A minimum 12-inch intermediate cover layer of earthen material

B. Cover System Installation

The final cover should be constructed in accordance with the approved permit documents and design plans. The intermediate cover soils will be placed by the owner over the completed waste fill prior to installing the final cover system. The material used for the vegetation support layer shall classify as CL, CH, ML, SM, or SC according to the Unified Soil Classification System. The vegetation support layer material should be placed in one 24-inch lift. The material will be compacted by tracking in the material with low pressure earth moving equipment.

The vegetation layer will be placed over the vegetation support layer. This layer will consist of soil suitable for sustaining vegetative growth. The soil will be placed in one lift (12-inch minimum thickness) over the entire surface of the final cover and compacted in place with low pressure earth moving equipment.

Individual areas of the C&D Cell may be closed in phases. For construction of each final cover phase, project specific design plans will be prepared and sealed by an independent professional engineer licensed in the State of Oklahoma, in accordance with the site's current permit documents and QNQC plan. At this time it is anticipated the final cover will be constructed in one phase at the time of closure. To reduce financial assurance for the disposal area closed in a phased closure scenario, a certification prepared and sealed by an independent professional engineer licensed in the State of Oklahoma shall be submitted to the ODEQ. The ODEQ must approve closure of the disposal area before financial assurance may be reduced. The certification shall:

- Certify that the area was closed according to the approved permit documents, design plans, QNQC plan, and applicable rules and regulations; and
- Contain a closure report with related drawings, plans, or specifications describing how closure was performed.

IV. BORROW AREAS

Onsite and offsite soil borrow areas will be re-shaped and vegetated to blend in with the surrounding terrain within 180 days of the time that they are no longer utilized. After

vegetation is established in the borrow areas, these areas will be routinely inspected throughout the life of the site and the Closure/Post-Closure periods. The vegetation cover will be capable of self- regeneration and will require no maintenance. If bare spots develop, then the area will be re- seeded and maintained (e.g., watered and fertilized) until the vegetation is re-established. Also during these inspections, the slopes will be inspected and if necessary re-shaped to maintain their grades.

V. CLOSURE PROCEDURES

A. Closure Sequence

The C&D Cell will conduct ongoing closure of the landfill throughout its active life. This procedure allows for successive closures of fill areas by placement of final cover, construction of drainage and erosion control features, and establishment of vegetative cover. It is anticipated that, where possible, portions of the landfill will be closed as additional phases are constructed. If the site is to undergo premature closure, closure activities would be required only on those areas of the site that had been constructed and received waste. The C&D Cell will submit a permit modification to the ODEQ showing redesigned final contours and permanent storm water structures in accordance with the Oklahoma Administrative Code (OAC) Rules and Regulations prior to premature closure of the landfill.

B. Closure During Active Life

As described above, the final cover will be constructed as fill areas achieve the design grades. Should complete closure of the landfill become necessary at any time during the active life of the landfill, the following steps will be taken:

- Engineering plans will be developed to address site closure at the time of discontinued waste filling;
- The final waste received will be placed and properly compacted;
- Excavations will be filled with suitable material, and the site will be graded to promote runoff and prevent ponding;
- The final cover system will be constructed according to specifications;
- The top of the landfill will be re-graded and re-shaped as needed to provide the proper slope for positive drainage;
- During the first growing season, following application of final cover, the site will be vegetated with permanent vegetation;
- Additional soil will be added to the side slopes, as needed, and processed using a disc to prepare the soil for seeding;
- A surface water management system will be constructed to minimize erosion;
- A closure certification report will be prepared by an independent registered professional engineer in the State of Oklahoma and submitted to ODEQ for approval; and
- All proper notices and documentation will be filed with the appropriate agencies.

C. Additional Closure Information

There are currently two onsite structures. These structures along with all other structures that are on site at the time of final closure will be removed or decommissioned. The office and maintenance building are not located on the

permit boundary. All equipment used during the operation and closure of the landfill will be removed from the site after final closure has been certified as complete.

The access roads will be maintained throughout the active life and post-closure period of the landfill. Facilities at the site, including the perimeter fencing, will be maintained throughout the post-closure period.

Prior to initiating closure, the existing conditions and applicable regulations will be re-evaluated to ensure that this Closure Plan is still applicable.

VI. CLOSURE SCHEDULE

The site will be closed in an orderly fashion, consistent with OAC 252:515-25-33. The final closure schedule is as follows:

- The ODEQ shall be notified in writing prior to beginning final closure of Altus Municipal Landfill or closure of the C&D Cell;
- Closure activities shall begin no later than 90 days after final receipt of wastes at the Altus Municipal Landfill or final receipt of wastes into the C&D Cell;
- Closure activities shall be completed according to the approved Closure Plan within 180 days after closure activities are initiated; and
- Extensions of the closure period may be granted by the ODEQ if Altus Municipal Landfill demonstrates that closure will, of necessity, take longer than 180 days, and that all steps have been taken, and will continue to be taken, to prevent threats to human health or the environment from the unclosed cell or facility.

A. Certification of Final Closure

Upon completion of closure activities, a professional engineer registered in the State of Oklahoma will submit a certification of final closure to the ODEQ, certifying that the facility or disposal cell was closed in accordance with approved permit documents and this closure plan. The certification of final closure shall:

- Be signed by the owner/operator;
- State the facility was closed according to the approved closure plan, the permit documents, and applicable rules;
- Contain a closure report with related drawings, plans, or specifications describing how closure was performed;
- Indicate whether inspection of gas, groundwater, or surface water monitoring has shown the presence of elevated levels of any constituent or if any evidence of contamination related to site operations has been found and, if so, what corrective measures were taken; and
- Include a final closure map. The final closure map shall show as-built conditions at the time of closure including but not limited to:
 - Final contours of the entire site;
 - The final permit boundary and boundaries of disposal areas;
 - The location of gas monitoring probes;
 - The location of groundwater monitoring wells;
 - The location of leachate management systems or surface impoundments;
 - The location of permanent surface drainage structures;
 - Aesthetic enhancements; and
 - Other relevant information.

B. County Land Records Notice

The ODEQ shall approve the final closure of the facility before the post-closure period can begin. Upon approval of the final closure of the facility, a notice shall be recorded in the land records of the property for Carter County giving notice in perpetuity that the site was used for the disposal of municipal solid waste and is now closed. The notice shall specify the type, location, and quantity of wastes disposed. The notice shall also identify the required post-closure monitoring period and state that the facility will be monitored for at least 30-years; that a survey plat and record of the disposal area's locations and elevations have been filed with the ODEQ and with an identified city or county; and that future uses may be restricted in accordance with OAC 252:515-25-57. The C&D Cell is responsible for providing a file-stamped copy of the notice to the ODEQ.

VII. CLOSURE COST ESTIMATE

Closure estimates and the amount of financial assurance provided must be increased if, at any time during the active life, changes to the closure plan of the facility increase the maximum cost of closure. Proposals for reduction of closure cost estimates and the amount of financial assurance required must be submitted to the ODEQ for approval. To qualify for a reduction, the cost estimate must be demonstrated to exceed the minimum cost of closure during the remaining life of the facility, the amount of security remaining after the reduction must adequately cover the estimated closure cost yet to be performed, and financial assurance shall not be reduced until ODEQ approval has been granted.

At a minimum, cost estimates for closure shall be adjusted no later than April 9th of each year; the adjustment must be submitted to the ODEQ for approval. In the adjustment, maximum costs of closure may be recalculated, in current dollars, in accordance with OAC 252:515-27-51. If there are no significant changes to the closure plan, the cost estimate may be adjusted by use of an inflation factor derived from the most recent annual Implicit Price Deflator for Gross National Product or the Implicit Price Deflator for Gross Domestic Product published by the U.S. Department of Commerce in its Survey of Current Business in a year for which the adjustment is made. The approved adjusted cost estimate shall be placed in the operating record.

VIII. POST-CLOSURE ACTIVITIES

A. Monitoring and Maintenance

In accordance with OAC 252:515-25-51(b), post-closure care maintenance will commence immediately upon ODEQ approval of final closure. Post-closure activities will continue for a period of 30 years, unless the ODEQ approves a post-closure period of a different duration. Documentation pursuant to OAC 252:515-3-34 is on file with DEQ showing that they have legal right to access all property subject to post-closure care requirements.

Post-closure inspections shall be performed on a quarterly basis. Additional inspections may be conducted to observe repairs or evaluate problem areas discovered during prior inspections.

The quarterly post-closure inspections will consist of the inspection and evaluation of the final cover system and vegetative cover, the drainage and erosion control structures, the leachate collection system, and the security system. The frequency and specific inspections associated with the groundwater monitoring and gas

monitoring programs are addressed in the C&D Cell's Groundwater Monitoring Plan and Explosive Gas Control Plan.

1. Final Cover

Post-closure care will verify the integrity of the final cover system and its ability to minimize infiltration and erosion. The following conditions should be examined during the inspection:

- Settlement;
- Cracking;
- Erosion;
- Animal burrows; and
- Other disturbances affecting either the thickness or configuration of the final cover.

Maintenance and repairs should be conducted as soon as practical and may consist of filling in areas of settlement, re-grading, and slope restabilization. In areas of substantial settlement or displacement of the final cover, the integrity of the cap should be re-evaluated and any necessary repairs made. The final cover should be maintained to provide the proper slope to promote surface water runoff and to assure continuity of the soil components to minimize infiltration and leachate production. Settlement that occurs on side slopes of the landfill will generally not require re-grading or placement of additional cover to maintain surface drainage. Side slopes are designed no greater than 4:1 (horizontal: vertical) slope, and the crown of the landfill area slopes at a minimum of four percent to minimize the effect of settlement. With these slope conditions, it is anticipated that minimal soil will be required during the post-closure care period for maintenance of this site.

Included as part of the final cover system inspection, the integrity of the vegetation and its ability to minimize infiltration and erosion will be determined. The following conditions should be examined during the inspection:

- Erosion;
- Overgrowth of shrubs, trees, and other deep-rooted vegetation; and
- Patches of dead vegetation.

Maintenance and repairs of the vegetative cover may consist of the following activities:

- Reseeding, fertilizing, liming, and mulching of washed out areas;
- Brush removal; and
- Mowing.

Reseeding should be conducted as necessary to assure proper vegetative growth over all areas of the final cover. Mowing and removal of deep-rooted brush and vegetation should be performed as necessary during the growing season.

2. Borrow Area Reclamation

The borrow areas will have a gently sloping topography to provide wet weather drainage. The borrow area will be excavated in a manner which

results in final contours similar to those present before disturbance, except the area will have a lower elevation. The areas will be excavated in a manner to provide positive drainage and to possibly create one or more impoundments. In the case that impoundments are proposed/constructed, all applicable permits will be obtained and copies provided to the ODEQ.

Activities will be scheduled to minimize erosion and sedimentation. The borrow area will be re-graded in a manner to provide sufficient soil material for the re-establishment of vegetation. Re-vegetation activities will be completed as needed during the spring or fall growing seasons.

3. Drainage and Erosion Control Structures

Drainage and erosion controls will be inspected throughout the post-closure period to assure that surface water is conveyed away from the landfill to the perimeter drainage system. Items or conditions to be examined include the following:

- Erosion;
- Settlement;
- Structural integrity of berms, letdown structures, and other drainage and erosion control structures; and
- Silt and sediment buildup.

Maintenance and repairs should be conducted as soon as practical, and may consist of the following activities:

- Replacement of riprap, gabions, or other structural lining installed for erosion protection;
- Removal of obstructions to permit conveyance of surface water;
- Placement of fill and re-grading;
- Removal of silt and sediment;
- Repairs to berms; and
- Repair or replacement of stacked hay bales or silt fencing.

4. Leachate Collection System

Post-closure care of the leachate collection system consists of operation and maintenance of the leachate collection system, as well as any storage, pumping, or conveyance systems. As required per OAC 252:515-25-54(b)(2)(B), the leachate collection system will be equipped with a system for automatic and continuous leachate removal not requiring intervention by the owner/operator.

The leachate collection system will be observed during each scheduled inspection event throughout the post-closure period. Based on the results of the inspections, more frequent or less frequent monitoring may be required due to problems with the system or changes in the rate of production of leachate. During these inspections, leachate collection sumps and/or piping, cleanouts, or inspection points will be observed to determine the effectiveness of the system in removing leachate and minimizing the head on the liner system.

Maintenance, on an annual or otherwise as-needed basis, may include flushing and pressure cleaning of the leachate collection and removal pipes.

5. Groundwater Monitoring System

Semi-annual groundwater monitoring of the monitoring network wells will be completed in accordance with the most recently approved groundwater monitoring plan.

6. Surface Water Monitoring Plan

During site inspections, surface water control structures (drainage swales, letdown channels, perimeter channels, culverts, and detention ponds) will be inspected to ensure they are functioning properly. Any problems noted during the inspection will be addressed as soon as reasonably possible.

7. Landfill Gas Monitoring System

Monitoring of explosive gas monitoring wells located along the site boundary will be conducted on a semi-annual basis during the post-closure period as outlined in the most recently approved explosive gas monitoring plan.

8. Site Security and Access Control

Post-closure care of the security system is necessary to control unauthorized access and prevent illegal dumping of wastes. Inspection of the security system at the site should be performed during the post-closure inspections. Signs shall be posted on the outer perimeter indicating the site is a closed MSWLF, as required by OAC 252:515-25-54(a)(I). The closed facility will be maintained as necessary to provide access to the closed areas throughout the post-closure period.

IX. POST-CLOSURE COST ESTIMATE

A cost estimate for post-closure care of the landfill, including costs for the activities described above, is provided in Appendix A. This estimate includes the following costs:

- Quarterly site inspection,
- Site security and access control,
- Final cover erosion and seeding repair,
- Semi-annual groundwater monitoring,
- Surface water control structure maintenance,
- Semi-annual explosive gas monitoring,
- Leachate collection, disposal, and system maintenance,
- Annual reporting, and
- Certification and recordkeeping.

Post-closure estimates and the amount of financial assurance provided must be increased if, at any time during the active life, changes to the closure plan of the facility increase the maximum cost of post-closure. Proposals for reduction of post-closure cost estimates and the amount of financial assurance required must be submitted to the ODEQ for approval. To qualify for a reduction, the cost estimate must be demonstrated to exceed the minimum cost of post-closure during the remaining post-closure care period, the amount of security

remaining after the reduction must adequately cover the estimated post-closure cost yet to be performed, and financial assurance shall not be reduced until ODEQ approval has been granted.

At a minimum, cost estimates for post-closure shall be adjusted no later than April 9th of each year; the adjustment must be submitted to the ODEQ for approval. In the adjustment, maximum costs of post-closure may be recalculated, in current dollars, in accordance with OAC 252:515-27-51. If there are no significant changes to the post-closure plan, the cost estimate may be adjusted by use of an inflation factor. The inflation factor can be derived from the most recent annual Implicit Price Deflator for Gross National Product or the Implicit Price Deflator for Gross Domestic Product published by the U.S. Department of Commerce in its Survey of Current Business in a year for which the adjustment is made. The approved adjusted cost estimate shall be placed in the operating record.

If corrective action is required at the C&D Cell, cost estimates for corrective action shall be submitted to the ODEQ for approval. The cost estimates shall be a detailed written estimate, in current dollars, of the cost of hiring a third party to perform the corrective action in accordance with an approved corrective action plan. The corrective action cost estimate shall be set by the ODEQ and account for the total costs of corrective action activities as described in an approved corrective action plan for the entire corrective action period. The amount of financial assurance provided must be increased to account for corrective action costs.

X. FINANCIAL ASSURANCE INSTRUMENT

At a minimum, the financial assurance instrument (FAI) shall be updated no later than April 9th of each year. Updates will address modifications to the landfill's closure and post-closure requirements, if any, and the associated cost estimates. If there are no significant changes to the post-closure plan, the cost estimate may be adjusted by use of an inflation factor. The inflation factor can be derived from the most recent annual *Implicit Price Deflator for Gross National Product* or the *Implicit Price Deflator for Gross Domestic Product* published by the U.S. Department of Commerce in its *Survey of Current Business* in a year for which the adjustment is made. The current FAI shall be placed in the operating record.

XI. POST-CLOSURE LAND USE

There are no current planned uses for the C&D Cell after closure. Should use of the closed landfill not associated with solid waste activities be considered, plans will be prepared and submitted to the ODEQ for review and approval per OAC 252:515-25-55.

XII. POST-CLOSURE REPORTING REQUIREMENTS

A. Annual Post-Closure Report

Beginning one year after the ODEQ's approval of the certification of final closure, Altus Municipal Landfill will submit an annual post-closure maintenance and monitoring report to the ODEQ until the post-closure period ends. This report will document the maintenance performed at the site and summarize all monitoring data for the previous year. The report shall be submitted by April 9th of each year after ODEQ's certification of final closure.

B. Certification of Post-Closure Performance

At the conclusion of the post-closure period, Altus Municipal Landfill will submit, in

lieu of the annual post-closure report, a certification prepared and sealed by a professional engineer registered in the State of Oklahoma certification, indicating that the C&D Cell was maintained and monitored in accordance with the approved post-closure plan, the permit, and applicable regulations. This certification will also indicate whether monitoring throughout the post-closure period has shown the presence of elevated levels of any constituent or if any evidence of contamination related to site operations has been found and, if so, what corrective measures were taken. The certification will be maintained in the site operating record.

SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Maintain at the site for the OWNER one record copy of:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the contract.
 - 5. Approved shop drawings, product data and samples.
 - 6. Field test records.
- B. Related Requirements in other parts of the Project Manual:
 - 1. Conditions of the Contract.

1.2 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Store documents and samples in CONTRACTOR'S field office apart from documents used for construction.
 - 1. Provide files and racks for storage of documents.
 - 2. Provide locked cabinet or secure storage space for storage of samples.
- B. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.
- C. Make documents and samples available at all times for inspection by OWNER'S REPRESENTATIVE.

1.3 RECORDING

- A. Label each document "PROJECT RECORD" in neat large printed letters.
- B. Record information concurrently with construction progress.
 - 1. Do not conceal work until required information is recorded.
 - 2. All reports should include the requirements from Section 1.5 of EPA Technical Guidance Document in accordance with OAC 252:515-11-4(a)(1).
- C. Drawings: Legibly Mark to Record Actual Construction:
 - 1. Location of C&D debris cell, referenced to permanent improvements.
 - 2. Actual construction of C&D debris cell.

3. Actual construction of permanent installation.
- D. Specifications and Addenda; Legibly Mark Each Section to Record:
 1. Manufacturer, trade name, catalog number, and supplier of Representative for the OWNER.
 2. Changes made by Change Order.
- E. Drawings and Specifications: Post addenda items, whether written or drawn, on the pages affected such that:
 1. Cut-outs of items are securely attached to the sheet that the addenda modified.
 2. The addenda number is reflected in each posted item.
 3. Completely revised sheets are posted over the sheet revised and the outdated sheet is labeled "void".

1.4 SUBMITTALS

- A. At contract close-out, deliver Record Documents to OWNER'S REPRESENTATIVE.
- B. Accompany submittal with transmittal letter in duplicate, containing:
 1. Date.
 2. Project title and number.
 3. CONTRACTOR'S name and address.
 4. Title and number of each Record Document.
 5. Signature of CONTRACTOR or his authorized REPRESENTATIVE.

END OF SECTION 01 78 39

SECTION 31 35 26.13 - RECONSTRUCTED CLAY LINER (LANDFILLS)

PART 1 - GENERAL

1.1 SCOPE

- A. The CONTRACTOR shall furnish all labor, materials, supervision and equipment to complete the excavation, embankment and a reconstructed clay liner with a minimum thickness of two (2) feet, as shown on the Plans and as included in these Specifications.

1.2 DEFINITIONS

The following list of definitions is provided for reference:

- A. **"Authorized Representation"** shall mean a duly named individual who has the authority to execute a change order on behalf of the City.
- B. **"City"** shall mean the City of Altus, Oklahoma.
- C. **"Classification System"** shall mean the soil classification system shall be in accordance with the standard test method for classification of soils for engineering purposes (ASTM D2487- 83).
- D. **"Compaction"** shall mean the process of increasing the density of soil by rolling, tamping, vibrating, or other mechanical means.
- E. **"Contractor"** shall mean the party entering into this general contract.
- F. **"Atterberg Limits"** includes the liquid limit, plastic limit, and shrinkage limit for soils (ASTM D4318-84 and D427-83, respectively). The water content when the soil behavior changes from the liquid to the plastic state is the liquid limit; from the plastic to the semi- solid state is the plastic limit; and from the semi-solid to the solid state is the shrinkage limit.
- G. **"Density"** shall mean the mass density of a soil is its weight per unit volume; usually reported in pounds per cubic foot.
- H. **"Department"** shall mean the Oklahoma Department of Environmental Quality, Land Protection Service (ODEQ/LPS).
- I. **"Engineer"** shall mean the consulting engineering firm providing design and general supervision, monitoring of earthwork and liner construction, construction surveillance, and surveying services and who is responsible interpreting for and enforcing the Specifications outlined herein.
- J. **"EPA Document"** shall mean the EPA (U.S. Environmental Protection Agency) Technical Guidance Document "Quality Control and Quality Assurance for Waste Containment Facilities", EPA/600/R-93/182, dated September 1993.
- K. **"Gas Well"** shall mean a vertically installed slotted, perforated, or porous pipe with a solid riser pipe surrounded by a gravel-packed zone over the perforated pipe section to allow removal of landfill gas and any intercepted leachate.

- L. **"Geomembrane"** shall mean an impermeable membrane liner or barrier used in civil engineering for geotechnical products. It can also be reinforced with a fabric scrim for added strength.
- M. **"Geotextile"** shall mean a relatively porous construction or reinforcement fabric used in civil engineering for geotechnical projects. The fabric structure may be knit, woven, or nonwoven. Filter geotextile is a material, which provides separation of materials with different pore size openings to prevent clogging. Drainage geotextiles are materials with adequate transmissivity to provide planar flow of fluid. Reinforcing geotextile is a material with sufficient in-plane strength to support some or all of the load applied to a composite system (such as soil-geotextile).
- N. **"In Situ"** shall mean "as is", or as it exists in-place naturally.
- O. **"Moisture Content"** shall mean the ratio of quantity of water in the soil (by weight) to the weight of the soil solids (dry soil), expressed in percentage; also referred to as water content.
- P. **"Optimum Moisture Content (OMC)"** shall mean the moisture content corresponding to maximum dry density as determined in the Standard Proctor (ASTM D-698) or Modified Proctor (ASTM D-1557) Test.
- Q. **"OAC"** shall mean the Oklahoma Administrative Code.
- R. **"Permeability"** shall mean the ability of pore fluid to travel through a soil mass via interconnected void. "High" permeability indicates relatively rapid flow of pore fluid and vice versa. Coefficients of permeability are generally reported in centimeters per second.
- S. **"Plasticity"** shall mean the ability of soil mass to be remolded without raveling or breaking apart. The plasticity index, numerically equal to the difference between the liquid and plastic limit, is a comparative number, which describes the range of moisture contents over which a soil behavior is plastic.
- T. **"QCA Engineer"** shall mean an independent consulting engineer and/or testing firm, working directly for the City, providing subsurface soil investigations, soil testing laboratory, oversight of earthwork and liner construction, and assisting in the construction surveillance, who is responsible for final approval of cell liner construction according to the Plans and Specifications outlined herein.

PART 2 - PRODUCTS

2.1 RECONSTRUCTED CLAY LINER

- A. Preliminary Liner Soil Testing (Furnished by QAQC Firm)
 - 1. Suitability determination. The OWNER shall collect samples and test soil proposed to be used as liner material.
 - 2. Sample collection. At least one sample shall be collected for each type of material proposed for use as liner material. One composite sample shall be taken for every

10,000 cubic yards of soil or more frequently if visual observations indicate a change in material characteristics. At least five natural or in-place moisture and density tests per acre shall be taken.

3. Testing. The soil samples shall be tested by a soil's laboratory under the direction of an independent professional ENGINEER registered in the State of Oklahoma. The test samples and report shall be sealed by a Registered Professional ENGINEER.
4. Tests. The following tests shall be conducted on each type of soil samples:

| | |
|--------------------------------------|----------------------------|
| a. Soil Classification | ASTM D-2487 |
| b. Particle-Size Analysis of Soil | ASTM D-422 |
| c. Sieve Analysis for the Following: | #4, #10, #40, #200 |
| d. Percent Fines (- #200 sieve) | ASTM 1140 |
| e. Atterberg Limits | ASTM D-4318 |
| f. Moisture Content | ASTM D-2216 or ASTM D-4643 |
| g. Moisture-Density Relationship | ASTM D698 or ASTM D1557 |
| h. Hydraulic Conductivity | ASTM D-5084 |
5. Test Pad. A test pad for the liner can be constructed and used to verify that the construction methods to produce the hydraulic conductivity of 1.0×10^{-7} cm./sec. or less throughout the reconstructed area. However, hydraulic conductivity tests shall be performed in the top 12 inches of the finished liner per Part 3.6 below.
6. Soils Report. A laboratory report of soil and rock characteristics shall be submitted as part of the application. All test results shall indicate the type of test used the method of testing and the condition, preparation, and orientation of each sample.

2.2. PERFORMANCE STANDARDS OF LINER MATERIAL

- A. The soil tests required for preconstruction shall meet or exceed OAC 252:515-11-32. These tests shall be conducted at a minimum rate of one sample per 4,000 cubic yards and for each soil type or visual change in soil appearance.
- B. The minimum performance standards required of recompacted liner material include:
 1. Plasticity Index must be no less than 10 percent and should be less than 30 percent
 2. Liquid Limit must be no less than 24 percent.
 3. Percent Fines Passing #200 Mesh Sieve shall be at least 50 percent.
 4. The amount of gravel (dry-weight percentage retained on the No. 4 sieve) must be less than or equal to 20 percent.
 5. The largest particle size allowed must be less than one (1) inches in diameter.
 6. The water content of the soil must be wet of optimum at the time the soil is compacted. The recommended range is 1 to 3 percent wet of optimum moisture or as determine by field geotechnical testing.

7. After the soil is compacted, it must have a hydraulic conductivity that is no greater than 1.0×10^{-7} cm./sec.

PART 3 - EXECUTION

3.1 SEQUENCE OF CONSTRUCTION

- A. The two (2) foot reconstructed clay liner shall be constructed to the lines and elevations shown on the Contract Drawings and in accordance with these Specifications.
- B. The recompacted liner shall be constructed in the following sequence:
 1. Removal of Overburden
 2. Subgrade Preparation
 3. Two (2) Foot Reconstructed Clay Liner
- C. During all phases of the project, construction will be tested, inspected, and evaluated prior to approval.

3.2 REMOVAL OF OVERBURDEN

- A. CONTRACTOR shall remove and stockpile overburden on-site in a location coordinated with the OWNER.

3.3 SUBGRADE PREPARATION FOR RECOMPACTED LINER

- A. The upper six (6) inches of the surface on which the clay liner is to be placed must be scarified and recompacted to a minimum density of 95 percent of the standard proctor density.

3.4. RECOMPACTED LINER PLACEMENT AND COMPACTION

- A. The steps shall be followed in constructing each lift of a recompacted liner.
 1. Internal side slopes of disposal areas where liner shall be constructed shall be no steeper than 3:1 (run: rise).
 2. Liner material shall be placed at 1 to 3 percent wet of optimum moisture, or as indicated by soil tests. If the soil must be moistened to achieve the proper level of water content, then the water must be distributed equally throughout, and a full hydration of the soil must take place. This may require that the soil be moistened in a separate area and allowed to hydrate for some time before it is placed in the liner. Moisture content must be verified by either a 95% Standard Proctor Test or a 90% Modified Proctor test.
 3. Scarify the surface on which the lift shall be placed to a nominal depth of approximately one (1) inch.
 4. Place a lift of soil at a loose depth of nine (9) inches or less. On the final lift, no more than 5 percent of the final lift thickness determinations can exceed this requirement and no lift thickness can exceed the maximum allowable lift thickness by more than 1 inch.

5. Compact the lift to a depth of six (6) inches or less by the use of a heavy-footed roller with feet that fully penetrate the loose lift of soil and at least 1" into the underlying layer. The minimum weight of roller shall be 3,000 pounds per liner foot along the axis of the drum(s). The soil test results, and the type of compaction equipment used shall determine the minimum number of passes. A pass shall be constituted as one pass for a self-propelled roller or one pass of the drums(s) for a towed roller. The minimum compaction coverage (C) anticipated to meet compaction is 150 to 200 percent, where the Number of passes (N) can be estimated from the following:

$$N = C \cdot A_d / A_f / 100$$

Where:

| | | |
|----------------|---|--|
| C | = | Percent of coverage |
| A _d | = | Surface area drum |
| A _f | = | Sum of the area of the feet on the drums |

6. At least 5 to 15 passes may be necessary to remold and compact the clay liner sufficiently to achieve the required permeability. The minimum density of the lift shall be greater than or equal to 95 percent of the standard proctor density or 90% of modified proctor density. Heavy compaction equipment may require the minimum density to be 95 percent of the modified proctor density, at the discretion of the ENGINEER. The required number of passes shall be observed/determine at least one time, per acre, per lift.
7. Inspect for and remove all rocks, cobbles, roots, and other foreign objects over one inch in diameter, as well as all surface rocks, regardless of size.
8. Inspect for flaws, cracks, and other defects; and,
9. Corrective action will be required in all areas that do not conform with specifications. The defective area must be repaired out to the limits defined by passing soils tests unless the limits are determined by additional field tests.

*The required inspections and removals must be continual as part of the placement of liner material.

3.5. RECOMPACTED LINER CONSTRUCTION TESTS

- A. The following moisture and density tests shall be performed on each compacted lift at a rate of at least three per acre for each approximately six-inch compacted lift. A minimum of two tests shall be performed on the bottom and one on side-slope areas.

1. Determination of moisture values of each lift by one of the following methods:

| | |
|------------------------------------|-------------|
| a. Nuclear density method | ASTM D-2922 |
| b. Drive-cylinder method | ASTM D-2937 |
| c. Rubber balloon method | ASTM D-2167 |
| d. Sand-cone method | ASTM D-1556 |
| e. Microwave drying method | ASTM D-4643 |
| f. Conventional oven drying method | ASTM D-2216 |

- B. As part of the QC/QA procedures, every tenth sample tested with the above methods; must be tested by the conventional oven drying method (ASTM D2216). The results of these tests must be compared with field tests to identify any significant or systematic calibration errors.
1. Determination of density values of each lift by one of the following methods:
 - a. Nuclear density method ASTM D-2922
 - b. Drive-cylinder method ASTM D-2937
 - c. Standard Proctor Test or ASTM D-698
Modified Proctor Test ASTM D-1557
- C. As part of the QC/QA procedures, every twentieth sample tested with ASTM D-2922 must be tested with the sand cone method (ASTM D-155, rubber balloon method (ASTM D-2167) or undisturbed sample method (ASTM D-1587). The results of these tests must be compared with field tests to identify any significant or systematic calibration errors.
- D. Sampling patterns will be based on a grid system establish by the ENGINEER. Tests will be randomly staggered in successive lifts so that sampling points vary in successive lifts. Areas missed by randomly sampling will require additional tests for liner verification.

3.6. RECOMPACTED LINER CONSTRUCTION VERIFICATION TESTS

- A. After completion of recompacted liner construction, the following quality control measures shall be performed and documented.
1. A control survey shall be performed on a 100-foot grid which verifies the thickness of the constructed liner.
 2. A visual inspection shall be performed to ensure liner integrity.
 3. Hydraulic conductivity shall be tested with at least one test per acre performed on the side-slopes and two per acre on the bottom, at DEQ approved locations, in the top 12" of the liner using one of the following methods:
 - a. Laboratory testing of undisturbed soil sample can be done according to ASTM Test Method D-5084 with a maximum confining stress of 35 kPa (5 psi). ASTM Method D-1587 shall be used to retrieve the undisturbed soil sample for an in-situ laboratory test.
 - b. A field test for hydraulic conductivity shall be according to the sealed double ring infiltrometer test (ASTM D-5093).
 - c. Any other method approved in advance by the ENGINEER and/or the OWNER in accordance with OAC 252:515-11-37(c)(2)(c).
 4. Liner Test Holes
 - a. All test holes deeper than three feet shall be plugged in accordance with OAC 252 :515-7-3 and OAC 785:35-11-2 (b).
 - (1) If no contaminated soil and groundwater is encountered in the boring, uncontaminated drill cuttings, uncontaminated surface clay, cement, and/or high solids (a minimum of twenty percent (20%) solids by dry weight)

bentonite grout, pellets, or granules shall be placed from the bottom of the boring to an elevation fourteen (14) feet below land surface and a minimum of ten (10) feet shall be filled with cement grout to an elevation four (4) feet below land surface. The remaining four (4) feet to land surface shall be backfilled with compacted uncontaminated soil.

- (2) If contaminated soil or contaminated groundwater is encountered in the boring, or if the boring is located at an underground storage tank site or within 300 feet of the outside perimeter of an existing wastewater lagoon or is located on a tract of land where a wastewater lagoon is proposed, cement grout shall be placed from the bottom of the borehole to an elevation four (4) feet below land surface. Cement grout shall be placed in the borehole through a tremie pipe and filled r pumped from the bottom upward. The remaining four (4) feet to land surface shall be backfilled with compacted uncontaminated soil.
- (3) If the boring is twenty (20) feet or less in total depth and groundwater has not been encountered, the boring shall, at a minimum, be filled with compacted uncontaminated cuttings from the bottom of the boring to land surface.
- (4) Direct push geotechnical borings. Direct push geotechnical borings shall be plugged to prevent pollution of groundwater within thirty (30) days after completion of drilling or immediately if drilled by an unlicensed or uncertified person or if the Board determines that the well does not meet the minimum construction standards set forth in this Chapter as follows:
 - (a) Bentonite chips shall be placed and effectively compressed within the annulus space from the bottom of the borehole to within ten (10) feet of the land surface.
 - (b) Cement grout shall be installed through a tremie pipe in the remaining annulus space from ten (10) feet to land surface, provide that no cement grout shall be required if the boring is less than ten feet (10') in total depth and no groundwater and no contaminated soil was encountered.
- b. All holes, three feet or less in depth shall be plugged in accordance with OAC 252:515-11-74. All boreholes must be plugged with pelletized or chipped bentonite and rehydrated after the core sampling is completed.
- c. Maximum allowable percentages of failing materials tests shall be as follows:

| Test | Maximum Percentage of Outliers |
|---|---------------------------------------|
| Atterberg Limits | Number of Passes Required |
| Percent fines | 5% |
| Percent Gravel | 5% |
| Clod Size | 10% |
| Hydraulic Conductivity of Laboratory Compacted Soil | 10% |
| Water Content | 5% |
| Dry Density | |

3%^{*1}

5%

3%^{*2}

*1 No water content less than 2% nor more than 3% of the allowable value

*2 No dry density values less than 5 lbs. per cubic foot below the allowable Value

Failing tests concentrated in one lift or one area will not be acceptable even if the above percentages are met.

- f. A report, prepared by QCA ENGINEER, of the above quality control measures shall be submitted to the ENGINEER for approval of the Recompacked Clay Liner. All soil property values as required by OAC regulation or this specification shall also be included as well as a summary of all construction testing.

3.7. REPAIR AND/OR REPLACEMENT OF FLAWED RECOMPACKED CLAY LINER

- A. If the liner fails any construction verification tests, the liner shall be repaired or replaced until it meets the requirement. The defective area must be repaired out to the limits defined by passing soils tests unless the limits are determined by additional field tests.
- B. The CONTRACTOR may proceed, at his own risk, to place additional lifts before all test results are available; however, if the QCA ENGINEER rejects the lift based on completed test reports, the defective soil and all overlying materials that have been replaced will be removed and replaced.
- C. All repairs will be certified by the QCA ENGINEER and will be documented in the liner installation and testing report in accordance with QAC 252:515-11-38.

3.8. PROTECTION OF RECOMPACKED CLAY LINER

- A. The recompacked clay liner must be protected from desiccation, freezing, and excess surface water after construction and until the geomembrane liner is completely installed. The Quality Assurance ENGINEER shall certify that the moisture content was maintained in the liner until placement of the geomembrane liner.
 1. The CONTRACTOR shall prevent the desiccation of the recompacked clay by any of the following methods or any other method approved by the ENGINEER and QCA ENGINEER:
 - a. Water the soil periodically (preferred).
 - b. Rolling the surface of the recompacked clay liner smooth with a drummed roller to produce a thin, dense layer of soil on the surface to minimize water transfer in and out of the liner.
 - c. Cover the recompacked clay liner, temporarily with a geomembrane, moist geotextile, or with moist soil.

2. Damage from freezing is not anticipated, however, should freezing temperatures occur, the recompacted clay liner shall be inspected as outlined in Section 2.9.2.3 of the EPA Document.
3. The CONTRACTOR shall provide adequate equipment to prevent ponding of water on the recompacted liner. Soils softened by excess rain, shall be removed, or allowed to dry by natural processes until the proper water content has been restored. The soil shall be disked and/or recompacted as necessary to restore the soils to meet the requirements of this section.
4. No additional payment shall be made for protecting and reworking the recompacted clay liner as outlined above. Costs to be included in the unit price bid for recompacted clay liner.

END OF SECTION 31 35 26.13

- The groundwater samples will be collected by pumping directly into each of the required containers in accordance with sample collection order described in Section 2.4.2.

2.4.3.3 Passive Sampling Procedures

To passively capture a groundwater sample, the passive sampler is activated to close mechanically from the surface, either through a manual pull trigger system for shallow applications (less than 40ft) or by possibly using a pneumatic triggering system for deeper applications. The passive sampler is then retrieved and the sample(s) are discharged from it directly into required sample containers in accordance with the sample collection order described in Section 2.4.2. The passive groundwater sampler is then redeployed into the well in preparation for the subsequent sampling event.

2.4.4 VOC Sample Collection

Filling VOC sample containers involves extra care. The water should be gently discharged into each vial until a positive meniscus is formed over the top of the container to ensure no headspace is present in the sample vial upon replacing the cap.

2.4.5 Sample Filtration

All efforts must be made to delete or minimize controllable factors to allow the collection of as representative and turbid-free sample as possible. Oklahoma DEQ, Oklahoma Administrative Code, Municipal Solid Waste Regulations do not currently allow for field sample filtration of constituents listed in OAC 252:515 Appendix A and C prior to laboratory analysis (OAC 252:515). The facility may collect samples for laboratory filtration and analysis of dissolved metals when deemed necessary. Otherwise, metal and inorganic indicator analyses will be for total concentrations.

2.4.6 Sample Preservation

All samples will be containerized and preserved according to Appendix B, *Sample Containerization and Preservation of Samples*. Preservation acids may be added to the applicable sample container in the field or pre-preserved to the applicable empty containers at the laboratory prior to sample collection. Methods of preservation are intended to retard biological action, retard hydrolysis of chemical compounds and complexes, and reduce the volatility of constituents.

Samples requiring refrigeration to four degrees Centigrade, according to Appendix B, will be accomplished by placing the sample containers immediately into coolers containing wet ice or the equivalent and delivering to the analytical laboratory as soon as practical.

4 SAMPLING FREQUENCY – DETECTION MONITORING

4.1 Background

The Altus Municipal Landfill will monitor for the list of parameters as listed in Table 1.

As per OAC 252:515, the number of samples to be collected to establish groundwater quality shall be consistent with the appropriate statistical procedures determined pursuant to OAC 252:515. Due to the seasonal and temporal variations natural in groundwater analytical data, eight (8) independent quarterly samples from each well shall be collected and analyzed for the constituents listed in Table 1 to establish background water quality.

Inter-well statistical procedures are not recommended at this facility due to the variable strata (gypsum and shale) in the saturated zone. Wells completed in gypsum strata may have significantly different water chemistry than wells completed in shale strata. This spatial variability will result in false positive test results. However, if inter-well statistical comparisons are used, they will commence after completion of the initial eight (8) quarterly background events. Analytical data from upgradient monitor wells will be incorporated in to the background after each monitoring event. Data will be evaluated for potential outliers prior to incorporation into background.

For intra-well statistical comparisons, after completion of the initial eight (8) quarterly background events, new quarterly or semi-annual data may be incorporated into background at a minimum frequency of once every two years. New data will be evaluated for any significant trends and potential outliers (or by alternative tests that provide equivalent or better evaluation of data) and appropriate data incorporated into background.

4.2 Detection Monitoring Events

Within six (6) months after completion of background, sampling and analysis for both upgradient and downgradient monitoring wells will be conducted on a semi-annual basis (approximately every six (6) months) for constituents listed in Table 1.

4.3 Groundwater Analysis Result Submittals

A report of all groundwater sampling and analysis results will be submitted to the ODEQ no later than sixty (60) days after each sampling event (OAC 252:515).

In the event that statistical analysis of the groundwater analytical results indicate an initial Statistically Significant Increase (SSI) from background of a tested constituent at a

downgradient monitoring well, a notice in writing to the ODEQ will be submitted within sixty (60) days after each sampling event (OAC 252:515. The notification to the ODEQ and notice in the operating record will be in the format of a statistical analysis report with any SSI appropriately identified. Verification resampling to confirm the initial SSI or declare a false positive may be performed in accordance with Section 5.1.

5 STATISTICAL METHODOLOGY – GROUNDWATER DATA ANALYSIS

Statistical comparisons will be performed using Sanitas™, a commercial software program developed by Intelligent Decision Technologies, Inc. or another comparable computer program. Statistical analyses of groundwater data will be performed in accordance with OAC 252:515.

5.1 Statistically Significant Constituents and Verification Resampling

Statistical Analysis of constituents in GWSAP Table 1, will commence within six (6) months after completion of the eight (8) quarterly background events as referenced in Section 4.1 of this plan. An initial Statistically Significant Increase (SSI) will be based on any compound detected in any downgradient monitor well at a concentration above the specific constituent's statistical limit. If an initial SSI of any constituent is indicated at any downgradient monitoring well, a notice will be made to the ODEQ in the form of a statistical analysis report within sixty (60) days of the sampling event as referenced in Section 4.3 of this plan.

As previously mentioned, inter-well statistical procedures are not recommended at this facility due to the variable strata (gypsum and shale) in the saturated zone. Wells completed in gypsum strata may have significantly different water chemistry than wells completed in shale strata. This spatial variability will result in false positive test results.

Verification resampling is an integral part of the presented statistical methodology. In the event of an initial SSI, verification resampling may be performed and the results reported to the ODEQ within 90 days of the determination.

In the event that one or more constituents listed in Table 1 in any downgradient monitor well are confirmed through verification resampling as a SSI and/or no source other than the MSWLF, error, or natural variation is demonstrated per OAC 252:515 then within 90 days of the initial determination, assessment monitoring will be initiated under OAC 252:515.

5.2 Updating Background Data

As monitoring continues, the background mean and variance will be updated periodically to incorporate new data. At a minimum of every two (2) years all new data that are in control will be pooled with the initial eight (8) background samples and the mean and variance will be recomputed and used in constructing future statistical limits.