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MAR 11 2010

McGill ASSOCIATES

March 8, 2010

Mr. Allen Gaither
Solid Waste Permitting Section
Division of Waste Management
North Carolina Department of Environment and Natural Resources
2090 U.S. Highway 70
Swannanoa, North Carolina 28778

RE: Request for Additional Information
Construction Plan Approval
Gas Collection and Combustion System
Francis Farm Landfill
Haywood County, North Carolina
Permit # 44-03

Dear Mr. Gaither:

We appreciate your review of the submittal pertaining to the construction of a gas collection and combustion system at the Francis Farm Landfill in Haywood County. The following is our response to your review letter, dated January 27, 2010.

1. A technical discussion of the construction practices for drilling, excavation, backfilling material and fabrication, waste disposal, control of nuisance odors, vectors and windblown material, personnel safety, decontamination of tools and machinery, testing protocols and frequencies, etc.

Well Construction Methods

Proposed wells were laid out to provide a radius of influence of approximately 105 feet. Twenty-one new well locations were identified. The well locations will be staked out and the ground elevation at the well recorded. There is only limited information pertaining to the bottom grades of the landfill, and these base elevations have not been verified. Haywood County will install their methane extraction wells such that the bottom of the well is 5-10 feet above the bottom elevation of the landfill. As noted on the plans, it is anticipated that 4-5 wells may be extended into the soil beneath the bottom of the landfill in order to determine the bottom elevation of the landfill. The depth to bottom of the landfill will be recorded. These wells will then be immediately backfilled with a clay/bentonite mixture to an elevation 5 feet above the bottom of the landfill. The landfill bottom elevation information will be utilized to estimate the

depth of the remaining wells. See the well construction details on Sheet C-502 of the plans for the requirements of the well installation, including the materials used for backfilling the wells.

The County will hire a company experienced in landfill gas extraction well installation to install the wells and well piping. A bucket auger or rotary auger/drill installation will be utilized. See Specification Section 02440 pertaining to landfill gas extraction well installation for additional information relating to the extraction well construction.

Prior to beginning any well installation activities, the contractor will be required to submit their Safety Manual and Standard Operating Procedure Manual, as it pertains to the construction of landfill gas extraction wells, for review and approval. At a minimum, a protective cover/screen shall be placed over the excavated well any time the boring operation is not underway to ensure that personnel do not enter the well. Under no circumstances shall an open borehole be left unattended. All boreholes shall be completed and backfilled prior to the end of each day's work.

The contractor will be required to use whatever means or methods are necessary to prevent contamination of the surrounding landfill surface with refuse tailings removed from the borehole. Any contamination shall be immediately removed and the landfill surface restored to its original condition. Additionally, Haywood County will provide the institutional controls necessary to ensure that the contractor maintains the environmental integrity of each work site as well as the integrity of the landfill cap system as a whole..

The Haywood County Landfill Manager, Denese Ballew, or landfill staff under her supervision, will be at the site during the drilling to ensure that the well driller installs the wells as shown on the plans and to determine landfill bottom depths. The County staff will also ensure that any damage done to the landfill cap system, as a part of this project, is promptly repaired to its original condition (i.e., contours, cap thickness, drainage berms, etc.).

Wastes removed during the drilling will be buried at the top of the landfill, as shown on Sheet C-101 of the plans, and covered in accordance with the detail on Sheet C-501 of the plans. In order to control odors, vectors, and wind-blown material, all wastes shall be covered as soon as possible after placing at the top of the landfill in the location designated on the plans. At a minimum, all wastes shall be covered at the end of the day's work. Additionally, drilling equipment shall be cleaned of all loose debris and/or waste material prior to relocating the equipment to a new drilling location or staging area. The materials removed from the drill rig shall be contained and buried in the same area as the refuse tailings from the borehole.

It is not clear at this point regarding the amount of water in the waste mass or the extent of dewatering appurtenances that may be required. The County will monitor water elevations within the waste mass after the installation of the extraction wells prior to proceeding with the dewatering appurtenances shown on the plans.

Piping will be installed by a Contractor experienced in utility construction. Testing of installed pipes will be to industry standards, utilizing air testing or water testing, at the discretion of the Contractor. Pipe trenches will be constructed as shown on Sheet C-501 of the plans. Any wastes uncovered during piping installation will be removed and disposed of as noted above.

The methane flare station will be purchased from a company experienced in flare station fabrication and the system will installed by a Contractor experienced in methane flare installations. The flare and appurtenances will be installed as shown on Sheets C-101, C-503, and C-504 of the plans. The flare supplier will be on site during the installation of the flare system to ensure that the flare is installed properly. The supplier will also be responsible for initial flare startup and training County employees in the operation of the flare system.

One hard copy and one digital copy of the following information is enclosed along with a digital copy of the letter:

- Specification Section 02410 – HDPE Methane Condensate Sump
- Specification Section 02420 – Landfill Gas Collection Piping
- Specification Section 02430 – Landfill Gas Header Isolation Valves
- Specification Section 02440 – Landfill Gas Extraction Wells
- Specification Section 02450 – Landfill Gas Wellheads
- Specification Section 02460 – Leachate Well Pumps

Once construction is complete, a completion report will be prepared and submitted to the Department for review and approval. The report will include, at a minimum, the information requested in your review letter dated January 27, 2010.

We look forward to obtaining an authorization to construct for this project. Please do not hesitate to contact us if you have any further questions regarding this submittal or if you require additional information.

Sincerely,
McGILL ASSOCIATES, P.A.

WILLIAM H. SPERRY, PE
Project Manager

Enclosures

cc: Andrea Keller, NCDENR Solid Waste Section, w/o enc
Stephen King, Haywood County Director of Solid Waste, w/enc
Denese Ballew, Haywood County Landfill Manager, w/enc

SECTION 02410 PREFABRICATED HDPE METHANE CONDENSATE SUMPS (KO TANKS)

02410.1 Scope of Work

The Contractor shall furnish all labor, materials, supervision, and equipment necessary to complete the prefabricated HDPE Methane Condensate Sump installation including fabrication, excavation, hauling, spreading, grading, compacting and all necessary and incidental items required to complete the Work, all in accordance with the Contract Drawings and these Contract Specifications.

02410.2 HANDLING AND STORING MATERIALS

The Contractor shall unload material so as to avoid deformation or other injury thereto. Material shall not be rolled or dragged over gravel or rock during handling. The Contractor shall store the appurtenances on sills above storm drainage level and deliver for installation after the trench is excavated. When any material is damaged during transporting, unloading, handling or storing, the undamaged portions may be used or, if damaged sufficiently, the Engineer will reject the material as being unfit for installation.

If any defective material is discovered after installation, it shall be removed and replaced with sound material or shall be repaired by the Contractor in an approved manner and at his own expense.

02410.3 Submittals

Submit manufacturer's product data for the HDPE sheet, HDPE pipe, pipe accessories, sizes and all appurtenances.

Submit scale drawings showing the position of the inlets, outlets, overall dimensions, wall and top thickness, welding and fabrication details for piping connections, fittings, and outlets, and other special features as shown on the Contract Drawings or set forth in theses Specifications, etc.

Submit all required design calculations, certifications and copies of applicable warranties.

02410.4 Materials

The KO tanks, pipes, fittings and other appurtenances shall be High Density Polyethylene (HDPE) pipe.

HDPE material utilized in the fabrication of the KO tanks shall be from the same manufacturer as the HDPE piping used for pipe connections, landfill gas collection piping, and other fittings.

KO Tanks:

All prefabricated HDPE structures and fittings shall be manufactured from first quality virgin polyethylene with the following nominal properties:

Property	ASTM Method	Frequency	Acceptable Value
Material Designation			PE3608
Cell Classification	D3350	Per Shipment	345464C
Relative Density	D1505	Per Shipment	.95 gms/cm^3
Melt Index	D1238	Per Shipment	0.08 gms/10 min.
Carbon Black Content	D3350	Per Shipment	Min. 2%
Tensile Strength @ Yield	D638, Type IV	Per Shipment	3200 psi
Elastic Modulus	D638	Per Shipment	> 150,000 psi

The chemical resistance of the HDPE material used in the fabrication of the KO tank shall be in keeping with typical properties of high quality polyethylene products currently available through commercial sources. All mechanical fasteners or fittings shall be stainless steel.

Piping:

1. HDPE piping attached to the KO tank shall have nominal diameters as noted on the Contract Drawing.

2. HDPE piping shall have a maximum Standard Dimension Ratio (SDR) of 17 or as specified on the Contract Drawings.

3. Pipe shall be manufactured to meet the requirements of ASTM D2513.

4. All pipe and fittings shall be provided by one manufacturer.

5. Pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, or other defects.

6. The HDPE pipe shall be manufactured from first quality virgin polyethylene with the following nominal properties.

Property	ASTM Method	Frequency	Acceptable Value
Material Designation			PE3608
Cell Classification	D3350	Per Shipment	345464C
Relative Density	D1505	Per Shipment	.95 gms/cm^3
Melt Index	D1238	Per Shipment	0.08 gms/10 min.
Carbon Black Content	D3350	Per Shipment	Min. 2%
Tensile Strength @ Yield	D638, Type IV	Per Shipment	3200 psi
Elastic Modulus	D638	Per Shipment	> 150,000 psi

The chemical resistance of the HDPE pipe and all fittings shall be in keeping with typical properties of high quality polyethylene products currently available through commercial sources. All mechanical fasteners or fittings shall be stainless steel.

02410.5 Construction

KO Tanks Below Grade:

KO tanks to be installed below grade shall be fabricated in accordance with the latest ASTM Standards for the "Design of High Density Polyethylene (HDPE) Manholes for Subsurface Applications". The structure should be proven to have acceptable design for the following areas as a minimum: ring compressive strain, combined ring compressive and ring bending strain, ring buckling, axial strain, axial buckling, and thickness of bottom based on depth of installation and groundwater. Thickness should be based on acceptable stress and deflection amounts.

KO tanks shall be constructed of HDPE pipe with a nominal OD and depth as shown on the Contract Drawings. For sizes above 63", a profile wall pipe can be used. The service conditions will determine the class of pipe. Calculations must be provided to verify the wall thickness.

The bottom thickness will be determined in accordance with the latest version of ASTM F 1759. Calculations must be provided to justify thickness of the bottom.

The top of the KO tank shall be a minimum 1.5" HDPE sheet and will be flanged for easy access. The seal at the top will use a neoprene gasket. The top will be secured with 1 inch (1") bolts evenly spaced in a pattern that will ensure the top will not leak.

The inlets and outlets shall be extrusion welded on the inside and outside of the structure using good welding practice. Gussets shall be attached at 90 degrees, 180 degrees, 270 degrees, and 360 degrees around the inlets and outlets at a minimum.

All KO tank connections larger than 3" shall be butt fusion welded, electrofusion welded or flanged connections as shown on the Contract Drawings. For 3" and smaller connections, threaded transition fittings may be used as well as the aforementioned acceptable connection types.

Flanged Connections: Flange adapters (where shown on the Contract Drawings) shall be attached to HDPE KO tank inlet and outlet stubs during fabrication by butt fusion welding. A ductile iron back up ring will be used with each flanged connection. The rings will use a standard ANSI 150# bolt pattern.

Ladders in the KO tanks, if specified or shown on the Contract Drawings, shall conform to OSHA requirements.

Tops of the KO tanks shall be built to the requirements of the Contract Drawings.

Anti-flotation and/or anti-settling anchor collars, if required, shall be designed as an integral part of the KO tank by the fabrication/manufacturer of the KO tank. Shop drawings, approved by the Engineer shall be required of restraints, collars, etc.

Equipment Mounting: Special provisions must be made when mounting pumps and/or other equipment (as shown on the Contract Drawings) in an HSPE KO tank. Bolting directly to the wall of the HDPE structure will not be allowed.

KO Tanks Above Grade:

The body of the KO tank shall be fabricated from HDPE solid wall pipe, with a nominal OD as shown on the Contract Drawings. Wall thickness of less than 1.25" will not be accepted.

The top of the KO tank shall be a minimum 1.5" HDPE sheet and will be flanged for easy access. The seal at the top will use a neoprene gasket. The top will be secured with 1 inch (1") bolts evenly spaced in a pattern that will ensure the top will not leak.

The bottom of the KO tank shall be a minimum 1.5" HDPE sheet and extrusion welded to the body.

The inlets and outlets shall be extrusion welded on the inside and outside of the structure using good welding practice. Gussets shall be attached at 90 degrees, 180 degrees, 270 degrees, and 360 degrees around the inlets and outlets at a minimum.

All KO tank connections larger than 3" shall be butt fusion welded, electrofusion welded or flanged connections as shown on the Contract Drawings. For 3" and smaller connections, threaded transition fittings may be used as well as the aforementioned acceptable connection types.

Flanged Connections: Flange adapters (where shown on the Contract Drawings) shall be attached to HDPE KO tank inlet and outlet stubs during fabrication by butt fusion welding. A ductile iron back up ring will be used with each flanged connection. The rings will use a standard ANSI 150# bolt pattern.

Ladders in the KO tanks, if specified or shown on the Contract Drawings, shall conform to OSHA requirements.

02410.6 Testing

KO tanks shall be factory tested for leaks prior to being shipped to the site. KO tanks shall be tested with 5 psi air pressure (minimum) for a period of at least 30 minutes. A sufficient pressure equalization period will be allowed prior to conducting the 30 minute pressure test. Data showing the structure to be leak-free will be supplied to the Engineer. The owner or owner's representative may request to observe the test.

02410.7 Installation

The layout of KO tank shall be as shown on the Contract Drawings.

The Contractor shall do all field layout work for line and grades from the information shown on the Contract Drawings or as furnished by the Engineer.

The KO tank foundation shall be prepared to be uniformly firm and the structure bedding or pad shall be in accordance with the typical

cross-sections as shown on the drawings. Under no circumstances shall the KO tank be laid in water, on rock, or when excavation conditions or weather is unsuitable for such work.

Should any landfill waste be encountered during excavation, it will be removed and hauled to the active landfill cell at the time of excavation for disposal. In no case will excavated waste be placed on the surrounding ground.

The Contractor shall remove all water which may be encountered or which may accumulate in the excavation by pumping or bailing and no structure shall be set until the water has been removed from the excavation. Any leachate encountered will be pumped directly to the leachate collection system or to a holding tank for later disposal in the leachate collection system. In no case will leachate be allowed to accumulate on the surrounding soil area.

In all cases, the KO tank is to be installed in strict accordance with the manufacturer's recommendations and the contract specifications. The Engineer may augment any manufacturer's installation recommendations if, in his opinion, it will best serve the interest of the Owner.

Proper tools, implements, and facilities satisfactory to the Engineer shall be provided and used for the safe and convenient prosecution of KO tank installation. The KO tank and other materials used in setting the KO tank will be lowered into the excavation by means of suitable equipment in such a manner to prevent damage to the structure, materials, to any protective coating on the structure, and to provide a safe working condition to all personnel in the excavation. The structure shall be clean, sound and free from defects. It shall be laid on the prepared foundation to produce a uniform grade.

Open ends of pipe connections and other appurtenances shall be closed and no trench water or other material shall be permitted to enter the structure.

All backfill shall be compacted so as not to damage the structure, pipe connections and appurtenances and shall be compacted to 95 percent of the Standard Proctor Test for the various types of backfill materials.

Methods of backfilling shall be in strict accordance with the structure manufacturer's recommendations. All backfill materials shall have been approved by the Engineer. Select backfill material shall be used when requested by the Engineer. Select material shall be defined as a finely graded material free from stones over 1/2 inch in diameter, plastic clays,

organic material, frozen lumps and various debris and shall be approved by the Engineer prior to its installation.

Care shall be taken during backfill and compaction operations to maintain alignment and prevent damage to the structure, pipe connections and appurtenances. The backfill shall be kept free from stones, frozen lumps, chunks of highly plastic clay, or other objectionable material. All pipe backfill areas shall be graded and maintained in such a condition that erosion or saturation will not damage the pipe bed or backfill.

Heavy equipment shall not be operated over any structure. Where any part of the required cover is above the proposed finish grade, the Contractor shall place, maintain, and finally remove such material at no cost to the Owner. If the structure becomes mis-aligned, shows excessive settlement, or has been otherwise damaged by the Contractor's operations, it shall be removed and replaced by the Contractor at no cost to the Owner. The Contractor shall maintain the structure in a condition that will function continuously from the time the structure is installed until the project is accepted.

02410.8 Measurement and Payment

See Section 01700.

END OF SECTION

02420.1 Scope of Work

The Contractor shall furnish all labor, materials, supervision, and equipment necessary to complete the Landfill Gas Collection Piping (LFGCP) System including trench excavation, hauling, spreading, grading, rolling and all necessary and incidental items required to complete the Work, all in accordance with the Contract Drawings and these Contract Specifications.

02420.2 HANDLING AND STORING MATERIALS

The Contractor shall unload material so as to avoid deformation or other injury thereto. Material shall not be rolled or dragged over gravel or rock during handling. The Contractor shall store the appurtenances on sills above storm drainage level and deliver for installation after the trench is excavated. When any material is damaged during transporting, unloading, handling or storing, the undamaged portions may be used or, if damaged sufficiently, the Engineer will reject the material as being unfit for installation.

If any defective material is discovered after installation, it shall be removed and replaced with sound material or shall be repaired by the Contractor in an approved manner and at his own expense.

02420.3 Submittals

Submit manufacturer's product data indicating pipe properties, pipe accessories, sizes, etc., and required certifications and warranties.

Scale drawings showing welding and fabrication details for concentric piping connections, fittings, and outlets, etc.

02420.4 Certification

The pipe supplier shall submit certification that the pipe and fittings meet the specifications.

02420.5 Materials

Pipe and fittings for the LFGCP System shall be High Density Polyethylene (HDPE) pipe.

1. HDPE piping shall have nominal diameters as noted on the Contract Drawings.

2. HDPE piping shall have a maximum Standard Dimension Ratio (SDR) of 17 or as specified on the Contract Drawings.

3. Pipe shall be manufactured to meet the requirements of ASTM D2513.

4. Fittings shall be molded or fabricated from the same material as the pipe and shall be supplied by the same manufacturer as the pipe.

5. Pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, or other defects.

6. The chemical resistance of the HDPE pipe and all fittings shall be in keeping with typical properties of high quality polyethylene products currently available through commercial sources.

7. The HDPE pipe shall be manufactured from first quality virgin polyethylene with the following nominal properties:

Property	ASTM Method	Frequency	Acceptable Value
Material Designation			PE3608
Cell Classification	D3350	Per Shipment	345464C
Relative Density	D1505	Per Shipment	.95 gms/cm^3
Melt Index	D1238	Per Shipment	0.08 gms/10 min.
Carbon Black Content	D3350	Per Shipment	Min. 2%
Tensile Strength @ Yield	D638, Type IV	Per Shipment	3200 psi
Elastic Modulus	D638	Per Shipment	> 150,000 psi

02420.6 Flanged Connections

Flange adapters shall be used to connect the HDPE pipe to valves and other appurtenances (knockout pots, etc.) where shown on the Contract Drawings. Flange adapters shall be the same SDR and from the same resin as the HDPE pipe. A ductile iron backup ring matching the bolt pattern of the valve or appurtenance will be used with each flanged connection. Bolts shall be tightened in a "star pattern" to recommended torque values. Bolts must be tightened a second time after 24 hours to insure a positive seal. Gaskets may be required per appurtenance manufacturer's recommendation.

02420.7 Certification

The pipe supplier shall submit certification that the pipe and fittings meet the specifications.

02420.8 Construction

Only two methods shall be utilized to join HDPE pipe: heat fusion and mechanical joining:

1. Heat fusion joints shall be used for all HDPE pipe and shall be made in accordance with pipe manufacturer's recommendations. Fusion equipment and a trained operator shall be provided by the Contractor. Pipe fusion equipment shall be of the size and nature to adequately weld all pipe sizes and fittings necessary to complete the project. Heat fusion shall be performed outside of the trench whenever practical. Before heat fusing pipe, each length shall be inspected for damage and for the presence of dirt, sand, mud, shavings, and other debris. Any foreign matter shall be completely removed. At the end of each day, all open ends of fused pipe shall be capped or otherwise covered to prevent entry by animals or other debris.

2. Branch saddle fusions shall be made in accordance with the pipe manufacturer's recommendations. Branch saddle fusion equipment shall be of the size to facilitate saddle fusion within the trench. For such operations, a bell hole shall be excavated of sufficient size to ensure an adequate and safe work area and in no case shall be less than required by applicable OSHA Standards.

3. No fusion shall be performed in the rain or other adverse conditions.

4. Mechanical joining shall be accomplished with HDPE flange adapters, neoprene gaskets (where required), and ductile iron back-up flanges, and shall be used only for connection to valves and other appurtenances as shown on the Contract Drawings.

5. Lengths of pipe to be handled as one section shall not exceed 300 feet unless approved by the Engineer.

6. Pipe Handling: HDPE pipe shall not be bent more than the minimum radius recommended by the manufacturer for the type, grade, and SDR and in no case less than 40 pipe diameters.

02420.9 Installation

The layout of landfill gas collection piping system shall be as shown on the Contract Drawings.

The Contractor shall do all field layout work for lines and grades from the information shown on the Contract Drawings or as furnished by the Engineer.

The pipe foundation shall be prepared to be uniformly firm and the pipe bedding shall be in accordance with the typical trench cross-sections as shown on the drawings. Under no circumstances shall pipe be laid in water, on rock, or when trench conditions or weather is unsuitable for such work.

Should any landfill waste be encountered during excavation, it will be removed and hauled to the active landfill cell at the time of excavation for disposal. In no case will excavated waste be placed on the surrounding ground.

The Contractor shall remove all water which may be encountered or which may accumulate in the excavation by pumping or bailing and no structure shall be set until the water has been removed from the excavation. Any leachate encountered will be pumped directly to the leachate collection system or to a holding tank for later disposal in the leachate collection system. In no case will leachate be allowed to accumulate on the surrounding soil area.

In all cases, pipe is to be installed in strict accordance with the manufacturer's recommendations and the material specifications. The

Engineer may augment any manufacturer's installation recommendations if, in his opinion, it will best serve the interest of the Owner.

Proper tools, implements, and facilities satisfactory to the Engineer shall be provided and used for the safe and convenient prosecution of pipe laying. All pipe and other materials used in the laying of pipe will be lowered into the trench piece by piece by means of suitable equipment in such a manner to prevent damage to the pipe, materials, to the protective coating on the pipe materials, and to provide a safe working condition to all personnel in the trench. Each piece of pipe being lowered into the trench shall be clean, sound and free from defects. It shall be laid on the prepared foundation, as specified elsewhere to produce a straight line on a uniform grade, each pipe being laid so as to form a smooth and straight inside flow line. Pipe shall be removed at any time if broken, damaged or displaced in the process of laying same, or of backfilling the trench.

During times when pipe laying is not in progress, the open ends of pipe shall be closed and no trench water or other material shall be permitted to enter the pipe.

All backfill shall be compacted so as not to damage the pipe and appurtenances and shall be compacted to 95 percent of the Standard Proctor Test for the various types of backfill materials.

Methods of backfilling shall be in strict accordance with the pipe manufacturer's recommendations. All backfill materials shall have been approved by the Engineer. Select backfill material shall be used when requested by the Engineer. Select material shall be defined as a finely graded material free from stones over 1/2 inch in diameter, plastic clays, organic material, frozen lumps and various debris and shall be approved by the Engineer prior to its installation.

Care shall be taken during backfill and compaction operations to maintain alignment and prevent damage to the joints. The backfill shall be kept free from stones, frozen lumps, chunks of highly plastic clay, or other objectionable material. All pipe backfill areas shall be graded and maintained in such a condition that erosion or saturation will not damage the pipe bed or backfill.

Heavy equipment shall not be operated over any pipe until it has been properly backfilled and has a minimum cover as required by the plans. Where any part of the required cover is above the proposed finish grade, the Contractor shall place, maintain, and finally remove such material at no cost to the Owner. Pipe which becomes mis-aligned, shows excessive settlement, or has been otherwise damaged by the Contractor's operations shall be removed and replaced by the Contractor at no cost to the Owner.

The Contractor shall maintain all pipes installed in a condition that they will function continuously from the time the pipe is installed until the project is accepted.

02420.10 LINE CLEANING

Prior to testing of any section(s) of the landfill gas collection piping system, the Contractor shall completely clean the lines of all debris, silt, etc. The pipe shall be proved to be ready for use by the Owner and shall be proved to be in first class condition and constructed in accordance with the drawings and specifications.

The Contractor shall maintain the project, insofar as his construction work is concerned, in first class condition for such time as is necessary to satisfy the Engineer that all installations are correct and acceptable.

02420.11 Testing

All HDPE pipes shall be subjected to an air test as described herein to detect any leaks in the piping. Testing shall be performed below grade (inside the trench). The Contractor shall be responsible for locating, uncovering (if previously backfilled), and repairing any leaks detected during testing.

Like sizes of HDPE piping shall be fusion welded together into testing segments not to exceed 500 feet unless approved by the Engineer. Segments shall be connected to a testing apparatus on one end and fitted with caps on all openings.

The segment to be tested shall be allowed time to reach constant and/or ambient temperature before initiating the test.

Tests shall be performed during periods when the pipe segments will be out of direct sunlight when possible; i.e., early morning, late evening, or cloudy days. This will reduce the pressure changes that will occur due to temperature fluctuations.

The test pressure shall be 5 psig (168 inches, w.c.) and the Contractor shall use a digital pressure gauge.

Pressure drop during the test shall not exceed one percent of the testing gauge pressure over a period of one (1) hour. This pressure drop shall be corrected for temperature changes before determining pass or failure. The Engineer shall sign off on the test form to indicate test compliance.

The Engineer shall be notified at least 24 hours prior to commencement of the testing procedure and shall be present during the test.

Equipment for this testing procedure shall be furnished by the Contractor. This shall consist of a polyethylene flange adapter with a blind flange. Tapped and threaded into the blind flange will be a temperature gauge (0 to 100 degrees C); a schraeder type air valve to facilitate pressurization with an air compressor hose; a ball valve to release pressure upon completion of the test; and a pressure measuring device. The pressure measuring device shall be a digital manometer capable of measuring positive or differential pressures of air and other non-corrosive gases over a range of 0 to 199.9 in-w.c.

Once any leaks are located and repaired, a retest of the line segment shall be performed.

02420.12 Measurement and Payment

See Section 01700.

END OF SECTION

SECTION 02430 LANDFILL GAS BUTTERFLY HEADER ISOLATION VALVES

02430.1 Scope of Work

The Contractor shall furnish all labor, materials, supervision, and equipment necessary to install, complete and ready to use, the Landfill Gas Butterfly Header Isolation Valves including excavation, hauling, spreading, grading, rolling and all necessary and incidental items required to complete the Work, all in accordance with the Contract Drawings and these Contract Specifications.

02430.2 HANDLING AND STORING MATERIALS

The Contractor shall unload valves and appurtenances so as to avoid deformation or other injury thereto. Valves and appurtenances shall not be rolled or dragged over the ground, gravel or rock during handling. The Contractor shall store the valves and appurtenances on sills above storm drainage level and deliver for installation after the trench is excavated. When any material is damaged during transporting, unloading, handling or storing, the undamaged portions may be used or, if damaged sufficiently, the Engineer will reject the material as being unfit for installation.

If any defective material is discovered after installation, it shall be removed and replaced with sound material or shall be repaired by the Contractor in an approved manner and at his own expense.

02430.3 Submittals

Submit manufacturer's certificates of compliance on materials furnished, product data, manufacturer's brochures containing complete information and instructions pertaining to the storage, handling, installation, inspection, maintenance, operation, and repair of each type of valve furnished. Submittal information shall also include applicable warranties.

02430.4 Certification

The valve supplier shall submit certification that the valves and appurtenances meet the specifications.

02430.5 Materials

U-PVC – Conforming to ASTM D1784 Cell Classification 12454A
PP – Polypropylene conforming to ASTM D4101 Cell Classification PP0210B67272
Nitrile - Nitrile Butadiene Rubber
SS – Stainless Steel

02430.6 Valves:

Butterfly valves less than 16" diameter shall be bubble tight, wafer design with a PVC body, PP disc and Nitrile seat and seals. Butterfly valves 16" diameter and larger shall be bubble tight, wafer design with a PVC or PP body, PP disc and Nitrile seat and seals. The liner shall be full seat design, fully molded around the body where only the disc and seat are wetted parts and features raised convex rings on the face to be utilized as the mating flange gaskets. Valve shall have a spherical disc design. Valves shall accept flat faced flanges in accordance with ANSI B16.5 bolt pattern for 150 lb flanges. Valve stem shall be either 316 SS (sizes 1-1/2" – 12"), or 403 SS (Sizes 14" – 24"), be non-wetted, and have engagement over the full length of the disc. Valves shall feature a molded ISO bolt pattern for accessory mounting.

Valves shall have a minimum pressure rating of:

150 psi @ 70° F sizes 1-1/2" – 10"
100 psi @ 70° F sizes 12" – 14"
85 psi @ 70° F sizes 16"
75 psi @ 70° F sizes 18" – 24"

02430.7 Operators:

Lever Type – Standard sizes – 1-1/2" to less than 8" butterfly valves unless otherwise shown on the Contract Drawings or specified in the Contract Documents.

Gear Type – Standard – 8" -16" butterfly valves unless otherwise shown on the Contract Drawings or specified in the Contract Documents.

Gear Type – Standard – 18" – 24" butterfly valves.

02430.8 Stem Extensions:

Stem extensions, where shown on the Contract Drawings or otherwise specified in the Contract Documents, shall be designed, built and provided by the same manufacturer as the butterfly valves. Stem extensions shall be free standing two-piece stem and housing type. Stem extensions shall be stainless steel. Outer housing shall be an epoxy coated carbon steel housing, 100% sealed, with the gear box assembly mounted on top and equipped with a removable manual operating wheel.

02430.9 Installation

Valves shall be installed at the locations and elevations as shown on the Contract Drawings and in accordance with the manufacturer's recommendations. Care should be taken to avoid stripping bolts when tightening.

Flanged butterfly valves may require spacers between the flange adapters and the valve body in order to allow full travel of the internal disk. If spacers are necessary for any butterfly valve, the Contractor shall install valve spacers, subject to the Engineer's approval.

All accessories and appurtenances shall be installed in accordance with the manufacturer's recommendations as well as any facility requirements.

02430.10 Measurement and Payment

See Section 01700.

END OF SECTION

02440.1 SCOPE OF WORK

The Contractor shall furnish all labor, materials, supervision, equipment and appurtenances necessary to complete the Landfill Gas (LFG) Extraction Wells in accordance with the Contract Drawings and these Contract Specifications.

The well screens, seals, gravel, and soil backfill packs shall be set at depths shown on the Contract Drawings or as designated in the field by the Engineer. It is expected that combustible gas will be venting from boreholes drilled to install the landfill gas extraction wells. The Contractor's bid price shall include provision for all equipment and procedures necessary to safely install wells under this condition.

All work shall be performed by qualified workmen in accordance with the best standards and practices available.

The Contractor is responsible to provide a level bench area for the auger/drill rig to install the landfill gas extraction wells.

The Contractor, at all times, shall keep the premises free from accumulation of waste materials or debris caused by his operations. He shall remove all his waste materials and debris from the site, as well as all his tools, construction equipment, machinery and surplus materials.

02440.2 MATERIALS

STONE – Stone used for backfilling annular space around the slotted well casing shall be as washed aggregate material meeting the NCDOT Specification for #5 stone. It shall be composed of clean, hard and durable fragments, with a calcium carbonate content of less than one percent (1%) by weight (for which at least one (1) Quality Control test per source shall be performed and submitted to the Engineer for approval). Stone shall be free of dirt, vegetation or other objectionable matter, and free from an excess of soft, thin elongated, laminated, calcareous material or disintegrated pieces.

SOIL – Soil backfill material shall be clean fill free of stones larger than 1-inch (1"), construction debris, refuse, muck, soft clay, loam, sponge material, vegetation/organic matter, or angular rock.

BENTONITE – "Bentonite Plug", as used in the Contract Drawings, shall refer to a well seal comprised of sodium bentonite pellets or chips.

SLOTTED PVC PIPE – Pipe and fittings shall be 6-inch (6") Schedule 80 PVC. The slots or perforations may be as follows: (a) 1/4-inch x 3-inch slots at 1/4 points at 6-inch on center. Stagger adjacent rows by 45 degrees or (b) 1/2-inch holes at 1/4 points at 6-inch on center. Stagger adjacent rows by 45 degrees. Slotted pipes shall be supplied by the manufacturer/supplier/factory. Perforated pipe may be supplied by the manufacturer/supplier/factory or may be field constructed in accordance with the pattern specified above.

SOLID PVC PIPE – Solid pipe and fittings shall be Schedule 80 PVC.

02440.3 HANDLING AND STORING MATERIALS

Unloading and storage of the material shall be the responsibility of the Contractor. The Contractor shall unload materials so as to avoid deformation or other injury thereto. Materials shall not be rolled or dragged over the ground, gravel or rock during handling. The materials shall be stored on sills above storm drainage level and deliver for installation after the well bore has been completed. When any material is damaged during transporting, unloading, handling or storing, the undamaged portions may be used or, if damaged sufficiently, the Engineer will reject the material as being unfit for installation.

The sodium bentonite shall be stored off the ground in an area that is dry and well drained and will be covered with a plastic sheet or waterproof tarpaulin until installation.

If any defective material is discovered after installation, it shall be removed and replaced with sound material or shall be repaired by the Contractor in an approved manner at his own expense.

02440.4 SUBMITTALS

Submit manufacturer's certificates of compliance on materials furnished, product data, manufacturer's brochures containing complete information and instructions pertaining to the storage, handling, installation, inspection, and repair of each material furnished. Submittal information shall include applicable warranties.

The Contractor shall submit copies of their Safety Manual as it pertains to safety procedures and precautions relative to the augering and construction of landfill gas extraction wells.

The Contractor shall submit copies of their Standard Operating Procedures Manual as it pertains to the augering and construction of landfill gas extraction wells as well as the decontamination procedures undertaken prior to relocating to a new well hole or moving the equipment to a staging area or off site.

Contractor shall submit a minimum of five (5) copies of all submittals plus the additional number of copies required by his office, subcontractors, and/or field crews.

02440.5 EXECUTION

DRILLING / AUGERING

The Contractor shall coordinate the start of drilling/augering activities with the Engineer.

The Contractor shall provide at all times an experienced, competent driller during all drilling/augering activities.

The locations of the wells, as shown on the Contract Drawings, shall be surveyed and staked by the Owner prior to beginning drilling/augering activities. Well locations may be adjusted by the Engineer, prior to beginning drilling/augering. The Contractor must use dry drilling/augering equipment.

Wells are to be drilled/augered to the approximate depths and the diameter as shown on the Contract Drawings. The boring depths shown on the Contract Drawings are estimated and may be adjusted in the field by the Engineer. Under no circumstances are the drilling/augering depths, from the well schedule on the Contract Drawings, to be exceeded, unless approved by the Engineer in advance.

All boreholes shall be completed and backfilled prior to the end of each day's work. Under no circumstances shall an open borehole be left unattended. Once the auger is removed for the last time or during periods of maintenance on the drilling equipment when the auger is removed from the borehole, the borehole opening shall be covered with a safety grate.

Wet Borings:

If water is encountered in a boring, the Contractor may be directed to drill beyond the point at which it was encountered. If wet conditions continue, the boring may be terminated, and the length of the perforated pipe adjusted by the Engineer. If wet conditions cease

(e.g., due to a perched water layer), then drilling will continue to the design depth.

If water is encountered in a boring at a shallow depth, the Engineer may decrease the well depth and length of perforated pipe, or relocate the well.

Abandoned Borings:

If, in the opinion of the Engineer, the borehole has not reached a sufficient depth to function as an effective extraction well, the Contractor shall abandon the borehole by backfilling it with cuttings removed during drilling. A 2-foot thick bentonite plug will be placed in the borehole at the depth of the low permeability soil barrier layer. The remaining depth of the borehole will then be filled with soil and compacted to several inches above the elevation of the landfill cover.

The Contractor shall keep detailed well logs for all wells drilled, including the total depth of the well, length of perforated pipe, length of solid pipe, the static water level, the depth, thickness, and description of soil or waste strata, the occurrence of the water bearing zones, required plugs and backfill. Well logs shall be submitted to the Engineer.

The Contractor shall remove all loose debris and/or waste material from the auger prior to relocating the equipment to a new drilling location or staging area at the end of each day's operation. All waste shall be disposed in accordance with Section 02440.6.

The bore for the well shall be straight and cleaned of all loose debris before placement of well piping and stone. The well pipe shall be installed in the center of the borehole. The Contractor shall take care to maintain the well pipe vertically plumb during the backfill operation of the bored hole to the satisfaction of the Engineer. If the pipe installed is out of plumb, the Contractor, at his own expense, will correct the alignment.

JOINING OF PIPES

All pipes shall be inspected for cuts, scratches, or other damage prior to installation. Pipe with imperfections shall not be used. All burrs, chips, etc. shall be removed from the pipe interior and exterior. All loose dirt and moisture shall be wiped from the interior and exterior of the pipe end and the interior and exterior of the fitting. All pipe cuts shall be square, perpendicular to the centerline of the pipe. Pipe ends shall be beveled prior to applying primer and solvent cement so that the cement does not get wiped off during insertion into the fitting socket.

A coating of primer, as recommended by the pipe supplier, shall be applied to the entire interior surface of the fitting socket and to an equivalent area on the exterior of the pipe prior to applying solvent cement. The solvent cement shall comply with the requirements of the pipe supplier and shall be applied in strict conformance with the manufacturer's specifications. Pipe shall not be primed or solvent welded when it is raining, when atmospheric temperature is below 40 degrees F, or above 90 degrees F.

After solvent welding, the pipe shall remain undisturbed until cement has thoroughly set.

Pipe and pipe fittings shall be selected so that there will be as small a linear deviation as possible at the joints. Pipe and fittings which do not fit together to form a tight fitting will be rejected.

In addition to priming and solvent welding, lag screws shall be installed at each coupling to secure vertical piping during placement in the well boring. Four lag screws per coupling or two lag screws per bell fitting shall be installed. The length of the lag screws shall equal the sum of the pipe and coupling (or bell fitting) wall thickness. The end of the lag screws shall not protrude through to the interior of the pipe.

BACKFILLING

Backfilling of the well shall commence immediately after the well drilling is completed and the well piping installed. Backfill materials shall be placed carefully within the well to the dimensions shown on the Contract Drawings and as approved by the Engineer. Stone and soil backfill containing foreign material may be rejected on the basis of a visual examination. Both well piping and backfill shall be installed with a safety grate installed over the borehole.

Bentonite pellet plug shall be backfilled in 6-inch lifts. The Contractor shall soak each lift prior to filling the next one.

Soil backfill shall be rodded in the boring to provide even distribution and compaction. If approved by the Engineer, the Contractor may use on-site material at no cost but is responsible for loading and transporting the soil from the borrow area and restoring the borrow area appropriately.

After installation of the riser pipe, the Contractor shall cap the pipe in accordance with the Contract Documents and/or Contract Drawings. The capping system shall be kept in place until just before installing the wellhead assembly.

02440.6 DISPOSAL OF REFUSE TAILINGS

The Contractor shall use whatever means and methods are necessary to prevent contamination of the surrounding landfill surface with the refuse tailings removed from the borehole. Any contamination of the surrounding surface will be immediately removed and the landfill cover restored to its original condition, lines and grades. Refuse tailings from well drilling operations shall be removed at least daily or more often as is necessary to prevent contamination of the surrounding landfill surface. Refuse tailings are to be hauled to the designated disposal area as shown on the Contract Drawings or to the active working face of the landfill at no charge to the Contractor. However, the Contractor shall coordinate this activity with the landfill Owner or operator.

02440.7 MEASUREMENT AND PAYMENT

See Section 01300

END OF SECTION

SECTION 02450 LANDFILL GAS WELLHEADS

02450.1 SCOPE OF WORK

The Contractor shall furnish all labor, materials, supervision, equipment, and appurtenances necessary to complete the Landfill Gas Wellheads in accordance with the Contract Drawings and these Contract Specifications.

02450.2 MATERIALS

WELLHEAD – The wellhead assembly shall be a pre-fabricated unit consisting of a flow control gate valve, union disconnect, a stainless steel impact pitot tube suitable for flow measurements, elastomeric adapter and bushing, temperature port, impact and static pressure ports, gas sample port and dust cap as manufactured by Landtec, Colton CA, 800-526-3832, or approved equal.

02450.3 HANDLING AND STORING MATERIALS

Unloading and storage of the material shall be the responsibility of the Contractor. The Contractor shall unload materials so as to avoid deformation or other injury thereto. Materials shall not be rolled or dragged over the ground, gravel or rock during handling. The materials shall be stored on sills above storm drainage level, covered with a plastic sheet or waterproof tarpaulin, and delivered to the extraction well just prior to installation. If any defective material is discovered after installation, it shall be removed and replaced with sound material or shall be repaired by the Contractor in an approved manner at his own expense.

02450.4 SUBMITTALS

Submit manufacturer's certificates of compliance on materials furnished, product data, manufacturer's brochures containing complete information and instructions pertaining to the installation, operation, calibration, inspection, and repair of each material furnished. Submittal information shall include applicable warranties.

Contractor shall submit a minimum of five (5) copies of all submittals plus the additional number of copies required by his office, subcontractors/vendors, and/or field crews.

02450.5 IDENTIFICATION

Each well shall have its identification number neatly painted on side of the well at the top of the well casing using stencil letters and numerals 2 inches high.

02450.6 EXECUTION

The wellhead assembly shall be installed on the extraction well riser pipes and/or the existing horizontal collector riser pipes in accordance with the manufacturer's instructions and/or recommendations. Connections to the landfill gas extraction piping system laterals and/or header pipes shall be as shown on the Contract Drawings. Care shall be taken not to damage the impact pitot tube during installation.

END OF SECTION

02460.1 Scope of Work

The Contractor shall furnish all labor, materials, supervision, equipment and appurtenances necessary to furnish and install an electric leachate well pump/condensate pump system, complete and ready for operation, in accordance with the Contract Drawings and these Contract Specifications.

02460.2 MATERIALS

PUMP SYSTEM

The pumping systems shall be an electrically driven positive displacement piston pump as manufactured by Blackhawk Technology Company, Glen Ellyn, IL, 800-469-4887, www.blackhawkco.com, or approved equal. The pump motor shall be located above grade. The fluid inlet shall be located at the bottom of the pump intake foot valve.

The pump shall have the pump motor and controls above grade. The pump shall not introduce any electrical power into the well. The pump shall be powered from grade by a fiberglass sucker-rod assembly. Water shall be discharged through a 2" discharge pipe.

The pump shall be able to pump to 0 submergence. Power to the pump shall be direct from grade through the sucker-rod assembly.

The pump materials of construction shall be stainless steel, Buna Nitrile or Viton, and PVC.

Pump motor description:

1. The pump motor shall be located at grade on top of the well head assembly.
2. The pump motor assembly shall need one electrical input, three (3) phase, 460 volts.
3. No air or electricity shall be introduced down the well.
4. No air or electricity shall come in contact with the liquid to be pumped.
5. The pump shall use limit switches to cycle the sucker-rod in and out.

02460.3 SUBMITTALS

The Contractor shall prepare and submit to the Engineer, for review and approval, manufacturer's brochures containing complete information and instructions pertaining to the storage, handling, installation, inspection, maintenance, and repair of all equipment furnished under this Section. The Contractor shall also submit complete diagrams and elevations showing all components, wires, connections, and numbered terminals, and complete electrical interconnect diagrams showing all wires and terminals between the control panel and external devices.

O & M Manual: Copies of a complete draft O & M manual will be required for review prior to system start-up. The Contractor shall submit to the Engineer copies of a final operations and maintenance manual after startup of the system that incorporate the Engineer's comments on the draft manual. The manual shall be prepared specifically for this installation and shall include all required catalog cuts, record drawings, descriptions, and information necessary to instruct operating personnel unfamiliar with such equipment.

02460.4 EXECUTION

Install electric pump system, control system, and all appurtenances in existing condensate sump as shown on the Drawings for discharge to the existing storage tank.

Install pump, control system, and appurtenances per the manufacturer's recommendations.

END OF SECTION