

Exhibit 2

TECHNICAL SPECIFICATIONS

DRAFT

TABLE OF CONTENTS

SECTION	Page Numbers
1. SECTION 02221 – TRENCHING AND BACKFILLING INSIDE THE LIMITS OF WASTE	02221-1 to 02221-5
2. SECTION 02222 – TRENCHING AND BACKFILL OUTSIDE THE LIMITS OF WASTE	02222-1 to 02222-6
3. SECTION 02610 – LANDFILL GAS EXTRACTION WELLS	02610-1 to 02610-7
4. SECTION 11315 – CONDENSATE MANAGEMENT SYSTEM	11315-1 to 11315-6
5. SECTION 15051 – HIGH DENSITY POLYETHYLENE (HDPE) PIPE AND FITTINGS	15051-1 to 15051-8
6. SECTION 15061 – POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS	15061-1 to 15061-3

SECTION 02221

TRENCHING AND BACKFILLING INSIDE THE LIMITS OF WASTE

PART 1. GENERAL

1.01 SCOPE OF APPLICATION

- A. Furnish all labor, material, tools, equipment and incidentals required to perform trench excavation and backfill operations necessary to achieve the specified grades and elevations shown on the Construction Drawings. Review with the Owner's Representative the location, limits and methods to be used prior to commencing work under this Section. Provide support for as-built survey work by installing and removing survey markers.

1.02 REFERENCES

- A. ASTM D2488 - Standard Practice for Description of Soils (Visual-Manual Procedure).

1.03 SUBMITALS (RESERVED)

PART 2- PRODUCTS

2.01 PIPE BEDDING

- A. Clean coarse sand (1/4 inches minus granular material or 1-1/4 to 3/8 inches pea gravel) or equivalent material approved by the Owner's Representative.

2.02 GENERAL FILL

- A. Mineral soil, substantially free from organic materials, loam, wood, trash and other objectionable materials that may be compressible or that cannot be properly compacted. General fill shall not contain stones larger than 4 inches in the largest diameter, broken concrete, masonry rubble, or other similar materials. Natural soils visually classified as SM, ML, SC, and CL or as mixtures of these soil types in Unified Soil Classification System (USCS) are acceptable soil types.
- B. The soil shall be visually inspected and approved by the Owner's Representative before use. Contractor shall notify the Owner's Representative of any changes in the soil borrow source and submit new soil samples for inspection and approval.

2.03 STOCKPILES

- A. All pipe bedding and other material purchased by the Contractor can be stockpiled on site as directed by the Owner's Representative.
- B. General fill material soils are available onsite. The Contractor shall load and haul this material.

PART 3- EXECUTION

3.01 EXCAVATION

- A. Trench excavation is anticipated to be through daily or intermediate soil cover and refuse.
- B. Safety precautions shall be taken during these construction activities that conform to all Occupational Safety and Health Administration (OSHA) regulations, safety requirements of these specifications, and project Health and Safety Plan.
- C. Contours of existing ground elevations shown on the Construction Drawings are approximate and are based on aerial topographic mapping. The trenching alignments shown on the Construction Drawings were based on anticipated ground contours at the time of construction. The Contractor shall satisfy itself as to the existing contours and elevations at the time of construction. If significant changes from what is shown on the Construction Drawings to the trench alignments are required, the Contractor shall notify the Owner's Representative prior to initiating work and shall submit a design change request to the Owner's Representative at least one week prior to initiating work in that area of the site.
- D. Trenches shall be excavated to the alignments shown on the Construction Drawings. Contractor shall be responsible for reviewing the field stakeouts along proposed trench alignments in the field before starting trenching work. Minimum bottom trench width shall be 1-1/2 times the pipe diameter but not less than 18 inches. If more than one pipe is to be installed in a common trench, pipes shall be separated by a horizontal distance of at least 1/4 times the larger pipe diameter.
- E. Excavated cover material shall be separated from excavated refuse wherever possible. Any cover material free of refuse shall be used as backfill material. Any material not suitable for backfill will be loaded and hauled to the working face by the Contractor for disposal by the Owner.
- F. Excavated refuse is to be loaded and hauled by the Contractor to the operating portion of the landfill for disposal by the Owner, and a representative sample of the waste shall be provided to the Owner.

- G. If waste disposal operations at the working face are not operational on a particular day or at a particular time, the Contractor shall store the excavated materials in stockpiles on the landfill surface. These stockpiles shall be covered with temporary plastic covers and shall be anchored firmly by use of weights to prevent uplift by winds. The Contractor shall haul and dispose of the stored materials as soon as the waste disposal operations at the working face commence. The Contractor shall also clean the storage location of all excavated materials.
- H. To the extent possible, the trench invert shall slope uniformly in accordance with the Construction Drawings. Minimum trench slope will be 3% for all gas collection pipe trenches. Slight adjustments in the depths and alignments may be necessary to maintain a minimum cover of two (2) feet. Variations in slope alignment may not be so great as to result in a pipe deflection or change in the slope more than 0.5% from what is shown on the Construction Drawings.
- I. The Contractor may not excavate more trench than can be completely backfilled after installation of the pipe. Excavations shall not be left open overnight. If for any reason a trench must be left open overnight, safety screens and/or warning signs will be placed at the excavated trench.
- J. All excavation shall be open cut unless otherwise permitted by the Owner's Representative.

3.02 LIQUIDS & WATER

- A. Perched pockets of leachate may be encountered during trenching operations. The Contractor shall notify the Owner's Representative immediately if leachate is encountered. The Owner's Representative will furnish revised construction plans which may include backfilling the affected area, realignment of the trench, sump installation, or placement of a gravel French drain (or some combination of these alternatives).
- B. The Contractor shall take every precaution to prevent water from entering an open trench. Should water enter the trench the water shall be removed so as to return the trench bottom to a firm, dry condition.

3.03 ROAD CROSSING

- A. The Contractor shall schedule all road crossings with Owner's Representative to minimize disruption to waste disposal operations and traffic.
- B. All road crossings shall be installed in accordance with details on the Construction Drawings. The Contractor shall present a work plan detailing its construction method to build the road crossings to the Owner's Representative. Road crossing construction work shall only start after the Owner's Representative approves the Contractor's work plan.

- C. Corrugated metal pipe (CMP) approved by the Owner's Representative shall be used as a casing to protect pipes along the road crossing. Seal CMP ends with foam as approved by the Owner's Representative.

3.04 BLASTING

- A. Blasting will not be permitted for purposes of excavation.

3.05 BACKFILLING

- A. Pipe bedding shall be placed and compacted (maximum of 8-inch lifts) using hand compaction tools, as required. The depth of bedding shall be as shown on the Construction Drawings with a minimum of 6 inches below and above the pipe. This bedding material shall provide continuous support for the pipe and be well-compacted and free of rocks and other debris.
- B. Next, the trench shall, be backfilled with general fill, placed and compacted in 8 to 12-inch layers using mechanical compaction equipment. The compaction of this material shall conform to the surrounding material and to the satisfaction of the Owner's Representative. During general fill placement all roots, debris and stones larger than 4 inches in largest dimension shall be completely removed from the backfill material.
- C. Metallic utility marker tape shall be placed in each pipe trench above the pipe as shown on the Construction Drawings.

3.06 FINISH GRADING

- A. All areas covered by the work, including excavated and filled areas, shall be uniformly back-bladed to the finished ground elevations. The finish surface shall be reasonably smooth and free of irregularities and shall provide a presentable and well-drained area.
- B. Excess backfill material shall be stockpiled onsite as directed by the Owner's Representative.
- C. The work area shall be cleaned and restored to a condition ready for re-vegetation by the Contractor. Re-vegetation shall include seeding and mulching or installation of Bermuda Sod as directed by the Owner's Representative.

3.07 COMPACTION

- A. Compaction of backfill material shall be by tracking over the fill material with Contractor's onsite pipeline equipment to be consistent with the surrounding daily or intermediate cover material.
- B. Final cover backfill shall be consistent with the existing landfill cover system and compacted to a similar density and thickness.

3.08 PROTECTION OF UNDERGROUND PIPING AND UTILITIES

- A. The Contractor shall conduct an underground utilities location survey before initiating construction work and shall take all necessary precautions to protect underground piping, utilities, and features during the construction. Contractor shall perform excavation using hand tools close to the anticipated pipe locations. Contractor shall be responsible to repair and restore to original conditions, any damage to the existing piping, utilities, and other features caused from construction activities.

3.09 FIELD SURVEYING SUPPORT

- A. Proposed trench routes shall be marked on the ground using stakes by the Contractor. The Contractor shall review the staked-out route and discuss with the Owner's Representative and obtain approval before commencing work.
- B. The Contractor shall provide markers to perform as-built survey along the trench location to survey the pipe line route and elevations generally at 50-foot intervals and more frequently if the alignment of the route changes. The markers shall be 6-inch diameter PVC pipes or equivalent installed to stand vertically while touching the buried pipes. All marker pipes shall be removed by the Contractor after the as-built survey to be performed by the Owner's Representative. The marker pipe locations shall be backfilled with hydrated bentonite by the Contractor.

3.10 FIELD QUALITY CONTROL AND QUALITY ASSURANCE

- A. Field quality control shall be the responsibility of the Contractor. Field quality assurance will be the responsibility of the Owner's Representative.
- B. Visual soil classification and approval of soil will be performed by the Owner's Representative.
- C. Field inspection of all construction materials and approval will be performed by the Owner's Representative.
- D. Field inspection of trenching and backfilling work and approval will be performed by the Owner's Representative.

END OF SECTION

SECTION 02222

TRENCHING AND BACKFILL OUTSIDE THE LIMITS OF WASTE

PART 1. GENERAL

1.01 SCOPE OF APPLICATION

- A. Furnish all labor, material, tools, equipment and incidentals required to perform trench excavation and backfill operations necessary to achieve the specified grades and elevations shown on the Construction Drawings. Review with the Owner's Representative the location, limits, and methods to be used prior to commencing work under this Section. Provide support for as-built survey work by installing and removing survey markers.

1.02 REFERENCES

- A. ASTM D2488 - Standard Practice for Description of Soils (Visual-Manual Procedure).

1.03 SUBMITALS (RESERVED)

PART 2- PRODUCTS

2.01 PIPE BEDDING

- A. Clean coarse sand (1/4 inch minus granular material or 1-1/4 to 3/8 inches pea gravel) or equivalent material approved by the Owner's Representative.

2.02 GENERAL FILL

- A. Mineral soil, substantially free from organic materials, loam, wood, trash and other objectionable materials that may be compressible or that cannot be properly compacted. Common fill shall not contain stones larger than 4 inches in the largest diameter, broken concrete, masonry rubble, or other similar materials. Natural soils visually classified as SM, ML, SC, and CL or as mixtures of these soil types in Unified Soil Classification System (USCS) are acceptable soil types.
- B. The soil shall be visually inspected and approved by the Owner's Representative before use. Contractor shall notify the Owner's Representative of any changes in the soil borrow source and submit new soil samples for inspection and approval.

2.03 STOCKPILES

- A. All pipe bedding and other material purchased by the Contractor may be stockpiled on site as directed by the Owner's Representative.
- B. General fill material soils are available onsite. The Contractor shall load and haul this material.

PART 3- EXECUTION

3.01 EXCAVATION

- A. Trench excavation is anticipated to be in native soils.
- B. Safety precautions must be taken during these construction activities that conform to all OSHA regulations, safety requirements of these specifications, and project Health and Safety Plan. If refuse is encountered, inform the Owner's Representative immediately.
- C. Contours of existing ground elevations shown in the Construction Drawings are approximate and are based on aerial topographic mapping. The trenching alignments shown in the Construction Drawings were based on anticipated ground contours at the time of construction. The Contractor shall satisfy himself as to the existing contours and elevations at the time of construction. If significant changes, from what is shown in the Construction Drawings, to the trench alignments are required, the Contractor shall notify the Owner's Representative prior to initiating work and shall submit a design change request to the Owner's Representative at least one week prior to initiating work in that area of the site.
- D. Trenches shall be excavated to the alignments shown on the Construction Drawings. Contractor shall be responsible for staking out and reviewing the proposed trench alignments in the field before starting trenching work. Minimum bottom trench width shall be 1-1/2 times the pipe diameter but not less than 18 inches. If more than one pipe is to be installed in a common trench, pipes shall be separated by a horizontal distance of at least 1/4 times the larger pipe diameter.
- E. Excavated material shall be reused as backfill material. Any material not suitable for backfill will be loaded and hauled to the working face by the Contractor for disposal by the Owner.
- F. The Contractor may not excavate more trench than can be completely backfilled after installation of the pipe. As a general rule, excavations shall not be left open overnight. If for any reason a trench must be left open overnight, safety screens and/or warning signs will be placed at the excavated trench.
- G. If waste disposal operations at the working face are not going operational on a particular day or at a particular time, the Contractor shall store the excavated

materials in stockpiles near the excavation without obstruction to traffic and other landfill operations. These stock piles shall be covered with temporary plastic covers and anchored firmly by use of weights to prevent uplift by winds. The Contractor shall haul and dispose of the stored materials as soon as the waste disposal operations at the working face commence. The Contractor shall also clean the storage location of all excavated materials.

- H. To the extent possible, the trench invert shall slope uniformly in accordance with the Construction Drawings. Minimum trench slope will be 3% for gas pipe trenches. Slight adjustments in the depths and alignments may be necessary to maintain a minimum cover of two (2) feet. Decrease in pipe slope is not acceptable.
- I. All excavation shall be open cut or ditch witted unless otherwise permitted by the Owner's Representative.

3.02 LIQUIDS & WATER

- A. The Contractor will be responsible for the furnishing, operation, and maintaining of dry excavations, and shall pump out or otherwise remove and dispose of as fast as it may collect, any water, other liquids, which may be found or may accumulate in the excavations, regardless of whether it be water or liquid from groundwater, stormwater runoff, or from existing conduits and works. If such water be muddy or carrying settleable solids, it shall be disposed of in a proper manner.
- B. There shall be at the work site, at all times during construction, proper and approved machinery of sufficient capacity to meet the maximum requirements for the removal and disposal of water or other liquids, in such manner as not to interfere with the proper laying of pipeline or other work under this or other contract, nor endanger existing structures.
- C. The Contractor shall take every precaution to prevent water from entering an open trench. Should water enter the trench the water shall be removed so as to return the trench bottom to a firm, dry condition.

3.03 ROAD CROSSING

- A. Schedule all road crossings with Owner's Representative to minimize disruption to waste disposal operations and traffic.
- B. All road crossings shall be installed in accordance with details on the Construction Drawings. The Contractor shall present a work plan detailing its construction method to build the road crossings to the Owner's Representative. Road crossing construction work shall only start after the Owner's Representative approves the Contractor's work plan.

- C. Corrugated metal pipe (CMP) approved by the Owner's Representative shall be used as a casing to protect pipes along the road crossing. Seal CMP ends as approved by the Owner's Representative.

3.04 BLASTING

- A. Blasting will not be permitted for purposes of excavation.

3.05 BACKFILLING

- A. Pipe bedding shall be placed and compacted (maximum of 8-inch lifts) using hand compaction tools, as required. The depth of bedding shall be as shown on the Construction Drawings with a minimum of 6 inches below and above the pipe. This bedding material shall provide continuous support for the pipe and be well-compacted and free of rocks and other debris.
- B. Next, the trench shall, be backfilled with general fill, placed and compacted in 8 to 12-inch layers using mechanical compaction equipment. The compaction of this material shall conform to the surrounding material and to the satisfaction of the Owner's Representative. During general fill placement, all roots, debris, and stones larger than 4 inches in largest dimension shall be completely removed from the backfill material.
- C. Remove excessively wet soil before placement or additional lifts. Do not use frozen material or place fill material on frozen subgrade.
- D. Metallic utility marker tape shall be placed in each pipe trench above the pipe as shown on the Construction Drawings.

3.06 FINISH GRADING

- A. All areas covered by the work, including excavated and filled areas, shall be uniformly back-bladed to the finished ground elevations. The finish surface shall be reasonably smooth and free of irregularities and shall provide a presentable and well-drained area.
- B. Excess backfill material shall be stockpiled onsite as directed by the Owner's Representative.
- C. The work area shall be cleaned and restored to a condition ready for re-vegetation by the Contractor. Re-vegetation shall include seeding and mulching or installation of Bermuda Sod, or approved equal, as directed by the Owner's Representative.

3.07 COMPACTION

- A. Compaction of backfill material shall be by tracking over the fill material with Contractors onsite pipeline equipment to be consistent with the surrounding cover material.
- B. After completion of the work, or when so ordered by the Owner's Representative, that portion of material remaining on stockpile areas which may be spoiled on those areas, shall be rough graded to the elevations established by the Owner's Representative.

3.08 PROTECTION OF UNDERGROUND PIPING, UTILITIES, AND OTHER FEATURES

- A. The Contractor shall conduct an aboveground and underground utilities location survey before initiating construction work and shall take all necessary precautions to protect underground and aboveground piping, utilities, and features during the course of the construction. Contractor shall perform excavation using hand tools close to the anticipated pipe locations. Contractor shall be responsible to repair and restore to original conditions, any damage to the existing piping, utilities, and other features caused from construction activities.

3.09 FIELD SURVEYING SUPPORT

- A. Proposed trench routes shall be marked on the ground using stakes by the Owner's Representative. The Contractor shall review the staked-out route and discuss with the Owner's Representative and obtain approval before commencing work.
- B. The Contractor shall provide markers to perform as-built survey along the trench location to survey the pipe line route and elevations generally at 100-foot intervals and more frequently if the alignment of the route changes. The markers shall be 6-inch diameter PVC pipes, or equivalent, installed to stand vertically while touching the buried pipes. All marker pipes shall be removed by the Contractor after the as-built survey to be performed by the Owner. The marker pipe locations shall be backfilled with bentonite by the Contractor.

3.10 FIELD QUALITY CONTROL AND QUALITY ASSURANCE

- A. Field quality control shall be the responsibility of the Contractor. Field quality assurance shall be the responsibility of the Owner's Representative.
- B. Visual soil classification and approval of soil will be performed by the Owner's Representative.
- C. Field inspection of all construction materials and approval will be performed by the Owner's Representative.

- D. Field inspection of trenching and backfilling work and approval will be performed by the Owner's Representative.

END OF SECTION

SECTION 02610

LANDFILL GAS EXTRACTION WELLS

PART 1 - GENERAL

1.01 SCOPE OF APPLICATION

- A. Supply all equipment, materials, and labor needed to install landfill gas (LFG) extraction wells, wellheads, well hoses, and connections to lateral gas collection pipes as specified herein and as shown on the Construction Drawings.

1.02 REFERENCES

- A. ASTM D2488 - Standard Practice for Description of Soils (Visual-Manual Procedure).

1.03 SUBMITTALS

- A. Submit to the Owner's Representative Certificates of Compliance on materials furnished, and manufacturer's brochures containing complete information and instructions pertaining to the storage, handling, installation, and inspection of pipe and appurtenances furnished.
- B. The Contractor shall submit to the Owner's Representative samples of all well backfill materials furnished.
- C. The Contractor shall keep detailed well logs and construction diagrams for all wells drilled, including the total depth of the well, the static water level, the temperature of spoils, depth, thickness, and description of soil or waste strata, (including dates from any readable material), and the occurrence of any water bearing zones. Well logs shall be submitted to the Owner's Representative.
- D. The Contractor shall obtain the ground surface elevation and location survey data from the Owner's Representative after the as-built survey and include them on the well construction logs.

1.04 SITE CONDITIONS

- A. Obstructions and saturated conditions such as sludge, and foundry sands are sometimes encountered when drilling in a landfill, many of which can be drilled through. Contractor is expected to make reasonable effort to drill through obstructions and saturated conditions and will be paid for offset re-drilling and boring abandonment only if approval is given by the Owner's Representative as described in this Section. Contractor will be paid for abandonment of abandoned hole

and for well installation at new location. Wells shall not be relocated under any circumstances without the permission of the Owner's Representative.

PART 2- PRODUCTS

2.01 AGGREGATE

- A. Gravel pack shall be a non-calcareous washed 1 to 2-inch diameter crushed rock or washed #4 gravel. Gravel pack shall not impair flow to perforations/slots.

2.02 BENTONITE SLURRY MIX

- A. Coarse-ground granulated bentonite from an approved source (e.g., Baroid Benseal or approved equivalent) is to be mixed thoroughly with potable water at a ratio of 5 gallons of water to every 50 lbs. of bentonite prior to placement in wells.
- B. "Soil/bentonite plug," if used, shall refer to a mixture consisting of four parts soil backfill to one part bentonite.

2.03 GENERAL FILL

- A. Mineral soil that is substantially free from organic materials, loam, wood, trash, and other objectionable materials that may be compressible or that cannot be properly compacted. General fill shall not contain stones larger than 4 inches in the largest diameter, broken concrete, masonry rubble, or other similar materials. Natural soils visually classified as SM, ML, SC, and CL or as mixtures of these soil types in Unified Soil Classification System (USCS) are acceptable soil types.
- B. The soil shall be visually inspected and approved by the Owner's Representative before use. Contractor shall notify the Owner's Representative of any changes in the soil borrow source and submit new soil samples for inspection and approval.

2.04 FILTER FABRIC

- A. Isolation ring shall be a 36-inch diameter donut shaped filter fabric (e.g., geotextile, geomembrane, double-sided geocomposite) with an 8-inch opening for wells.

2.05 SOLID WALL PIPE

- A. All pipes and fittings shall be rigid Poly Vinyl Chloride (PVC) Schedule (SCH) 80. Refer to Section 15061 for PVC pipe.

2.06 PERFORATED / SLOTTED PIPE

- A. Perforated or slotted pipe may be used for well completions. Perforated pipe shall be 8-inch diameter PVC SCH 80 with 5/8-inch diameter holes. Holes on perforated pipe shall be spaced 2-inches apart around the circumference of

the pipe and 8-inches apart on the length of the pipe, at 120-degree angles. Slots in PVC perforated well piping shall be 8-inch long by 3/8-inch wide. Slots shall be installed in 8-staggered rows, spaced 45 degrees apart around the circumference of the pipe. Contractor shall present other configuration types to the Owner's Representative for approval.

2.07 WELLHEAD

- A. Vertical wellheads shall be CES-LANDTEC ACCU-FLO 2-inch vertical wellheads (AF2V-PV-020-2-G), or equivalent approved by the Owner's Representative, and consistent with the Construction Drawings.

2.08 WELLHOSE

- A. All well hoses shall be green kanaflex or tigerflex flexible hoses inspected and approved by the Owner's Representative and consistent with the Construction Drawings.

PART 3- EXECUTION

3.01 DRILLING

- A. Extraction wells locations shall be staked in the field by the Contractor prior to initiating drilling, according to information provided in the Construction Drawings. Contractor can initiate drilling of extraction wells at the staked locations after field verification. If the Contractor proposes to relocate a well, the Contractor shall provide to the Owner's Representative the proposed new well location survey data and proposed new well depth. Wells shall not be relocated under any circumstances without the written permission of the Owner's Representative.
- B. The bore for the well shall be both vertical and straight. At wells located on sloped ground, Contractor shall install a soil platform using general fill material to level the ground prior to drilling a vertical bore.
- C. Extraction wells are to be 36-inch diameter, drilled to the depth shown on the Construction Drawings. Contractor must use dry drilling equipment; wet rotary drilling equipment may not be used. All borings shall be made with bucket type augers.
- D. The boring depths shown on the Construction Drawings are estimated and may be adjusted in the field by the Owner's Representative. Three reasons limiting depth might be as follows:
 - 1. 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 remain, the boring may be terminated and the length of perforated pipe adjusted by the

Owner's Representative, or the well may be relocated. If wet conditions cease (e.g. due to trapped water layer), then drilling will continue to the design depth.

2. If a no-progress obstruction is encountered, the Contractor shall make a conscious effort to drill through the obstruction. If drilling through is not possible, the Contractor shall immediately contact the Owner's Representative and as directed by the Owner's Representative install a shorter well or relocate the well and abandon the drill hole. If the drill rates drop below 2 linear feet of drilling per hour due to the presence of any obstructions, the Contractor shall immediately contact the Owner's Representative to inform them of the situation. If the Owner's Representative asks the Contractor to continue drilling through the obstruction, the Contractor can charge the Owner at the hourly drilling rate provided in the bid form until the drilling rate increases above 2 linear feet of drilling per hour or the Owner's Representative instructs the Contractor to stop the drilling.
 3. If for any reason the Contractor suspects that drilling may have advanced to or beyond the liner system, the Contractor shall immediately notify the Owner's Representative verbally and in writing.
- E. As soon as drilling is completed, a 5-foot by 5-foot safety grate shall be installed over the top of the borehole. This safety grate shall stay in place until backfilling is within one foot of the surface. The safety grate shall be made of welded 3/8-inch rebar. Safety grate mesh shall be large enough to accommodate all backfill materials and any tools used during backfill, yet not large enough for any human to accidentally fall through. A 1-foot by 1-foot center opening shall be provided for installation of the perforated/slotted extraction pipe. The safety grate shall be removed prior to final construction.
- F. The bore for the well shall be both vertical and straight and the well pipe shall be installed in the center of the bore hole. The Contractor shall take all tension off of the pipe by mechanical means and center the pipe in the middle of the borehole before starting to backfill. Wells that are leaning more than 5 degrees from the vertical shall be replaced by the Contractor at its own expense.
- G. PVC well pipe shall be solvent cemented and lag bolted.
- H. Contractor shall leave a solid well casing above the existing landfill grades at the location of the gas extraction wells and horizontal manifold, in accordance with the Construction Drawings.
- I. Contractor shall remove all working platforms constructed for the drill rig after the installation of the well. Hauling, construction, removal, and other work tasks related to well installation shall be carried out with minimal disturbance to the vegetation on the landfill. Any disturbance to the vegetation on the landfill shall be restored to original conditions by the Contractor at its own expense.

3.02 BACKFILLING

- A. Backfilling of the well shall commence immediately after well drilling is completed and the well piping has been installed in the borehole. Backfill materials shall be installed as shown on the Construction Drawings and as approved by the Owner's Representative. Refer to this Section for details on type of backfill materials.
- B. Gravel pack shall be poured or scooped through the safety grate at a rate that will not endanger the integrity of the well casing. Care shall be taken during backfilling to prevent bridging. Contractor shall keep record of number of buckets used as fill at each well.
- C. Isolation ring shall be installed after the gravel pack reaches six inches above the slotted/perforated to solid pipe connection.
- D. The 2-foot thick well seal shall be formed by bucket-pouring and evenly distributing saturated bentonite slurry around the annulus of the well. Bentonite shall be hydrated and mixed in a surface mixer prior to placement around the annulus of the well. Each 50-gallon bag of bentonite shall be mixed with ten gallons of fresh water in a manner that will allow for a thorough saturation of the bentonite material. Well completion for traditional and remote wells includes two 2-foot thick bentonite seals, and for caissons wells includes one 2 1/2-foot thick bentonite seal, as shown on the Construction Drawings.
- E. Soil/bentonite plug shall be backfilled as per the material specifications. The Contractor shall soak each lift prior to filling the next one.
- F. General fill soil shall be used to fill the annulus space around the well as shown in the Construction Drawings. Soil shall be rodded to provide even distribution and compaction. Finished grade at the well location shall prevent any water accumulation near the well location by promoting drainage away from the well.
- G. All material layer thicknesses shall be verified by taking measurements before, during, and after installation of each layer.

3.03 WELLHEAD AND HOSE INSTALLATION

- A. Wellheads and hoses shall be installed per the manufacturer specifications.
- B. Vertical wellhead and hose installations shall provide the flexibility to make adjustments to accommodate differential settlements. Installation shall be at one foot above minimum wellhead adjustment.
- C. Well hose connection shall be about 4 feet long and shall be fitted in a manner that prevents the accumulation of condensate.
- D. The well pipe and lateral pipe vertical extension shall be spaced at 2 feet \pm 6 inches.

The lateral pipe vertical extension shall have a stick-up from the existing final grades of the landfill, such that the well casing stick-up is 1-foot lower than the lateral pipe vertical extension.

- E. The Contractor shall install permanent markers along the lateral pipes located in future active landfilling areas (lateral pipes to caisson and remote gas extraction wells). The markers shall be 6-in diameter PVC pipes with end caps, or equivalent, installed to stand vertically while touching the buried pipes with a minimum three-foot stick-up from ground surface. The markers shall generally be installed at 100-foot intervals and more frequently if the alignment of the route changes, with a minimum of two markers per lateral pipe. After installation, the permanent markers shall be gravel-filled and capped.

3.04 DISPOSAL

- A. Excavated refuse is to be loaded and hauled by the Contractor to the working face of the landfill for disposal by the Owner. Contractor shall keep record of the quantity of refuse hauled to the working face of the landfill and provide a disposal log to the Owner's Representative on a weekly basis.
- B. If waste disposal operations at the working face are not operating on particular day or time, the Contractor shall store the excavated materials in stockpiles on the landfill surface. These stock piles shall be covered with temporary plastic covers and anchored firmly by use of weights to prevent uplift by winds. The Contractor shall haul and dispose the stored materials as soon as the waste disposal operations at the working face commence. The Contractor shall also clean the storage location of all excavated materials.

3.05 PNEUMATIC PUMPS

- A. Pneumatic pumps for the gas extraction wells shall be procured by the Contractor and provided to the Owner's Representative. The pneumatic pumps shall be of the same type as the existing pumps at the site (QED AP4B including air regulator, pump counter, and all necessary valves and fittings – see Bid Form). Installation will be by others.

3.06 FIELD QUALITY CONTROL AND QUALITY ASSURANCE

- A. Field quality control shall be the responsibility of the Contractor. Field quality assurance shall be the responsibility of the Owner's Representative.
- B. Contractor shall provide representative samples of soil to be used in the project for visual soil classification and approval by the Owner's Representative.

- C. Owner's Representative shall conduct field inspection of all construction materials and provide approval to the Contractor.
- D. Owner's Representative shall conduct field inspection of well installation work and provide approval to the Contractor.
- E. All wells will be inspected by the Owner's Representative after setting the well casing in the borehole and backfilling with gravel, but before placement of bentonite, unless directed otherwise by the Owner's Representative on a case by case basis. The Contractor shall inform the Owner's Representative before backfilling with bentonite for each well.

END OF SECTION

SECTION 11315

CONDENSATE MANAGEMENT SYSTEM

PART I GENERAL

1.01 SCOPE OF APPLICATION

- A. This Section covers the minimum requirements for the supply, installation, and startup of: (i) two condensate sumps (48-inch diameter SDR 21 casing) with electric submersible pumps and force main line connections as shown on the Construction Drawings, and (ii) pneumatically operated automatic pump system to dewater.
- B. Equipment supplied under this Section shall have a proven performance of not less than two years in actual landfill condensate liquid collection and pump service.

1.02 SITE CONDITIONS

- A. Condensate liquid from the gas collected from several wells will flow through a section of the gas collection pipe to engineered low points within the gas piping system. Condensate liquid shall freely drain to sealed condensate sumps (48-inch diameter casing) to be installed at the engineered low points within the gas piping system. Liquid collected in the sump shall be automatically pumped using an electric pump through the newly constructed forcemain to the existing dual contained forcemain (outside the waste limits) as shown on the Construction Drawings.
- B. Contractor shall verify all dimensions provided on the Construction Drawings are achievable by performing a field survey prior to fabrication or ordering materials.
- C. An air compressor unit is installed near the blower/flare facility. A compressed air line and liquid transmission forcemain shall be installed as shown on the Construction Drawings to connect to the thirty-two (32) new gas extraction wells with new pneumatic pumps (pumps to be provided to Owner; installation will not be performed by Contractor). The compressed air line and forcemain installation shall follow the route shown on the Construction Drawings in the same trench as the gas collection pipes.
- D. The route of the forcemain from gas extraction wells shall follow in the same trench as the gas collection pipes and terminate at the existing dual contained forcemain (outside the waste limits) as shown on the Construction Drawings.

1.03 CONDENSATE SYSTEM DIMENSIONS

- A. The condensate system dimensions shall be as shown on the Construction Drawings unless determined otherwise by the Contractor per requirements of Parts 1.01 and

1.02 of this specification. In case of differences, all proposed changes shall be submitted to the Owner's Representative for review and approval prior to commencing work, including fabrication or ordering materials.

- B. Contractor shall provide and install, in the condensate sumps, electric pumps with automatic level controllers that are of the same type as other pumps at the site and as specified by the Owner.
- C. The equipment shall be rated for service in harsh and potentially explosive environments.
- D. Pneumatic pumps that are of the same type as the existing pumps at the site (QED AP4B, or Owner approved equivalent, including air regulator, pump counter, and all necessary valves and fittings – See Bid Form), shall be purchased by Contractor and provided to Owner. Installation will be by others.

1.04 SUBMITTALS – The Contractor shall submit the following:

- A. The condensate sumps shop drawings and specifications.
- B. Drawings showing details of the condensate sumps based on site-specific survey and verification of the existing ground elevations.
- C. Manufacturer's specifications for pneumatic/electric pumps for the condensate sumps and gas extraction wells.
- D. A piping and instrumentation diagram showing the workings of the automatic pump system in condensate sump.

1.05 REFERENCES

- A. The condensate sumps and compressed air and forcemain pipes used as part of the condensate system shall meet the requirements of Section 15051- HDPE Pipe and Fittings.

PART 2 PRODUCTS

2.01 CONDENSATE SUMPS

- A. The Contractor shall provide condensate knockout pots which shall be constructed of 48-inch diameter SDR 21 HDPE casing with other dimensions, connectors, flanges, fittings, and appurtenances as shown on the Construction Drawings and verified in the field by the Contractor per requirements of Parts 1.01 and 1.02 of this

specification. The sump shall be liquid and gas tight and shall be designed to withstand vacuum of 100 inches of water and pressure of 5 psig.

2.03 PIPING

- A. Piping requirements shall be in accordance with Section 15051.

2.04 ELECTRIC LIQUID PUMPS FOR CONDENSATE SUMPS

- A. The Contractor may use an automatic electric pump that is of the same type as the electric pumps at the site in the condensate sump, as specified by the Owner.
- B. The pump shall be capable of pumping liquid at a head of 100 ft. at a capacity of 15 gpm.
- C. Contractor shall construct major parts in contact with landfill gas condensate of Type 304 stainless steel.
- D. Contractor shall install O-ring system to provide efficient sealing between volute and impeller.
- E. Integral thermal sensors and moisture sensors are required. Contractor shall use thermal sensors to monitor stator temperatures on unit with water jacket and provide one for each phase group in motor. Contractor shall use in conjunction with supplemental to external motor over current protection and available at control panel.
- F. MATERIALS OF CONSTRUCTION

The Contractor shall provide major pump components which shall be Type 304 stainless steel. All watertight O-rings shall be nitrile rubber. All fasteners shall be Type 304 stainless steel. The pump shaft shall be of 420 stainless steel and shall be completely isolated from the liquid.

G. PUMP SEAL

The Contractor shall provide seals requiring neither maintenance nor adjustment, but easily inspected and replaced. Provide shaft sealing system capable of operating submerged to depths of or pressures equivalent to 35 feet.

H. PUMP MOTOR

The motor shall be 1-horsepower, non-overloading, and suitable for operation with 230/460 v, 3-ph, 60 Hz supply of power. Motor shall be suitable for leachate applications, be permanently lubricated, and constructed of stainless steel wetted parts with stainless steel clad or corrosion resistant end housings. Power cable shall

be heavy duty submersible type, jacketed, continuous length, and sized per U.S. NEC standards. A strain relief/riser exit fitting shall be provided. The cable shall be equal to the riser pump length plus a minimum length needed to reach the control panel. Motor shall be capable of sustaining minimum of 10 starts per hour, 24 hours per day, 365 days per year.

2.05 PNEUMATIC PUMPS FOR GAS EXTRACTION WELLS

- A. The Contractor shall provide pneumatic pumps that are of the same type as the existing pumps at the site (QED AP4B including air regulator, pump counter, and all necessary valves, fittings, and appurtenances – See Bid Form), shall be purchased by Contractor and provided to Owner. Installation will be by others.

2.06 SEALS FOR GAS EXTRACTION WELLS

- A. Contractor shall use a PVC flexible membrane seal to seal the excavation as part of the backfill operations.

2.07 BACKFILL MATERIAL

- A. Contractor shall provide clean coarse sand (1/4 inches minus granular material or 1-1/4 to 3/8 inches pea gravel) for use as bedding and backfill material or equivalent material approved by the Owner's Representative.
- B. Contractor shall provide soil backfill for sump excavation which does not have any large stones or other foreign materials present and is suitable for adequate compaction as approved by the Owner's Representative. Care shall be taken by the Contractor to ensure that the materials adjacent to the condensate sump are fine graded and that no objects are present that could cause damage to the sump.

PART 3 EXECUTION

3.01 HANDLING AND SETTING THE CONDENSATE SUMPS

- A. The Contractor shall lift and handle the condensate sump unit according to written procedures supplied by the manufacturer.
- B. The unit is to be set within 1/4 percent of vertical.
- C. The unit shall be set so that it is concentrically located in the prepared hole.

- D. The condensate collection sump shall be isolated from any landfill refuse by a minimum of 12 inches of sand bedding or backfill material. The top 1-foot of backfill material shall be soil backfill material to seal the bedding material.
- E. The condensate liquid sump shall be installed in an area that does not allow accumulation or ponding of water. The vault assembly shall be at least 6 inches higher than surrounding grade unless installed in a water tight vault

3.02 CONDENSATE SUMP AND PUMP CONNECTIONS

- A. Prior to making connections, the Contractor shall purge all lines of debris and thoroughly clean them.
- B. Contractor shall install pumps in accordance with manufacturer's written instructions, approved submittals, and additional instructions below.
- C. Air inlet for Pneumatic Pumps: The air line connection shall be made using 1/4-inch Schedule 40 304 SS pipe. A 304 SS union shall be connected to the pipe leading to the condensate liquid pump assembly.
- D. Condensate liquid discharge: The condensate liquid discharge line shall be connected to the condensate sump using good engineering practices. Materials and installation shall be as indicated on the piping plans.
- E. Equalizing line: A pressure equalizing line shall be connected between the condensate sump and the top of the LFG header. The equalizing line shall be free draining to either the landfill gas collection pipe or the sump and shall be free of kinks or other obstructions to liquid or air flow.
- F. Condensate liquid inlet line: The condensate liquid inlet line shall be connected to the condensate sump as shown on the Construction Drawings. The flanged connections shall be wrapped by the Contractor with two layers of 20 mil PVC pipe wrap tape.

3.04 TESTING

- A. Contractor shall check sump storage tank, lines, and block valve positions prior to operation.
- B. Testing by Contractor shall include the minimum operations:
 - 1. Pressure test to verify that all connections are tight.

2. Leak test the buried sump connection prior to setting and backfill.
3. For pneumatic pumps, check the lubricator to make sure that it is feeding at the proper rate. Adjust the air pressure regulator. Dry operation of the pump for two minutes.

3.04 ACCEPTANCE

- A. Prior to acceptance by the Owner, the following verifications shall be made by the Contractor:
 1. Verify unit is installed vertically.
 2. Verify unit has been installed per manufacturer's recommendations.
 3. Verify all connections have been pressure tested per the manufacturer's recommendations.
 4. Verify the pipes and connections are clean and free of debris.
 5. Verify the level switch displacers are installed at elevations appropriate for the installation. As-built displacer elevations shall be recorded and submitted to the Engineer by the Contractor prior to project acceptance.
 6. Verify all required functional testing has been completed.

END OF SECTION

SECTION 15051

HIGH DENSITY POLYETHYLENE (HDPE) PIPE AND FITTINGS

PART I GENERAL

1.01 SCOPE OF APPLICATION

- A. The Contractor shall supply and install High Density Polyethylene (HDPE) pipe and fittings in nominal pipe sizes of 2, 3, 6, 8, 24, and 48 inches. SDR 17 HDPE pipes will be utilized as gas collection pipes (6, 8, 24, and 48 inches). SDR 11 HDPE pipes will be utilized as condensate forcemains (3 inches). SDR 9 HDPE pipes will be utilized as compressed air pipes (2 and 3 inch).

1.02 REFERENCES

- A. ASTM D 2513 - Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings.
- B. ASTM D 3350 - Standard Specification for Polyethylene Plastics Pipe and Fitting Materials.
- C. ASTM F 714 – Standard Specification for Polyethylene (PE) Plastic Pipe (SDRPR) Based on Outside Diameter.
- D. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DRPR) Based on Controlled Outside Diameter.
- E. PPI TR-3 – Policies and Procedures for Developing Hydrostatic Design Bases (HDB), Pressure Design Bases (PDB) and Minimum Required Strengths (MRS) for Thermoplastic Piping Materials or Pipe.
- F. PPI TR-4 – PPI Listing of Hydrostatic Design Bases (HDB), Pressure Design Bases (PDB) and Minimum Required Strengths (MRS) for Thermoplastic Piping Materials.

1.03 SUBMITTALS

- A. The Contractor shall submit all manufacturer quality assurance certificates to the Owner's Representative and obtain approval before using the materials in construction. These quality assurance certificates shall include, at a minimum, details or values to demonstrate compliance with Part 2 of this specification.
- B. The Contractor shall submit all field pressure testing results to the Owner's Representative for approval.

1.04 MANUFACTURER'S QUALITY ASSURANCE

- A. The pipe and fittings manufacturer shall have an established quality assurance program responsible for inspecting incoming and outgoing materials.
- B. The pipe and fittings manufacturer shall have an established quality assurance program responsible for assuring the long-term performance of materials and products.
- C. The pipe and fitting manufacturer shall maintain permanent quality control and quality assurance records.

1.05 PACKAGING DELIVERY AND HANDLING

- A. The pipe and fitting manufacturer shall package products for shipment in a manner suitable for safe transport by commercial carrier. When delivered, a receiving inspection shall be performed by the Contractor, and any shipping damage reported to the pipe and fittings manufacturer. Pipe and fittings shall be handled, installed, and tested in accordance with manufacturer's recommendations, and the requirements of this specification.

PART 2- PRODUCTS

2.01 PHYSICAL PROPERTIES:

- A. Materials used for the manufacture of polyethylene pipe and fittings shall meet all industry standards. In general, pipes utilized for flow of gas shall conform with ASTM D 2513. Pipes utilized for flow of liquids shall conform with ASTM F714 or ASTM D3035. ASTM F714 or ASTM D3035 may be used for pipes conveying gas based on the approval of the Owner's Representative.
- B. Polyethylene compounds utilized in the manufacture of products furnished under this specification shall have a grade PE34, as defined in ASTM D 3350. These materials shall meet the following requirements:

Property	Unit	Test Procedure	Value
Material designation	-	ASTM/PPI	-
PPI material listing	-	PPI TR-4	PE 3408
Property	Unit	Test Procedure	Value
Density	g/cm3	ASTM D 1505	> 0.941

Melt index (190 °C / 2.16 kg)	g/10 min	ASTM D 1238	< 0.15
Flexural modulus	psi	ASTM D 790	110,000 – 160,000
Tensile strength at yield	psi	ASTM D 638	3,000 – 3,500
Environmental slow crack resistance (ESCR)	hours	ASTM D 1693 (f0, C) or F 1473 (PENT)	> 5,000 (for D 1693) > 10 (for F 1473)
UV stabilizer	% carbon black	ASTM D 1603	2 - 3
Brittleness temperature	°F	ASTM D 746	< -180
Vicat softening temperature	°F	ASTM D 1525	255
Thermal expansion coefficient	in/in/°F	ASTM D 696	< 12 x 10 ⁻⁵
Hardness	Shore D	ASTM D 2240	> 64

- C. Polyethylene compounds utilized in the manufacture of products shall have a Plastic Pipe Institute (PPI) recommended hydrostatic design basis (HDB) of 1,600 psi at a temperature of 73.4°F and 800 psi at a temperature of 140°F. Hydrostatic Design Stress (HDS) shall be 800 psi at a temperature of 73.4°F and 400 psi at a temperature of 140°F. Material shall be listed in the name of the pipe and fitting manufacturer.
- D. PPI material listing in the name of the resin supplier is not acceptable in meeting this requirement.
- E. The pipe and fittings shall be homogenous throughout and free from visible cracks, holes, foreign inclusions or other injurious defects. The pipe shall be as uniform as commercially practical in color, opacity, density and other physical properties.

2.02 PIPE AND FITTINGS:

A. DIMENSIONS:

1. Pipe Dimensions: The nominal inside diameter of the pipe shall be true to the specified pipe size in accordance with ASTM D 2513. Standard laying lengths shall be 40 feet ±2 inches. Exceptions may be made for 2-inch diameter pipes in coils if suitable strengthening devices are used.
2. Fitting Dimensions: fittings such as coupling, flanges, wyes, tees, adaptors, etc. for use in laying pipe shall have standard dimensions that conform to ASTM.

- B. Where possible, pipe and fittings should be produced by the same manufacturer from identical materials meeting the requirements of this specification. Special or custom fittings may be exempted from this requirement.
- C. Pipe and fittings shall be pressure rated to meet the service pressure requirements specified by the Owner's Representative. Whether molded or fabricated, fittings shall be fully pressure rated to at least the same service pressure rating as the pipe to which joining is intended.
- D. Marking: Each standard and random length of pipe and fitting in compliance with this standard shall be clearly marked with the following information:
 - 1. ASTM Standard Designation
 - 2. Manufacturer's Name
 - 3. Pipe Size and Sizing System
 - 4. Class & Profile Number
 - 5. Production Code
 - 6. Standard Dimension Ratio
 - 7. Manufactured Date

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

- A. Field quality control is the responsibility of the Contractor. The Owner's Representative shall inspect and approve the Contractor's field quality control measures.
- B. Pipe shall be rejected for failure to conform to Specifications or the following:
 - 1. Fractures or cracks passing through pipe wall, except single crack not exceeding 2 inches in length at either end of pipe which could be cut off and discarded. Pipes within one shipment shall be rejected if defects exist in more than 5% of shipment or delivery.
 - 2. Cracks sufficient to impair strength, durability or serviceability of pipe.

3. Defects indicating improper proportioning, mixing, and molding.
 4. Damaged ends, where such damage prevents making satisfactory joint.
 5. Gouges of more than ten percent of the minimum wall thickness of the pipe.
- C. Acceptance of fittings, stubs or other specifically fabricated pipe sections shall be based on visual inspection at job site and documentation of conformance to these Specifications.

3.02 INSTALLATION

- A. Trench, backfill, and compact in accordance with Sections 02221 and 02222.
- B. Heat Fusion of Pipe:
1. Weld in accordance with manufacturer's recommendation for butt fusion methods. Provide at least one fusion operator certified by the pipe manufacturer and with prior field experience in at least three projects to manage the fusing operations for the project.
 2. Butt fusion equipment for joining procedures shall be capable of meeting conditions recommended by pipe manufacturer including, but not limited to, temperature requirements, alignment, and fusion pressures.
 3. For cleaning pipe ends, solutions such as detergents and solvents, when required, shall be used in accordance with manufacturer's recommendations.
 4. Do not bend pipe to greater degree than minimum radius recommended by manufacturer for type and grade.
 5. Do not subject pipe to strains that will overstress or buckle piping or impose excessive stress on joints.
 6. Branch saddle fusions shall be joined in accordance with manufacturer's recommendations and procedures. Branch saddle fusion equipment shall be of size to facilitate saddle fusion within trench.
 7. Before butt fusing pipe, inspect each length for presence of dirt, sand, mud, shavings, and other debris or animals. Remove debris from pipe.
 8. Cover at end of each working day open ends of fused pipe. Cap to prevent entry by animals or debris.

9. Use compatible fusion techniques when polyethylenes of different melt indexes are fused together. Refer to manufacturer's specifications for compatible fusion.

C. Flange Jointing:

1. Use on flanged pipe connection sections.
2. Connect slip-on carbon steel backup flanges with stainless steel nuts and bolts.
3. Butt fuse fabricated flange adapters to pipe.
4. Observe the following precautions in connection of flange joints:
 - a. Align flanges or flange valve connections to provide tight seal. Require nitrile-butadiene gaskets if needed to achieve seal. Gaskets are required for flange/valve connections.
 - b. Place U.S. Standard round washers as may be required on some flanges in accordance with manufacturer's recommendations. Bolts shall be lubricated in accordance with manufacturer's recommendations.
 - c. Tighten flange bolts in sequence and accordance with manufacturer's recommendations. Do not over-torque bolts.
5. Pull bolt down by degrees to uniform torque in accordance with manufacturer's recommendation.
6. Protect below grade bolts and flanges by covering with a polyethylene wrap. Duct tape wrap to HDPE pipe.
7. Electrofusion couplers, where used, shall be installed per manufacturer's specifications.

D. Pipe Placement:

1. Grade control equipment shall be of type to accurately maintain design grades and slopes during installation of pipe.
2. Dewatering: Remove standing water in trench before pipe installation.
3. Unless otherwise specifically stated, install pipe in accordance with manufacturer's recommendations.
4. Maximum lengths of fused pipe to be handled as one section shall be placed according to manufacturer's recommendations as to pipe size, pipe SDR, and

topography so as not to cause excessive gouging or surface abrasion; but not to exceed 500 feet.

5. Cap pipe sections longer than single joining (usually 40 feet) on both ends during placement except during fusing operations.
6. Notify Owner's Representative prior to installing pipe into trench and allow time for Owner's Representative's inspection. Correct irregularities found during inspection.
7. Complete tie-ins within trench whenever possible to prevent overstressed connections.
8. Allow pipe sufficient time to adjust to trench temperature prior to testing, segment tie-ins or backfilling activity.
9. Install reducers adjacent to laterals and tees.
10. To reduce branch saddle stress, install saddles at slope equal to and continuous with lateral piping.
11. Place in trench by allowing minimum 12 inch/100 feet for thermal contraction and expansion.
12. Coordinate construction of pipes near access roads with Owner's Representative to limit impediment of landfill operations or operations of other Contractors.

3.03 PIPE TESTING

- A. Contractor shall Air Test all pipe sections and fittings after placement in trench, in accordance with manufacturer's recommendations. Wells and other system openings should be blocked off for testing. Pressure test below ground systems (only). Special precautions are required for this type of testing. It is not recommended that above ground systems be pressure tested.
- B. Pressure testing shall be performed by the Contractor for a period of one hour. Testing time shall be measured after a stable reading of the testing pressure has been achieved and the pressure source removed.
- C. For pressure testing gas pipes, a pressure gauge with a maximum range not greater than 20 psig, and minor gradations not greater than 0.1 psig, shall be used. All pressure testing for gas pipes shall be done at ten psig. A test shall be acceptable if the pressure drop at the end of the one hour test period is less than five percent of the testing pressure. Owner's Representative will provide modified requirements for pressure testing if such changes are warranted based on manufacturer specifications.

- D. For pressure testing air and condensate forcemain pipes, a pressure gauge with a maximum range not greater than 100 psig, and minor gradations not greater than 0.5 psig, shall be used. All pressure testing for air pipes shall be done at 50 psig. All pressure testing for condensate forcemain pipes shall be done at 25 psig. A test shall be acceptable if the pressure drop at the end of the one hour test period is less than five percent of the testing pressure. Owner's Representative will provide modified requirements for pressure testing if such changes are warranted based on manufacturer specifications.
- E. Keep all persons at a safe distance during pressure testing.
- F. Disconnect the test section from all gas collection and control system (GCCS) components that are not being tested. Failure of a section should result in compressed air being released to atmosphere.
- G. Completely backfill extraction pipes before pressure testing to provide adequate restraint.
- H. Heat fusion joints must be properly cooled before pressure testing. Mechanical connections should be installed and tightened per manufacturer instructions.
- I. Repair work should be carried out only after release of pressure. Release pressure gradually.

3.04 VALVES

- A. Valves shall be provided at the locations specified on the Construction Drawings.
- B. Valves shall be provided in accordance with the details provided by the Owner's Representative. All valves shall meet the industry standard requirements.
- C. Valves shall include monitoring ports at either side in accordance with the details provided by the Owner's Representative and similar to the existing GCCS valves on the site.

END OF SECTION

SECTION 15061

POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

PART 1 GENERAL

1.01 SCOPE OF APPLICATION

- A. Supply 8-inch diameter polyvinyl chloride (PVC) Schedule (SCH) 80 pipe and fittings for gas extraction well casings for the GCCS expansion. Both solid and slotted or perforated pipes are required to be provided.

1.02 REFERENCES

- A. ASTM D-2855: Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings
- B. ASTM D-402: Standard Practice for Safe Handling of Solvent Cements Primers, and Cleaners used for Joining Thermoplastic Pipe and Fittings

1.03 SUBMITTALS

- A. The Contractor shall submit all manufacturer quality assurance certificates to the Owner's Representative and obtain approval before using the materials in construction.

PART 2 PRODUCTS

2.01 PIPE & FITTINGS

- A. Materials used for the manufacture of polyethylene pipe and fittings shall meet all industry standards.
- B. The pipe and fittings shall be homogenous throughout and free from visible cracks, holes, foreign inclusions, or other injurious defects. The pipe shall be as uniform as commercially practical in color, opacity, density and other physical properties.

2.02 SLOTTED PIPE

- A. Refer to Section 02610 for gas extraction well slotting requirements.

PART 3 EXECUTION

3.01 PVC PIPE HANDLING

- A. PVC pipe and pipe fittings shall be handled carefully while loading and unloading. They shall be lifted by hoists and lowered on skidways in such a manner as to avoid shock. Derricks, ropes, or other suitable equipment shall be used for lowering the pipe into the extraction well borings. Pipe and pipe fittings shall not be dropped or dumped.

3.02 PVC PIPE INSTALLATION

- A. PVC pipe installation shall conform to these specifications and manufacturer's recommendations.

3.03 JOINING OF PVC PIPES

- A. Joining of pipes shall be in accordance with ASTM D2855.
- B. Contractor shall inspect all pipe for cuts, scratches, or other damage prior to installation. Pipe with imperfections shall not be used.
- C. All burrs, chips, etc., shall be removed from pipe interior and exterior.
- D. All loose dirt and moisture shall be wiped from the interior and exterior of the pipe end and the interior of the fitting.
- E. All pipe cuts shall be square, perpendicular to the center line of pipe.
- F. 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.
- G. A coating of CPS primer as recommended by 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.
- H. The solvent cement shall be applied in strict accordance with manufacturer's specifications.
- I. Pipe shall not be primed or solvent welded when it is raining or when atmospheric temperature is below 40°F or above 90°F when under direct exposure to the sun. This requirement may be waived by the Owner's Representative for extraction well pipe joining vertically by utilizing lag screws as specified in Section 02610.
- J. After solvent welding, the pipe shall remain undisturbed until cement has thoroughly set. As a guideline for joint settling time, use 1 hour for ambient temperatures 60-

100°F, or 2 hours when ambient temperature is 40-60°F. This requirement may be waived for extraction well piping utilizing lag screws as specified in Section 02610.

- K. Pipe and pipe fittings shall be selected so that there will be as small a deviation as possible at the joints, and so that inverts present a smooth surface. Pipe and fittings which do not fit together to form a tight fitting will be rejected.

END OF SECTION