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SECTION 01 22 04

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 SUMMARY

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   b. Horizontal Gas Trench Installation (Bid Item 2)
   c. Horizontal Gas Well Head Installation (Bid Item 3)
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   q. Additional Mobilization and Demobilization (Bid Item 17)

B. Unit Prices include:
1. Defined work for each Unit Price Item which will provide a functionally complete Project when combined with all Unit Price Items. If there are specific work items which the Contractor believes are not identified in any Unit Price Item, but is required to provide a functionally complete Project, then the identified specific work items shall be included in the appropriate Unit Price Item.
2. The method of measurement for payment.
3. The price per unit for payment.

C. Lump sum prices include:
1. All work items which will result in a functionally complete project in accordance with the specifications and drawings.

1.2 GENERAL WORK ITEMS

A. Include with the appropriate Bid Item the following work items which are common to the Bid Items for this Section.

B. If there is a specific Bid Item for any of the following items, then the work item shall be included with that specific unit price item.
   1. Maintenance, protection, replacement and/or repair of damaged facilities outside the area identified for payment in a separate Unit Price Item.
   2. Site access requirements.
   3. Dust control.
   4. Traffic control.
   5. Erosion control construction.
   6. Regulatory requirements.
   7. Construction staking and other survey work not provided by Owner's representative.
   8. Location of existing utilities and piping.
   9. Protection of existing underground piping and utilities.
   10. Quality assurance and quality control testing and inspections not provided by the Owner's representative.
   11. Shop drawings and other submittals.
   12. All costs for compliance with health and safety requirements.

1.3 INITIAL MOBILIZATION AND DEMOBILIZATION (Bid Item 1)

A. The unit price for Item 1 includes:
   1. General Work Items of Article 1.2.
   2. All costs relating to mobilizing equipment and personnel to site.
   3. Attendance at pre-construction and progress meetings.
   4. Project management costs.
   5. Furnishing and installing any necessary facilities required to complete the work.
   6. Removal of all equipment and personnel from site.
   7. Restoration of all affected areas to conditions prior to work.

B. Measurement for payment will not be made.

C. The unit of measurement for payment is lump sum.

1.4 HORIZONTAL GAS TRENCH INSTALLATION (BID ITEM 2)

A. The unit price for Item 2 includes:
   1. General Work Items of Article 1.2.
   2. Stripping and segregating existing cover.
   3. Excavation of trench.
   4. Furnish and install pipe.
   5. Furnish and install pipe bedding.
   6. Furnishing and installing of geotextile.
   7. Backfill of trench with waste.
   8. Replacement of intermediate cover.
   9. Loading, hauling and placing supplemental clay cover from on-site stockpile if necessary.

10. Construction staking, including documentation of pipe elevations.
11. Removal of excess excavated waste to the active area of the landfill.
12. Daily cover of the active area if after hours.
13. Litter control including picking of litter created by excavation.

B. Measurement for payment will be based on the actual length of trench installed as measured by survey. Measurement will be from each end of excavated trench.

C. The unit of measurement for payment is lineal feet. The estimated quantity is 5,300 lineal feet.

1.5 HORIZONTAL GAS WELL HEAD INSTALLATION (Bid Item 3)

A. The unit price for Item 3 includes:
1. General Work items of Article 1.2.
2. Furnish and install well heads and all necessary fittings and accessories as shown on the drawings.
3. Furnish and install all piping and fittings from trench to well head.
4. Furnish and install all piping and fittings from well head to lateral pipe.

B. Measurement for payment will not be made.

C. The unit of measurement for payment is per each well head installed. The total estimated quantity is 16 well heads.

1.6 6” GAS LATERAL PIPE INSTALLATION (Bid Item 4)

A. The unit price for Item 4 includes:
1. General Work Items of Article 1.2.
2. Excavation of trench.
3. Furnish and install pipe.
4. Backfill of trench.
5. Construction staking.
6. Pressure testing of installed piping.
7. Furnish and install any necessary fittings.

B. Measurement for payment will be based on the actual length of lateral pipe installed as measured by survey. Measurement will be from the leachate recirculation and gas well heads to the connection to existing gas pipe stubouts.

C. The unit of measurement for payment is lineal feet. The estimated quantity is 2,025 lineal feet.

1.7 WYE OR TEE CONNECTIONS TO EXISTING OR NEW LATERAL PIPING (Bid Item 5)

A. The unit price for Item 5 includes:

1. General Work Items of Article 1.2.
2. Excavate existing lateral pipe tie in location.
3. Furnish and install wye or tee connection to lateral piping.
4. Backfill of trench.

B. Measurement for payment will be based on each wye or tee connection made.

C. The unit of measurement for payment is per each wye or tee connection made. The estimated quantity is 46.

1.8 CONNECTIONS TO EXISTING HEADER PIPING STUBOUT (Bid Item 6)

A. The unit price for Item 6 includes:
1. General Work Items of Article 1.2.
2. Excavate existing lateral pipe tie in location.
3. Furnish and install wye or tee connection to gas header piping stubout.
4. Backfill of trench.

B. Measurement for payment will be based on each connection made.

C. The unit of measurement for payment is per each wye or tee connection made. The estimated quantity is 2.

1.9 COMPRESSED AIR PIPE INSTALLATION (Bid Item 7)

A. The unit price for Item 7 includes:
1. General Work Items of Article 1.2.
2. Excavation of trench.
3. Furnish and install pipe.
4. Backfill of trench.
5. Construction staking.
6. Loading, hauling and placing supplemental clay cover from on-site stockpile if necessary.
7. Pressure testing of installed piping.
8. Furnish and install any necessary fittings.

B. Measurement for payment will be based on the actual length of compressed air pipe installed as measured by survey. Measurement will be from each end of excavated trench.

C. The unit of measurement for payment is lineal feet. The estimated quantity is 2,150 lineal feet.

1.10 GAS LATERAL AND COMPRESSED AIR PIPE INSTALLATION (Bid Item 8)

A. The unit price for Item 8 includes:

1. General Work Items of Article 1.2.
2. Excavation of trench.
3. Furnish and install pipe.
4. Backfill of trench.
5. Construction staking.
6. Pressure testing of installed piping.
7. Loading, hauling and placing supplemental clay cover from on-site stockpile if necessary.
8. Furnish and install any necessary fittings.

B. Measurement for payment will be based on the actual length of gas lateral and compressed air pipe installed as measured by survey. Measurement will be from each end of excavated trench.

C. The unit of measurement for payment is lineal feet. The estimated quantity is 1,140 lineal feet.

1.11 VERTICAL GAS WELL HEAD INSTALLATION (Bid Item 9)

A. The unit price for Item 9 includes:
1. General Work Items of Article 1.2.
2. Install gas well head and flexible hose provided by Owner.
3. Furnish and install lateral pipe connection.
4. Furnish and install compressed air piping stubout.
5. Furnish and install fused cap on compressed air piping stubout.
6. Backfill of trench.
7. Construction staking.
8. Furnish and install any necessary fittings.

B. Measurement for payment will be based on each well head installed.

C. The unit of measurement for payment is per each well head installed. The estimated quantity is 15.

1.12 4” DIA. GAS LATERAL PIPE INSTALLATION (Bid Item 10)

A. The unit price for Item 10 includes:
1. General Work Items of Article 1.2.
2. Excavation of trench.
3. Furnish and install pipe.
4. Backfill of trench.
5. Construction staking.
6. Loading, hauling and placing supplemental clay cover from on-site stockpile if necessary.
7. Pressure testing of installed piping.
8. Furnish and install any necessary fittings.

B. Measurement for payment will be based on the actual length of gas lateral pipe installed as measured by survey. Measurement will be from each end of excavated trench.

C. The unit of measurement for payment is lineal feet. The estimated quantity is 700 lineal feet.

1.13 LEACHATE RECIRCULATION TRENCH INSTALLATION (PERFORATED SECTION, BID ITEM 11)

A. The unit price for Item 11 includes:
1. General Work Items of Article 1.2.
2. Stripping and segregating existing cover.
3. Excavation of trench.
4. Furnish and install pipe.
5. Furnish and install pipe bedding.
6. Furnishing and installing of geotextile.
7. Backfill of trench with waste.
8. Replacement of intermediate cover.
9. Loading, hauling and placing supplemental clay cover from on-site stockpile if necessary.
10. Construction staking, including documentation of pipe elevations.
11. Removal of excess excavated waste to the active area of the landfill.
12. Daily cover of the active area if after hours.
13. Litter control including picking of litter created by excavation.

B. Measurement for payment will be based on the actual length of trench installed as measured by survey. Measurement will be from each end of excavated perforated pipe trench.

The unit of measurement for payment is lineal feet. The estimated quantity is 2,007 lineal feet.

1.14 LEACHATE RECIRCULATION TRENCH INSTALLATION (SOLID SECTION, BID ITEM 12)

A. The unit price for Item 12 includes:
1. General Work Items of Article 1.2.
2. Stripping and segregating existing cover.
3. Excavation of trench.
4. Furnish and install pipe.
5. Furnishing and installing of geotextile.
6. Backfill of trench with waste.
7. Replacement of intermediate cover.
8. Furnish and install all necessary fittings.
9. Loading, hauling and placing supplemental clay cover from on-site stockpile if necessary.
10. Construction staking, including documentation of pipe elevations.

11. Removal of excess excavated waste to the active area of the landfill.
12. Daily cover of the active area if after hours.
13. Litter control including picking of litter created by excavation.

B. Measurement for payment will be based on the actual length of trench installed as measured by survey. Measurement will be from each end of excavated solid pipe trench.

The unit of measurement for payment is lineal feet. The estimated quantity is 1,000 lineal feet.

1.15 LEACHATE RECIRCULATION WELL HEAD INSTALLATION (Bid Item 13)

A. The unit price for Item 13 includes:
1. General Work items of Article 1.2.
2. Furnish and install well heads and all necessary fittings and accessories as shown on the drawings.
3. Furnish and install all piping and fittings from trench to well head.
4. Furnish and install all piping and fittings from well head to lateral pipe.

B. Measurement for payment will not be made.

C. The unit of measurement for payment is per each well head installed. The total estimated quantity is 10 well heads.

1.16 3" GATE VALVE INSTALLATION (Bid Item 14)

A. The unit price for Item 14 includes:
1. General Work items of Article 1.2.
2. Furnish and install gate valve and extension.

B. Measurement for payment will not be made.

C. The unit of measurement for payment is per each valve installed. The total estimated quantity is 5 valves.

1.17 3" DIA. LEACHATE FORCEMAIN INSTALLATION (Bid Item 15)

A. The unit price for Item 15 includes:
1. General Work Items of Article 1.2.
2. Excavation of trench.
3. Furnish and install pipe.
4. Backfill of trench.
5. Loading, hauling and placing supplemental clay cover from on-site stockpile if necessary.
6. Construction staking.
7. Pressure testing of installed piping.

8. Furnish and install any necessary fittings.

B. Measurement for payment will be based on the actual length of gas lateral pipe installed as measured by survey. Measurement will be from each end of excavated trench.

C. The unit of measurement for payment is lineal feet. The estimated quantity is 700 lineal feet.

1.18 3" TEE OR BENDS IN LEACHATE FORCEMAIN (Bid Item 14)

A. The unit price for Item 14 includes:
1. General Work items of Article 1.2.
2. Locate and expose existing forcemain.
3. Furnish and install TEEs or Bends.

B. Measurement for payment will not be made.

C. The unit of measurement for payment is per each TEE or bend installed. The total estimated quantity is 6.

1.19 ADDITIONAL MOBILIZATION AND DEMOBILIZATION (Bid Item 11)

A. The unit price for Item 11 includes:
1. General Work Items of Article 1.2.
2. All costs relating to remobilizing equipment and personnel to site.
3. Attendance at pre-construction and progress meetings.
4. Project management costs.
5. Furnishing and installing any necessary facilities required to complete the work.
6. Removal of all equipment and personnel from site.
7. Restoration of all affected areas to conditions prior to work.

B. Measurement for payment will not be made.

C. The unit of measurement for payment is lump sum.

END OF SECTION

SECTION 01 35 53.13

SAFETY AND ENVIRONMENTAL PROCEDURES FOR HAZARDOUS MATERIAL SITES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
   1. Site safety and health plan
   2. Personal injury and property damage prevention
   3. Personnel organization, qualifications and responsibilities

1.2 REFERENCES

A. Code of Federal Regulations
   1. 29 CFR 1910 Occupational Safety and Health Standards
   2. 29 CFR 1926 Safety and Health Regulations for Construction

1.3 SUBMITTALS

A. Submit Site Safety and Health Plan, not for approval, but as evidence of compliance with State and Federal requirements.

1.4 SITE SAFETY AND HEALTH PLAN

A. Develop and implement a site safety and health plan meeting the requirements of 29 CFR 1910.120, 29 CFR 1926 and other applicable federal, state and local regulations.

B. Prepare the plan specifically for the site and the anticipated activities based on available information on site conditions and hazards.

C. The plan shall be considered a living document, updated as conditions change during Project execution.

D. On-site work shall not begin until the plan has been prepared and implemented.

E. Include the following in the implementation portion of the plan:
   1. Monitoring for flammable atmospheres in the work area including excavations.
   2. Monitoring of atmosphere for toxic vapors.
   3. Monitoring for other hazards commonly associated with construction activities.

1.5 PERSONAL INJURY AND PROPERTY DAMAGE PREVENTION

A. Provide necessary protection to prevent damage, injury or loss to:
   1. Persons on the Site or who may be affected by the Work;
   2. Materials and equipment to be incorporated in the Work;
   3. Other property at or adjacent to the Site, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and underground facilities not designated for removal, relocation, or replacement.

B. Comply with all applicable laws, ordinances, rules and regulations affecting the safety of persons or property providing any necessary safeguards for such safety and protection.

C. Notify the owners of any properties or utilities that are affected by the Work.

D. The duties and responsibilities of the Contractor for the safety and environmental protection of the workers and the site shall continue until final payment is made by the Owner to the Contractor.

1.6 PERSONNEL ORGANIZATION, QUALIFICATIONS AND RESPONSIBILITIES

A. Designate the Safety Representative per the General Conditions, a Site Safety and Health Officer and at least one alternate.

B. The Site Safety and Health Officer shall:
   1. Implement and enforce the site health and safety plan.
   2. Provide hazard communication information.
   3. Be responsible for any safety environmental monitoring.
   4. Have the authority to stop work activities if unacceptable health or safety conditions exist.
   5. Coordinate and recommend corrective actions for identified health and safety deficiencies and oversee the corrective actions.

C. Training
   1. As a minimum, personnel performing duties with potential for exposure to on-site contaminates shall meet the 29 CFR 1910.120 and 29 CFR 1926 training requirements.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 31 05 10

SOILS AND AGGREGATES FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
1. Engineered soils and aggregates materials

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM)
1. ASTM C33 Spec. for Concrete Aggregates.
2. ASTM C88 Test for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
3. ASTM C117 Test for Material Finer than No. 200 Sieve in Mineral Aggregates by Washing.
4. ASTM C131 Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
5. ASTM C136 Sieve Analysis of Fine and Coarse Aggregates.
6. ASTM C144 Spec. for Aggregate for Masonry Mortar.
7. ASTM C207 Spec. for Hydrated Lime for Masonry Purposes.
8. ASTM C535 Test for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
9. ASTM C602 Spec. for Agricultural Liming Materials.
10. ASTM D75 Sampling Aggregates.
11. ASTM D422 Particle Size Analysis of Soils.
12. ASTM D448 Spec. for Standard Sizes of Coarse Aggregate for Highway Construction.
13. ASTM D1140 Test for Amount of Material in Soils Finer than the No. 200 Sieve.
14. ASTM D1241 Spec. for Materials for Soil-Aggregate Subbase, Base, and Surface Courses.
15. ASTM D2216 Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil Aggregate Mixtures.
16. ASTM D2487 Classification of Soils for Engineering Purposes.
17. ASTM D4318 Test Method for Liquid Limit, Plastic Limit, and Plasticity of Soils.
18. ASTM D5268 Standard Specification for Topsoil Used for Landscaping Purposes.

1.3 SUBMITTALS

A. Provide test reports showing the results of required material testing.

B. Provide topsoil analysis performed in accordance with ASTM D5268 and demonstrating the topsoil meets Soil Conservation Service specified soil types. Also, submit results of test for nutrient levels and provide recommendations for fertilizer type and application.

C. Daily delivery tickets for each load of material delivered to the site.

PART 2 - PRODUCTS

2.1 ENGINEERED SOILS AND AGGREGATES (SOIL CLASS A)

A. General
1. Material shall be clean, sound, hard, dense, durable, field or quarry stone which is free from seams, cracks, or other structural defects. It shall be angular material from shot rock (blasted) or crushed rock having substantially all face of which have resulted from artificial crushing.
2. Loss due to sulfate soundness test shall not exceed 10 percent.
3. Loss due to abrasion test shall not exceed 40 percent.
4. Material shall not be frozen.

B. Gradation
1. Soil Class A-1 (Heavy Riprap Rock)

Size of Stone	% Total Weight Smaller Than the Given Size
500 lbs.	100
400 lbs.	90
150 lbs.	50
40 lbs.	20

2. Soil Class A-MR (Medium Riprap Rock)

Size of Stone	% Total Weight Smaller Than the Given Size
400 lbs.	100
200 lbs.	90
80 lbs.	50
15 lbs.	20

3. Soil Class A-2 (Light Riprap Rock)

Size of Stone	% Total Weight Smaller Than the Given Size
150 lbs.	100
60 lbs.	80

20 lbs.	20
2 lbs.	10

4. Soil Class A-3 (Breaker Run Rock or 6" Crushed Rock)

Sieve Size	% Passing by Weight
7-inch	100
6-inch	90
4-inch	75
3-inch	10

5. Soil Class A-4 (3½-inch Crushed Rock - ASTM D448-No. 1)

Sieve Size	% Passing by Weight
4-inch	100
3½-inch	90-100
2½-inch	25-60
1½-inch	0-15
¾-inch	0-5

6. Soil Class A-5 (2½-inch Crushed Rock - ASTM D448-No.2)

Sieve Size	% Passing by Weight
3-inch	100
2 ½ inch	90-100
2-inch	35-70
1 ½-inch	0-15
3/4-inch	0-5

7. Soil Class A-6 (1½-inch Crushed Rock - ASTM D448-No. 4)

Sieve Size	% Passing by Weight
2-inch	100
1 1/2 inch	90-100
1-inch	20-55
¾ inch	0-15
3/8 inch	0-5

8. Soil Class A-7 (¾-inch Crushed Rock - ASTM D448-No. 67)

Sieve Size	% Passing by Weight
1-inch	100
¾-inch	90-100
3/8-inch	20-55
No. 4	0-10
No. 8	0-5

9. Soil Class A-8 (⅜-inch Crushed Rock Chips - ASTM D448-No. 8)

Sieve Size	% Passing by Weight
½-inch	100
3/8-inch	85-100
No. 4	10-30
No. 8	0-10
No. 16	0-5

2.2 ENGINEERED SOILS AND AGGREGATES (SOIL CLASS B)

A. General
1. Aggregate shall be hard, strong, durable particles free from seams, cracks, and other structural defects.
2. Rounded to subangular.
3. Free from organic impurities and debris.
4. Material shall not be frozen.

B. Gradation
1. Soils Class B-1 (Coarse Aggregate - ASTM C33 - No. 3)

Sieve Size	% Passing by Weight
2 ½-inch	100
2-inch	90-100
1 ½-inch	35-70
1-inch	0-15
½-inch	0-5

2. Soil Class B-2 (Coarse Aggregate - ASTM C33 - No. 7)

Sieve Size	% Passing by Weight
¾-inch	100
½-inch	90-100
3/8-inch	40-70
No. 4	0-15
No. 8	0-5

3. Soil Class B-3 (Fine Aggregate - ASTM C33)

Sieve Size	% Passing by Weight
3/8-inch	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	10-30
No. 100	2-10

4. Soil Class B-4 (Masonry Sand - ASTM C144)

Sieve Size	Percent Passing Natural Sand	Manufactured Sand
No. 4	100	100
No. 8	95 to 100	95 to 100
No. 16	70 to 100	70 to 100
No. 30	40 to 75	40 to 75
No. 50	10 to 35	20 to 40
No. 100	2 to 15	10 to 25

Sieve Size	Percent Passing Natural Sand	Manufactured Sand
No. 200	---	0 to 10

2.3 ENGINEERED SOILS AND AGGREGATES (SOIL CLASS C)

A. General

1. Stone shall be hard, durable, granular material of uniform quality resulting from crushed rock or crushed bank run sand and gravel.
2. Material shall be free from clay lumps, organic matter, shale, excess elongated or flat pieces, and other deleterious substances.
3. Forty-five percent of the particles retained on a No. 4 sieve shall have at least one fractured face.
4. Wear shall not exceed 50 percent.
5. Loss due to sulfate soundness test shall not exceed 18 percent by weight.
6. Total moisture content shall not exceed 7 percent.
7. Filler for blending shall have a maximum liquid limit of 25 percent and a maximum plasticity index of 6.
8. Material shall not be frozen.

B. Gradation

1. Soil Class C-1 (Crushed Stone)

Sieve Size	% Passing by Weight
1 ½-inch	100
3/8-inch	30-65
No. 4	25-55
No. 10	15-40
No. 200	2-12

2. Soil Class C-2 (Crushed Stone)

Sieve Size	% Passing by Weight
1-inch	100
3/8-inch	40-75
No. 4	25-60
No. 10	15-45
No. 200	3-12

3. Soil Class C-3 (Crushed Stone)

Sieve Size	% Passing by Weight
1-inch	100
¾-inch	95-100
3/8-inch	50-90
No. 4	35-70
No. 10	15-55

Sieve Size	% Passing by Weight
No. 200	5-15

4. Soil Class C-4 (Crushed Gravel)

Sieve Size	% Passing by Weight
1 1/2-inch	100
1-inch	75-100
3/8-inch	40-75
No. 4	30-60
No. 10	20-45
No. 40	10-30
No. 200	3-10

5. Soil Class C-5 (Crushed Gravel)

Sieve Size	% Passing by Weight
1-inch	100
3/8-inch	50-85
No. 4	35-65
No. 10	25-50
No. 40	10-30
No. 200	3-10

6. Soil Class C-6 (Crushed Gravel)

Sieve Size	% Passing by Weight
1-inch	100
¾-inch	95-100
3/8-inch	50-90
No. 4	35-70
No. 10	20-55
No. 200	8-15

2.4 BANK RUN SOILS

A. Soil Class D-1 and D-2
   1. Materials shall be rounded or subangular material resulting from pit run or crushed material.
   2. Materials shall be free from clay lumps, organic matter, and deleterious substances.
   3. One hundred percent by weight shall pass a 3-inch sieve.
   4. Maximum liquid limit shall be 25 percent and maximum plasticity index shall be 6.
   5. Material shall not be frozen.
   6. The portion of material which passes a No. 4 sieve shall conform to the following gradation:

	Maximum % By Weight Passing	
Sieve Size	Grade D-1	Grade D-2
No. 4	100	100
No. 40	75	---
No. 100	15	30
No. 200	8	15

B. Soil Class D-3 (Sand)
1. Well graded, unwashed bank run or crushed bank run which is free from clay lumps, organic matter, and other deleterious substances with gradation as follows:

Sieve Size	% Passing by Weight
¾-inch	100
No. 4	90-100
No. 10	45-90
No. 40	15-45
No. 200	0-10

C. Soil Class E-1 (Clay Soil)
1. Minimum 50 percent by weight passing the No. 200 sieve.
2. For the fraction passing the No. 40 sieve, the minimum plasticity index shall be 15.
3. Minimum Atterberg liquid limit of 30.
4. Free from organic material, boulders, cobbles, excessive amounts of gravel (greater than ¾-inch), and other deleterious substances.

D. Soil Class F-1 (Topsoil)
1. Topsoil shall meet the definition and specification stated in ASTM D5268 and meets one of the following SCS (Soil Conservation Service) soil textures:
   a. Loam.
   b. Sandy loam.
   c. Silt loam.
   d. Silty clay loam.
   e. Clay loam.
2. The topsoil shall consist of adequate mineral content to support the growth of the intended vegetation and shall not contain herbicides which would be detrimental for the intended use.
3. The topsoil shall have adequate fertility for quick establishment of vegetation.
4. The pH of the topsoil shall be between 6.0 and 7.0.
5. Topsoil shall be free from deleterious substances.
6. Pulverize and screen the topsoil such that 100 percent passes the 1-inch (25 mm) sieve and at least 90 percent passes the No. 10 (2.00 mm).

E. Soil Class G-1 (Clean Earth Fill)

1. Soil Class G-1 shall be any soil material excavated on the project site or obtained from borrow areas.
2. Soil materials unsuitable and, therefore, not approved for this classification are:
   a. Soils with high organic contents such as: topsoil, peat, muck, organic silts, and clays, marls, etc.
   b. Manmade or rubble filled soils containing such materials as: foundry sand, fly ash cinders, asphalt, and concrete rubble, etc.
   c. Silty soils such as: rock flour, loess, etc.
   d. Soils with gravel larger than 3-inch.
   e. Silty clay or clays with a high plasticity (CH soils as defined in ASTM D2487).
   f. All soil contaminated with hazardous waste materials as defined by the EPA.

F. Soils Class G-2 (Clean Earth Fill)
1. Same as G-1 above except shall not contain gravel larger than 1½-inch.

2.5 MANUFACTURED AND SPECIAL SOILS

A. Soil Class H-1 (Polymer Treated and Chemically Treated Bentonite)
1. Bentonite shall be defined as being largely composed of sodium montmorillonite (a clay mineral).
2. Contain an optimum level of anionic or non-ionic or organic polymer to maximize wetting, expansion, and dispersing action in all types of soils.
3. Shall be high swelling which is defined as the ability of 2 grams of the base bentonite, when mechanically reduced to -100 sieve, to swell in water to an apparent volume of 16.0 cc's, or more when added a little at a time to 100 cc's of distilled water in a graduate. Swelling action shall be indefinitely reversible.
4. Shall have a colloid content exceeding 85 percent as measured by evaporating the suspended portion of a 2 percent solution after 24 hours of sedimentation in a graduated beaker.
5. Shall have a mineralogical composition of 90 percent minimum montmorillonite with 10 percent maximum sediments of feldspar, micas, and unaltered volcanic ash.
6. Material shall not be frozen.

B. Soil Class H-1 (Polymer Treated Bentonite)
1. Have properties equal to American Colloid Company Volcloy SG-40 Federal Bentonite Fluid Stop 610, or equal.

C. Soil Class H-2 (Chemically Treated Bentonite)
1. Be chemical treated to resist reaction and degradation from contact with the contaminant being stored.
2. Have properties and composition equal to America Colloid Company Volcloy Saline Seal - 100, Federal Bentonite Marine Seal 123, or equal.

D. Soil Class J-1 (Agricultural Limestone)
1. Conform to ASTM C602.

2. Ground or crushed limestone.
3. Neutralization index of not less than 40 or more than 109.
4. Meet the following gradation:
   a. Passing a No. 4 sieve - 100 percent.
   b. Passing a No. 10 sieve - 90 to 100 percent.
   c. Passing a No. 50 sieve - 50 to 100 percent.

E. Soil Class J-2 (Hydrated Lime)
1. Shall consist of essentially calcium, hydroxide or a mixture of calcium hydroxide, magnesium oxide, and magnesium hydroxide.
2. Dry powder obtained by treating quick lime with enough water to satisfy its chemical affinity for water under the conditions of its hydration.
3. Hydrated lime shall conform to the requirements of ASTM C207, Type N or S.

2.6 SOURCE QUALITY CONTROL

A. To establish acceptability of material, perform tests for each soils class in accordance to the following standards:
1. Soils Class A and C:
   a. ASTM C88.
   b. ASTM C131 (for coarse aggregates smaller than 1½ inches).
   c. ASTM C136.
   d. ASTM C535 (for coarse aggregates 1½ inches and larger).
   e. ASTM C117 (use when aggregate contains materials finer than No. 200 sieve).
2. Soils Class B:
   a. ASTM C88.
   b. ASTM C117.
   c. ASTM C136.
3. Soils Class D:
   a. ASTM C117.
   b. ASTM C136.
   c. ASTM D1241.
   d. ASTM D2487.
4. Soils Class E:
   a. ASTM C136 (test when gravel content is present).
   b. ASTM D422.
   c. ASTM D1140.
   d. ASTM D2216.
   e. ASTM D4318
5. Soils Class F:
   a. ASTM D2487.
6. Soils Class G:
   a. ASTM D2487.

B. In addition to the above, furnish a soil analysis of Soil Class F:
1. Analyze for the following:

a. pH
b. Phosphorus
c. Potassium
d. Soluble Salts
e. Calcium
f. Magnesium

C. Source sample all soils and aggregates in accordance with ASTM D75.

D. Perform one (1) acceptable test for each type of material at each source.

PART 3 - EXECUTION

3.1 APPLICATION

A. Use the soil classification as specified or stated on Drawings.

B. Place material in accordance with the Drawings and appropriate Specification Sections for the type of work being performed.

END OF SECTION

SECTION 31 32 19

GEOTEXTILE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
1. Separation geotextile in horizontal gas trenches.
2. Separation geotextile in leachate recirculation trenches.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
1. ASTM D123 Standard Terminology Relating to Textiles.
2. ASTM D4354 Standard Practice for Sampling Geotextiles for Testing.
3. ASTM D4355 Standard Test Method for Determination of Geotextiles from Exposure to Ultraviolet Light and Water (Xeron-Arc Type Apparatus).
4. ASTM D4491 Standard Test Method for Water Permeability of Geotextiles by Permittivity.
5. ASTM D4533 Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
6. ASTM D4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
7. ASTM D4751 Standard Test Method for Determining Apparent Opening Size of Geotextiles.
8. ASTM D4833 Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products.
9. ASTM D4873 Standard Guide for Identification, Storage and Handling of Geosynthetic Rolls.
10. ASTM D4884 Standard Test Method of Strength of Sewn or Thermally Bonded Seams of Geotextiles.

B. Geosynthetics Research Institute (GRI)
1. GT12(a) Test Methods and Properties for Nonwoven Geotextiles Used as Protection (or cushioning) Materials – ASTM Version.
2. GT13 Test Methods and Properties for Geotextiles Used as Separation Between Subgrade Soils and Aggregate.

1.3 SUBMITTALS

A. Provide, prior to delivery of the geotextile fabric, a manufacturer's Certificate of Compliance that the geotextile fabric meets the requirements of this Section.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver only geotextiles meeting the specifications to the Site.

B. All geotextiles shall be labeled, shipped, stored and handled in accordance with ASTM D4873.

C. Do not use hooks, tongs or other sharp instruments for handling geotextile.

D. Store geotextile fabric in a dry location until installed.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide geotextile fabric consisting of either woven or non-woven polyester, polypropylene, stabilized nylon, polyethylene or polyvinylidene chloride.
   1. All fabric shall have the minimum strength values in the weakest principle direction.
   2. Non-woven fabric may be needle punched, heat bonded, resin bonded or combinations thereof.

B. The geotextile fabric shall be insect, rodent, mildew and rot resistant.

C. Clearly mark the geotextile fabric rolls showing the type of fabric.

D. If sewn seams are used, provide a field sewn seam sample produced from the geotextile fabric and thread and with the equipment to be used on the project, prior to its incorporation into the work.

2.2 MATERIALS

A. Nonwoven Geotextile Fabric, Type C
   1. Type C nonwoven geotextile fabric shall be used for separation layer.
   2. The fabric shall comply with the following special physical properties.

Test	Method	Value[(1)]
Grab Tensile Strength (lbs)	ASTM D4632	200 min.
Puncture Strength (lbs)	ASTM D4833	70 min.
Apparent Opening Size (U.S. Standard Sieve)	ASTM D4751	40-140.
Permittivity, sec^{-1}	ASTM D4491	0.10 min.

[(1)]All numerical values represent minimum/maximum average roll values (i.e., the average of minimum test results on any roll in a lot should meet or exceed the minimum specified values).

3. The following non-woven fabrics are approved for Type C:
   a. Amoco (Nilex) – 4553
   b. Carthage – FX-80HS
   c. Contech – C-200
   d. Mirafi – 180N

PART 3 - EXECUTION

3.1 SEAMS

A. Sew the seams of the geotextile with thread having the same or greater physical properties as the material or bond by heat.

B. Test seams in accordance to ASTM D4884.

C. Seams shall develop a tensile strength equal to or greater than 90 percent of the required grab tensile strength of the fabric, unless otherwise specified.

3.2 NON-WOVEN GEOTEXTILE FABRIC, TYPE C

A. Grade the area smooth and remove all stones, roots, sticks or other foreign material which would interfere with the fabric being completely in contact with the soil.

B. Place the fabric loosely and parallel to the direction of water movement.
   1. Join separate pieces of fabric by overlapping.
   2. Place the fabric in the overlapped joints with a minimum overlap of 24 inches in the direction of flow.

C. After placement, do not expose the fabric longer than 48 hours prior to covering.

D. Cover damaged areas with a patch of fabric using a 3 foot overlap in all directions.

3.3 PROTECTION

A. Protect the geotextile at all times during construction from contamination by surface runoff. Remove and replace any geotextile so contaminated with uncontaminated geotextile.

B. Replace any damaged geotextile.

C. Schedule the work so that the covering of the geotextile with a layer of the specified material is completed within seven (7) calendar days after placement of the geotextile.

D. Protect the geotextile from damage prior to and during the placement of riprap or other materials.

1. Limit the height of drop to less than 1 foot (300 mm), or place a cushioning layer of sand or gravel on top of the geotextile before placing the material, or other methods deemed necessary.
2. Take care to ensure that the utilized cushioning materials do not impede the flow of water.
3. Before placement of riprap or other materials, demonstrate that the proposed placement technique will not cause damage to the geotextile.

E. In no case shall any type of equipment be allowed on the unprotected geotextile.

END OF SECTION

SECTION 33 00 10

HIGH DENSITY POLYETHYLENE PIPE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work under this section includes material and performance requirements for high density polyethylene pipe and fittings.

1.2 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM D638 Test for Tensile Properties of Plastics.
2. ASTM D790 Tests for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
3. ASTM D1238 Test for Flow Rates of Thermoplastics by Extrusion Plastometer.
4. ASTM D1248 Spec. for Polyethylene Plastics Molding and Extrusion Materials.
5. ASTM D1505 Test for Density of Plastics by the Density Gradient Technique.
6. ASTM D1508 Testing Carbon Black, Pelleted - Fines Content.
7. ASTM D1693 Test for Environmental Stress - Cracking of Ethylene Plastics.
8. ASTM D2657 Practice for Heat Joining Polyolefin Pipe and Fittings.
9. ASTM D2837 Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.
10. ASTM D3350 Spec. for Polyethylene Plastics Pipe and Fittings Materials.

1.3 QUALITY ASSURANCE

A. Pipe shall be available to Owner's representative for inspection.

B. Pipe shall be considered defective and will be rejected when:

1. Not homogeneous throughout.
2. Contains cracks, holes, or foreign inclusions.
3. Not utilized within six (6) months of date of production.
4. Improperly stored.

C. Material brands and/or pipe classes shall not be mixed.

1.4 PRODUCT DELIVERY

A. Pipe Marking
Pipe shall be marked as follows:

1. Manufacturer's name, trademark or logo.
2. Nominal size.
3. National Sanitation Foundation designation.
4. ASTM cell classification or Plastic Pipe Institute designation.
5. Dimension ratio, schedule size, or pressure rating.
6. Production date.

B. Storage
1. Provide a protected storage area.
2. Keep pipe material safe from damage and theft.

1.5 SUBMITTALS

A. Submit following:
1. Shop drawings on pipe and fittings.
2. Manufacturer's certification of the following:
a. Production date of all materials.
b. That the material complies with the requirements of this section.
3. Evidence of certification of personnel performing thermal butt fusion.

PART 2 - PRODUCT

2.1 MATERIAL REQUIREMENTS (PIPE AND FITTINGS)

A. Shall conform to the following:
1. Meet the requirements of Plastic Pipe Institute Designation PE3408.
2. Comply with requirements for Type III, Class C, Category 5, Grade P34 in accordance to ASTM D1248.
3. Cell classification of 345434C in accordance to ASTM D3350 and limits and test methods shall be as follows:

Property	Limits	Test
Density	0.941 – 0.955	ASTM D1505
Melt Index	<0.15	ASTM D1238
Flexural Modulus (PSI)	80,000 - <110,000	ASTM D790
Tensile Strength at Yield (PSI)	3,000 - <3,500	ASTM D638
Environmental Stress Crack Resistance		
♦ Test Condition	C	
♦ Test Duration, Hours	192	
♦ Failure, Max. Percentage	20	
Hydrostatic Design Basis (PSI at 23°C)	1,600	ASTM D2837

B. Fittings and Custom Fabrications
1. Polyethylene fittings and custom fabrications shall be molded or fabricated by the pipe manufacturer. Butt fusion outlets shall be made to the same outside

diameter, wall thickness, and tolerances as the mating pipe. All fittings and custom fabrications shall be fully rated for the same internal pressure as the mating pipe. Pressure de-rated fabricated fittings are prohibited.

C. Molded Fittings
1. Molded fittings shall be manufactured in accordance with ASTM D 3261, and shall be so marked. Each production lot of molded fittings shall be subjected to the tests required under ASTM D 3261. The Manufacturer shall submit samples from each molded fittings production lot to x-ray inspection for voids, and shall certify that voids were not found.

D. Fabricated Fittings
1. Fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock, or molded fittings. Fabricated fittings shall be rated for internal pressure service equivalent to the full service pressure rating of the mating pipe.

E. Polyethylene Flange Adapters
1. Flange adapters shall be made with sufficient through-bore length to be clamped in a butt fusion joining machine without the use of a stub-end holder. The sealing surface of the flange adapter shall be machined with a series of small v-shaped grooves to provide gasketless sealing, or to restrain the gasket against blow-out.

F. Back-up Rings and Flange Bolts
1. Flange adapters shall be fitted with back-up rings pressure rated equal to or greater than the mating pipe. The back-up ring bore shall be chamfered or radiused to provide clearance to the flange adapter radius. Flange bolts and nuts shall be Grade 2 of higher.

2.2 MATERIAL SUPPLIED BY OWNER

A. A total of 140 lineal feet of perforated horizontal gas pipe is on-site and can be used by the Contractor.

PART 3 - EXECUTION

3.1 POLYETHYLENE PIPE INSTALLATION

A. In addition to the applicable sections for installing piping, the Contractor shall conform to the following:
1. Thermal butt fuse all joints as per ASTM D2657 or D2620.
2. Utilize certified personnel for jointing operation.
3. Electro-fusion couplings may only be used when butt fusing is not possible.

B. Size and class (SDR rating) shall be as shown on drawings.

END OF SECTION

SECTION 33 01 05

TESTING AND INSPECTION OF PIPELINES AND APPURTENANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
1. Low pressure air test.
2. Pressure and leakage test for pressurized pipelines.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM)
1. ASTM D3034 Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
2. ASTM C828 Standard Test Method for Low-Pressure Air Test of Vitrified Clay Pipe Line.
3. ASTM F679S Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
4. ASTM C1244 Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test.
5. ASTM C1107 Spec. for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

B. American Water Works Association (AWWA)
1. AWWA C600 Installation of Ductile-Iron Water Mains and Their Appurtenances
2. AWWA C605 Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
3. AWWA C651 Disinfecting Water Mains

1.3 SUBMITTALS

A. Quality Control Submittals
1. Test reports and results.
2. Proposed method to correct deficiencies.
3. Record of deficiency repair method and location.

1.4 PROJECT/SITE CONDITIONS

A. Notify Engineer a minimum of 48 hours prior to any testing.

B. Notify Engineer when testing equipment is setup and ready for testing.

C. Testing shall be performed in the presence of the Engineer.

D. Provide access to test equipment to enable the Engineer to monitor and record test results.

E. Repeat failed test after correction of deficiencies until satisfactory tests are obtained.

F. Proposed correction of deficiencies shall be approved by Engineer prior to correction.

G. Repair visible leaks within the pipeline and/or pipeline appurtenances.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Low Pressure Air Test
1. Inflatable pipe plugs.
2. Bracing.
3. Compressor.
4. Hose and fittings.
5. Pressure gauge.

B. Standard Pressure and Leakage Test
1. High pressure pump with electric or gas engine drive with capacity in excess of test conditions.
2. Provide calibrated vessel for measuring water pumped into the main to replace leakage.
3. Provide certified pressure gauge calibrated in pounds per square inch of sufficient capacity to conduct test.

PART 3 - EXECUTION

3.1 PREPARATION OF PIPELINE BEFORE TESTING

A. Clean pipeline of any debris, soils, and construction material.

B. Repair or replace piping, valves, fittings, manholes, inlets and other parts of the piping system which have visible defects or leakage, before commencing tests, even though amount of leakage or pressure loss may be below the allowable limit.

C. Provide traffic control and other safety equipment including confined space entry equipment, if required.

3.2 LOW PRESSURE AIR TEST

A. Provide the low pressure air test for all gas piping.

B. Preparation
1. For testing consistency, wet interior pipe surface.
2. Install appurtenances including, but not limited to, wyes, tees, laterals, stubs, and structures prior to testing to ensure the system is being tested.
3. Plug pipe outlets (including laterals) adequately to retain testing pressure.
4. Visually inspect pipeline and repair visible defective joints and leaks.

C. Testing Procedure
1. Determine test time as follows:
   a. Test times for pipeline segments with uniform pipe size shall be taken from test timetable list below.
   b. Test times for pipeline segments longer than those shown and/or of non-uniform pipe size shall be calculated utilizing appropriate formulas in ASTM C828.

Test Timetable

	Pipe Diameter "D" in Inches										
Length	≤8	10	12	15	18	21	24	27	30	36	42
25	0.30	0.37	0.45	0.52	0.60	0.74	0.89	1.04	1.19	1.50	1.82
50	0.59	0.74	0.89	1.04	1.20	1.49	1.78	2.08	2.39	3.01	3.64
75	0.89	1.11	1.34	1.57	1.80	2.23	2.67	3.12	3.58	4.51	5.45
100	1.19	1.48	1.78	2.09	2.40	2.97	3.56	4.16	4.77	6.01	7.27
125	1.48	1.86	2.23	2.61	3.01	3.72	4.45	5.20	5.96	7.51	9.09
150	1.78	2.23	2.67	3.13	3.61	4.46	5.34	6.24	7.16	9.02	10.91
175	2.08	2.60	3.12	3.65	4.21	5.21	6.23	7.28	8.35	10.52	12.73
200	2.37	2.97	3.56	4.17	4.81	5.95	7.12	8.32	9.54	12.02	14.54
225	2.67	3.34	4.01	4.70	5.41	6.69	8.01	9.36	10.73	13.52	16.36
250	2.97	3.71	4.45	5.22	6.01	7.44	8.90	10.40	11.93	15.03	18.18
275	3.26	4.08	4.90	5.74	6.61	8.18	9.79	11.44	13.12	16.53	20.00
300	3.56	4.45	5.34	6.26	7.21	8.92	10.68	12.48	14.31	18.03	21.81
325	3.86	4.82	5.79	6.78	7.81	9.67	11.58	13.52	15.50	19.53	23.63
350	4.16	5.19	6.23	7.30	8.41	10.41	12.47	14.56	16.70	21.04	25.45
375	4.45	5.57	6.68	7.83	9.02	11.16	13.36	15.60	17.89	22.54	27.27
400	4.75	5.94	7.12	8.35	9.62	11.90	14.25	16.64	19.08	24.04	29.09
425	5.05	6.31	7.57	8.87	10.22	12.64	15.14	17.68	20.27	25.54	30.90
450	5.34	6.68	8.01	9.39	10.82	13.39	16.03	18.72	21.47	27.05	32.72
475	5.64	7.05	8.46	9.91	11.42	14.13	16.92	19.76	22.66	28.55	34.54
500	5.94	7.42	8.90	10.43	12.02	14.87	17.81	20.80	23.85	30.05	36.36
525	6.23	7.79	9.35	10.96	12.62	15.62	18.70	21.84	25.04	31.55	38.18
550	6.53	8.16	9.79	11.48	13.22	16.36	19.59	22.88	26.24	33.06	39.99
575	6.83	8.53	10.24	12.00	13.82	17.10	20.48	23.93	27.43	34.56	41.81
600	7.12	8.90	10.68	12.52	14.42	17.85	21.37	24.97	28.62	36.06	43.63

I. Specified test time (minutes) required for pressure drop from 3½ to 2½ psi when testing one pipe diameter only.
II. Interpolate test times for segment lengths not specifically listed.

2. Pressurize pipeline to 4.0 psi and allow to stabilize (stabilization of air temperature may cause pressure drop).
3. When pressure has stabilized, start test at 3.5 psi and record time.
4. If pressure drops more than 1.0 psi during the determined test time, the test will be considered failed.
5. If the test section is below the ground water level, determine the height of the groundwater above the spring line of the pipe at each end of the test section and compute the average. For every foot of groundwater above the pipe spring line, increase the gage test pressures by 0.43 pounds per square inch.

3.3 PRESSURE AND LEAKAGE TEST FOR PRESSURIZED PIPELINES

A. Provide pressure and leakage tests for leachate force main and compressed air piping.
1. Testing shall be in accordance with AWWA C605 for PVC pipe, as modified herein.
2. Testing shall be in accordance with AWWA C600 for ductile iron pipe, as modified herein.

B. Preparation
1. Install temporary plugs or caps, as required, prior to testing.
2. Install thrust restraints before testing including temporary plugs or caps.
   a. If high-early cement concrete thrust restraints are used, then test after 36 hours of thrust restraint replacement.
   b. If standard cement concrete thrust restraints are used, then test after 7 days of thrust restraint replacement.
3. At a minimum, provide bedding, cover material and partial backfill for buried pipe, except joints may be left uncovered until testing is completed.
4. Install appurtenances including, but not limited to, hydrants, valves, services and air release valves prior to testing to ensure the entire system is being tested.
5. Filling and flushing with water.
   a. Fill each valved section with water slowly with maximum velocity of 1 ft./sec., venting air completely from the pipeline and appurtenances.
   b. Where permanent air vents are not located at high points or dead ends, install corporation stops/valves to vent air as the line is filled with water.
      1) Close all these corporation stops/valves before applying pressure or leakage tests.
      2) At the conclusion of the leakage and pressure test, remove and plug corporation stops/valves, or at the discretion of the Owner left in place.
   c. After filling, flush the lines with a minimum of three changes of water at blowoffs and dead ends with a minimum velocity of 3 ft/sec. purging the lines of air.
   d. Discharge water without causing erosion, nuisance, or interruption of traffic.
6. Provide test connections and pressurize the pipe to normal working pressure.

a. Inspect pipeline and repair visible leaks.
b. Re-pressurize pipeline to normal working pressure as many times as necessary until there are no visible leaks.

7. Provide backflow protection acceptable to the owner of the water system when existing water mains are used to supply test water.

C. Pressure Test

1. At the option of the Contractor, the pressure and leakage tests may be performed at the same time.
2. Test pressure at the lowest point of elevation of the segment being tested shall be not less than or at 10 lbs. per sq. inch less than the pressure rating of the pipe, if less than 150 lbs. per sq. inch.
3. Pressurize the system being tested to pressure required above by adding water with high pressure test pump.
4. Repair any visible leaks occurring due to test pressure application.
5. Repeat pressurizing of system to test pressure until no visible leaks can be found.
6. Test period shall be two continuous hours with no visible leaks occurring.
7. Measure pipeline pressure during test period.
8. Maintain system pressure within plus or minus 5 lbs. per sq. inch of the required test pressure by adding water with the test pump.

D. Leakage Test

1. Perform a leakage test after satisfactory completion of the pressure test.
2. Test pressure at the lowest point of elevation of the segment being tested shall be not less than 150 lbs. per sq. inch or at 10 lbs. per sq. inch less than the pressure rating of the pipe, if less than 150 lbs. per sq. inch.
3. Leakage is defined as the quantity of water supplied into the pipe section being tested to maintain a pressure within 5 lbs. per sq. inch of the specified leakage test pressure after the pipe has been filled with water and the pipeline air has been expelled.
4. Provide gauges, measuring device, pump, piping, connections, container of water and all other apparatus required to perform the test.
5. Leakage shall not exceed the number of gallons per hour as determined by the following formula:

$$L = \frac{SD\sqrt{P}}{133{,}200}$$

When:

L = Allowable Leakage in Gallons/Hr.
S = Total Length of Pipe Tested in Feet
D = Nominal Pipe Dia. in Inches
P = Average Test Pressure in lbs/sq. in.

6. When the section under test contains various diameters of pipe, the available leakage will be the sum of the computed leakage for each size of pipe.

7. Test period shall be two continuous hours without exceeding the allowable leakage.
8. Repair pipeline as required to meet allowable leakage requirements, repeating the test after each repair.

END OF SECTION

SECTION 33 05 07

HORIZONTAL LANDFILL GAS EXTRACTION WELLS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The Contractor shall furnish all necessary labor, transportation, tools, equipment and appurtenances necessary for the complete construction of horizontal landfill gas extraction wells hereinafter specified, and as shown on the Plans and Details. Variance from the gas well profile shown on the Plans and Details shall only be made with the approval of the Engineer.

1.2 APPLICABLE REGULATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. Wisconsin Administrative Codes NR 500 and NR 141
   2. Federal Register 29 CFR 1910.120

1.3 PERMITS, CERTIFICATES AND LICENSES

A. The Contractor shall, at his expense, procure all permits, certificates and licenses required of him by law for his work. He/she shall comply with all Federal, State and local laws, ordinances or rules and regulations relating to the performance of the work.

1.4 RELATED SECTIONS

A. Environmental Protection/Site Safety Requirements

PART 2 - PRODUCTS

2.1 MATERIALS PROVIDED BY OWNER

A. The following materials will be provided by the Owner:
   1. Supplemental clay if needed.
   2. Well head sample ports as shown on drawings.

PART 3 - EXECUTION

3.1 GENERAL

A. Keep the amount of open trench to a minimum. All trenches must be backfilled and covered with clay at the end of each day. All work must be coordinated with landfill personnel and must not interfere with the daily operations of the landfill.

3.2 TRENCH EXCAVATION

A. Perform trench excavation in a safe manner. All personnel working in or around the trench must be properly trained and follow all requirements of the Site Safety Plan.

B. Strip and segregate existing cover soils from the daily length of trench.

C. Excavate trench to design profile. Load, haul and place excess waste in the active area of the landfill. Provide daily cover if the waste is placed in the active area after the normal operating hours of the landfill.

D. Control all litter. Collect all litter created by trenching by the end of each day.

E. Replace intermediate cover over completed trench by the end of each day. Supplement cover with clay from on-site stockpile if necessary to completely cover the trench.

3.3 PIPE INSTALLATION

1. Install pipe bedding and piping to correct elevation and grade.
2. Install geotextile as shown on Drawings.
3. Document top of pipe elevation on a 25’ interval. Provide summary to Engineer.
4. Maintain positive slope in accordance with the drawings.

3.4 WELL HEAD INSTALLATION

A. Install well heads in accordance with the drawings. Coordinate all connections to existing gas header piping with landfill personnel.

END OF SECTION

SECTION 33 05 08

LEACHATE RECIRCULATION SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The Contractor shall furnish all necessary labor, transportation, tools, equipment and appurtenances necessary for the complete construction of a leachate recirculation system hereinafter specified, and as shown on the Plans and Details. Variance from the gas well profile shown on the Plans and Details shall only be made with the approval of the Engineer.

1.2 APPLICABLE REGULATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. Wisconsin Administrative Codes NR 500 and NR 141
   2. Federal Register 29 CFR 1910.120

1.3 PERMITS, CERTIFICATES AND LICENSES

A. The Contractor shall, at his expense, procure all permits, certificates and licenses required of him by law for his work. He/she shall comply with all Federal, State and local laws, ordinances or rules and regulations relating to the performance of the work.

1.4 RELATED SECTIONS

A. Environmental Protection/Site Safety Requirements

PART 2 - PRODUCTS

2.1 MATERIALS PROVIDED BY OWNER

A. The following materials will be provided by the Owner:
   1. Supplemental clay if needed.

PART 3 - EXECUTION

3.1 GENERAL

A. Keep the amount of open trench to a minimum. All trenches must be backfilled and covered with clay at the end of each day. All work must be coordinated with landfill personnel and must not interfere with the daily operations of the landfill.

3.2 TRENCH EXCAVATION

A. Perform trench excavation in a safe manner. All personnel working in or around the trench must be properly trained and follow all requirements of the Site Safety Plan.

B. Strip and segregate existing cover soils from the daily length of trench.

C. Excavate trench to design profile. Load, haul and place excess waste in the active area of the landfill. Provide daily cover if the waste is placed in the active area after the normal operating hours of the landfill.

D. Control all litter. Collect all litter created by trenching by the end of each day.

E. Replace intermediate cover over completed trench by the end of each day. Supplement cover with clay from on-site stockpile if necessary to completely cover the trench.

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END OF SECTION