SECTION 31 00 00 - EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Work governed by this section, as shown or specified shall be in accordance with the requirements of the Contract Documents and the New York State Building Code (International Building Code 2018 edition).

1.2 SUMMARY

A. This Section includes the following:
1. Removal of existing pavements, curbs, abandoned pipes, retaining walls, utilities, former foundation structures, and other structures encountered which require removal for successful completion of the Work.
2. General excavation to levels established within the Contract Drawings and as described herein.
3. Local excavation for the footings, slabs, walls, and other foundation elements indicated on the Contract Drawings and as directed by the Owner's Engineer.
4. Excavation, fill placement, grading and compaction to required elevations for appurtenances and general site work as shown on the Contract Drawings and as directed herein.
5. Excavation, trenching and backfilling for mechanical trades, including but not limited to plumbing, heating, water, steam, gas, and electric within and outside the site as shown on the Contract Drawings or as required to make the work complete; backfilling same with suitable fill materials as described herein; and thoroughly compacting said materials to "Rough Grading" elevations.
6. Excavation, trenching, and backfilling for temporary works as shown or as required; backfilling same with approved fill; compacted and rough grading.
7. Improvement of subgrade conditions via the removal and replacement program as outlined on the project's geotechnical report, and placement of approved fill as directed by the Owner's Engineer.
8. Preparing subgrades for walks, pavements, utility structures, stormwater management and bioretention basins, lawns, and plantings.
9. Subbase course for concrete walks and pavements.
10. Excavating and backfilling utility trenches.
11. Excavating and backfilling for structural foundations.
12. Disposal of unsuitable material.
13. Disposal of surplus suitable material, if required.

14. Protection of adjacent structures, utilities, and pavements.
15. Temporary groundwater control as required for execution of the Work for this Section and for all other related foundation Work.
16. All other labor equipment, and materials as may be reasonably inferred to be required to make the Work under this Section complete.

B. Related Sections include the following:
1. Section 311000 – Site Clearing.
2. Section 312513 – Erosion and Sediment Control.
3. Section 331101 – Water Utility Distribution Piping.
4. Section 331216 – Water Utility Distribution Valves.
5. Section 333104 – Sanitary Sewer Pipe.
6. Section 333901 – Sanitary Sewer Structures.
7. Section 333913 – Storm Drainage Structures.
8. Section 334105 – Storm Drainage Piping.

1.3 REFERENCES

A. New York State Department of Transportation (NYSDOT) September 1, 2021 Standard Specifications.

B. All Work under this Section shall conform to the most restrictive requirements of the New York State Building Code (IBC 2018 edition), and to the regulations of all governmental authorities having jurisdiction.

C. New York State Department of Environmental Conservation (NYSDEC) "New York State Standards and Specifications for Erosion and Sediment Control, latest edition (a.k.a. Blue Book).

D. Occupational Safety and Health Administration (OSHA) Excavation Regulations, latest edition.

E. American Society for Testing and Materials (ASTM)
1. ASTM C-33 Standard Specifications for Concrete Aggregates.
2. ASTM D-422 Standard Test Method for Particle Size Analysis of Soils (sieve only).
3. ASTM D-2216 Test Method for Laboratory Determination of Water (Moisture) Content of Rock and Soil.
4. ASTM D-4318 Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
5. ASTM D-448: Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
6. ASTM D-698: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600kN-m/m3)).
7. ASTM D-1556 – Standard Test Method for Density and Unit weight of Soil in Place by the Sand-Cone Method
8. ASTM D-1557: Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.

9. ASTM D-2167 - Standard Test Method for Density and Unit weight of Soil in Place by the Rubber Balloon Method.
10. ASTM D-2487: Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
11. ASTM D-2940: Standard Specification for Graded Aggregate Material for Bases or Subbases for Highways or Airports.
12. ASTM D-6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

F. ACI-318 – Building Code Requirements for Structural Concrete, latest edition.

G. ACI-299R – Controlled Low Strength Materials, latest edition.

H. Geotechnical Report: A Geotechnical Engineer engaged by the Owner has prepared a report entitled Report, Geotechnical Investigation, Proposed Animal Shelter, Pomona, Rockland County, New York, prepared by Melick-Tully & Associates, dated October 29, 2021. A copy of the report shall be available to the Contractor for reference. Boring and other in situ test logs are made available to the Contractor for information only. Conditions are not intended as representations or warranties of accuracy or continuity between borings. The Owner will not be responsible for interpretation conclusions drawn from this data by the Contractor.

1.4 DEFINITIONS

A. Backfill: Soil materials used to fill trench, structure or pit excavations.
1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course/Binder Course: Layer placed between the subbase course and bituminous concrete paving.

C. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.

D. Bituminous Concrete Paving Course: Layer of bituminous concrete paving placed above the base/binder course.

E. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

F. Cohesive Materials: Cohesive materials include materials classified by ASTM D2487 as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesive only when fines have a plasticity index greater than zero.

G. Cohesionless Materials: Cohesionless materials include materials classified by ASTM D2487 as GW, GP, SW, and SP. Materials classified as GM and SM will be identified as cohesionless only when the fines have a plasticity index of zero.

H. Compaction: The process of mechanically stabilizing a material by increasing its density at a controlled moisture condition. "Degree of Compaction" is expressed as a percentage of the maximum density obtained by the test procedure described in ASTM D1557 for general soil types abbreviated in this specification as 95 percent ASTM D1557 maximum density.

I. Crushed Stone: Natural, non-friable crushed material used for drainage and granular backfill.

J. Drainage Fill: Clean, poorly graded crushed rock, stone, or natural sand or gravel having a high porosity which is placed beneath a building slab or adjacent to structures with or without a vapor barrier to cut off the capillary flow of pore water and provide free drainage to the area immediately below a slab or adjacent to structures.

K. Embankment: The portion of a fill section situated between the embankment foundation and the subgrade surface, excluding any material placed under another section of these specifications.

L. Engineered Fill/Structural Fill/Select Fill: Soil materials used to raise existing grades and placed under controlled conditions.

M. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

N. Hard Material: Weathered rock, dense consolidated deposits or conglomerate materials which are not included in the definition of "rock" but which usually require the use of heavy excavation equipment with ripper teeth or the use or jack hammers for removal.

O. Lift: A layer (or course) of soil placed on top of a previously prepared or placed soil in a fill or embankment.

P. Rock: Limestone, Sandstone, Shale, Granite and similar material in solid beds or masses in its original or stratified position which can be removed only by blasting operations, drilling, wedging, or use of pneumatic tools.

Q. Soil: The loose surface material of the earth's crust resulting from the chemical and mechanical weathering of rock and organic material. Materials free from debris, roots, wood, scrap materials, vegetative matter, refuse or frozen material. Maximum particle size permitted is 3 inches. Use excavated material from the site for the work indicated when material falls within the requirements specified herein.

R. Stabilized Sub-grade: A layer of compacted crushed stone that replaces the in-place existing material to provide a stable, uniform bearing foundation for further construction.

S. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

T. Subbase Course: Layer or layers placed between the subgrade and base course for bituminous concrete paving, or layer placed between the subgrade and a concrete pavement or walk.

U. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

V. Topsoil: In natural or undisturbed soil formations, the fine-grained, weathered material on the surface or directly below any loose or partially decomposed organic matter. Topsoil may be a dark-colored, fine, silty, or sandy material with a high content of well decomposed organic matter, often containing traces of the parent rock material. Gradation and material requirements specified herein apply to all topsoil references in this contract. The material shall be representative of productive soils in the vicinity.

W. Unsatisfactory Material: Existing, in-place soil or other material which can be identified as having insufficient strength characteristics or stability to carry intended loads in fill or embankment without excessive consolidation or loss of stability. Unsatisfactory materials also include manmade fills, refuses, frozen material, un-compacted backfills for previous construction, unsound rock or soil lenses, or other deleterious or objectionable material.

X. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within structures.

Y. Unclassified Excavation: Unclassified excavation shall consist of the excavation and disposal of all materials, of any description, encountered in the course of construction, unless otherwise specified in the contract. Estimated limits and descriptions of subsurface deposits and formations which may be shown in the contract documents are supplied as part of Base Line Data.

Z. Filter and Stabilization Fabric: Nonwoven geotextiles consisting of polypropylene fibers having an apparent opening size (AOS) of the U.S. Sieve size 70, and meets AASHTO M288-15 Class 2 for Elongation > 50%. Mirafi 160N or approved equal.

AA. Geotextile: Woven geotextiles consisting of high-Tenacity polypropylene yarns having an apparent opening size (AOS) of the U.S. Sieve size 30. Mirafi HP570 or approved equal.

1.5 SUBMITTAL

A. Materials Source: Submit name of imported materials source.

B. Material Test Reports: For each soil material proposed for fill and backfill.

1. From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated. Prepare separate reports for each type and application of borrow material.
   a. Classification according to ASTM D-2487.
   b. Laboratory compaction curve according to ASTM D-1557.
   c. Moisture content in accordance with ASTM D-2216
   d. Origin of material.
   e. Classification and laboratory compaction curve for on-site soil material, in accordance with the above requirements, when requested by the Owner's Engineer.

C. Product Data: Submit gradation, maximum wash loss, minimum durability index, maximum abrasion loss, air voids.

D. Manufacturer's product data, specifications, installation instructions, product samples for waterproofing and drainage panel proposed for use.

E. Samples:
   1. Where requested, the Contractor shall submit samples of materials proposed for use as fill, including, but not limited to general fill, drainage fill, structural fill, pavement subbase course, etc. Samples shall be submitted at least 1 week prior to proposed use on site. Test reports as required under Section 1.5.B shall accompany each sample

F. Submit mix designs, vendor information, materials test data and reports and any other pertinent product data for all proposed concrete fill including but not limited to: structural concrete, lean concrete, and controlled low strength materials (CLSM). All concrete fill mix designs shall be prepared by a Professional Engineer, licensed in New York State.

G. Shop Drawings: Submit detailed shop drawings and calculations to be reviewed by the Owner's Engineer. The drawings and calculations shall be prepared by a Professional Engineer registered in the State of New York. The submittals shall include but not limited to following:
   1. Earth excavation procedures.
   2. Temporary excavation support where required by field conditions. Submit shop drawings, manufacturer's literature, and engineering calculations, and show and describe proposed excavation support system, general arrangement and sequencing procedures to be used, method of installation, materials, equipment, and emergency action plans.
   3. Temporary dewatering procedures where required by field conditions. Submit shop drawings, manufacturer's literature, and engineering calculations, and show and describe proposed groundwater control system, general arrangement procedures to be used, method of installation, materials, equipment, methods of treatment and disposal of pumped water, emergency action plans, and procedures for deactivating the system.
   4. Fill materials, equipment, and procedures for placement and methods of compaction, where required.

H. Catalog Cuts: Submit catalog cuts and manufacturer's literature for all compaction equipment, vapor barriers, geosynthetics, and drainage materials including composite sheets and piping.

I. Samples: Submit a 12-inch by 12-inch sample of each geotextile filter fabric, geogrid, and drainage panel proposed for use. Submit a 12-inch-long sample of the proposed drainage pipe.

J. All required certifications and permits pertaining to the work of this Section.

K. Certification for Examination of Site and Records: Before proceeding with the Work, submit certification in an acceptable form, signed by the Contractor, stating that careful examination has been made of the site, existing structures, existing adjacent structures, records of utility lines, test boring records, soil samples, subsurface exploration reports, the Contract Drawings, and all other Contract Documents.

L. Substitutions: Should the Contractor desire a substitution from the Contract Drawings or specifications, or both, Contractor shall submit the specific substitution in writing prior to submittal of Shop Drawings. Requests for substitutions shall be submitted on the Contractor's letterhead. Approval of the Contractor's request for substitutions shall be at the discretion of the Owner and Owner's Structural and Geotechnical Engineers. Rejection of substitutions shall not be grounds for an adjustment to the Contract price.

1.6 QUALITY ASSURANCE

A. Materials and work shall conform to the latest edition of reference standards specified herein and to applicable codes and requirements of local authorities having jurisdiction.

B. Contractor Qualifications.
   1. The Contractor performing the work of this Section shall be a qualified excavation contractor with at least 5 years of relevant field experience on projects of similar size, scope, and complexity.

C. Work of this Section, as shown or specified, shall be in accordance with the Site Management Plan.

1.7 QUALITY CONTROL – INSPECTION AND TESTING

A. Special Inspection
   1. The Owner will engage, under the requirements of Section 1704.2 of the Building Code, one or more Special Inspection Agencies to observe and provide all necessary material testing related to the work of this Section. All inspections and all materials testing shall be performed by Special Inspectors meeting the minimum qualifications outlined in Section 1704.2.1 of the Building Code.
   2. The Special Inspector shall prepare and submit daily reports summarizing the construction and/or material testing activities. Reports shall include descriptions and sketches of the

work performed to clearly document plan location(s) and elevation(s) of any excavations, fill placement, and testing performed.

3. The Special Inspector shall submit all logs and test reports necessary to facilitate any corrective design requirements by the Engineer of Record.
4. Where work is observed to be non-conforming, the Special Inspector shall immediately inform the Construction Manager and Owner's Engineer(s) of such conditions in writing. A summary of the observed non-conformance shall be issued within 24-hrs. The Special Inspector shall maintain a tracking log of all non-conformances and shall update the tacking log on a daily basis such that corrective measures, if required, can be facilitated in timely fashion. The tracking log shall include such information as ID number, date opened, description of non-conformance, actions required, actions taken, and date closed.
5. The Special Inspector shall provide all necessary certifications of the work in compliance with Building Code requirements.

B. The Special Inspector(s) shall be provided with reasonable office space (heating, cooling, electric) on-site by the Construction Manager to conveniently prepare and maintain all necessary project records pertinent to their duties and to store equipment. At a minimum the Special Inspector shall be provided with a minimum of one desk, a locking cabinet or closet, and wireless internet access.

C. The Contractor shall have the sole responsibility for coordinating his work with the Construction Manager to assure that all tests and inspection procedures required by the Contract Documents and the governing Building Codes are properly provided by the Special Inspector. The Contractor shall cooperate fully with the Special Inspector in the performance of his work.

D. Materials and installed work may require testing at any time as work progresses. Allow free access to material stockpiles and facilities. Tests not specifically indicated herein may be performed at Owner's expense, as required by the Special Inspector.

E. Retesting of rejected materials and installed work shall be Contractor's responsibility and shall be performed at his expense.

F. The Contractor shall notify the Construction Manager and all other necessary parties at least 72 hours prior to each day of required inspection to allow for the appropriate personnel to be on the site.

G. The role of the Special Inspector(s) shall not relieve the Contractor from any responsibility with respect to conformance to the proper workmanship, management of materials and waste, or any other requirements of the Contract Documents.

1.8 PRECONSTRUCTION MEETING

A. Prior to work on site, the Construction Manager will arrange a series of meetings to discuss coordination and scheduling. Parties to be present: Structural Engineer, Geotechnical Engineer, Civil Engineer, Architect, Testing Laboratory, Construction Manager, Excavation Contractor and

his Engineer, the Special Inspector, and the Owner. Review the earthwork procedures and responsibilities including testing and inspection procedures and requirements. Notify participants at least 3 working days prior to convening conference. Record discussions and agreements and furnish a copy to each participant.

1.9 DELIVERY AND STORAGE

A. Deliver and store materials in a manner to prevent contamination or segregation. Store synthetic fiber filter cloth to prevent exposure to direct sunlight in accordance with the manufacturer's recommendations.

1.10 PROJECT CONDITIONS

A. Contact “Dig Safe New York” at 1-800-962-7962 before excavating. Proceed with excavation only after utility locator service completes marking of utility locations.

B. Site Information: Subsurface conditions are not intended as representations or warranties of accuracy or continuity. The Owner will not be responsible for interpretations, conclusions, or quantity estimates drawn from this data by Contractor.

C. Subsurface Conditions: The subsurface conditions within the development areas are generally characterized in the geotechnical report prepared for the project site entitled Report, Geotechnical Investigation, Proposed Animal Shelter, Pomona, Rockland County, New York, prepared by Melick-Tully & Associates, dated October 29, 2021.
   1. Boring logs are available for the Contractor’s review. The Owner makes no predictions or representations regarding the character or extent of soil, rock, or other subsurface conditions to be encountered during the work. The Contractor shall make his own deductions of the subsurface conditions which may affect the methods or cost of construction of the work hereunder, and he agrees that he will make no claims for damages or compensations, except as are provided under the agreement, should he find conditions during the progress of the work different from those as calculated or anticipated by him.
   2. The Contractor, by careful examination, shall inform himself as to the nature and location of the work; the conformation of the ground, the nature of the subsurface conditions; the locations of the groundwater table; the character, quality and quantity of the materials to be encountered; the character of the equipment and facilities needed preliminary to and during the execution of the work; and all other matters which can in any way effect the work.
   3. The Contractor shall be held to have visited the site and to have familiarized himself with the existing conditions of adjoining properties, utilities and buildings.
   4. Additional test borings and other exploratory operations may be performed by Contractor, at the Contractor’s option; however, no change in the Contract Sum will be authorized for such additional exploration or the conclusion drawn by the contractor based upon the additional exploratory operation.

D. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

E. Perform excavation by hand within drip line of large trees to remain. Protect root systems from damage or dry out to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with moistened burlap.

F. Existing Utilities: Locate existing utilities underground utilities in area of Work before starting earthwork operations. Where utilities are to remain in place, provide adequate means of protection during earthwork operations.
   1. If uncharted, or incorrectly charted, piping or other utilities are encountered during excavation, consult utility owner and Civil Engineer immediately for directions. Cooperate with Owner, and public and private utility companies to keep their respective services and facilities in operation. Repair damaged utilities as required by utility owner.
   2. Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Construction Manager and then only after arranging to provide temporary utility services according to requirements indicated:
      a. Provide minimum of 48-hour notice to Construction Manager, and receive written notice to proceed before interrupting any utility.
      b. Do not proceed with utility interruptions without Civil Engineer's written permission.
      c. Demolish and completely remove from site all existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

G. Prevent undermining of pavements and slabs.

H. Extent of trench excavation and excavated areas will be controlled by site conditions and Civil Engineer’s requirements as indicated in the project plans and specifications.

I. Do not commence earth moving operations until temporary erosion and sedimentation control measures, specified in Section 312513 “Erosion Controls” are in place.

J. Provide groundwater and runoff controls consisting of drains and diversions or additional measures, as necessary, so as to maintain dry excavations. Implement in accordance with the SWPPP and regulations of the New York State Department of Environmental Conservation (NYSDEC).

K. Provide erosion and sediment controls and construction sequencing in accordance with the SWPPP and regulations of the New York State Department of Environmental Conservation.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Structural Fill: Structural Fill and Backfill (non-building related): Provide where indicated materials classified as GW, GP, SW or SP. The liquid limit of such material shall not exceed 35 percent when tested in accordance with ASTM D4318. The plasticity index shall not be greater than twelve percent (12%) when tested in accordance with ASTM D4318, and not more than fifteen percent (10%) by weight shall be finer than No. 200 sieve when tested in accordance with ASTM D1140. Material shall meet requirements for select structure fill according to NYSDOT Spec. Item 203.21.

B. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand, meeting the gradation of NYSDOT 2021 Standard Specifications Section 304 Type 4 material.

C. General Site Fill: Provide a soil material from the site that can be readily compacted to the specified densities. Materials shall be classified as GP, GM, GC, SP, SM or SC, and shall meet the requirements for select fill according to NYSDOT Spec. Section 203.06.

D. Pipe Bedding:
   1. Within County Highway Right-of-Way: #1 and #2 crushed stone bedding conforming to NYSDOT Material Specification 703.0201.
   2. Outside County Highway Right-of-Way: Mixture of crushed stone and gravel, free of soft, nondurable particles, organic materials and elongated particles. The maximum diameter of the large particles shall not exceed ¾ inches. When in ledge, use AASHTO No. 67 or approved equal processed sand and gravel, free of debris, clay lumps, organic, or other deleterious material. Compact in maximum 6 inch loose lifts.

E. Trench Backfill:
   1. Within County Highway Right-of-Way: NYSDOT Spec. Item 203.07 Select Granular Fill or equal.
   2. Outside County Highway Right-of-Way: Place above pipe backfill. Predominantly granular fill material. The maximum diameter of the large particles shall not exceed 3 inches. Compact in maximum 6 inch loose lifts to 95% modified Proctor Density.

F. Drainage Course, Choker Course and Reservoir Course for bioretention basins, asphalt porous pavement. All stone must be clean washed stone from the quarry or material producer, and meet the gradations referenced below:
   1. Drainage course: ASTM D-448, Size No. 57
   2. Checker course: ASTM D-448, Size No. 57
   3. Reservoir course: ASTM D-448, Size No. 3

2.2 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility.

B. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep.

C. Identifying Colors for Utilities:
1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Contact "Dig Safe New York" at 1-800-962-7962 before excavating. Proceed with excavation only after utility locator service completes marking of utility locations.

B. The Contractor shall furnish all labor, equipment and materials required to prepare site and to excavate all materials of whatever type encountered to the lines and grades shown on the Contract Drawings and as specified.

C. The Contractor shall give 72 hours advance notice to the Construction Manager and Owner's Special Inspector of the impending completion of excavations so as to allow inspection of the exposed surface for footings, slabs and pads and review the ground water conditions in accordance with the NYS Building Code requirements for Special Inspection.

D. The Contractor is to obtain and pay for all necessary permits to perform the work from the appropriate authorities and agencies prior to start of such work. Obey all applicable local and federal work safety rules and regulations.

E. Install all necessary protection equipment, structures such as fences, signs, scaffolding etc. prior to start of work.

F. Remove all existing structures, utilities, pavement in accordance with the Contract Documents.

G. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

H. Protect and maintain erosion and sedimentation controls during earth moving operations.

I. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary. Remove temporary protection and all frost damaged soils before placing subsequent materials.

J. Perform all excavations in accordance with current OSHA safety requirements. Excavation side slope support shall be provided using soldier piles and lagging, where necessary.

3.2 STORAGE OF SOIL MATERIALS

A. Storage of Soil Materials: Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Prevent windblown dust. Provide erosion and sediment control measures.

B. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

C. Stockpile on-site materials anticipated for re-use. Care shall be taken to avoid blending with the deleterious materials.

3.3 EXCAVATION

A. General
1. The excavation shall be unclassified and shall comprise and include the satisfactory removal and legal disposal of all materials encountered regardless of the nature of the materials and shall be understood to include miscellaneous fill, organics, granular soils, cobbles, boulders, foundation remnants, structures, slabs, walls, utilities, pavements, curbs, piping and debris.
2. All excavation shall be properly sized and shall extend to the depths of the form and size required for the installation of the work as indicated on the Contract Drawings. When excavations for foundation and site work have reached the required depths, the Special Inspector shall make an inspection of the conditions.
3. Excavation shall be to required elevations for footings, or other foundation elements. Excavation shall be made to a depth that will allow installation of full depth of concrete slabs, and any subbase materials as shown on Contract Drawings or specified. Excavation lines shall provide sufficient clearance for the proper execution of all concrete work including allowances for form work, shoring and inspection.

4. Materials that, in the opinion of the Owner's Engineer or Special Inspector, are not suitable for backfill, and any surplus earth, and all rock shall be removed from the site and legally disposed of.
5. The bottom of excavations shall be leveled off, free of standing water, snow, ice and loose materials, and graded to receive foundations, slabs, pits, trenches, grade beams, etc.
6. Where required, waterproofing shall be installed in accordance with the Contract Drawings and Specifications.
7. Subgrades shall be level and free of loose soil, standing water and frost prior to acceptance for placement of concrete or fill. Hand-excavate to achieve final subgrade elevation as directed by the Special Inspector or Owner's Engineer.
8. Contractor shall provide all equipment, labor and acceptable means necessary to maintain dry excavations at all times. No changes in the Contract Sum or the Contract Time will be authorized for dewatering, treatment, or disposal of water.

B. For Walks and Pavements:
1. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

C. For Utility Trenches:
1. Excavate trenches to indicated gradients, lines, depths, and elevations.
2. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit.
3. Clearance: min 12 inches each side of pipe or conduit.
4. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
5. Excavate trenches 12 inches deeper than elevation required in rock or other unyielding bearing material, 6 inches deeper elsewhere, to allow for bedding course.

D. Trenches in Tree- and Plant-Protection Zones:
1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrowtine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.

E. Excavation for Footings.
1. Subgrades: Footing subgrades shall be approved by the Owner's Special Inspector before proceeding with the formwork, rebar or concrete placement. Bottoms of footings shall be founded on materials suitable for achieving the bearing pressures indicated on Contract Drawings and as approved by the Owner's Special Inspector.
2. Subgrade Bearing Capacity – The subgrade shall be as indicated on the Contract Drawings.

3. Subgrade of footings shall be level and free of loose rock, dirt, debris, standing water and frost before acceptance for placing concrete.
4. Unauthorized Excavation: When suitable bearing material is encountered at subgrade elevations shown and excavation is made to greater depth, the footings and foundation walls shall be extended to the lower elevation with concrete of the same strength used for the footing, at no additional cost to the Owner.
5. Authorized Additional Excavation: When unsuitable bearing material is encountered at subgrade elevations shown, the Owner's Special Inspector may require removal of unsuitable material and extension of footings and foundation walls.

F. Excavation for the Removal and Replacement Program.
1. Removal and Replacement Program: Unsuitable bearing materials at foundation bearing subgrades should be removed within the foundation zone of influence 1H:1V (i.e., 1 horizontal to 1 vertical) projection from the edge of the footing.
2. Subgrades: Subgrades shall be approved by the Owner's Special Inspector before proceeding with the fill placement and compaction of the over-excavation.
3. Unauthorized Excavation: When suitable bearing material is encountered at subgrade elevations shown and excavation is made to greater depth, the footings and foundation walls shall be extended to the lower elevation with concrete of the same strength used for the footing, at no additional cost to the Owner.
4. Authorized Additional Excavation: When unsuitable bearing material is encountered at subgrade elevations shown, the Owner's Special Inspector may require removal of unsuitable material and extension of footings and foundation walls.

G. Excavation for Slabs and Other Structural Members
1. Subgrades of slabs and other structural members, including framed slabs and grade beams, shall be approved by the Special Inspector before proceeding with their construction. Subgrades shall consist of material that meets the allowable bearing pressure requirements indicated in the Contract Documents. Subgrades resulting from excavation shall be free of unsuitable material (fill, loose materials, organics, debris, etc.) as judged by the Owner's Engineer or Special Inspector.
2. Unauthorized Excavation: Excavations performed below the elevations shown or specified, shall be filled and compacted as hereinafter specified, at no additional cost.
3. Authorized Additional Excavation: Where the Owner's Engineer or Special Inspector determines that the bearing material encountered is unsuitable, remove the unsuitable bearing material as directed. The removed material shall be replaced with structural fill or concrete as directed by the Owner's Engineer or Special Inspector

3.4 SUBGRADE

A. Proofrolling General
1. Proofrolling shall be performed for all soil subgrades within and outside the limits of the proposed development including all adjacent site work and pavements.
2. Proofrolling of soil subgrades shall conform to the following requirements:

a. All soil subgrades shall be compacted in the presence of the Owner's Special Inspector.
b. Proofrolling shall be accomplished with a minimum of six (6) overlapping cross-rolled coverages of a smooth drum vibratory roller having a static weight of at least 5 tons or as approved by the Owner's Engineer. A vibratory trench roller having a static weight of at least 1.5 tons shall be in confined areas as approved by the Owner's Engineer or Special Inspector. Areas inaccessible to the heavy equipment shall be compacted using a vibratory plate or jumping jack compactor as directed by the Owner's Engineer. The maximum travel speed of rollers should not exceed 1.5 mph.
c. Vibratory or impact compaction shall not be performed on soils which are not within 2 % of the optimum moisture content as determined by ASTM D1557.
d. Fill shall not be placed until the subgrade is approved by the Owner's Special Inspector.
e. Soft Areas during Compaction: Areas deemed unsatisfactory due to "pumping, rutting, or heaving" shall be undercut within the limits and extent ordered by the Owner's Special Inspector. These areas shall be replaced with an approved fill, and compacted to the requirements of this Section or as directed by the Owner's Special Inspector.

3. Do not proof-roll wet or saturated subgrades.
4. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Owner's Special, without additional compensation.

B. Approval:
1. Notify Owner's Special Inspector when excavations have reached required subgrade.
2. If Owner's Special Inspector determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
a. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

3.5 FILLING AND BACKFILLING

A. Filling and backfilling shall not be performed until related work has been inspected by the Special Inspector.

B. All subgrades shall be free of water, snow, ice, wood, organics, or other deleterious materials prior to placement of any fill.

C. Fill shall be placed such that there are no void spaces below floors, bottoms of pits, trenches, pipe haunches, pavements, etc.

D. Fill shall not be placed against concrete elements until the concrete has obtained its specified compressive strength, unless otherwise directed by the Owner's Engineer. Where fill is required on both sides of a wall, said fill shall be brought up simultaneously and evenly on both sides.

E. Fill voids caused by the removal of boulders, and/or below grade improvements, with lean concrete, or structural fill.

F. The Contractor shall supply and install all fill materials necessary to bring the ground surfaces to the required levels as shown on the Contract Drawings and as necessary to make the work complete.

G. All surplus materials shall be removed from the site and legally disposed of. Should additional material be required for the placing of backfill, other than material obtained from the site, the Contractor shall obtain, deliver, and place accepted backfill material as required.

H. Fill Placement:
   a. Begin placement of fill and backfill at the lowest section of the area. Spread material evenly by mechanical equipment or by manual means above the approved compacted subgrade in lifts not exceeding 12-inches for material compacted by heavy machinery and 4-inches for material compacted by light machinery or by hand tamping.
   b. Build layers as horizontally as practical to prevent thickness of lift from exceeding that specified but provide with sufficient longitudinal and transverse slope to provide for runoff of surface water from every point.

I. Moisture Control:
   a. The moisture-density curve for the fill used shall be supplied by the Contractor as a guide in controlling moisture to achieve the required degree of compaction. If, in the opinion of the Special Inspector, fill material becomes too wet for the required compaction, the fill shall be dried by a method approved by the Owner's Engineer prior to commencing or continuing compaction operations. Likewise, if, in the opinion of the Special Inspector, the fill material becomes too dry for the required compaction, the fill shall be moistened by a method approved by the Owner's Engineer prior to commencing or continuing compaction operations.

J. Compaction:
   a. Compact each lift to 95% of the maximum dry laboratory density as determined by ASTM D1557.
   b. The degree of compaction shall be checked by the Special Inspector and each successive lift shall not be placed or compacted until the previous lift is inspected and approved by the Special Inspector. Compact all fill to elevations and limits shown on Contract Drawings.

K. Frost:

a. Do not place fill materials when either the fill materials or the previous lift (or subgrade) on which it is placed is frozen. In the event that any fill which has already been placed on the surface shall become frozen, it shall be scarified and recompacted, or removed, to the approval of the Special Inspector before the next lift is placed. Remove or recompact any soft spots resulting from frost to the satisfaction of the Special Inspector before new fill is placed.

L. Filling and Backfilling Adjacent to Structures:
1. Place backfill adjacent to structures and compact to prevent wedging action or eccentric loading upon or against the structures.
2. Step or serrate slopes bounding or within areas to be backfilled to prevent sliding of the fill.
3. Do not use equipment for backfilling operations or for the formation of embankments against structures that will overload the structure.

3.6 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Place and compact initial backfill of subbase material, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

D. Place and compact final backfill of satisfactory soil to final subgrade elevation.

E. Install detectable warning tape directly above utilities, 12 inches below finished grade.

3.7 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

B. Site Rough Grading: Slope grades to direct water away from structures and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
1. Turf or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1/2 inch.
3. Pavements: Plus or minus 1/2 inch.

C. Protect prepared areas from damage.

3.8 MAINTENANCE

A. Finished subgrades shall be verified to ensure proper elevation and conditions for construction above subgrade.

B. Protect subgrade from excessive wheel loading during construction, including concrete trucks and dump trucks.

C. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

D. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

E. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

F. Where settling is measurable or observable at excavated areas during general project warrantee period, remove surface (pavement, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.9 SOIL RESTORATION

A. The Contractor will be required to complete soil restoration in the areas of the proposed pervious surfaces once final grade has been achieved in these areas. The type of soil restoration will depend on the type of soil disturbance and the type of hydrologic soil group. The Contractor will be required to complete soil restoration in conformance with the various methods outlined in the following table:

Type of Soil Disturbance	Soil Restoration Requirement
Minimal Soil Disturbance (e.g., clearing and grubbing)	Restoration not required
Areas where topsoil is stripped only (e.g., no change in grade)	Apply 6 inches of topsoil
Areas of cut or fill	Aerate and apply 6 inches of topsoil
Heavy traffic areas on-site (especially in 5 feet to 25 feet around buildings, but not within a 5 foot perimeter around foundation walls)	Apply full soil restoration

Type of Soil Disturbance	Soil Restoration Requirement
Areas where runoff reduction or infiltration practices are applied	Restoration may not be required, but may be applied to enhance the reduction specified for the appropriate practices.

B. Before applying full soil restoration, all construction activity, including construction equipment and material storage, site cleanup and trafficking, should be finished and the site closed to further disturbance. Full soil restoration is implemented in a two-phase process:
   1. Deep rip the affected thickness of exposed subsoil material, aggressively fracturing it before the protected topsoil is reapplied on the site.
   2. Decompact, simultaneously through the restored topsoil layer and upper half of the affected subsoil.

C. During periods of relatively low to moderate subsoil moisture, the disturbed soils are returned to rough grade and the following is applied:
   1. Apply 3 inches of compost over the subsoil.
   2. Till compost a minimum of 12 inches into the subsoil using a cat-mounted ripper, tractor-mounted disc, or tiller mixing and circulating air and compost into subsoils.
   3. Rock-pick until uplifted stone/rock materials of 4 inches or larger size are cleaned off the site. All construction/foreign debris and existing root masses shall be removed from proposed planting areas.
   4. Apply 6 inches of topsoil. Newly installed planting soils shall be mixed with existing soils where they meet in order to create a transitional gradient to allow for proper drainage.
   5. Install plants and vegetation in accordance with the Landscaping Plan.

3.10 SUBBASE AND BASE COURSES

A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course under pavements and walks as follows:
   1. Shape subbase course to required crown elevations and cross-slope grades.
   2. Place subbase course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
   3. Compact subbase course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 98 percent of maximum dry unit weight according to ASTM D 1557.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform tests and inspections.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; re-compact and retest until specified compaction is obtained.

D. The Owner will employ, at his own expense, an Engineer to review all laboratory test results and submitted reports specified in this Section.

E. The Owner's Engineer will interpret the tests, state in each report whether or not the test specimens and results comply with all requirements of the Contract Documents, and note any deviations.

F. The Owner's Engineer will identify when and where samples are to be obtained for the use of on-site materials. The Contractor shall collect samples, provide all necessary laboratory testing, and shall submit the following laboratory test reports to the Owner's Engineer for review:
1. Gradation Analysis - ASTM D422.
2. Atterberg limits - ASTM D4318.
3. Modified Moisture-density curve determination - ASTM D1557.

G. The Owner's Engineer will determine the conformance of materials to be used for fills.

H. Backfilling and Compaction: Backfilling and compaction below foundations, slabs, behind foundation walls, and any other backfilling and compaction work shall be inspected by the Special Inspector. No fill shall be placed unless the previous lift is approved by the Special Inspector. The Special Inspector shall take field density tests of the subgrade for every 1,000 square feet, but not less than 3 tests in each compacted fill layer. Field density tests shall be performed in accordance with ASTM D2922.

I. The Contractor shall cooperate with the Special Inspector in the performance of the required tests and inspections.

3.12 PROTECTION AND REPAIR

A. Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris. Protect subgrade from excessive wheel loading during construction, including concrete trucks and dump trucks.

B. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

D. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

E. Finished subgrades shall be verified to ensure proper elevation and conditions for construction above subgrade.

F. Where settling is measurable or observable at excavated areas during general project warrantee period, remove surface (pavement, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.13 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

3.14 CLOSEOUT

A. Substantial Completion Requirements:
   1. Provide final cleaning immediately prior to Substantial Completion inspection.

B. Corrective Work:
   1. Remove, repair and reinstall, or restore in place damaged items.
   2. Replace damaged materials or items with new if repair not acceptable to Architect.

C. Provide product data to complete Operation & Maintenance Manuals.

D. Submit executed Warranties.

END OF SECTION 31 00 00

SECTION 31 10 00 – SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
1. Protecting existing vegetation to remain.
2. Removing existing vegetation and trees.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing, removing site utilities and abandoning site utilities in place.

B. Related Sections include the following:
1. Section 31 00 00 – Earthwork.
2. Section 31 25 13 – Erosion and Sediment Control.

1.3 REFERENCES

A. "Report, Geotechnical Investigation, Proposed Animal Shelter, Pomona, Rockland County, New York" prepared by Melick-Tully & Associates, dated October 29, 2021.

1.4 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil, and is the zone where plant roots grow.

D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and as indicated on Drawings.

E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.5 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

B. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

C. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

D. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

E. Do not commence site clearing operations until temporary erosion and sedimentation control, wetland vegetation, and plant and tree protection measures are in place.

F. The following practices are prohibited within protection zones:
1. Land or vegetation disturbance.
2. Storage of construction materials, debris, or excavated material.
3. Parking vehicles or equipment.
4. Foot traffic.
5. Erection of sheds or structures.
6. Impoundment of water.
7. Excavation or other digging unless otherwise indicated.
8. Attachment of signs to, or wrapping materials around trees or plants unless otherwise indicated.

G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

I. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

J. Tree clearing shallow occur within the required tree clearing period to protect endangered bat species or as specified by authorities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Construction Fencing

1. Where indicated on the Drawings or as required to provide visual warning and control, provide plastic mesh fencing supported by steel posts driven into ground or set in precast concrete blocks.
2. Height: 36 inches minimum.
3. Color: Safety orange.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly identify trees, shrubs, and other vegetation to remain. Install tree protection and construction fencing in accordance with plans.

C. Protect existing site improvements to remain from damage during construction.
   1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TREE AND PLANT PROTECTION

A. General: Protect trees and plants remaining on-site according to requirements in this section.

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Owner's representative.

3.3 EXISTING UTILITIES

A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.

B. Arrange with utility companies to shut off indicated utilities.

C. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted by the utility company and then only after arranging to provide temporary utility services according to their requirements.

D. Excavate for and remove underground utilities indicated to be removed.

3.4 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
   1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.

2. Grub stumps and remove roots, obstructions, and debris to a depth of 18 inches below exposed subgrade.
3. Use only hand methods for grubbing within protection zones.
4. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

C. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL-STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil in a manner to prevent intermingling with underlying subsoil or other waste materials.
1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects more than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover and stabilize to prevent windblown dust and erosion by water.
1. Do not stockpile topsoil within protection zones.
2. Stockpile surplus topsoil to allow for re-spreading deeper topsoil.

3.6 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove concrete slabs, paving, curbs, gutters, and aggregate base as indicated.
1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property. These materials are the contractor’s property.

B. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 31 10 00

SECTION 32 32 15

PRECAST MODULAR BLOCK RETAINING WALL SYSTEM

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Work governed by this section, as shown or specified shall be in accordance with the requirements of the Contract Documents and the New York State Building Code (International Building Code 2018 edition).

1.02 DESCRIPTION

A. Work includes furnishing and installing precast modular blocks (PMB) to the lines and grades shown on the plans and as specified herein. Also included is furnishing and installing appurtenant materials required for construction of the complete system.

B. The contractor is solely responsible for safety. The Engineer and Owner shall not be responsible for means or methods of construction or for safety of workers or the public.

1.03 REFERENCES

A. ASTM - American Society for Testing and Materials (AASHTO - American Association of State and Highway Transportation Officials)

B. ASTM C33 - Standard Specification for Concrete Aggregates (AASHTO M43)

C. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens (AASHTO T22)

D. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregate (AASHTO T27)

E. ASTM C1776 - Standard Specification for Wet-Cast Precast Modular Retaining Wall Units

F. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils (AASHTO T89 & T90)

G. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (AASHTO T99)

H. ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

I. ASTM D4595 - Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method

J. ASTM D5262 - Standard Test Method for Evaluating the Unconfined Creep Behavior of Geosynthetics

K. ASTM D6637 - Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-Rib Tensile Method

L. ASTM D6638 - Standard Test Method for Determining Connection Strength Between Geosynthetic Reinforcement and Segmental Concrete Units (Modular Concrete Blocks)

M. ASTM D6916 - Standard Test Method for Determining the Shear Strength Between Segmental Concrete Units

N. Geotechnical Report: A Geotechnical Engineer engaged by the Owner has prepared a report entitled Report, Geotechnical Investigation, Proposed Animal Shelter, Pomona, Rockland County, New York, prepared by Melick-Tully & Associates, dated October 29, 2021. A copy of the report shall be available to the Contractor for reference. Boring and other in situ test logs are made available to the Contractor for information only. Conditions are not intended as representations or warranties of accuracy or continuity between borings. The Owner will not be responsible for interpretation conclusions drawn from this data by the Contractor.

1.04 SUBMITTALS

A. Submit for review shop drawings for the retaining wall system prepared by a Structural Engineer Licensed by the State of New York. The shop drawings shall indicate the layout, height, and construction details of the retaining wall system. Design calculations shall also be submitted. Minimum safety factors for design shall be as follows:

	Gravity Wall	Geosynthetic Reinforced Wall
Sliding	1.5	1.5
Overturning	1.5	2.0
Bearing	2.0	2.0

B. If stain will be applied to the wall system, a sample shall be stained on site for review and approval by the Owner's representative. The color sample may be part of the completed

wall, but shall be located in an inconspicuous area.

C. If an alternate geosynthetic reinforcement is included in the contractor's design, submit manufacturer's literature and test data for geosynthetic to be used in the reinforced wall system. Test data shall include connection strength data for geogrid with precast modular units determined in accordance with ASTM D6638, as well as geogrid tensile strength and creep data in accordance with ASTM D4595 and ASTM D5262.

D. Submit grain size test results for aggregates to be used for the wall base and for unit fill.

E. Submit test results on borrow material to be used for common backfill and for select backfill (if used) including Proctor and grain size or Atterberg limits results.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Contractor shall check the materials upon delivery to assure that proper materials have been received.

B. Contractor shall protect the materials from damage. Damaged material shall not be incorporated into the wall or the reinforced soil embankments.

C. Contractor shall prevent excessive mud, concrete, adhesives and other substances that may adhere from coming in contact with the materials.

D. Exposed faces of precast modular block units shall be reasonably free of chips, cracks, or stains when viewed from a distance of 10 feet (3 m).

PART 2 PRODUCTS

2.01 WALL UNITS

A. Precast modular blocks shall be Stone Strong units manufactured under license from Stone Strong LLC., or approved equal.

B. Wall units shall conform to ASTM C1776.

C. Dimension tolerances for precast modular blocks shall be +/- 1/8 inch (+/-3 mm) for height, +/- 1/8 inch (+/-3 mm) for length (along face), and +1/2 to -1/4 inch (+13 mm to -6 mm) for width (face to tail).

D. Concrete for precast modular blocks shall have a minimum 28-day compressive strength of 4,000 psi (28 MPa). Entrained air content shall be between 5 and 7%.

E. Internal unit reinforcement or unreinforced units shall be provided according to published Stone Strong engineering guidance. Reinforced units shall be marked with the type of reinforcement.

F. The face pattern shall be selected from the manufacturer's standard molds. The color of the units shall be natural gray. A concrete stain may be field applied to color the units if specified by the Engineer or Owner.

2.02 WALL BASE

A. The wall base shall consist of dense graded crushed aggregate. A minimum of 75% of coarse material shall have 2 or more fractured faces. Wall base material shall meet the following gradation:

US Standard Sieve Size	Percent Passing
1-1/4 in	80 to 100
3/4 in	50 to 90
No. 4	0 to 40
No. 200	0 to 10

B. The contractor may substitute concrete with a minimum 28-day compressive strength of 3,000 psi for the granular base material. Concrete may be placed full thickness or as a topping over a compacted granular base. If used as a topping, the concrete shall have a minimum thickness of 3 inches.

2.03 UNIT FILL

A. Unit fill shall consist of a screened crushed aggregate. A minimum of 75% of coarse material shall have 2 or more fractured faces. Unit fill material shall meet the following gradation:

US Standard Sieve Size	Percent Passing
1-1/2 in	100
3/4 in	50 to 90
No. 4	0 to 10
No. 8	0 to 5

2.04 BACKFILL

A. If a select granular reinforced zone is indicated, it shall consist of fill sand or other clean aggregate meeting the following gradation:

US Standard Sieve Size	Percent Passing
3/4 in	100
No. 200	0 to 5

B. All other backfill behind and in front of the wall shall consist of suitable on-site soil or imported borrow and shall be approved by the Geotechnical Engineer. Backfill shall generally consist of sands, silts, or lean clays with a liquid limit less than 45 and a plasticity index less than 20. Fat clay soils, cobbles, and large rock shall not be used. Frozen soils, excessively wet or dry soils, debris, and deleterious materials shall not be used.

2.06 DRAIN TILE

A. Drain tile shall be perforated or slotted PVC or corrugated HDPE pipe. The drain tile shall be connected to storm drains or daylighted at low points and/or periodically along the wall alignment. The configuration of the drain tile and outlets shall be provided on the shop drawings.

PART 3 EXECUTION

3.01 EXCAVATION

A. Excavate as required for installation of the retaining wall system. Excavate to the base level for a sufficient distance behind the face to permit installation of the base

B. Slope or shore excavation as necessary for safety and for conformance with applicable OSHA requirements.

3.02 WALL BASE

A. Foundation soils shall be excavated to the dimensions shown on the plans. Foundation soil shall be observed by the Geotechnical Engineer to confirm that the bearing soils are similar to the design conditions or assumptions.

B. Construct the wall base to the lines and grades shown on the plans. Place and consolidate concrete, strike, and finish plane and level. Overexcavated areas shall be filled with additional concrete or granular base material. Compact granular base material to provide a hard and level surface to support the wall units. Base material shall be compacted to a minimum of 95 percent of the maximum dry density (ASTM D698, Standard Proctor). Final base elevation shall be within 0.1 feet (30 mm) of plan elevation.

C. Prepare and smooth the granular material to ensure complete contact of the first course with the base. The base may be dressed with fine aggregate to aid leveling.

3.03 INSTALLATION

A. Place the first course of units directly on the wall base. Check units for level and alignment. Units shall be within 1/8 inch (3 mm) of level from end to end and from front to back. Adjacent units should be in contact. If possible, begin placing units at the lowest section of the wall.

B. Fill all voids between and within the blocks with granular unit fill. Additional unit fill is not required behind the units, but may be placed for the convenience of the contractor.

C. Place backfill behind the units in maximum loose lifts of 8 inches (200 mm) and compact. Compact all backfill to a minimum of 95 percent of the maximum dry density (ASTM D698, Standard Proctor). For cohesive soils, the moisture content at the time of compaction should be adjusted to within -2 and +3 percent of optimum. Place backfill in successive lifts until level with the top of the facing unit.

D. Remove all excess aggregate and other materials from the top of the units before laying up the next course.

E. Place the next course of precast modular block units in running bond with the previous course. Place the web recess over the alignment hoop protruding from the unit below, and pull the unit forward to contact the hoop. Batter should be within ¼ inch (6 mm) tolerance (4 inches/102 mm from 24 SF unit below, 2 inches/51 mm from 6 SF unit below).

F. Continue placing successive courses to the elevations shown on the plans. Construct wall in level stages, placing the units at each course for the entire length of the wall, if possible. Unit fill and backfill should be placed to the level of the top of the facing unit before placing the next course.

G. Provide temporary swales to divert runoff away from wall excavation and away from face.

H. Final grade above and below the retaining wall shall provide for positive drainage and prevent ponding. Protect completed wall from other construction. Do not operate large equipment or store materials above the wall that exceed the design surcharge loads.

PART 4 CONSTRUCTION QUALITY CONTROL AND ASSURANCE

4.01 CONSTRUCTION QUALITY CONTROL

A. The contractor is responsible to ensure that all installation and materials meet the quality specified in the construction drawings.

B. The contractor shall verify that installation is in accordance with the specifications and construction drawings.

4.02 QUALITY ASSURANCE

A. The owner is responsible to engage testing and inspection services to provide independent quality construction assurance.

B. Compaction testing shall be done a minimum of every 1 foot (300 mm) of vertical fill and every 100 lineal feet) 30 m) along the wall.

C. Testing shall be done at a variety of locations to cover the entire backfill zone.

D. The independent inspection professional should perform sufficient testing and observation to verify that wall installation substantially conforms to the design drawings and specifications.

END OF SECTION 32 32 15

SECTION 33 11 01 - WATER UTILITY DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes water distribution piping and fittings.

B. Related Sections include the following:
1. Section 31 00 00 – Earthwork
2. Section 33 11 26 – Water Utility Distribution Valves.

1.3 REFERENCES

A. Recommended Standards for Water Works (Ten State Standards) latest Edition.

B. "Report, Geotechnical Investigation, Proposed Animal Shelter, Pomona, Rockland County, New York", prepared by Melick-Tully & Associates, dated October 29, 2021.

1.4 SUBMITTALS

A. Product Data: For the following:
1. Piping specialties.

B. Field Quality-Control Test Reports: From Contractor. Identify the following:
1. System Test: Conducted section-by-section or as an entire system.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Comply with requirements of utility company supplying water.
2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.
4. Comply with the requirements of the American Water Works Association, AWWA.
   a. C104 – Cement-Mortar Lining for Ductile Iron Pipe and Fittings.
   b. C151 – Ductile Iron Pipe.
   c. C600 – Installation of Ductile Iron Water Mains and Their Appurtenances
   d. C605 – Underground Installation of Polyvinyl Chloride (PVC)
   e. C900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fitting

5. Comply with Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers, "Recommended Standards for Water Works", latest edition.
6. Comply with Occupational Safety and Health Administration, OSHA, Standards 29 CFR, Section 1926, Subpart P and its latest revision.
7. Water and Sewer/Stormwater Line Separations:
    a. Horizontal Separation from Water Mains: 10 feet minimum clear.
    b. Vertical Separation from Water Mains: 18 inches minimum clear.
        1) If existing conditions prevent minimum vertical separation:
            a) Construct sewer of PVC pressure pipe material 10 feet on each side of the water main/sewer crossing. The sewer is to be pressure tested.
            b) Encase sewer pipe in concrete, 4 feet on each side of the water main/sewer crossing. Concrete encasement shall be a minimum of 6 inches around the sewer pipe.
    c. Where a water main crosses under a sewer, provide adequate structural support for sewer to maintain line and grade.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency. Defective pipe or fittings found after installation shall be removed and replaced by the Contractor at his own expense.

C. Disinfection of water mains and appurtenances: AWWA C651, excluding Section 5.1 covering the tablet method.

D. Inspection of pipes and appurtenances prior to backfilling.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane of lift. Rig valves to avoid damage to exposed parts. Do not use hand wheels or stems as lifting or rigging points. Unload materials so as to avoid shock or damage. Handle and store all pipe in such a manner as to avoid deterioration or other injury thereto. Place no pipe within pipe of a larger size. Store pipe and fittings on sills above storm drainage level and delivery for laying after the trenches are excavated. Valves and hydrants shall be drained and stored to protect them from damage.

B. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

C. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

D. Protect flanges, fittings, and specialties from moisture, dirt, and falling debris.

E. Store plastic piping protected from direct sunlight. Support pipe to prevent sagging and bending.

F. Do not store or place materials on private property without written approval from the property owner.

1.7 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.

B. Locate existing structures and piping to be closed and abandoned.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Civil Engineer not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner's and Civil Engineer's written permission.

1.8 COORDINATION

A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.1 DUCTILE IRON PIPE

A. Kind
1. Ductile iron pipe shall be centrifugally cast Ductile Iron Pipe, 60-42-10 grade, cement lined in accordance with ANSI Specification A21.5. All Ductile Iron Pipe shall be Class 54 unless otherwise indicated.

B. Brand
1. The weight, class or nominal thickness and casting period shall be shown on each pipe. The manufacturer's mark, the year of manufacture and the letters "DI" or "DUCTILE" shall be cast or stamped. All markings shall be clear and legible and cast on or painted on or near the bell with an approved durable paint which will withstand field handling. Markings shall be in accordance with ANSI Specification A 21.51-71, latest revision.

C. Material
1. Pipe shall be centrifugally cast Ductile Iron Pipe, 60-42-10 grade, cement lined in accordance with ANSI Specification A21.5. Laying lengths shall not exceed twenty (20) feet.
2. All inside surfaces of ductile iron pipes shall be cement lined in accordance with ANSI specification A21.4. All outside surfaces of ductile iron pipe shall be shop coated with an approved bituminous enamel, applied hot in conformity with AWWA specification 203.

D. Joints
1. Unless otherwise specified, all joints for Ductile Iron Pipe shall be Push-On Joints.

2. The following type joints shall be used as specified:
   a. PUSH-ON JOINTS - Push-on joints shall be the Super Bell-Tite Joint of Amstead Industries, the Tyton Joint of U.S. Pipe and Foundry Company, the Fastite Joint of the American Cast Iron Company or such other joint as may be approved as equal by Suez Water New York. For each bell, there shall be furnished a rubber gasket. All of the above shall conform with the applicable provisions of ANSI Specification A21.11.
   b. MECHANICAL JOINTS - The joint material shall conform to requirements of ANSI Specification A21.11. The mechanical joint installation shall conform to the latest ANSI Specifications. Surface of joint in contact with rubber gasket seal shall be brushed thoroughly with a wire brush just prior to assembly and all loose rust or foreign material shall be removed. The cleaned surface shall be brushed with soapy water just prior to slipping with torque indicating wrenches. The applied torque shall be within the ranges shown below:

SIZE OF BOLT	TORQUE (Foot-Pounds)
5/8"	40-60
3/4"	50-90
1"	70-100

3. When tightening bolts, the flanges shall be brought up toward the pipe flanges evenly by partially tightening first the bottom bolt, then the top bolt, then the side bolts and repeating the cycle until all bolts are within the specified torque range. Over stressing of bolts to obtain tightening will not be permitted.
4. Mechanical joints showing visible leakage at the maximum permitted torque shall be disassembled, thoroughly cleaned and reassembled with new gaskets.

E. FIELD LOK GASKET SYSTEM - Field Lok Gasket Systems shall be as manufactured by the U.S. Pipe and Foundry Company or approved equal.
   1. These gaskets shall be installed on Tyton Joint Pipe (4" thru 12") and Fittings where specified in the Contract Documents.

F. TR FLEX RESTRAINED JOINT - TR Flex Restrained Joint Pipe shall be as manufactured by the U.S. Pipe and Foundry Company or approved equal.
   1. These joints shall be employed where specified in the Contract Documents.
   2. TR Flex Pipe shall conform to applicable requirements of ANSI/AWWA C151/A21.51 TR Flex Fittings shall conform to applicable requirements of ANSI/AWWA C110/A21.10.

2.2 CEMENT LINING

A. All ductile iron pipe shall be cement lined. Cement mortar lining shall be in accordance with ANSI A21.4 or latest revision. Thickness of lining shall be as follows:

NOMINAL SIZE OF PIPE	THICKNESS OF LINING*
6", 8", 12"	1/8" Min.
16", 18", 24"	3/16" Min.
30", 36", 42", 48"	1/4" Min.

*A plus tolerance of one eighth (1/8) inch shall be permitted on all size of pipe.

2.3 BOLTED MECHANICAL JOINTS

A. Mechanical joints shall be in accordance with ANSI A21.11 (AWWA C111) and made up with gaskets, glands, and bolts. No short body mechanical joints fittings will be allowed, only full body mechanical joint fittings per specification ANSI/AWWA C110/A21.10. When a joint is to be made up, the bell or socket and plain end shall be cleaned and washed with a solution of mild soap in water as supplied by the pipe manufacturer; the gland and gasket shall be slid onto the plain end then entered into the socket until it is fully "home" in the centering ring. The gasket shall then be painted with soapy water and slid into position, followed by the gland. All bolts shall be inserted and made up hand tight and then tightened with a ratchet wrench. Bolts 180° apart shall be tightened alternately to bring the gland into position evenly. Excessive tightening up of the bolts shall be avoided and torsion wrenches shall be used if needed to prevent excessive tightening. Care shall be taken to assure that the pipe remain fully "home" while the joint is being made up. Where joint restraint is required, the methods specified herein shall be followed.

2.4 JOINT RESTRAINT SYSTEM

A. The Contractor shall provide joint restraint systems to prevent against joint separation of joints on the water main and hydrant connection where restrained pipe is indicated on the drawings and/or as directed by the Engineer. The materials shall be SUPERSTAR, COR-TEN STEEL consisting of tie-bolts, tie-nuts, tie-pins, tie-couplings, tie-clamps, tie-rods, tie-bars, and tie-washers as manufactured by Star National Products, Columbus, Ohio or approved equal. (Certification letter required for COR-TEN STEEL supplied.) Rodding shall include two (2) opposing riser clamps per fitting. The restraint system shall be capable of preventing joint separation for a test pressure of 250 psi or required pressure (for testing 1.5. times working pressure) for each pipe size where restrained pipe is indicated on the drawings and at any additional locations required by Suez Water New York (SWNY) Division. The Contractor may also elect to utilize the MEG-A-LUG restrained joint system as manufactured by EBAA IRON SALES, INC., or approved equal in lieu of the rodding system, however, the required concrete thrust blocks must be installed. The mechanical joint restraint system shall incorporate a restraining mechanism in the follower gland which shall impart a multiple wedging action against the pipe. Glands shall be manufactured of ductile iron conforming to ASTM A536-80. Restraining devices shall be of ductile iron heat treated to a minimum hardness of 370 BHN. All dimensions of each gland shall be such that it can be used with the standardized mechanical joint bell and tee-head bolts conforming to ANSI/AWWA A21.11 and ANSI/AWWA C153/A21.53 of latest revision. Twist-off nuts shall be used to insure proper actuating of the restraining devices. If TR FLEX pipe is utilized, pipe to be restrained shall utilize TR FLEX restrained push-on joint type as manufactured by U.S. Pipe and Foundry Co., or approved equal. Restraint for field cut pipe shall be with TR FLEX GRIPPER RINGS or approved equal. Where GRIPPER RINGS are to be installed on the pipe in the field, the instructions of the pipe manufacturer shall be strictly followed. In addition to the GRIPPER RINGS, the Contractor will install tie-rodding to the first bell on each side of the fittings or valves.

B. Where tie rods are used, the manufacturer's recommendation for the number of rods for size and pressure of main will be followed.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 31 00 00.

3.2 INSTALLATION

A. Inspect pipe and fittings prior to installation to preclude installation of defective materials

B. Install Work in accordance with SWNY Division, the New York State Department of Health and the recommended Standards for Water Works (Ten State Standards) latest Edition.

C. Install piping as shown on the Drawings.

D. All fittings shall be supported independently from the pipe in such a manner that no part of the weight of the fitting is held by the pipe.

E. Fittings and pipe within structures shall be placed to line and grade and properly supported before joints are made. The Contractor shall furnish all the necessary pipe supports, including stirrups, rods, clamps, hangers, pipe columns and piers, necessary to sustain the pipe and fittings in a firm and substantial manner to the lines and grades given.

F. Each valve and valve box shall be installed in accordance with the manufacturers' recommendations or as directed.

G. The Contractor shall construct and install hydrants in the locations shown on the Drawings and/or as directed.

H. Bury piping with depth of cover shown on the Drawings.

I. Install bedding at sides and over top of pipe. Pipe backfill to be installed a minimum of 12-inches overtop of the pipe and compacted in 6-inch loose lifts maximum.

3.3 IDENTIFICATION

A. After the pipe zone and the first 12-inches in the trench zone have been backfilled and compacted, place the marking tape on the compacted backfill and center over the pipe. Run tape continuously along the trench and tie ends of tape together. Wrap marking tape around valve box extension pipes and continue along pipe.

3.4 FIELD QUALITY CONTROL

A. All pipelines carrying water shall be tested for strength and tightness after installation. All testing shall conform to Suez Water New York Division requirements, and AWWA C600, latest edition.

B. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks (if present) have hardened sufficiently or as directed by SWNY. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Test pressure shall be 150 psi or 1.5 times working pressure, whichever is greater, or as directed by SWNY. All aspects of the test, duration, allowable leakage, etc., shall be in accordance with the latest AWWA standards. Use only potable water.

C. Hydrostatic Tests: Test at not less than one-and-one half times working pressure for two hours. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

D. Prepare reports of testing activities.

3.5 CLOSING ABANDONED WATER SYSTEMS

A. Abandoned Piping:

1. Remove underground piping that has been shown to be removed according to the Drawings.

2. Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

   a. Close open ends of piping with at least 8-inch thick, brick masonry bulkheads.

   b. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

3. Backfill to grade according to Section 31 00 00.

3.6 INSPECTION AND ACCEPTANCE

A. Certified physical test reports shall be furnished by the Contractor to the Engineer. In lieu of in-plant inspection, the Engineer may accept such certified physical test reports as evidence of compliance with this section.

3.7 FIELD CUTTING

A. Ductile Iron Pipe shall be cut only by means of abrasive saws, hack saws, wheel type cutters, or milling type cutters. The use of "squeeze" type pipe cutters and cutting torches will not be permitted. The use of diamond points and dog chisels will not be permitted.

3.8 CLEARING AND DISINFECTION

A. Disinfection will be performed after the pipe has passes any leakage tests.

B. The Owner's Representative and Civil Engineer shall be notified at least 48 hours prior to the start of pressure testing, leakage testing, and disinfection.

C. Disinfection will be performed in accordance with the drawings and AWWA C651, excluding Section 5.1 covering the tablet method.

D. Prepare reports of disinfecting activities

END OF SECTION 33 11 01

SECTION 33 12 16 - WATER UTILITY DISTRIBUTION VALVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes water distribution valves.

B. Related Sections include the following:
1. Section 31 00 00 – Earthwork
2. Section 33 11 01 – Water Utility Distribution Piping.

1.3 REFERENCES

A. Recommended Standards for Water Works (Ten State Standards) latest Edition.

B. "Report, Geotechnical Investigation, Proposed Animal Shelter, Pomona, Rockland County, New York", prepared by Melick-Tully & Associates, dated October 29, 2021.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Comply with requirements of utility company supplying water.
2. Comply with the requirements of the American Water Works Association, AWWA.
   a. C104 – Cement-Mortar Lining for Ductile Iron Pipe and Fittings.
   b. C151 – Ductile Iron Pipe.
   c. C600 – Installation of Ductile Iron Water Mains and Their Appurtenances
3. Comply with Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers, "Recommended Standards for Water Works", latest edition.
4. Comply with Occupational Safety and Health Administration, OSHA, Standards 29 CFR, Section 1926, Subpart P and its latest revision.
5. Water and Sewer/Stormwater Line Separations:
   a. Horizontal Separation from Water Mains: 10 feet minimum clear.

b. Vertical Separation from Water Mains: 18 inches minimum clear.
   1) If existing conditions prevent minimum vertical separation:
      a) Construct sewer of PVC pressure pipe material 10 feet on each side of the water main/sewer crossing. The sewer is to be pressure tested.
      b) Encase sewer pipe in concrete, 4 feet on each side of the water main/sewer crossing. Concrete encasement shall be a minimum of 6 inches around the sewer pipe.

c. Where a water main crosses under a sewer, provide adequate structural support for sewer to maintain line and grade.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency. Defective pipe or fittings found after installation shall be removed and replaced by the Contractor at his own expense.

C. Disinfection of water mains and appurtenances: AWWA C651, excluding Section 5.1 covering the tablet method.

D. Inspection of pipes and appurtenances prior to backfilling.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
1. Ensure that valves are dry and internally protected against rust and corrosion.
2. Protect valves against damage to threaded ends and flange faces.
3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves, including fire hydrants, according to the following:
1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
2. Protect from weather. Store indoors and maintain temperatures higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane of lift. Rig valves to avoid damage to exposed parts. Do not use hand wheels or stems as lifting or rigging points. Unload materials so as to avoid shock or damage. Handle and store all pipe in such a manner as to avoid deterioration or other injury thereto. Place no pipe within pipe of a larger size. Store pipe and fittings on sills above storm drainage level and delivery for laying after the trenches are excavated. Valves and hydrants shall be drained and stored to protect them from damage.

D. Protect flanges, fittings, and specialties from moisture, dirt, and falling debris.

E. Do not store or place materials on private property without written approval from the property owner.

PART 2 - PRODUCTS

2.1 GATE VALVES

A. The gate valves shall be iron body, bronze stem, fusion epoxy coated, resilient wedge gate valve designed for 350 psi working pressure. The valves shall conform to the requirements of the latest edition AWWA Specification C509, with operating nut, and shall turn CLOCKWISE TO OPEN. The valves shall have mechanical joint ends. Valves shall be as manufactured by the Mueller Corp., Series 2361 or approved equal.

2.2 VALVE BOXES

A. Cast iron shall be tough, close grained cast iron, free from blow holes, shrinkage cracks or other defects and shall conform to ASTM Designation A48-36.

B. The Contractor shall furnish and install valve boxes at all buried valve locations. The valve boxes for all main valves shall be as shown on the Suez Water New York Division Standard Details latest revision, suitable for use under heavy traffic. The covers shall be marked "WATER".

C. Valve boxes for water service valves between and including the sizes of 2" (two inch) shall be a two piece adjustable screw type, 5-1/4 inch shaft, size number 21 (twenty-one) with approximately 39" to 48" extension. The boxes shall be as manufactured by Bingham and Taylor "5 ¼" Shaft 2-Piece Valve Boxes – Fig. No. CUL5B64BARC" or approved equal.

D. All valve boxes shall be placed so as not to transmit shock or stress to the valve and shall be centered and plumb over the operating nut of the valve. The ground in the trench upon which the valve box rest shall be thoroughly compacted to prevent settlement. The box shall be fitted together securely and set so that the cover is flush with the proposed finished grade. Prior to final asphalt restoration, the Contractor shall, if necessary, raise or lower the valve box so that the cover is even with the proposed finished grade. If non-rising extension stems are required, the Contractor shall provide at no additional cost to the Owner.

2.3 MISCELLANEOUS METALS

A. Cast iron shall be tough, close grained cast iron, free from blow holes, shrinkage cracks or other defects and shall conform to ASTM Designation A48-36.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Gate Valves shall be installed as shown on the Contract Drawings. All Valves shall be set plumb. Mechanical joints shall be made as specified in this document. All materials for harnessing the pipe and valve shall be furnished and installed by the Contractor

END OF SECTION 33 12 16

SECTION 33 31 04 - SANITARY SEWER PIPE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes gravity sewer pipe.

B. Related Sections include the following:
1. Section 31 00 00 – Earthwork.
2. Section 33 11 01 – Water Utility Distribution Piping.
3. Section 33 39 01 – Sanitary Sewer Structures.

1.3 DEFINITIONS

A. PVC: Polyvinyl chloride plastic.

1.4 REFERENCES

A. "Report, Geotechnical Investigation, Proposed Animal Shelter, Pomona, Rockland County, New York", prepared by Melick-Tully & Associates, dated October 29, 2021.

1.5 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

1.6 SUBMITTALS

A. Product Data: Manufacturer's specifications with all pertinent information regarding dimensions, fittings and installation instructions.

1.7 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Comply with standards of authorities having jurisdiction for sanitary sewer piping, including materials, installation, and testing.
2. Comply with Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers, "Recommended Standards for Wastewater Facilities", dated 2004, as amended.
3. Comply with Occupational Safety and Health Administration, OSHA, Standards 29 CFR, Section 1926, Subpart P and its latest revision.

4. Water and Sewer Line Separations: See Section 33 11 01 – Water Utility Distribution Piping.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic structures, pipe, and fittings in direct sunlight. Keep plastic items at ambient outdoor temperature.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

D. Inspection: Upon delivery of pipe, inspect pipe.
1. Straightness Tolerance: Maximum deviation of 1/16 inch per foot from straight line drawn between centers of openings.
2. Immediately remove lengths of pipe that fail straightness requirement.
3. Rejection of Manufacturer and Product: Remove all pipe supplied by a manufacturer if more than five percent of shipment is rejected.

1.9 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.

B. Locate existing structures and piping to be closed and abandoned.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Owner’s representative not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner’s representative’s written permission.

PART 2 - PRODUCTS

2.1 GENERAL

A. Each length of pipe and each fitting shall be marked in accordance with the applicable ASTM Designation.

2.2 DRAINAGE PIPE AND FITTINGS

A. PVC Sewer Pipe and Fittings; (6 inches Diameter and Larger): SDR 35 and ASTM D 3034.

2.3 SOLVENT CEMENTS

A. Solvent cement used for joining plastic pipe and fittings shall meet the following designations for the various types of plastic pipe listed.
   1. PVC: ASTM D 2564.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 310000.

3.2 INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements. Check previously made joints as installation progresses. Maintain swab or drag in line, and pull past each joint as it is completed.

C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Install gravity-flow piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.

F. Install piping pitched down in direction of flow, at slope indicated.

G. Install piping with minimum cover as shown on the Drawings.

3.3 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. PVC Sewer Pipe and Fittings: As follows:
   1. Join pipe and fittings with gaskets according to ASTM D2321 and manufacturer's written instructions.
   2. If full entry of pipe joint is not achieved, remove pipe and replace with new unit and gasket.

B. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

C. Install pipe, fittings, and accessories in accordance with Drawings.

D. Route piping in straight line.

E. Install bedding at sides and over top of pipe in accordance with Drawings.

F. Refer to Section 31 00 00 Earthwork for backfilling and compacting requirements. Do not displace or damage pipe when compacting.

G. Connect to sanitary sewer manholes, pumping stations and existing manhole as shown on Drawings.

H. Install Work in accordance with Quality Assurance standards described above.

3.4 CONNECTIONS TO EXISTING STRUCTURES

A. Core drill existing structures and boot with flexible pipe connector.

3.5 CLOSING ABANDONED SANITARY SEWERAGE SYSTEMS

A. Abandoned Piping:

1. Remove underground piping that has been shown to be removed according to the Drawings.

2. Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

   a. Close open ends of piping with at least 8-inch thick, brick masonry bulkheads.

   b. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

3. Backfill to grade according to Section 31 00 00.

3.6 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.

1. Place plug in end of incomplete piping at end of day and when work stops.

2. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place; after completion of backfill and compaction; and again at completion of Project.

C. Submit separate reports for each system inspection.

1. Defects requiring correction include the following:
    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 95 percent of piping diameter.
    c. Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping; maximum of 100 gallons per inch diameter per mile of sewer pipe per day.
    e. Exfiltration: Water leakage from or around piping; maximum of 100 gallons per inch diameter per mile of sewer pipe per day.
2. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
3. Reinspect and repeat procedure until results are satisfactory.

D. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 48 hour advance notice.
4. Submit separate reports for each test.
5. If authorities having jurisdiction do not have published procedures, perform tests as follows:
    a. Infiltration Test: This test may be used only when ground water levels are at least five (5) feet above the top of the pipe for the entire length of the section to be tested during the entire period of the tests. Ground water levels may be measured in an open trench or in standpipes previously placed in backfilled trenches during the backfilling operation. When standpipes are installed in the backfill for ground water measurement, the lower ends of these shall be satisfactorily embedded in a mass of crushed stone or gravel to maintain free percolation and drainage. Infiltration through joints shall be measured by using a watertight weir or any other approved device for volumetric measurement installed at the lower end of the section under test.
    b. Exfiltration Test: This test consists of filling the pipe with water to provide a head of at least five (5) feet above the top of the pipe or five (5) feet above ground water, whichever is higher, at the highest point of the pipe line under test and then measuring the loss of water from the line by the amount which must be added to maintain the original level. In this test the line must remain filled with water for at least twenty-four (24) hours prior to the taking of measurements. Exfiltration shall be measured by the drop of water level in a closed-end standpipe or in one of the sewer manholes available for convenient measuring. When a standpipe and plug arrangement is used in the upper manhole of a line under test, there must be some

positive method of releasing entrapped air in the sewer prior to taking measurements.

c. Low Pressure Air Testing of Piping

1) The Contractor may request, in writing to the Owner's Representative, the substitution of low pressure air testing of the sewer system. Low pressure air testing shall be supervised and certified by a registered New York State Licensed Professional Engineer hired by the Contractor. The test shall satisfy all requirements of the Rockland County Department of Health and the New York State Department of Environmental Conservation Pamphlet TIP 15 (4/19/89).

2) The test length intervals for either type of test shall be as ordered or approved but in no event shall they exceed 1,000 feet. In the case of sewers laid on steep grades, the length of line to be tested by exfiltration at any one time may be limited by the maximum allowable internal pressure on the pipe and joints at the lower end of the line.

3) The test period, wherein the measurements are taken, shall be no less than two (2) hours in either type of test.

4) The total leakage of any section tested by either test method shall not exceed the rate of 100 gallons per mile of pipe per 24 hours per inch of nominal pipe diameter. For purposes of determining the maximum allowable leakage, manhole shall be considered as sections of 48 inch diameter pipe, five (5) feet long, and the equivalent leakage allowance shall be 4.5 gallons per manhole per 24 hours.

5) If leakage exceeds the specified amount, the Contractor shall make the necessary repairs or replacements required to permanently reduce the leakage to within the specified limit and the tests shall be repeated until the leakage requirement is met.

6. Leaks and loss in test pressure constitute defects that must be repaired.

7. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

8. Deflections greater than allowances specified constitute defects that must be repaired.

9. Replace piping using new materials, and repeat test until deflection is within allowances specified.

END OF SECTION 33 31 04

SECTION 33 39 01 - SANITARY SEWER STRUCTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes sanitary manholes.

B. Related Sections include the following:
1. Section 31 00 00 – Earthwork.
2. Section 33 11 01 – Water Utility Distribution Piping.
3. Section 33 31 00 – Sanitary Sewer Pipe.

1.3 REFERENCES

A. "Report, Geotechnical Investigation, Proposed Animal Shelter, Pomona, Rockland County, New York", prepared by Melick-Tully & Associates, dated October 29, 2021.

1.4 SUBMITTALS

A. Shop Drawings: Indicate manhole locations, elevations, piping, sizes, and elevations of penetrations.

B. Product Data: Submit cover and frame construction, features, configuration, and dimensions.

C. Design Mix Reports and Calculations: For each class of cast-in-place concrete.

D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Comply with standards of authorities having jurisdiction for sanitary sewer piping, including materials, installation, and testing.
2. Comply with Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers, "Recommended Standards for Wastewater Facilities", latest edition.
3. Comply with Occupational Safety and Health Administration, OSHA, Standards 29 CFR, Section 1926, Subpart P and its latest revision.

4. Water and Sewer Line Separations: See Section 33 11 01 - Water Utility Distribution Piping.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.

B. Locate existing structures and piping to be closed and abandoned.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Owner's representative not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner's representative's written permission.

PART 2 - PRODUCTS

2.1 MANHOLES

A. Manholes shall be constructed of the sizes and shapes shown and of the types specified complete with frames and covers.

B. Materials
1. Concrete shall comply with the requirements shown on the plans.
2. Brick and brick masonry shall comply with the following:
   a. Brick shall be of the following types:
      1) Type 1 - Manhole Brick
      2) Type 2 - Sewer and Liner Brice
   b. Unless otherwise specified, Type 1 shall be used and shall be either solid or cored, as directed by the Engineer.
      1) Brick shall be of standard size as approved.
      2) Except as otherwise provided herein, brick shall comply with the following requirements:
         a) Type 1 Brick, ASTM Designation C32, Grade MS
         b) Type 2 Brick, ASTM Designation C32, Grade SS
      3) Brick shall be subject to visual inspection. Individual imperfect brick will be rejected for any of the following causes:

a) DEFECTS - The presence of cracks, warpage, stones, pebbles or particles of lime that would affect the serviceability of the brick.
b) IRREGULAR SHAPE - Brick not of rectangular cross-section with substantially straight square corners or where ends and at least one (1) edge do not have plain surfaces.
c) VARIATION IN SIZE - Brick which vary from specified size by more than plus or minus one eighth (1/8) inch in either transverse dimension or by more than plus or minus one quarter (14) inch in length.
d) VARIATION FROM APPROVED SAMPLES - Brick which shall vary from the standard or comparison as established from the approved samples.

3. Frames and covers shall be of cast iron, unless otherwise shown on the Contract Plans, complying with the requirements of the Standard Detail. Include indented top design with lettering "R.C.S.D. No 1" cast into cover.
4. Steps shall be cast iron and shall comply with the requirements shown on the plans.
5. Cement mortar shall comply with the following:
   a. Materials: The cement used in the work shall be of a high quality Portland Cement of a well-established and approved brand and shall conform to the requirements of A.S.T.M. Portland Cement Specifications, Designation C-150, as last amended. Portland Cement type 2 with Darex Additive (one-half (½) ounce per sack of cement) shall be used for Classes "A", "B" and "C" Concrete.
   b. Tests: Provisions of A.S.T.M C-150 as to analysis and test requirements, inspection and rejection will govern. The Engineer will make or cause to be made such of these tests as he deems necessary at the expense of the County and the Contractor will supply without charge all cement samples required.
6. Reinforcement shall comply with the following:
   a. Additional steel reinforcing bars shall be the steel reinforcing bars ordered in writing by the Engineer to be incorporated in the work exclusive of steel reinforcing bars for which payment is provided under separate item. All steel reinforcing bars are to conform to the Standard Specifications for Billet Steel Bars for Concrete Reinforcement, A.S.T.M. Designation A-615, as amended.
   b. Included therein shall be all the steel reinforcing bars placed in pile caps of sewers and structures on piles as shown on the Sewer Design Standards.
   c. Where more than one bar is necessary to complete a required length, the joints shall be made by lapping the ends of the bars for a distance of 40 times their nominal diameters.

C. Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.
   1. Channels: concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
      a. Invert Slope: 2 percent through manhole.
      b. Benches: concrete, sloped to drain into channel.

c. Slope: 4 percent.

2.2 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:
1. Cement: ASTM C150, Type II.
2. Fine Aggregate: ASTM C33, sand.
3. Coarse Aggregate: ASTM C33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water-cementitious materials ratio.
1. Reinforcement Bars: ASTM A615/A615M, Grade 60, deformed steel.

C. Structure Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water-cementitious materials ratio. Include channels and benches in manholes.
1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
2. Benches: Concrete, sloped to drain into channel.

2.3 PROTECTIVE COATINGS

A. Description: SSPC-Paint 16, Coltar-epoxy-polyamide 15-mil. minimum thickness, unless otherwise indicated, factory or field applied to the following surfaces:
1. Concrete Manholes: On exterior surface.

2.4 CONNECTIONS TO EXISTING STRUCTURES

A. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 31 00 00.

3.2 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated on Drawings.

B. Form continuous concrete channels and benches between inlets and outlet.

C. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere, unless otherwise indicated on Drawings.

D. Install precast concrete manhole sections with gaskets according to ASTM C891.

3.3 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.4 CONNECTIONS TO EXISTING STRUCTURES

A. Core drill existing structures and boot with flexible pipe connector.

3.5 CLOSING ABANDONED SANITARY SEWERAGE SYSTEMS

A. Abandoned Structures: Excavate around structure as required.

1. Remove structure and close open ends of remaining piping.
2. Backfill to grade according to Section 310000.

3.6 FIELD QUALITY CONTROL

A. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Schedule tests and inspections by authorities having jurisdiction with at least 48 hour advance notice.
3. Submit separate reports for each test.
4. If authorities having jurisdiction do not have published procedures, perform tests as follows:
   a. Both vacuum testing and hydrostatic testing are acceptable means of testing newly constructed sewer manholes. Sanitary sewer manhole testing shall be supervised and certified by a registered New York State Licensed Professional Engineer hired by the Contractor. The testing shall satisfy all requirements of the Rockland County Department of Health and the New York State Department of Environmental Conservation Pamphlet TIP 15 (4/19/89).
   b. The Contractor shall conduct the manhole tests in accordance with Rockland County Department of Health Regulations. The Contractor must hire a Professional Engineer to supervise and verify in writing that the pipe passes to the County of Rockland. All tests shall be witnessed by the County Inspector. The cost of conducting these tests shall be paid for under the unit price bid for the contract on a “per each” unit bid item. No house connections shall be permitted to tie into the new work until these tests have been passed to the satisfaction of the Rockland County Department of Health.

c. The Contractor shall furnish all labor, testing materials and equipment (such as plugs and standpipes) and shall perform the tests described herein under the supervision and to the satisfaction of the Engineer.
d. All tests must be performed in accordance with the requirements of the 2014 Edition of Recommended Standards for Wastewater Facilities established by the Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers.

5. Leaks and loss in test pressure constitute defects that must be repaired.

6. Replace leaking structure using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION 33 39 01

SECTION 33 39 13 - STORM DRAINAGE STRUCTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
1. Underground stormwater chambers.
2. Trench drains.
3. Drainage Manhole
4. Drainage Cleanout (Refer to Plan)
5. Floor Drain (Refer to Architectural Plans)

B. Related Sections include the following:
1. Section 31 00 00 – Earthwork.
2. Section 33 11 01 – Water Utility Distribution Piping.
3. Section 33 41 05 – Storm Drainage Pipe.

1.3 REFERENCES

A. "Report, Geotechnical Investigation, Proposed Animal Shelter, Pomona, Rockland County, New York", prepared by Melick-Tully & Associates, dated October 29, 2021.

1.4 SUBMITTAL

A. Shop Drawings: Include plans, elevations, details, and attachments for the following:
1. Hydrodynamic separators.
2. Outlet control structures for bioretention.
3. Catch basins.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Water and Sewer Line Separations: See Section 33 11 01 – Water Utility Distribution Piping.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic structures, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle structures according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Engineer not less than 2 days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Engineer's written permission.

PART 2 - PRODUCTS

2.1 HYDRODYNAMIC SEPARATOR

A. The hydrodynamic separators must meet the following specifications:
   1. Contech CDS® CDS2015-4-C.
      a. Size: 48” I.D.
   2. Or approved equal.

2.2 CATCH BASINS, DRAIN INLETS AND YARD DRAINS

A. Catch basins shall be built of the sizes and dimensions and of the types shown on the Plans or as directed by the Engineer. The following shall apply:
   1. The concrete for bases of catch basins shall be deposited continuously for their entire area together with keys. Bases shall be carefully protected from all injury during the progress of the work. The bases of catch basins shall be true and smooth.
   2. Concrete in side walls of catch basins shall be deposited continuously to the height and to the thickness approved and for their entire length.
   3. Concrete in roofs of catch basins shall be deposited continuously for the full depths and for the entire widths and lengths of the roofs. The outer surfaces of roofs shall be finished true and smooth.

B. The location of the catch basins shown on the plans are approximate. The Engineer shall establish the catch basin locations taking into consideration the drainage of the area to the catch basin location and damage to trees or their root system.

C. No basin shall be installed in a location where a pedestrian ramp or driveway depressed curb exists. The minimum distance between a catch basin frame and grating and the end of a depressed curb apron shall be one (1) foot.

D. SETTING FRAMES, GRATES AND COVERS - The brick masonry or concrete for the catch basins shall be built to within such distance of the final grade as shown, specified or ordered. Frames, grates and covers shall be as shown on the plans. The frames shall be set on the masonry or concrete in a full bed of stiff fresh cement mortar.

E. Catch basin connection pipe or catch basin connection pipe openings will not be permitted through the corner of catch basins unless directed otherwise in writing by the Owner's Representative. The distance from the edge of a pipe or an opening to the inside face of the adjoining wall shall be a minimum of 12".

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 31 00 00.

3.2 DRAINAGE STRUCTURE INSTALLATION

A. Install drainage structures in the locations shown on the plans.

B. Set frames and grates to elevations indicated.

C. Brick Masonry
1. The bricks shall be wet when laid and each brick shall be laid in cement mortar so as to form full bed, end and side joints at one operation. The joints shall not be wider than three eighth (3/8) inch, except when the bricks are laid radially, in which case the narrowest part of the joint shall not exceed one quarter (1/4) inch . Brickwork shall be smoothly coated both inside and outside with a layer of cement mortar one-half (1/2) inch thick. Brickwork shall be laid with a satisfactory bond, and as it progresses shall be racked back in courses, unless otherwise permitted.
2. All fresh brickwork shall be carefully protected from freezing and from the drying effects of the sun and wind and, if required, it shall be sprinkled with water at such intervals and for such time as may be directed. Brickwork shall be protected from injuries of all sorts, and all portions which may become damaged or may be found defective shall be repaired or if directed, be removed and rebuilt. In freezing weather, bricks shall be heated sufficiently to remove all ice and frost from laying.

3.3 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24-inches of backfill is in place, and again at completion of Project.
1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:
   a. Alignment: Less than full diameter of inside of pipe is visible between structures.
   b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
   c. Crushed, broken, cracked, or otherwise damaged piping.
   d. Infiltration: Water leakage into piping.
   e. Exfiltration: Water leakage from or around piping.
3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Re-inspect and repeat procedure until results are satisfactory.

3.4 CLEANING

A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
   1. In large, accessible piping, brushes and brooms may be used for cleaning.
   2. Place plug in end of incomplete piping at end of day and when work stops.

B. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.

END OF SECTION 33 39 13

SECTION 33 41 05 - STORM DRAINAGE PIPE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes storm pipe and fittings.

B. Related Sections include the following:
1. Section 31 00 00 - Earthwork.
2. Section 33 11 01 - Water Utility Distribution Piping.
3. Section 33 39 13 – Storm Drainage Structures.

1.3 DEFINITIONS

A. CPP: Corrugated polyethylene pipe.

B. HDPE: High-density polyethylene plastic.

C. LLDPE: Linear low-density polyethylene.

D. NPS: Nominal pipe size.

E. PVC: Polyvinyl chloride plastic.

1.4 REFERENCES

A. “Report, Geotechnical Investigation, Proposed Animal Shelter, Pomona, Rockland County, New York”, prepared by Melick-Tully & Associates, dated October 29, 2021.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic structures, pipe, and fittings in direct sunlight. Keep plastic items at ambient outdoor temperature.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

D. Inspection: Upon delivery of pipe, inspect pipe.

1. Straightness Tolerance: Maximum deviation of 1/16 inch per foot from straight line drawn between centers of openings.
2. Immediately remove lengths of pipe that fail straightness requirement.
3. Rejection of Manufacturer and Product: Remove all pipe supplied by a manufacturer if more than five percent of shipment is rejected.

1.6 SUBMITTALS

A. Product Certification: Pipe, fittings, precast concrete units, metal items, and miscellaneous appurtenances.

B. Product Data: For the following:
1. Pipe.

1.7 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Water and Sewer Line Separations: See Section 33 11 01 – Water Utility Distribution Piping.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic structures, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

1.9 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Engineer not less than 2 days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Engineer's written permission.

PART 2 - PRODUCTS

2.1 HDPE PIPE AND FITTINGS

A. High Density Polyethylene Pipe (HDPE) Smooth Interior Pipe:
1. Pipe and Fittings: Shall conform to AASHTO M252 and M294 and/or ASTM F2360 unless otherwise shown on the Drawings.
2. Gaskets: Rubber gaskets shall meet requirements of ASTM F477 with joints conforming to AASHTO M294, watertight designations, or ASTM F 2306.
3. Maximum permitted diameter is 48".

4. See Section 310000 – Earthwork and drawings for bedding details.
5. HDPE Pipe shall be NTPEP Certified.
6. Approved Manufacturers:
   a. Advance Drainage Systems, Inc., 3300 Riverside Drive, Columbus, Ohio 43221 (614) 457-3051
   b. Hancor, Inc., 401 Olive Street, Findlay, Ohio 45840 (888) 367-7473
   c. Lane Enterprises, Inc. (for Type S Lok-Tite Pipe) 3905 Hartzdale Drive, Suite 514, Camp Hill, PA 17011 (717) 761-8175
   d. Or approved equal.

2.2 PVC PIPE AND FITTINGS

A. ASTM D3034 SDR35 Poly Vinyl Chloride (PVC) Pipe and Fittings, AASHTO M278, 4-inch to 10-inch perforated pipe, with 3/8-inch perforations at 3-inches on center, solid connectors.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 31 00 00.

3.2 PIPING INSTALLATION

A. Locations and Arrangements: Contractor shall install all drainage structures and pipe in the locations shown on the drawings and/or as approved by the Owner. Pipe shall be of the type and sizes specified on the drawings and shall be laid accurately to line and grade. Structures shall be accurately located and properly oriented. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, on prepared foundation, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Lap joint pipes shall be laid with the inside circumferential laps pointing downstream and with the longitudinal laps at the side or quarter points.

C. Manholes, catch basins and drain inlets shall be constructed as soon as the pipe laying reaches the location of the structures. If the Contractor continues pipe installation without making provisions for completion of the structures the Owner shall have the authority to stop the pipe installation until the structure is completed.

D. Any structure which is miss-located or oriented improperly shall be removed and reconstructed at its proper location, alignment and orientation without cost to the Owner.

E. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing storm drainage is indicated.

F. Precast drainage structures shall be assembled in accordance with the manufacturer's instructions to form a sound structural unit.

G. Cast-in-Place drainage structures shall be installed in accordance with the details or referenced specifications shown on the drawings. Concrete shall comply with the requirements of this section.

H. Fittings and Connections:
1. Water-Tight: Pipe connections to drainage structures for water-tight (resilient) conditions shall meet ASTM F2510/F2510M for HDPE pipe, or ASTM C 923 for reinforced concrete pipe. Grout, if used for water-tight connection shall be Non-Shrink type only.
2. Bottom invert connections shall be constructed of concrete form smooth to provide a bench between pipe inverts unless otherwise detailed on the plans.

I. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

J. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of micro-tunneling.

K. Install gravity-flow, non-pressure drainage piping according to the following:
1. Install piping pitched down in direction of flow.
2. Install piping NPS 6 (DN 150) and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
3. Install piping with 24-inch minimum cover.
4. Install HDPE piping according to pipe manufacturer's installation guidelines for heavy duty drainage applications and ASTM D 2321.

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping according to the following:
1. Join HDPE pipe according to ASTM D 2321
2. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
3. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.4 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
1. In large, accessible piping, brushes and brooms may be used for cleaning.
2. Place plug in end of incomplete piping at end of day and when work stops.
3. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:
   a. Alignment: Less than full diameter of inside of pipe is visible between structures.
   b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 95 percent of piping diameter.
   c. Crushed, broken, cracked, or otherwise damaged piping.
   d. Infiltration: Water leakage into piping.
   e. Exfiltration: Water leakage from or around piping.

C. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.

D. Re-inspect and repeat procedure until results are satisfactory.

END OF SECTION 33 41 05