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DIVISION 26 – ELECTRICAL

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SECTION 01 41 00
REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The Work of this Section includes, but is not limited to:
   1. Stormwater regulations.

1.02 REFERENCE STANDARDS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section.

B. The Contractor must adhere to all requirements contained in the Stormwater Pollution Prevention Plan (SWPPP) filed with the New York State Department of Environmental Conservation (NYSDEC), and the Soil Erosion and Sediment Control specification, schedule, plans and details.
   1. NYSDEC New York State Standards and Specifications for Erosion and Sediment Control (Blue Book)
   2. NYSDEC State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity GP-0-20-001.

C. Comply with all industry standards and requirements of all Authorities having jurisdiction. If requirements specified conflicts with the requirements of Authorities having jurisdiction, the requirements of the Authority having jurisdiction applies.

1.03 QUALITY ASSURANCE

A. Provide a detailed installation and termination schedule for all items of work included in this Section. Notify the Site Engineer prior to the work taking place.

PART 2 NOT USED

PART 3 EXECUTION

3.01 PERFORMANCE REQUIREMENTS

A. Provide an employee, who must be on site at all times when soil disturbance is taking place, who is a NYSDEC certified individual, and whose certification has been obtained within the last three (3) years. This individual must have the authority to correct deficiencies noted in the SWPPP inspections within the timeframe specified, and be made available to meet weekly with the SWPPP inspector.

B. Should the Contractor fail to correct the deficiencies noted, he shall be subject to a fine issued by the Authorities having jurisdiction as mandated by law.

3.02 CLEANING AND REPAIR

A. The Contractor will be required to keep the site clean of all debris and maintain the site in accordance with the requirements of the SWPPP. Silt fencing must be inspected after every rainfall and on a continuous basis, promptly repaired and kept free of accumulated sediment.

   All work of cleaning and repair as specified herein shall be performed at the Contractor's expense and to the complete satisfaction of the Authority having jurisdiction.

3.03 FINAL INSPECTION

A. Upon completion of the Work and before final acceptance, all soil areas must have permanent stabilization and a full stand of grass as determined by the SWPPP inspector. The work shall not be considered complete, and the Notice of Termination (NOT) of the SWPPP shall not be issued, until all requirements of the SWPPP have been met.

STORMWATER POLLUTION PREVENTION PLAN

REGENERON DAYCARE

777 OLD SAW MILL RIVER ROAD
MT. PLEASANT, NY

Applicant/Operator/ Owner:

Regeneron Pharmaceuticals, Inc.
777 Old Saw Mill River Road
Tarrytown, NY 10591
Ted Jesson
(914) 418-0610 x 610

Prepared by:

120 Bedford Road
Armonk, NY 10504
JMC Project 20090-3

Date: 11/23/2021
Revised: 02/10/2022

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APPENDICES

REFERENCED DRAWINGS FOR SWPPP DESIGN AND DETAILS

JMC SITE PLANS

Dwg. No.	Title
C-000	*Cover Sheet*
C-010	*Existing Conditions*
C-020	*Demolition, Tree Removal And Preservation Plan*
C-021	*Tree List*
C-100	*Layout Plan*
C-200	*Grading Plan*
C-210	*Sections Plan*
C-220	*Earthwork Analysis Plan*
C-300	*Utilities Plan*
C-400	*Erosion and Sediment Control Plan*
C-600	*Lighting Plan*
C-700	*Fire Truck Turning Plan*
C-900	*Construction Details*
C-901	*Construction Details*
C-902	*Construction Details*
C-903	*Construction Details*
C-904	*Construction Details*
C-905	*Construction Details*
L-100	*Landscaping Plan*

I. INTRODUCTION

This Stormwater Pollution Prevention Plan has been prepared for the 4.7 acre Regeneron Daycare site, located in the Town of Mt. Pleasant, Westchester County, New York (hereinafter referred to as the "Site") on the Regeneron Pharmaceuticals Inc. property. The site is bordered by Old Saw Mill River Road to the south and Saw Mill River Road to the East. The development has been designed in accordance with the following:

- Requirements of the New York State Department of Environmental Conservation (NYSDEC) SPDES General Permit No. GP-0-20-001, effective January 29, 2020.
- Chapter 183 "Stormwater Management and Erosion and Sediment Control" of the Mt. Pleasant Code

The site area currently consists of mostly wooded area and is located immediately adjacent to the Regeneron North Campus Driveway and Old Saw Mill River Road. The applicant and owner Regeneron Pharmaceuticals, Inc. proposes to develop the vacant space and construct an approximately 16,450 square foot Daycare Center to be used exclusively by their employees.

II. STORMWATER MANAGEMENT PLANNING

In order to be eligible for coverage under the NYSDEC SPDES General Permit No. GP-0-20-001 for Stormwater Discharges from Construction Activities, the Stormwater Pollution Prevention Plan (SWPPP) includes stormwater management practices (SMP's) from the publication "New York State Stormwater Management Design Manual," last revised January 2015.

A Stormwater Pollution Prevention Plan has been prepared for this project because it is a construction activity that involves:

- Soil disturbances of one (1) or more acres of land.

The proposed stormwater facilities have been designed such that the quantity and quality of stormwater runoff during and after construction are not adversely altered or are enhanced when compared to pre-development conditions.

Based on the GIS information provided by the website of the New York State Office of Parks, Recreation and Historic Places, the site does not contain, nor is it immediately adjacent to any properties listed on the State or National Register of Historic Places.

The applicant will provide additional information to the ORPHP to engage in continuing discussions as the project moves forward with the input of ORPHP.

The Six Step Process for Stormwater Site Planning and Practice Selection

Stormwater management using green infrastructure is summarized in the six step process described below. The six step process was adhered to when developing this SWPPP. Information is provided in this SWPPP which documents compliance with the required process as follows:

Step 1: Site Planning

Implement planning practices that protect natural resources and utilize the hydrology of the site. Strong consideration must be given to reducing impervious cover to aid in the preservation of natural resources including protecting natural areas, avoiding sensitive areas and minimizing grading and soil disturbance.

Step 2: Determine Water Quality Treatment Volume (WQv)

Determine the required WQv for the site based on the site layout, impervious areas and sub-catchments. This initial calculation of WQv will have to be revised after green infrastructure techniques are applied. The following method has been used to calculate the WQv.

- **90% Rule -** According to the New York State Stormwater Design Manual, Section 4.1, the water quality volume is determined from the 90% rule. The method is based on 90% of the average annual stormwater runoff volume which must be provided due to impervious surfaces. The Water Quality Volume (denoted as the WQv) is designed to improve water quality sizing to capture and treat 90% of the average annual stormwater runoff volume. The WQv is directly related to the amount of impervious cover created at a site. The average rainfall storm depth for 90% of storms in New York State in one year is used to calculate a volume of runoff. The rainfall depth depends on the location of the site within the state. From this depth of rainfall, the required water quality volume is calculated.

Step 3: Runoff Reduction Volumes (RRv) by Applying Green Infrastructure Techniques and Standard SMP's

RRv is required for this project since it is a new development.

Green infrastructure techniques or standard SMP's with RRv capacity can potentially reduce the required WQv by incorporating combinations of green infrastructure techniques and standard SMP's within each drainage area on the site.

Green infrastructure techniques are grouped into two categories:

- Practices resulting in a reduction of contributing area such as preservation/restoration of conservation areas, vegetated channels, etc.
- Practices resulting in a reduction of contributing volume such as green roofs, stormwater planters, and rain gardens.

Apply a combination of green infrastructure techniques and standard SMPs with RRv capacity to provide 100% of the WQv calculated in Step 2. If the RRv calculated in this step is greater than or equal to the WQv in Step 2, the RRv requirement has been met and Step 4 can be skipped. If the RRv provided cannot meet or exceed 100% of the WQv, the project must, at a minimum,

reduce a percentage of the runoff from impervious areas to be constructed on the site. The percent reduction is based on the Hydrologic Soil Group(s) (HSG) of the site and is defined as Specific Reduction Factor (S).

The following green infrastructure techniques and practices are provided in the Design Manual:

- **Conservation of Natural Areas**
- **Sheet flow to Riparian Buffers or Filter Strips**
- **Vegetated Swales**
- **Tree Planting / Tree Pits**
- **Disconnection of Rooftop Runoff**
- **Stream Daylighting**
- **Rain Gardens**
- **Green Roofs**
- **Stormwater Planters**
- **Rain Barrels and Cisterns**
- **Porous Paving**
- **Standard Practices with RRv Capacity**
    - **Biofilters and Bioretention Basins**
    - **Infiltration Practices**

The Minimum RRv capacity required must be provided by green infrastructure techniques to verify that the RRv requirement has been met. The RRv that is provided by the green infrastructure techniques can then be subtracted from the Total Required WQv that must be provided by the SMP's.

Step 4: Determine the minimum RRv Required

The minimum RRv is calculated similar to the WQV. However, it is determined using only the new impervious cover and accounts for the hydrologic soil group present. In no case shall the

runoff reduction achieved from the newly constructed impervious area be less than the minimum runoff reduction volume (RRv_{min}).

Step 5: Apply Standard Stormwater Management Practices to Address Remaining Water Quality Volume

Apply the standard SMP's to meet additional water quality volume requirements that cannot be addressed by applying the green infrastructure techniques. The standard SMP's with RRv capacity must be implemented to verify that the RRv requirement has been met.

- **Biofilters and Bioretention Basins**
- **Pocket Pond**
- **Dry Swale**

Step 6: Apply Volume and Peak Rate Control Practices to Meet Water Quantity Requirements

The Channel Protection Volume (CPv), Overbank Flood Control (Qp) and Extreme Flood Control (Qf) must be met for the plan to be completed. This is accomplished by using practices such as infiltration basins, dry detention basins, etc. to meet water quantity requirements. The following standards must be met:

1. **Stream Channel Protection (CPv)**

   Stream Channel Protection Volume Requirements (CPv) are designed to protect stream channels from erosion. In New York State this goal is accomplished by providing 24-hour extended detention of the one-year, 24-hour storm event, remained from runoff reduction. Reduction of runoff for meeting stream channel protection objectives, where site conditions allow, is encouraged and the volume reduction achieved through green infrastructure can be deducted from CPv. Trout waters may be exempted from the 24-hour ED requirement, with only 12 hours of extended

detention required to meet this criterion. Detention time may be calculated using either a center of mass method or plug flow calculation method.

- CPv is not required because reduction of the entire CPv volume is achieved at a site through green infrastructure or infiltration systems.
- CPv is not required because the site discharges directly tidal waters or fifth order (fifth downstream) or larger streams.
- CPv for a redevelopment project is not required if there is no increase in impervious area or changes to hydrology that increase the discharge rate. This criterion, as defined in Chapter 4 of New York State Stormwater Design Manual, is not based on a pre versus post-development comparison. However, for a redevelopment project this requirement is relaxed. If the hydrology and hydraulic study shows that the post-construction 1-year 24 hour discharge rate and velocity are less than or equal to the pre-construction discharge rate, providing 24 hour detention of the 1-year storm to meet the channel protection criteria is not required.
- According to Section 10.4.3 of the Design Manual, infiltration practices sized for enhanced phosphorus removal automatically meet channel protection requirements.

2. Overbank Flood (Qp) which is the 10 year storm.

Overbank control requires storage to attenuate the post development 10-year, 24-hour peak discharge rate (Qp) to predevelopment rates.

The overbank flood control requirement (Qp) does not apply in certain conditions, including:

- The site discharges directly tidal waters or fifth order (fifth downstream) or larger streams.

- A downstream analysis reveals that overbank control is not needed.

3. Extreme Storm (Qf) which is the 100 year storm.

100 Year Control requires storage to attenuate the post development 100-year, 24-hour peak discharge rate (Qf) to predevelopment rates.

The 100-year storm control requirement can be waived if:

- The site discharges directly tidal waters or fifth order (fifth downstream) or larger streams.
- Development is prohibited within the ultimate 100-year floodplain
- A downstream analysis reveals that 100-year control is not needed.
- If redevelopment results in no increase in impervious area or changes to hydrology that increase the discharge rate from the site the hundred-year criteria does not apply.

Based on the foregoing, this project is eligible for coverage under NYSDEC SPDES General Permit No. GP-0-20-001.

III. STUDY METHODOLOGY

Runoff rates were calculated based upon the standards set forth by the United States Department of Agriculture Natural Resources Conservation Service Technical Release 55, Urban Hydrology for Small Watersheds (TR-55), dated June 1986. The methodology set forth in TR-55 considers a multitude of characteristics for watershed areas including soil types, soil permeability, vegetative cover, time of concentration, topography, rainfall intensity, ponding areas, etc.

The 1, 10, 25, 50 and 100-year storm recurrence intervals were reviewed in the design of the stormwater management facilities (see Appendices **A & B** Existing/Proposed Hydrologic Calculations).

Anticipated drainage conditions were analyzed taking into account the rate of runoff which will result from the construction of buildings, parking areas and other impervious surfaces associated with the site development.

Base Data and Design Criteria

For the stormwater management analysis, the following base information and methodology were used:

1. The site drainage patterns and outfall facilities were reviewed by JMC personnel for the purpose of gathering background data and confirming existing mapping of the watershed areas.

2. A Natural Resource and Existing Drainage Area Map was developed from the topographical survey. The drainage area map reflects the existing conditions within and around the project area.

3. A Proposed Drainage Area Map was developed from the proposed grading design superimposed over the topographical survey. The drainage area map reflects the proposed conditions within the project area and the existing conditions to remain in the surrounding area.

4. The United States Department of Agriculture (USDA) Web Soil Survey of the site available on its website at http://websoilsurvey.nrcd.usda.gov.

5. Soil Survey of Putnam and Westchester Counties, 1994.

6. The United States Department of Agriculture Natural Resources Conservation Service National Engineering Handbook, Section 4 - Hydrology", dated March 1985.

7. The United States Department of Agriculture Natural Resources Conservation Service Technical Report No. 55, Urban Hydrology for Small Watersheds (TR-55), dated June 1986.

8. United States Department of Commerce Weather Bureau Technical Release No. 40 Rainfall Frequency Atlas of the United States.

The time of concentration was calculated using the methods described in Chapter 3 of TR-55, Second Edition, June 1986. Manning's kinematics wave equation was used to determine the travel time of sheet flow. The 2-year 24 hour precipitation amount of **3.5** inches was used in the equation for all storm events. The travel time for shallow concentrated flow was computed using Figure 3-1 and Table 3-1 of TR-55. Manning's Equation was used to determine the travel time for channel reaches.

9. All hydrologic calculations were performed with the Bentley PondPack software package version 10.0.

10. The New York State Stormwater Management Design Manual, revised January 2015.

11. New York Standards and Specifications for Erosion and Sediment Control, November 2016.

12. The storm flows for the 1, 10, 25, 50 & 100-year recurrence interval storms were analyzed for the total watershed areas. The Type III distribution design storm for a 24 hour duration was used and the mass rainfall for each design storm was taken from the Extreme Precipitation in New York & New England developed by the Natural Resource Conservation Service (NRCS) and the Northeast Regional Climate Center (NRCC) as follows:

24 Hour Rainfall Amounts

Design Storm Recurrence Interval	Inches of Rainfall
1 Year	**2.8**
10 Year	**5.1**
25 Year	**6.4**
50 Year	**7.7**
100 Year	**9.1**

http://precip.eas.cornell.edu/

IV. EXISTING CONDITIONS

The existing conditions of the project site consists of mostly wooded area between Saw Mill River Road and Regeneron's north campus driveway with some lawn immediately adjacent to the driveway Saw Mill River Road and Old Saw Mill River Road. The existing topography generally slopes east to west from Saw Mill River Road to the existing driveway. Two existing catch basins located on the north and south sides of the site currently collect stormwater runoff from the site. After stormwater runoff exits the project site, it flows to the Saw Mill River.

The following natural features, conservation areas, resource areas and drainage patterns of the project site have been identified and utilized to develop Drawing DA-1 "Existing Drainage Area Map" which is included in Appendix I:

- Wetlands (jurisdictional, wetland of special concern)
- Buffers (stream, wetland, forest, etc.)
- Forest, vegetative cover
- Critical areas
- Topography (contour lines, existing flow paths, steep slopes, etc.)
- Soil (hydrologic soil groups, highly erodible soils, etc.)

Based on the USDA Web soil survey, all on-site soils are well drained and belong to hydrological group B. The soil types, boundaries and drainage areas/designations are depicted on Drawing DA-1 within Appendix I.

One Design Point was identified for comparing peak rates of runoff in existing and proposed conditions. Similarly, one drainage areas were identified in existing conditions based on the existing drainage divides at the site.

The following is a description of each of the drainage areas analyzed in the existing conditions analysis:

Existing Drainage Area 1 (EDA-1) is **4.3** acres in size and is comprised of the majority of the site. This area consists of mostly woods with some small lawn areas. This drainage area slopes east to west and drains towards the existing catch basins located at low points on the west side of the Regeneron North Campus driveway and eventually the design point. The Curve Number (CN) and Time of Concentration (Tc) for this drainage area are **55** and **16.92** minutes, respectively. Refer to Drawing DA-1 in Appendix I.

The peak rates of runoff to the design points from the drainage areas for each storm are shown in the table below:

Table 1
Summary of Peak Rates of Runoff in Existing Conditions
(Cubic Feet per Second)

Storm Recurrence Interval	DP-1
1 year	0.42
10 year	4.92
25 year	8.70
50 year	12.68
100 year	17.84

V. PROPOSED CONDITIONS

The proposed improvements consist of the removal of existing vegetation and construction of the 16,450 square foot daycare center. The daycare will also include an approximately 4,800 square foot play area as well as associated parking, drop-off area and landscaping. The proposed topography of the site will continue to slope east to west as in existing conditions, with a proposed series of catch basins and underground pipes to collect and convey stormwater to the proposed drainage system. The proposed drainage system will consist of a bioretention area and a pocket pond to meet water quality and quantity requirements.

This section describes the design and analysis of the proposed conditions used to demonstrate that the SWPPP meets the requirements of the General Permit.

The Six Step Process For Stormwater Site Planning and Practice Selection

Step 1: Site Planning

The following practices and site features were incorporated in the site design:

- **Preserving hydrology - Maintaining drainage divides**
- **Wetlands and buffers – This project requires the disturbance of 2,500 s.f. of wetland buffers.**
- **Floodplain considerations - The site does (does not) lie within the 100 year flood zone according to the National Flood Insurance Program Flood Insurance Rate Map.**
- **Forest, vegetative cover – The maximum amount of forest and vegetative cover has been maintained and/or provided.**
- **Topography (contour lines, existing flow paths, steep slopes, etc.) has been maintained or disturbed to the minimum extent practicable.**
- **Soil (hydrologic soil groups, highly erodible soils, etc.)**

Step 2: Determine Water Quality Treatment Volume (WQv)

WQV = (P x RV x A) / 12

Step 3: Runoff Reduction Volumes (RRv) by Applying Green Infrastructure Techniques and Standard SMP's

- **Bioretention Area**

Step 4: Determine the minimum RRv Required

RRv_{min} calculations can be found in Appendix 'C'. RRv_{min} was met through the Bioretention area which is an SMP with RRv capacity.

Step 5: Apply Standard Stormwater Management Practices to Address Remaining Water Quality Volume

Stormwater Ponds

Pocket Pond (P-5)

Stormwater ponds are practices that have either a permanent pool of water, or a combination of a permanent pool and extended detention, and some elements of a shallow marsh equivalent to the entire WQv. The term "pocket" refers to a pond or wetland that has such a small contributing drainage area that little or no baseflow is available to sustain water elevations during dry weather. Instead, water elevations are heavily influenced, and in some cases maintained, by a locally high water table.

Open Channel Systems

Dry Swale (O-1)

Open channel systems are vegetated open channels that are explicitly designed to capture and treat the full WQv within dry or wet cells formed by check dams or other means.

Filtering Systems

Bioretention (F-5)

Bioretention systems capture and temporarily store the WQv and pass it through a filter bed of sand, organic matter, or soil. Filtered runoff may be collected and returned to the conveyance system, or allowed to partially exfiltrate into the soil.

Step 6: Apply Volume and Peak Rate Control Practices to Meet Water Quantity Requirements

The Channel Protection Volume (CPv), Overbank Flood Control (Qp) and Extreme Flood Control (Qf) must be met for the plan to be completed. This is accomplished by using practices such as infiltration basins, dry detention basins, etc. to meet water quantity requirements. The following standards must be met:

1. **Stream Channel Protection (CPv)**

   Stream Channel Protection Volume Requirements (CPv) are designed to protect stream channels from erosion. In New York State this goal is accomplished by providing 24-hour extended detention of the one-year, 24-hour storm event, remained from runoff reduction. Reduction of runoff for meeting stream channel protection objectives, where site conditions allow, is encouraged and the volume reduction achieved through green infrastructure can be deducted from CPv. Trout waters may be exempted from the 24-hour ED requirement, with only 12 hours of extended detention required to meet this criterion. Detention time may be calculated using either a center of mass method or plug flow calculation method.

- The CPv requirement is met through extended detention in the proposed pocket pond.

2. **Overbank Flood (Qp) which is the 10 year storm.**

   Overbank control requires storage to attenuate the post development 10-year, 24-hour peak discharge rate (Qp) to predevelopment rates.

   - The overbank flood control requirement is met through the proposed stormwater practices.

3. **Extreme Storm (Qf) which is the 100 year storm.**

   100 Year Control requires storage to attenuate the post development 100-year, 24-hour peak discharge rate (Qf) to predevelopment rates.

   - The extreme storm requirement is met through the proposed stormwater practices.

Based on the foregoing, this project is eligible for coverage under NYSDEC SPDES General Permit No. GP-0-20-001.

All proposed practices exceed the required elements of SMP criteria as outlined in Chapter 6 of the NYS Stormwater Management Design Manual. A summary of each category is provided below.

1. Feasibility – Stormwater practices are designed based upon unique physical environmental considerations noted in the NYS Stormwater Management Design Manual (NYSSMDM).

2. Conveyance – The design conveys runoff to the designed stormwater practice in a manner that is safe, minimizes erosion and disruption to natural drainage channel and promotes filtering and

infiltration.

3. Pretreatment – All stormwater practices provide pretreatment as required in accordance with the NYSSMDM guidelines.

4. Treatment Geometry – The plan provides water quality treatment in accordance with NYSSMDM guidelines.

5. Environmental/Landscaping –Extensive landscaping has been provided for each proposed stormwater practice to enhance pollutant removal and provide aesthetic enhancement to the property.

6. Maintenance – Maintenance for the environment practices has been provided and is detain the SWPPP Report as required. Maintenance access is provided in the design plans.

In order to determine the post-development rates of runoff generated on-site, the following drainage areas were analyzed in the post-development conditions. These areas are graphically depicted on Drawing DA-2 "Proposed Drainage Area Map" located in Appendix I.

One Design Point was identified for comparing peak rates of runoff in existing and proposed conditions. Two drainage areas were identified in proposed conditions based on the proposed drainage divides at the site.

The following is a description of each of the drainage areas analyzed in the proposed conditions analysis:

Proposed Drainage Area 1A (PDA-1A) is 1.12 acres in size and is located on the southwest side of the site adjacent to Old Saw Mill River Road. This area consists of the south side of the proposed building and the southern parking area, as well as lawn and landscaped areas. stormwater runoff from this drainage area drains towards the proposed bioretention area in the landscaped area adjacent to Old Saw Mill River Road. The bioretention area consists of a 12 inch ponding layer, three inch mulch layer 30 inch planting soil layer and 12 inch gravel layer with an

eight inch perforated underdrain. The bioretention area has been designed to meet the water quality requirement for this drainage area and provides the runoff reduction volume requirement for the site. The Curve Number (CN) and Time of Concentration (Tc) for this drainage area are 79 and 5 minutes, respectively. Refer to Drawing DA-2 in Appendix I.

Proposed Drainage Area 1B (PDA-1B) is 3.27 acres in size and is located on the northeastern portion of the site along Saw Mill River Road and the wetland to the north. This area consists of the majority of the proposed improvements including the daycare building, sidewalks, driveways, parking, drop-off area, play area, lawn, landscaped and wooded areas. This drainage area is collected and conveyed by a series of proposed catch basins and underground HDPE pipes towards the Pocket Pond (P-5) located on the north side of the site. A pocket pond has been selected as the best management practice for this drainage area due to the high groundwater encountered in this area during the various soil testing performed on site. The pocket pond works with the groundwater table to maintain a permanent water surface elevation. Runoff from the proposed improvements will enter the forebay of the pond first for pre-treatment and then flow into the permanent pool. An outlet control structure has been designed to detain and slowly release stormwater runoff out of the pond to meet both water quality and quantity requirements. The Curve Number (CN) and Time of Concentration (Tc) for this drainage area are 66 and 5.0 minutes, respectively. Refer to Drawing DA-2 in Appendix I.

Proposed Drainage Area 1C (PDA-1B) is 1.16 acres in size and is located on the west side of the site. This area consists of the existing trees to remain, a portion of the existing Regeneron driveway, and landscaped area on the west side of the existing driveway. This drainage area drains east to west towards a proposed dry swale adjacent to the temporary parking area. The dryswale consists of a 30 inch soil layer and a gravel layer with a perforated underdrain. Runoff exits the dryswale and discharges into an existing drain inlet to the west. The Curve Number (CN) and Time of Concentration (Tc) for this drainage area are 72 and 10 minutes, respectively. Refer to Drawing DA-2 in Appendix I.

The peak rates of runoff to the design point of each of the analyzed drainage areas for each storm are shown on the table below:

Table 3
Summary of Proposed Peak Rates of Runoff in Proposed Conditions
(Cubic Feet per Second)

Storm Recurrence Interval	DP-1
1 year	0.32
10 year	3.00
25 year	6.90
50 year	9.70
100 year	14.18

The reductions in peak rates of runoff from proposed to existing conditions are shown on the table below:

Table 4
Percent Reductions in Peak Rates of Runoff (Existing vs. Proposed Conditions)
(Cubic Feet per Second)

Design Point	Storm Recurrence Frequency (Years)	Existing Peak Runoff Rate (cfs)	Proposed Peak Runoff Rate (cfs)	Percent Reduction (%)
1	1 year	0.42	0.32	23
	10 year	4.92	3.00	39
	25 year	8.70	6.90	20
	50 year	12.68	9.70	23
	100 year	17.84	14.18	20

As demonstrated in Table 4, the proposed stormwater improvements will result in significant reductions of peak rates of runoff for all storms and design points analyzed.

VI. SOIL EROSION & SEDIMENT CONTROL

A potential impact of the proposed development on any soils or slopes will be that of erosion and transport of sediment during construction. An Erosion and Sediment Control Management Program will be established for the proposed development, beginning at the start of construction and continuing throughout its course, as outlined in the "New York State Standards and Specifications for Erosion and Sediment Control," November 2016. A continuing maintenance

program will be implemented for the control of sediment transport and erosion control after construction and throughout the useful life of the project.

The Operator shall have a qualified professional conduct an assessment of the site prior to the commencement of construction and certify that the appropriate erosion and sediment controls, as shown on the Sediment & Erosion Control Plans, have been adequately installed to ensure overall preparedness of the site for the commencement of construction. In addition, the Operator shall have a qualified professional conduct one site inspection at least every seven calendar days and at least two site inspections every seven calendar days when greater than five acres of soil is disturbed at any one time.

Prior to the commencement of construction activity, the owner or operator must identify the contractor(s) and subcontractor(s) that will be responsible for installing, constructing, repairing, replacing, inspecting and maintaining the erosion and sediment control practices included in the SWPPP; and the contractor(s) and subcontractor(s) that will be responsible for constructing the post-construction stormwater management practices included in the SWPPP. The owner or operator shall have each of the contractors and subcontractors identify at least one person from their company that will be responsible for implementation of the SWPPP. This person shall be known as the trained contractor. The owner or operator shall ensure that at least one trained contractor is on site on a daily basis when soil disturbance activities are being performed. The owner or operator shall have each of the contractors and subcontractors identified above sign a copy of the certification statement provided in Appendix F before they commence any construction activity.

Soil Description

As provided by the United States Department of Agriculture, Soil Conservation Service "Web Soil Survey," soil classifications which exist on the subject site are described below.

Soils are placed into four hydrologic groups: A, B, C, and D. In the definitions of the classes, infiltration rate is the rate at which water enters the soil at the surface and is controlled by the

surface conditions. Transmission rate is the rate at which water moves in the soil and is controlled by soil properties. Definitions of the classes are as follows:

A. (Low runoff potential). The soils have a high infiltration rate even when thoroughly wetted. They chiefly consist of deep, well drained to excessively drained sands or gravels. They have a high rate of water transmission.

B. The soils have a moderate infiltration rate when thoroughly wetted. They chiefly are moderately deep to deep, moderately well drained to well drained soils that have moderately fine to moderately coarse textures. They have a moderate rate of water transmission.

C. The soils have a slow infiltration rate when thoroughly wetted. They chiefly have a layer that impedes downward movement of water or have moderately fine to fine texture. They have a slow rate of water transmission.

D. (High runoff potential). The soils have a very slow infiltration rate when thoroughly wetted. They chiefly consist of clay soils that have a high swelling potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. They have a very slow rate of water transmission.

A soil's tendency to erode is also described in the USDA web soil survey. The ratings in this interpretation indicate the hazard of soil loss from unsurfaced areas. The ratings are based on soil erosion factor K, slope, and content of rock fragments. The hazard is described as "slight," "moderate," or "SEVERE." A rating of "slight" indicates that little or no erosion is likely; "moderate" indicates that some erosion is likely, that the temporarily unsurfaced / unstabilized during construction may require occasional maintenance, and that simple erosion-control measures are needed; and "SEVERE" indicates that significant erosion is expected, that the roads or trails require frequent maintenance, and that erosion-control measures are needed.

Per the Soil Survey, the following soils listed below are present at the site. Following this list is a detailed description of each soil type found on the property:

SYM.	HYDRO. SOIL GROUP	DESCRIPTION
ChB	**B,**	**Charlton Fine Sandy Loam, 3-8% slopes**

ChB, Charlton Fine Sandy Loam, 3 TO 8 PERCENT SLOPE

This soil is gently sloping, very deep and well drained. The parent material consists of glacial till derived from granite, schist and gneiss. Depth to the top of a seasonal high water table is greater than six feet. Available water capacity is moderate.

Hydrologic group: **B**
Erosion Hazard Rating: **SLIGHT**

On-Site Pollution Prevention

There are temporary pollution prevention measures used to control litter and construction debris on site, such as:

- Silt Fence
- Silt Sack
- Stone Check Dam
- Excavated Drop Inlet Protection

There will be inlet protection provided for all storm drains and inlets with the use of curb gutter inlet protection structures and stone & block drop inlet protection, which keep silt, sediment and construction litter and debris out of the on-site stormwater drainage system.

Temporary Control Measures

Temporary control measures and facilities will include silt fences, construction ditches, stabilized construction access, temporary seeding, mulching and sediment traps with temporary riser and anti-vortex devices.

Throughout the construction of the proposed development, temporary control facilities will be implemented to control on-site erosion and sediment transfer. Construction ditches, if required, will be used to direct stormwater runoff to temporary sediment traps for settlement. The sediment traps will be constructed as part of this project will serve as temporary sediment basins to remove sediment and pollutants from the stormwater runoff produced during construction. Descriptions of the temporary sediment & erosion controls that will be used during the development of the site including silt fence, stabilized construction access, seeding, mulching and inlet protection are as follows:

1. Silt Fence is constructed using a geotextile fabric. The fence will be either 18 inches or 30 inches high. The height of the fence can be increased in the event of placing these devices on uncompacted fills or extremely loose undisturbed soils. The fences will not be placed in areas which receive concentrated flows such as ditches, swales and channels nor will the filter fabric material be placed across the entrance to pipes, culverts, spillway structures, sediment traps or basins.

2. Stabilized Construction Access consists of AASHTO No. 1 rock. The rock entrance will be a minimum of 50 feet in length by 24 feet in width by 8 inches in depth.

3. Seeding will be used to create a vegetative surface to stabilize disturbed earth until at least 80% of the disturbed area has a perennial vegetative cover. This amount is required to adequately function as a sediment and erosion control facility. Grass lining will also be used to line temporary channels and the surrounding disturbed areas.

4. Mulching is used as an anchor for seeding and disturbed areas to reduce soil loss due to storm events. These areas will be mulched with straw at a rate of 3 tons per acre such that the mulch forms a continuous blanket. Mulch must be placed after seeding or within 48 hours after seeding is completed.

5. Inlet Protection will be provided for all stormwater basins and inlets with the use of curb & gutter inlet protection and stone & block inlet protection structures, which will keep silt, sediment and construction debris out of the storm system. Existing structures within existing paved areas will be protected using "Silt Sacks" inside the structures.

6. Erosion Control Matting will be utilized on slopes and within swales, where applicable, to provide stabilization in advance of vegetation being established. Such matting will be biodegradable to facilitate long term growth of vegetation in swales, on slopes and within stormwater management facilities.

7. Sediments Traps will be used with the permanent SMP's until their contributing areas are stabilized. Once stabilized, the temporary risers will be removed and final grading/planting of the basins will be completed for permanent use as Stormwater Management basins.

8. Stone Check Dams are small barriers of crushed stone which will be laid across the grass swales which are approximately 12 inches high, located every one foot of elevation change along the swales so that the crest elevation of the downstream dam is at the same elevation of the toe of the upstream dam.

The contractor shall be responsible for maintaining the temporary sediment and erosion control measures throughout construction. This maintenance will include, but not be limited to, the following tasks:

1. For dust control purposes, moisten all exposed graded areas with water at least twice a day in those areas where soil is exposed and cannot be planted with a temporary cover due to construction operations or the season (December through March).

2. Inspection of erosion and sediment control measures shall be performed at the end of each construction day and immediately following each rainfall event. All required repairs shall be immediately executed by the contractor.

3. Sediment deposits shall be removed when they reach approximately ⅓ the height of the silt fence. All such sediment shall be properly disposed of in fill areas on the site, as directed by the Owner's Field Representative. Fill shall be protected following disposal with mulch, temporary and/or permanent vegetation and be completely circumscribed on the downhill side by silt fence.

4. Rake all exposed areas parallel to the slope during earthwork operations.

5. Following final grading, the disturbed area shall be stabilized with a permanent surface treatment (i.e. turf grass, pavement or sidewalk). During rough grading, areas which are not to be disturbed for fourteen or more days shall be stabilized with the temporary seed mixture, as defined on the plans. Seed all piles of dirt in exposed soil areas that will not receive a permanent surface treatment.

<u>Concrete Material and Equipment Management</u>

Concrete washouts shall be used to contain concrete and liquids when the chutes of concrete mixers and hoppers of concrete pumps are rinsed out after delivery. The washout facilities consolidate solid for easier disposal and prevent runoff of liquids. The wash water is alkaline and contains high levels of chromium, which can leach into the ground and contaminate groundwater. It can also migrate to a storm drain, which can increase the pH of area waters and harm aquatic life. Solids that are improperly disposed of can clog storm drain pipes and cause flooding. Installing concrete washout facilities not only prevents pollution but also is a matter of good housekeeping at your construction site.

Prefabricated concrete washout containers can be delivered to the site to provide maintenance and disposal of materials. Regular pick-ups of solid and liquid waste materials will be necessary.

To prevent leaks on the job site, ensure that prefabricated washout containers are watertight. A self installed concrete washout facility can be utilized although they are much less reliable than prefabricated containers and are prone to leaks. There are many design options for the washout, but they are preferably built below-grade to prevent breaches and reduce the likelihood of runoff. Above-grade structures can also be used if they are sized and constructed correctly and are diligently maintained. One of the most common problems with self-installed concrete washout facilities is that they can leak or be breached as a result of constant use, therefore the contractor shall be sure to use quality materials and inspect the facilities on a daily basis.

Washouts must be sized to handle solids, wash water, and rainfall to prevent overflow. Concrete Washout Systems, Inc. estimates that 7 gallons of wash water are used to wash one truck chute and 50 gallons are used to wash out the hopper of a concrete pump truck.

For larger sites, a below-grade washout should be at least 10 feet wide and sized to contain all liquid and solid waste expected to be generated in between cleanout periods. A minimum of 12-inches of freeboard must be provided. The pit must be lined with plastic sheeting of at least 10-mil thickness without holes or tears to prevent leaching of liquids into the ground. Concrete wash water should never be placed in a pit that is connected to the storm drain system or that drains to nearby waterways.

An above-grade washout can be constructed at least 10 feet wide by 10 feet long and sized to contain all liquid and solid waste expected to be generated in between cleanout periods. A minimum of 4-inches of freeboard must be provided. The washout structures can be constructed with staked straw bales or sandbags double-or triple lined with plastic sheeting of at least 10-mil thickness without holes or tears.

Concrete washout facilities shall not be located within 50 feet of storm drains, open ditches, or water bodies and should be placed in locations that allow for convenient access for concrete trucks. The contractor shall check all concrete washout facilities daily to determine if they have been filled to 75 percent capacity, which is when materials need to be removed. Both above-and

below-ground self-installed washouts should be inspected daily to ensure that plastic linings are intact and sidewalls have not been damaged by construction activities. Prefabricated washout containers should be inspected daily as well as to ensure the container is not leaking or nearing 75 percent capacity. Inspectors should also note whether the facilities are being used regularly. Additional signage for washouts may be needed in more convenient locations if concrete truck operators are not utilizing them.

The washout structures must be drained or covered prior to predicted rainstorms to prevent overflows. Hardened solids either whole or broken must be removed and then they may be reused onsite or hauled away for recycling.

Once materials are removed from the concrete washout, a new structure must be built or excavated, or if the previous structure is still intact, inspect it for signs of weakening or damage and make any necessary repairs. Line the structure with new plastic that is free of holes or tears and replace signage if necessary. It is very important that new plastic be used after every cleaning because pumps and concrete removal equipment can damage the existing liner.

Construction Site Chemical Control

The purpose of this management measure is to prevent the generation of nonpoint source pollution from construction sites due to improper handling and usage of nutrients and toxic substances, and to prevent the movement of toxic substances from the construction site.

Many potential pollutants other than sediment are associated with construction activities. These pollutants include pesticides; fertilizers used for vegetative stabilization; petrochemicals; construction chemicals such as concrete products, sealers, and paints; wash water associated with these products; paper; wood; garbage; and sanitary waste.

Disposal of excess pesticides and pesticide-related wastes should conform to registered label directions for the disposal and storage of pesticides and pesticide containers set forth in

applicable Federal, State and local regulations that govern their usage, handling, storage, and disposal.

Pesticides should be disposed of through either a licensed waste management firm or a treatment, storage and disposal (TSD) facility. Containers should be triple-rinsed before disposal, and rinse waters should be reused as product.
Other practices include setting aside a locked storage area, tightly closing lids, storing in a cool, dry place, checking containers periodically for leaks or deterioration, maintaining a list of products in storage, using plastic sheeting to line the storage areas, and notifying neighboring property owners prior to spraying.

When storing petroleum products, follow these guidelines:

- Create a shelter around the area with cover and wind protection;
- Line the storage area with a double layer of plastic sheeting or similar material;
- Create an impervious berm around the perimeter with a capacity of 110 percent greater than that of the largest container;
- Clearly label all products;
- Keep tanks off the ground; and
- Keep lids securely fastened.

Post spill procedure information and have persons trained in spill handling on site or on call at all times. Materials for cleaning up spills should be kept on site and easily available. Spills should be cleaned up immediately and the contaminated material properly disposed of. Maintain and wash equipment and machinery in confined areas specifically designed to control runoff.

Thinners or solvents should not be discharged into sanitary or storm systems when cleaning machinery. Use alternative methods for cleaning larger equipment parts, such as high-pressure, high-temperature water washes, or steam cleaning. Equipment-washing detergents can be used, and wash water may be discharged into sanitary sewers if solids are removed from the solution first. (This practice should be verified with the local sewer authority.) Small parts can be cleaned

with degreasing solvents, which can then be reused or recycled.

Solid Waste Management and Portable Sanitary Management

The purpose of this management measure is to prevent the potential for solid waste such as construction debris, trash, etc. from construction sites due to improper handling and storage. Debris and litter should be removed periodically from the BMP's and surrounding areas to prevent clogging of pipes and structures. All construction material shall be stored in designated staging areas. Roll-off containers shall be placed on site and all empty containers, construction debris and litter shall be placed in the containers.

Portable sanitary units may be utilized on-site or bathrooms will be provided within construction trailers. A sanitation removal company will be hired to pump/remove any sanitary waste. In the event that portable sanitary units are used and then cleaned after being emptied, the rinse water may not be disposed of to the storm drain system. It shall be contained for later disposal if it can't be disposed of on-site. Remove paper and trash before cleaning the portable sanitary units. The portable sanitary units shall be located away from the storm drain system if possible. Provide over head cover for wash areas if possible. Maintain spill response material and equipment on site to eliminate the potential for contaminants and wash water from entering the storm drain system.

Permanent Control Measures and Facilities for Long Term Protection

Towards the completion of construction, permanent sediment and erosion control measures will be developed for long term erosion protection. The following permanent control measures and facilities have been proposed to be implemented for the project:

1. Vegetated Swales will function to provide additional treatment of stormwater runoff by removal of pollutants and will promote a reduction of peak flows and provide runoff infiltration.

2. Pocket Pond will be used to treat the runoff volume generated from the developed area and provide improvement to water quality control. The water quality volume will be retained and higher storms will be released gradually. Refer to the water quality volume calculations, in Appendix 'C'.

3. Bioretention will be used to treat runoff as it flows through a soil matrix, and is returned to the storm drain system. Refer to the water quality volume calculations, in Appendix 'C'.

4. Dry Swale will be used to to treat a portion of the proposed and existing improvements. It consists of an open drainage channel or depression explicitly designed to detain and promote the filtration of stormwater runoff into the soil media.

5. Catch Basins will be used to remove some of the coarse sand and grit sediment before entering the drainage system. Each catch basin will be constructed with an 18 inch deep sump.

6. Rip-Rap Energy Dissipators At discharge points from the stormwater drainage system into the stormwater management basins, rip-rap pads consisting of angular rocks will be placed to dissipate velocity and reduce the risk of erosion.

7. Seeding of at least 70% perennial vegetative cover will be used to produce a permanent uniform erosion resistant surface. The seeded areas will be mulched with straw at a rate of 2 tons per acre such that the mulch forms a continuous blanket.

Specifications for Soil Restoration

Prior to the final stabilization of the disturbed areas, soil restoration will be required for all vegetated areas to recover the original properties and porosity of the soil. Soil Restoration Requirements are provided on Table 7 below:

Table 7

Soil Restoration Requirements

<table>
<tr><th>Type of Soil Disturbance</th><th colspan="2">Soil Restoration Requirement</th><th>Comments/Examples</th></tr>
<tr><td>No soil disturbance</td><td colspan="2">Restoration not permitted</td><td>Preservation of Natural Features</td></tr>
<tr><td>Minimal soil disturbance</td><td colspan="2">Restoration not required</td><td>Clearing and grubbing</td></tr>
<tr><td rowspan="2">Areas where topsoil is stripped only – no change in grade</td><td>HSG A&B</td><td>HSG C&D</td><td rowspan="2">Protect area from any ongoing construction activities</td></tr>
<tr><td>apply 6 inches of topsoil</td><td>Aerate* and apply 6 inches of topsoil</td></tr>
<tr><td rowspan="2">Areas of cut or fill</td><td>HSG A&B</td><td>HSG C&D</td><td rowspan="2">Clearing and grubbing</td></tr>
<tr><td>Aerate and apply 6 inches of topsoil</td><td>Apply full Soil Restoration**</td></tr>
<tr><td>Heavy traffic areas on site (especially) in a zone 5-25 feet around buildings but not within a 5 foot perimeter around foundation walls)</td><td colspan="2">Apply full Soil Restoration (decompaction and compost enhancement)</td><td></td></tr>
<tr><td>Areas where Runoff Reduction and/or Infiltration practices are applied</td><td colspan="2">Restoration not required, but may be applied to enhance the reduction specified for appropriate practices.</td><td>Keep construction equipment from crossing these areas. To protect newly installed practice from any ongoing construction activities construct a single phase operation fence area.</td></tr>
<tr><td>Redevelopment projects</td><td colspan="2">Soil Restoration is required on redevelopment projects in areas where existing impervious area will be converted to pervious area.</td><td></td></tr>
</table>

* Aeration includes the use of machines such as tractor-drawn implements with coulters making a narrow slit in the soil, a roller with many spikes making indentations in the soil, or prongs which function like a mini-subsoiler.

** Per "Deep Ripping and De-compaction, DEC 2008."

During periods of relatively low to moderate subsoil moisture, the disturbed subsoils are returned to rough grade and the following full soil restoration steps applied:

1. Apply 3 inches of compost over subsoil.

2. Till compost into subsoil to a depth of at least 12 inches 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 four inches and larger size are cleaned off the site.

Specifications for Final Stabilization of Graded Areas

Final stabilization of graded areas consists of the placement of topsoil and installation of landscaping (unless the area is to be paved, or a building is to be constructed in the location). Topsoil is to be spread as soon as grading operations are completed. Topsoil is to be placed to a minimum depth of six inches on all embankments, planting areas and seeding/sod areas. The subgrade is to be scarified to a depth of two inches to provide a bond of the topsoil with the subsoil. Topsoil is to be raked to an even surface and cleared of all debris, roots, stones and other unsatisfactory material.

Planting operations shall be conducted under favorable weather conditions as follows:

- Permanent Lawns - April 15 (provided soil is frost-free and not excessively moist) to May 15; August 15 to October 15.
- Temporary Lawn Seeding - if outside of the time periods noted above, the areas shall be seeded immediately on completion of topsoil operations with annual ryegrass (Italian rye) at a rate of six pounds per 1,000 square feet. Temporary lawn installation is permitted provided the soil is frost-free and not excessively moist. The permanent lawn is to be installed the next planting season.

On slopes with a grade of 3 horizontal to 1 vertical or greater, and in swales, a geotextile netting or mat shall be installed for stabilization purposes as shown on the Plans. Seeded areas are to be mulched with straw or hay at an application rate of 70-90 pounds per 1,000 s.f. Straw or hay mulch must be spread uniformly and anchored immediately after spreading to prevent wind blowing. Mulches must be inspected periodically and in particular after rainstorms to check for erosion. If erosion is observed, additional mulch must be applied. Netting shall be inspected after rainstorms for dislocation or failure; any damage shall be repaired immediately.

All denuded surfaces which will be exposed for a period of over two months or more shall be temporarily hydroseeded with (a) perennial ryegrass at a rate of 40 lbs per acre (1.0 lb per 1000 square feet); (b) Certified "Aroostook" winter rye (cereal rye) @ 100 lb per acre (2.5 lb/1000 s.f.) to be used in the months of October and November.

Permanent turfgrass cover is to consist of a seed mixture as follows:

(a) Sunny sites

Kentucky Bluegrass	2.0-2.6 pounds/1000 square feet
Perennial Ryegrass	0.6-0.7 pounds/1000 square feet
Fine Fescue	0.4-0.6 pounds/1000 square feet

(b) Shady sites

Kentucky Bluegrass	0.8-1.0 pounds/1000 square feet
Perennial Ryegrass	0.6-0.7 pounds/1000 square feet
Fine Fescue	2.6-3.3 pounds/1000 square feet

All plant materials shall comply with the standards of the American Association Of Nurserymen with respect to height and caliper as described in its publication American Standard for Nursery Stock, latest edition.

VII. CONSTRUCTION PHASE AND POST-CONSTRUCTION MAINTENANCE

During the construction phase and following construction of the project, a number of maintenance measures will be taken with respect to the site maintenance. Measures to be taken included the following:

1. During Construction

A comprehensive sediment and erosion control plan will be in place during the construction period. Maintenance measures for sediment and erosion controls will include:

A qualified professional acceptable to the municipality will be hired by the owner or operator to monitor the installation and maintenance of the sediment and erosion control plans. The qualified professional shall report directly to the Engineering Consultant and shall be responsible for ensuring compliance with the design of the sediment and erosion control plans.

The qualified professional so hired will inspect all sediment and erosion control measures at least every seven calendar days. In the event that there has been a variance with the design of the sediment and erosion control measures so that the ability of the measures to adequately perform the intended function is lessened or compromised and/or the facilities are not adequately maintained, the qualified professional shall be required to report such variance to the Engineering Consultant within 48 hours and shall be empowered to order immediate repairs to the sediment and erosion control measures.

The qualified professional will also be responsible for observing the adequacy of the vegetation growth (trees, shrubs, groundcovers and turfgrasses) in newly graded areas and for ordering additional plantings in the event that the established plant materials do not adequately protect the ground surface from erosion.

2. Following Construction

Site maintenance activities on the property will include:

- Grounds maintenance, including mowing of lawns;
- Planting of trees, shrubs and groundcovers; pruning of trees and shrubs;
- Application of fertilizer and herbicides;
- Maintenance of stormwater management area;

Grounds maintenance on the site will be performed by landscaping contractor.

Fertilizer is typically applied twice in the year - once in the spring and once in the fall. The application of fertilizer is usually necessary to maintain healthy lawn growth due to competition for nutrients with trees and shrubs and since the clippings are often removed. It is not recommended that fertilizer be applied during the summer. It is at this time that lawns are typically dormant.

Fertilizers come in three basic types: (1) Organic; (2) Soluble synthetic and (3) Slow release.

Organic fertilizers are derived from plant or animal waste. Since they are heavier and bulkier than other fertilizers, it is necessary to apply a much greater amount at one time. Soluble synthetic fertilizers are predictable with determining the exact impact on a lawn. However more applications are necessary since their effect is often short term. Slow release fertilizers have a high percentage of nitrogen so quantities that need be handled at one time are smaller. Slow release fertilizers will be utilized by the project.

A complete fertilizer contains all three of the primary nutrients - nitrogen (N), phosphorus (P) and potassium in the form of potash (K). Typically, a 3-1-2 ratio of nutrients (N-P-K) is used for lawn applications.

Fertilizer shall be applied by the landscape contractor in accordance with the manufacturer's instructions. The application of fertilizer does require some skill on the part of the operator. Should there be a spill of fertilizer, the landscape contractor shall be required to scrape or vacuum it up. The area will then be watered in accordance with the manufacturer's instructions to ensure that the fertilizer becomes soluble and available to plants and does not run off.

Regeneron Pharmaceuticals Inc. will be responsible for the long-term operation and maintenance of the permanent stormwater management practices. The permanent stormwater management practices shall be maintained in accordance with the Maintenance Inspection Checklists provided in Appendix D.

VIII. CONCLUSION

This Stormwater Pollution Prevention Plan has been prepared to describe the project's pre and post-development stormwater management improvements and its sediment and erosion control improvements to be utilized during construction. The proposed permanent improvements and the interim improvements to be utilized during construction have been designed in accordance with the requirements of the:

- New York State Department of Environmental Conservation (NYSDEC) SPDES General Permit No. GP-0-20-001, effective January 29, 2020.
- Chapter 183 "Stormwater Management and Erosion and Sediment Control" of the Mt. Pleasant Code
- New York State Stormwater Management Design Manual

The project employs the use of a variety of stormwater management practices to enhance stormwater quality and reduce peak rates of runoff associated with the proposed improvements. These practices include a pocket pond with outlet control structure, bioretention area with underdrains and a dry swale.

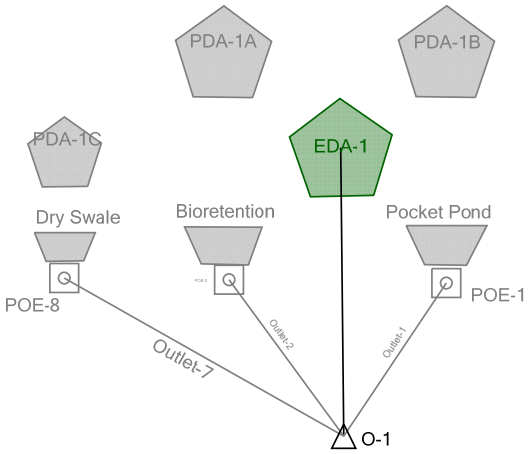
Based on the foregoing, it is our professional opinion that the proposed improvements will

provide water quantity and quality enhancements which exceed the above-mentioned requirements and are not anticipated to have any adverse impacts to the site or any surrounding areas.

APPENDIX A

EXISTING HYDROLOGIC CALCULATIONS

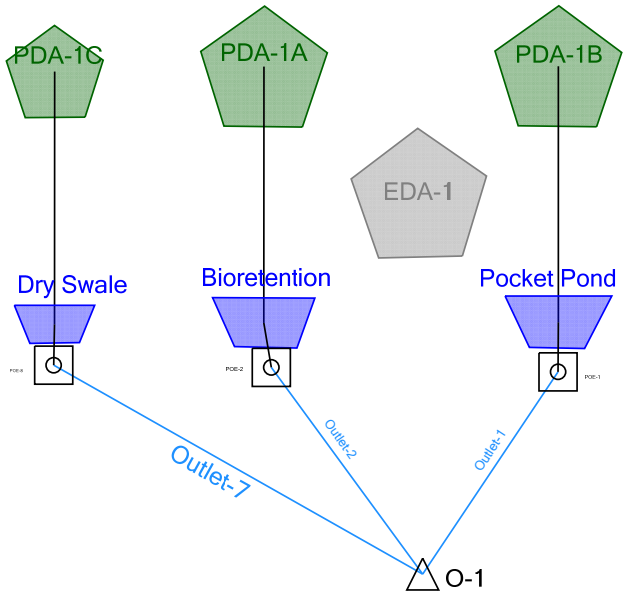
Scenario: Pre-Development 1 Year Storm



APPENDIX B

PROPOSED HYDROLOGIC CALCULATIONS

Scenario: Post-Development 1 Year Storm



APPENDIX C

NYSDEC STORMWATER SIZING CALCULATIONS

WATER QUALITY VOLUME WORKSHEET

JMC Project:	**20090-3**
Design Point:	**1**

Regeneron Daycare	Drainage Area:	**1A**

Initial Water Quality Treatment Volume

DESCRIPTION	Design Storm	Area	Impervious Area	Percent Impervious	Runoff Coefficient	Total Required WQ Volume
SYMBOL	P	A	I	%I	R_V	WQ_V
VALUE	1.5	0.72	0.67	92.91	0.886147387	**3,469**
UNITS	In	Ac	Ac	%	CF	CF

Adjusted Water Quality Treatment Volume

DESCRIPTION	Design Storm	Area	Impervious Area	Percent Impervious	Runoff Coefficient	Total Required WQ Volume
SYMBOL	P	A	I	%I	R_V	WQ_V
VALUE	1.5	0.72	0.67	92.91	0.886147387	**3,469**
UNITS	In	Ac	Ac	%	CF	CF
VALUE	Enhanced Phosphorus Removal (WQ_V = 1-yr Storm Runoff)					

Net Water Quality Treatment Volume = Adjusted WQv - Provided RRv

Initial Water Quality Treatment Volume	3,469	CF
Adjusted Water Quality Treatment Volume	3,469	CF
Provided Runoff Reduction Volume	3,469	CF
Net Water Quality Treatment Volume		CF

Date Printed: 11/23/2021

BIORETENTION WORKSHEET

JMC Project:	**20090-3**
Design Point:	**1**
Drainage Area:	**1A**

Bioretention

Site Data for Drainage Area to be Treated by Practice			
DESCRIPTION	*SYMBOL*	*VALUE*	*UNITS*
Design Storm [90% Rainfall Event Number]	P	1.5	In
Impervious Area	I	0.67	Ac
Area	A	0.72	Ac
Percent Impervious	%I	92.91	%
Runoff Coefficient [0.05 + 0.009 x %I]	R_V	0.89	CF
TOTAL VOLUME Required [$WQ_V = (P \times R_V \times A) / 12$]	WQ_V	**3,469**	CF

Minimum Filter Bed Area			
DESCRIPTION	*SYMBOL*	*VALUE*	*UNITS*
Water Quality Volume	WQ_V	3,469	CF
Coefficient of permeability of filter media (hydraulic conductivity)	k	0.35	Ft / Day
Filter bed Depth (soil media)	d_f	0.21	Ft
Average Height of water above filter bed	h_f	0.50	Ft
Design filter bed drain Time	t_f	2.00	Days
Required Surface Area of Filter Bed [$A_f = (WQ_V \times d_f) / (k \times (h_f + d_f) \times t_f)$]	A_f	**1,457.63**	SF

Proposed Bioretention Area			
DESCRIPTION	*SYMBOL*	*VALUE*	*UNITS*
Surface Area of Filter Bed Provided	A_f	**2,854.00**	SF
Actual Volume Provided		**6,792.52**	CF

Runoff Reduction			
DESCRIPTION	*SYMBOL*	*VALUE*	*UNITS*
100% Runoff Reduction capacity in HSG A and B	RR_V	**3,469**	CF
40% Runoff Reduction capacity in HSG C and D	RR_V	**2,717**	CF

Date Printed: 11/23/2021

RUNOFF REDUCTION VOLUME WORKSHEET

JMC Project:	**20090-3**
Design Point:	**1**

Regeneron Daycare	Drainage Area:	**1ABC**

Total Water Quality Treatment Volume

DESCRIPTION	*SYMBOL*	*VALUE*	*UNITS*
Initial Water Quality Volume	WQ_V	**3,469**	CF
Adjusted Water Quality Volume	WQ_V	**3,469**	CF

Minimum Runoff Reduction Volume

DESCRIPTION	*SYMBOL*	*VALUE*	*UNITS*
Design Storm [90% Rainfall Event Number] **or** [1-yr Storm Depth]	P	1.5	In
Total Area of *new* Impervious Cover	Aic	1.45	Ac
Hydrologic Soil Group (HSG) Specific Reduction Factor	S	0.40	
Runoff Coefficient [0.05 + 0.009 x %I]	R_V	0.95	CF
Impervious Cover targeted for Runoff Reduction [S x Aic]	Ai	0.58	Ac
TOTAL VOLUME Required [RR_V = (P x R_V x Ai) / 12]	RR_V	**2,998**	CF

Runoff Reduction Techniques (Volume)

GREEN INFRASTRUCTURE PRACTICE / SMP	*SYMBOL*	*VALUE*	*UNITS*
Bioretention	RR_V	3,469	CF
TOTAL	RR_V	**3,469**	CF

Runoff Reduction

Is Total RR_V > Adjusted WQ_V?	**NO**
Is Total RR_V > Minimum RR_V?	**YES**

Date Printed: 11/23/2021

WATER QUALITY VOLUME WORKSHEET

JMC Project:	**20090-3**
Design Point:	**1**

Regeneron Daycare	Drainage Area:	**1B**

Initial Water Quality Treatment Volume

DESCRIPTION	Design Storm	Area	Impervious Area	Percent Impervious	Runoff Coefficient	Total Required WQ Volume
SYMBOL	P	A	I	%I	R_V	WQ_V
VALUE	1.5	3.27	0.75	22.98	0.256837907	**4,576**
UNITS	In	Ac	Ac	%	CF	CF

Adjusted Water Quality Treatment Volume

DESCRIPTION	Design Storm	Area	Impervious Area	Percent Impervious	Runoff Coefficient	Total Required WQ Volume
SYMBOL	P	A	I	%I	R_V	WQ_V
VALUE	1.5	3.27	0.75	22.98	0.256837907	**4,576**
UNITS	In	Ac	Ac	%	CF	CF

Date Printed: 11/23/2021

DESIGN OF OUTLET CONTROL STRUCTURE
ORIFII FOR EXTENDED DETENTION OF WATER
QUALITY & STREAM CHANNEL PROTECTION VOLUMES

JMC Project No: **20090-3**
Computed By: BD
Checked BY: SS
Dwg, Ref: DA-1, DA-2

Project: Regeneron Daycare
Location: Mt. Pleasant NY

DESIGN PARAMETERS		SYMBOL	UNITS	
SUB AREA NAME				PDA-1B
DRAINAGE AREA		A	acres	3.27
PRACTICE DESIGNATION				P-5
PRACTICE NAME				Pocket Pond
PERCENTAGE PERMANENT POOL REQUIRED		PPR	%	50%
PERCENTAGE PERMANENT POOL PROVIDED		PPP		20%
PERCENTAGE FOREBAY PRETREATMENT POOL		PFR	%	10%
PERCENTAGE FOREBAY PRETREATMENT POOL PROVIDED		PFP		10%
TOTAL WATER QUALITY VOLUME REQUIRED		**WQvr**	cu. ft.	4,576
PERMANENT POOL REQUIRED Vpool=WQv*PPP		VR_{pool}	cu. ft.	2,288
PERMANENT POOL VOLUME PROVIDED		*VP_{pool}*	*cu. ft.*	*8,299*
FOREBAY PRETREATMENT REQUIRED Vpret=WQv*PFP		VR_{pret}	cu. ft.	458
FOREBAY PRETREATMENT PROVIDED		*VP_{pret}*	*cu. ft.*	*2,900*
ELEVATION PERMANENT POOL (orifice inv. above permanent pool)		E_1	(ft.)	204.00
Elev. Ext. Det. for rest of WQv (Use E-Q-V from PondPack at Volume WQVR)		E_2	(ft.)	205.00
EXTENDED DETENTION ELEV. PROVIDED (rounded UP)		E_{2P}	(ft.)	205.10

DESIGN WATER QUALITY ORIFICE	*(See Section 8.2 Step 6.)*			
VERIFY IF IS ENOUGH PERMANENT POOL PROVIDED				OKAY
VERIFY IF IS ENOUGH FOREBAY POOL PROVIDED				OKAY
EXTENDED DETENTION VOLUME REQUIRED	EDvr=WQvr-VRpool-VRpret	ED_{VR}	(cfs)	1,830
EXTENDED DETENTION VOLUME PROVIDED (to be)	EDvp=WQvp-VPpool	EDvp	cu. ft.	4,639
AVERAGE DISCHARGE (to be release in 24 hr)	$Q_0=ED_{VP}/(24hr*3600sec)$	Q_0	(cfs)	0.05369
AVERAGE HEAD WATER QUALITY	$H_0=(E_2-E_1)/2$	H_0	(ft.)	0.50
ORIFICE DIAMETER CALCULATION	$D_0=6.166*Q_0^{0.5}/H_0^{0.25}$	D_0	(in.)	2
ORIFICE DIAMETER ROUNDDOWN @ 1/8)		D_W	(in.)	3
ORIFICE DIAMETER PROVIDED	(suggested less than calculated)	D_W	(in.)	3
AVERAGE HEAD PROVIDED	$H_W=(Q_0/(C*\pi*D_W^2/4))^2=(Q_0/(0.02626*D_W^2))^2$	H_W	(ft.)	0.051612
EXTENDED DETENTION ORIFICE ELEV. PROVIDED	$E_{2P}=E_1+Dw/(2*12)+2*Hw$	**E_{2P}**	(ft.)	205.10
WATER QUALITY VOLUME PROVIDED WQ_{VP}	Use E-Q-V from PondPack at **E_{2P}**	WQvp	(cfs)	**12,938**
VERIFY IF ENOUGH WATER QUALITY IS PROVIDED				OKAY

DESIGN CHANNEL PROTECTION ORIFICE	*(See Section 8.2 Step 7.)*			
CHANNEL PROTECTION VOLUME REQUIRED		CP_{VR}	(cu. ft.)	**3,565**
PERMANENT POOL VOLUME PROVIDED		VP_{pool}	(cu. ft.)	8,299
TOTAL CHANNEL PROTECTION VOLUME REQUIRED	$TCP_{VR}=CP_{VR}+VP_{pool}$	**TCP_{VR}**	(cu. ft.)	11,864
ELEVATION PERMANENT POOL (orifice invert above permanent pool	see above	E_1	(ft.)	204.00
EXTENDED DETENTION ELEV. PROVIDED (rounded,1)	see above	E_{2P}	(ft.)	205.10
EXTENDED DETENTION C_{PV} ELEVATION	Use E-Q-V from PondPack at Volume CPv	E_3	(ft.)	204.85
AVERAGE HEAD WATER QUALITY	$H_0=(E_3-E_1)/2$	H_0	(ft.)	0.42
AVERAGE HEAD CHANNEL PROTECTION	$H_1=(E_3-E_{2P})/2$	H_1	(ft.)	-0.13
AVERAGE DISCHARGE (release rate in 24 hr)	$Q_{0C}=CP_{VR}/(24hr*3600sec)$	Q_{0C}	(cfs)	0.0413
AVERAGE DISCHARGE (calculated at WQ orifice)	$Q_W=0.02626*D_W^2*Hw^{0.5}$	Q_W	(cfs)	0.05
DISCHARGE CHANNEL PROTECTION	$Q_{1C}=Q_{0C}-Q_W$	Q_{1C}	(cfs)	-0.0124
TOTAL CHANNEL PROTECTION VOLUME PROVIDED	Use E-Q-V from PondPack at **E_{2CP}**	CPvp	(cu. ft.)	12,938
NET CHANNEL PROTECTION VOLUME PROVIDED	$CP_V=CP_{VP}-VPpool$		(cu. ft.)	**4,639**
VERIFY IF ENOUGH CHANNEL PROTECTION VOLUME IS PROVIDED				OKAY

STREAM CHANNEL PROTECTION VOLUME Cp_v

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Unified Stormwater Sizing Criteria (See Section 4.4 & Appendix B.2)

RAINFALL DISTRIBUTION TYPE		III			
$(R=I_a/P)$	$C_i=A*R^2+B*R+C$		A	B	C
Coefficients for the equation unit peak		C_0	-1.774	0.3301	2.4577
Coefficients for the equation unit peak		C_1	1.8622	-0.7397	-0.4627
Coefficients for the equation unit peak		C_2	-0.0648	0.2276	-0.1932

D E S I G N P A R A M E T E R S		SYMBOL	UNITS	PDA-1B
TOTAL DEVELOPED AREA		A	acres	3.27
RAINFALL EVENT (1-year recurrence, 24-hr. duration)		P_1	inches	2.84
RUNOFF CURVE NUMBER (proposed)		CN		66.00
TIME OF CONCENTRATION (Use TR-55 equations)		T_c	hours	0.08

D E S I G N C A L C U L A T I O N S				
CHANNEL PROTECTION VOLUME, (Cp_v) ((see Section 4.4 and Appendix B)				
INITIAL ABSTRACTION $I_a=(200/CN)-2$		I_a	inches	1.030
RATIO $R=I_a/P_1$		R		0.36
$C_0 = A*R^2 +B*R +C$		C_0		2.34
$C_1 = A*R^2 +B*R +C$		C_1		-0.49
$C_2 = A*R^2 +B*R +C$		C_2		-0.12
UNIT PEAK DIS. $q_u=10^{(C_0+C_1*Log(T_c)+C_2*(log(T_c))^2)}$		q_u	cfs/mi^2/in	537.08
RUNOFF (TR-55) $Q=((P_1-I_a)^2)/(P_1+4*I_a)$		Q	inches	0.47
PEAK DISCHARGE $Q_{p1}=q_u*A*Q$ (TR-5 1 year storm)		Q_{p1}	cfs	***1.29***
RATIO of out/in flow $(q_o/q_i)=14.121*q_u^{(-0.9703)}$		(q_o/q_i)		0.03
$(V_s/V_r)=0.682-1.43*(q_o/q_i)+1.64*(qo/qi)^2-0.804*(qo/qi)^3$		(V_s/V_r)		0.64
HYG RUNOFF VOLUME $V_r=Q*A*3630$ (TR-55 1year)		V_r	cu. ft.	***5,584***
			acres-ft	0.13
REQUIRED STORAGE VOLUME Vs=(Vs/Vr)*V_r (Cpv)		Vs	**cu. ft.**	**3,565**
			acres-ft	0.08
Provided Runoff Reduction Volume		RRv	CF	0.00
Net Channel Protection Volume Required				3,564.60
STORAGE VOLUME PROVIDED	EXDT.tab	(Cp_v)	**cu. ft.**	**4,639**
AVERAGE RELEASE $Q_{avg}=V_s/(24hr*3600sec)$		Q_{avg}	cfs	0.04
MAXIMUM RELEASE $Q_{max}=2*Q_{avg}$		Q_{max}	cfs	0.08

WATER QUALITY VOLUME WORKSHEET

JMC Project:	**20090-3**
Design Point:	**1**

Regeneron Daycare	Drainage Area:	**1C**

Initial Water Quality Treatment Volume

DESCRIPTION	Design Storm	Area	Impervious Area	Percent Impervious	Runoff Coefficient	Total Required WQ Volume
SYMBOL	P	A	I	%I	R_V	WQ_V
VALUE	1.5	0.76	0.40	52.37	0.521347454	**2,169**
UNITS	In	Ac	Ac	%	CF	CF

Adjusted Water Quality Treatment Volume

DESCRIPTION	Design Storm	Area	Impervious Area	Percent Impervious	Runoff Coefficient	Total Required WQ Volume
SYMBOL	P	A	I	%I	R_V	WQ_V
VALUE	1.5	0.76	0.40	52.37	0.521347454	**2,169**
UNITS	In	Ac	Ac	%	CF	CF

Date Printed: 11/23/2021

DRY SWALE WORKSHEET

JMC Project: **20090-3**

Design Point: **1**

Dry Swale

Drainage Area: **1C**

Site Data for Drainage Area to be Treated by Practice			
DESCRIPTION	*SYMBOL*	*VALUE*	*UNITS*
Design Storm [90% Rainfall Event Number]	P	1.5	In
Impervious Area	I	0.40	Ac
Area	A	0.76	Ac
Percent Impervious	%I	52.37	%
Runoff Coefficient [0.05 + 0.009 x %I]	R_V	0.52	CF
TOTAL VOLUME Required [$WQ_V = (P \times R_V \times A) / 12$]	WQ_V	**2,169**	CF

Design Parameters			
DESCRIPTION	*SYMBOL*	*VALUE*	*UNITS*
Water Quality Volume	WQ_V	2,169	CF
Water Quality Flow Rate	Q_{WQ}	0.65	CFS
10 Year Storm Flow Rate	Q_{10}	2.52	CFS

Channel Design			
DESCRIPTION	*SYMBOL*	*VALUE*	*UNITS*
Given/Assumed Information			
Channel Longitudinal Slope	S	1.65	%
Channel Bottom Width	W	2.00	Ft
Channel Depth	D	1.50	Ft
Channel Side Slope (Hori./Verti.)	z	2	
Determine WQv Flow Depth & Velocity			
WQv Flow Depth	$Q_{WQ}h$	0.33	Ft
Manning's Coefficeint (varying with flow depth see fig L.1)	n	0.15	
Water Quality Flow Rate in Channel	Q	0.46	CFS
Velocity of Q V=Q/(D*(z*D+W)	V	0.06	FPS
Determine Channel Length			
WQv Minimum Detention Time	t	10	min.
Length of Swale Required L=v*t*60	l	37	Ft
Length of Swale Provided	L		Ft
Determine Q_{10} Flow Depth & Velocity			
Peak Discharge Q_{10} (TR-55 10 year storm)	Q_{10}	2.52	CFS
Peak Discharge Q_{10} Depth	$Q_{10}h$	0.83	Ft
Q_{10} Free Board Provided	f	0.68	Ft
Minimum Depth of Swale Required	h	1.33	Ft
Total Depth of Swale Provided	H	1.50	Ft
Velocity of Q_{10} $V_{10}=Q_{10}/(Q_{10}h*(z*Q_{10}h+W)$	V_{10}	0.84	FPS

Date Printed: 11/23/2021

PROPRIETARY PRACTICE WORKSHEET

JMC Project:	**20090-3**
Design Point:	**1**
Drainage Area:	**1C**

Continuous Deflective Separation Unit

Rainfall Distribution Type: **III**

		A	B	C
Coefficients for the equation unit peak [$R = I_a / P$] [$C_i = A \times R^2 + B \times R + C$]	C_0	-1.774	0.3301	2.4577
	C_1	1.8622	-0.7397	-0.4627
	C_2	-0.0648	0.2276	-0.1932

Site Data for Drainage Area to be Treated by Practice

DESCRIPTION	*SYMBOL*	*VALUE*	*UNITS*
Design Storm [90% Rainfall Event Number]	P	1.5	In
Impervious Area	I	0.40	Ac
Area	A	0.76	Ac
Percent Impervious	%I	52.37	%
Runoff Coefficient [$0.05 + 0.009 \times \%I$]	R_V	0.52	CF
TOTAL VOLUME Required [$WQ_V = (P \times R_V \times A) / 12$]	WQ_V	**2,169**	CF

Water Quality Peak Flow Calculation

DESCRIPTION	*SYMBOL*	*VALUE*	*UNITS*
Water Quality Volume	WQ_V	2,169	CF
Design Storm [90% Rainfall Event Number] **or** [1-yr Storm Depth]	P	1.5	In
Time of Concentration	t_c	0.0833	Hr
Runoff Volume [$Q = WQ_V / (A \times 3630)$]	Q	0.78	In
Curve Number [$CN = 1000 / (10 + 5P + 10Q - 10 \times (Q^2 + 1.25\ QP)^{½}$]	CN	91.70	
Curve Number	CN	92	
Initial Abstraction [$I_a = 200 / CN - 2$]	I_a	0.18	In
Ratio [$R = I_a / P$]	R	0.12	
$C_0 = A \times R^2 + B \times R + C$	C_0	2.47	
$C_1 = A \times R2 + B \times R + C$	C_1	-0.52	
$C_2 = A \times R2 + B \times R + C$	C_2	-0.17	
Unit Peak Discharge	q_u	698.25	$cfs/mi^2/in$
Peak Discharge [$Q_p = q_u \times A \times Q / 640$]	Q_p	**0.65**	cfs

Date Printed: 11/23/2021

APPENDIX D

TEMPORARY EROSION AND SEDIMENT CONTROL INSPECTION AND MAINTENANCE CHECKLIST, PERMANENT STORMWATER PRACTICE OPERATION, MAINTENANCE AND MANAGEMENT INSPECTION CHECKLIST

JMC Project 20090-3
Regeneron Daycare
777 Old Saw Mill River Road
Mt. Pleasant, NY

Temporary Erosion and Sediment Control Inspection and Maintenance Checklist

Erosion and Sediment Control Measure	Inspection/Maintenance Intervals	Inspection/Maintenance Requirements
Stabilized Construction Entrance	Daily	• Periodic top dressing with additional aggregate as required • Clean sediment in public right-of-ways immediately
Silt Fence	Weekly + After Each Rain	• Remove & redistribute sediment when bulges develop in the silt fence.
Inlet Protection	Weekly + After Each Rain	• Remove sediment as necessary and replace filter fabric, crushed stone etc. • Any broken and damaged components should be replaced. • Check all materials for proper anchorage and secure as necessary.
Concrete Washout	Daily	• Damaged or leaking facilities shall be deactivated and repaired or replaced immediately.
	After Each Rain	• Pump excess rainwater that has accumulated over hardened concrete to a stabilized area.
	Monthly/As needed	• Remove accumulated hardened material when 75% of the storage capacity of the structure is filled. Replace plastic liner with each cleaning of the washout facility.

Permanent Stormwater Management Practice Inspection and Maintenance Checklist

Stormwater Management Practice	Inspection/Maintenance Intervals	Inspection/Maintenance Requirements
Rip-Rap Apron/Energy Dissipator and Check Dams	Annually + After Major Storms	• Check for evidence of flows going around the structure. • Check for evidence at downstream toe and repair as needed. • Clean sediment and install additional aggregate as necessary.
Drain Inlets	Monthly	• Check for blockage and/or erosion at top of each inlet. Repair/remove as necessary. • Check for sediment and debris collected within sumps and clean out as necessary.
Pocket Pond	Monthly	• Check Permanent Pool for undesirable vegetative growth and floatings or floatable debris. Remove as needed. • Check Forebays for sediment and cleanout when it depth <50% design depth. • Check Dry Pond areas for adequate vegetation, undesirable vegetative growth, low flow channels are clear of obstructions, standing water or wet spots and sediment and/or trash accumulation. Repair/remove as necessary.

Permanent Stormwater Management Practice Inspection and Maintenance Checklist (Cont'd)

Stormwater Management Practice	Inspection/Maintenance Intervals	Inspection/Maintenance Requirements
Pocket Pond	Monthly	• Check Permanent Pool for undesirable vegetative growth and floatings or floatable debris. Remove as needed. • Check Forebays for sediment and cleanout when it depth <50% design depth. • Check Dry Pond areas for adequate vegetation, undesirable vegetative growth, low flow channels are clear of obstructions, standing water or wet spots and sediment and/or trash accumulation. Repair/remove as necessary.
Pocket Pond	Annually + After Major Storms	• Check adequacy of vegetation and ground cover; for evidence of embankment erosion, animal burrows, unauthorized plantings and cracking, bulging or sliding of dam, clear/properly functioning drains, seeps/leaks on downstream face, failure of slope protection or riprap. Repair/remove as necessary. • Confirm emergency spillway is clear of obstructions and debris. • Confirm all inlets and outlet structures/pipes are operating properly.

Permanent Stormwater Management Practice Inspection and Maintenance Checklist (Cont'd)

Stormwater Management Practice	Inspection/Maintenance Intervals	Inspection/Maintenance Requirements
Bioretention	Routine and As Needed	• Mowing-Frequency depends upon location and desired aesthetic appeal. • Watering-If droughty, watering after the initial year may be required. • Miscellaneous Upkeep-Tasks include trash collection, spot weeding, and removing mulch from overflow device.
	Semi-Annually	• Pruning -Nutrients in runoff often cause biortention vegetation to flourish. • Mulching -Remulch bare areas with fresh mulch
	Annually	• Mulch Removal-Mulch accumulation reduces available water storage volume. Removal of mulch also increases surface infiltration rate of fill soil. • Remove and Replace Dead Plants-Within the first year, 10 percent of plants may die. Survival rates increase with time.

Permanent Stormwater Management Practice Inspection and Maintenance Checklist (Cont'd)

Stormwater Management Practice	Inspection/Maintenance Intervals	Inspection/Maintenance Requirements
Dry Swale	Monthly	• Check that contributing area is clean of debris. • Confirm vegetation is adequately maintained (mowing, fertilizer, etc.) • Check for rilling/erosion and repair as needed. • Confirm dewatering occurs between storms.
Dry Swale	Annually + After Major Storms	• Clean sediment and re-vegetate as necessary. • Check condition of outlet and repair as necessary

The owner/operator responsible for inspection and maintenance as outlined above:

Regeneron Pharmaceuticals Inc.
777 Old Saw Mill River Road
Tarrytown, NY 10591

APPENDIX E

CSA GEOTECHNICAL REPORT MEMORANDUM

REFER TO: SECTION 02 30 00
SUBSURFACE INVESTIGATION

APPENDIX A

Soils investigation data is furnished for information only. Engineer and Owner disclaim responsibility for accuracy, true location and extent of soils investigation. They further disclaim responsibility for interpretation of data, such as soil bearing values, rock profiles, soil stability and presence, level and extent of underground water. Bidder is expected to examine the site and the record of investigations and determine for itself the character of materials that may be encountered.

APPENDIX F

OWNER'S AND CONTRACTOR'S CERTIFICATION

Town of Mount Pleasant
Engineering Department
1 Town Hall Plaza
Valhalla, New York 10595
Department Phone: 914-742-2317

David A. Smyth, P.E.
Town Engineer
Susan Maskiell-Closi
Junior Civil Engineer

STORM WATER MANAGEMENT CONTROL PERMIT

CONTRACTOR CERTIFICATION

Storm Water Management Control Permit Number: _____

Project Address: 777 Old Saw Mill River Rd
Mount Pleasant, NY 10591

☑ A copy of the Trained Contractor's ES&C Training Certificate is included with this form.

As per Town of Mount Pleasant Code § 183 - Contractor Certification - each contractor and subcontractor identified in the SWPPP to be involved in soil disturbance and/or storm water management practice installation shall sign and date a copy of the following certification statement before undertaking any land development activity:

"I certify under penalty of law that I understand and agree to comply with the terms and conditions of the storm water pollution prevention plan. I also understand that it is unlawful for any person to cause or contribute to a violation of water quality standards."

Signature of Contractor Representative: _____

Name of Contractor Representative: Scott Prichard

Title of Contractor Representative: Sr. Supervisor

Certification Date: 9/29/2020

Contracting Company Name: Consigli Construction Co., Inc.

Contracting Company Address: 199 West Road | Suite 100
Pleasant Valley, NY 12569

Contractor Telephone Number: 845.635.1800

The Trained Contractor must provide a copy of their 4-Hour Erosion & Sediment (E&SC) Training Certificate must be included with the completed certification form. As per NYSDEC SPDES General Permit (GP-0-10-001), the Trained Contractor must be on site on a daily basis when soil disturbance activities are being performed.

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Owner/Operator Certification Form

SPDES General Permit For Stormwater Discharges From Construction Activity (GP-0-20-001)

Project/Site Name: Regeneron Childcare

eNOI Submission Number: Old Saw Mill Holdings, LLC as agent and attorney-in-fact of BA Leasing BSC, LLC

eNOI Submitted by: ☐ **Owner/Operator** ☑ **SWPPP Preparer** ☐ **Other**

Certification Statement - Owner/Operator

I have read or been advised of the permit conditions and believe that I understand them. I also understand that, under the terms of the permit, there may be reporting requirements. I hereby certify that this document and the corresponding documents were prepared under my direction or supervision. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further understand that coverage under the general permit will be identified in the acknowledgment that I will receive as a result of submitting this NOI and can be as long as sixty (60) business days as provided for in the general permit. I also understand that, by submitting this NOI, I am acknowledging that the SWPPP has been developed and will be implemented as the first element of construction, and agreeing to comply with all the terms and conditions of the general permit for which this NOI is being submitted.

Owner/Operator First Name M.I. Last Name

Old Saw Mill Holdings LLC as agent and attorney-in-fact of BA Leasing BSC, LLC
by: George Poth, authorized signatory

Signature

9-17-21

Date

APPENDIX G

SPDES GENERAL PERMIT NO. GP-0-20-001 & MS4 ACCEPTANCE FORM

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

NYS Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

MS4 Stormwater Pollution Prevention Plan (SWPPP) Acceptance Form

for

Construction Activities Seeking Authorization Under SPDES General Permit

*(NOTE: Attach Completed Form to Notice Of Intent and Submit to Address Above)

I. Project Owner/Operator Information	
1. Owner/Operator Name:	BA Leasing BSC, LLC/Regeneron Pharmaceuticals, Inc.
2. Contact Person:	Ted Jesson
3. Street Address:	777 Old Saw Mill River Road
4. City/State/Zip:	Tarrytown, NY 10591
II. Project Site Information	
5. Project/Site Name:	Regeneron Childcare
6. Street Address:	777 Old Saw Mill River Road - (SBL: 116.15-1-2.1)
7. City/State/Zip:	Mount Pleasant, NY 10504
III. Stormwater Pollution Prevention Plan (SWPPP) Review and Acceptance Information	
8. SWPPP Reviewed by:	David Smyth, PE
9. Title/Position:	Town Engineer
10. Date Final SWPPP Reviewed and Accepted:	4/27/22 per revised 2/10/22
IV. Regulated MS4 Information	
11. Name of MS4:	Town of Mount Pleasant
12. MS4 SPDES Permit Identification Number: NYR20A	188
13. Contact Person:	David Smyth, PE
14. Street Address:	1 Town Hall Plaza
15. City/State/Zip:	Valhalla, NY 10595
16. Telephone Number:	914-742-2317

MS4 SWPPP Acceptance Form - continued

V. Certification Statement - MS4 Official (principal executive officer or ranking elected official) or Duly Authorized Representative

I hereby certify that the final Stormwater Pollution Prevention Plan (SWPPP) for the construction project identified in question 5 has been reviewed and meets the substantive requirements in the SPDES General Permit For Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4s). Note: The MS4, through the acceptance of the SWPPP, assumes no responsibility for the accuracy and adequacy of the design included in the SWPPP. In addition, review and acceptance of the SWPPP by the MS4 does not relieve the owner/operator or their SWPPP preparer of responsibility or liability for errors or omissions in the plan.

Printed Name: David Smyth, PE

Title/Position: Town Engineer

Signature:

Date: 4/27/22

VI. Additional Information

SWPPP Original dated 4/23/21, Revised 2/10/22.

(NYS DEC - MS4 SWPPP Acceptance Form - January 2015)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Division of Water, Bureau of Water Permits
625 Broadway, Albany, New York 12233-3505
P: (518) 402-8111 F: (518) 402-9029
www.dec.ny.gov

5/6/2022

BA Leasing BSC, LLC
Ted Jesson
777 Old Saw Mill River Road
Tarrytown, New York 10591

RE: ACKNOWLEDGMENT of NOTICE OF INTENT for Coverage Under SPDES General Permit for Storm Water Discharges from CONSTRUCTION ACTIVITY – General Permit No. GP-0-20-001

Dear Prospective Permittee:

This is to acknowledge that the New York State Department of Environmental Conservation (Department) has received a complete Notice of Intent (NOI) for coverage under General Permit No. GP-0-20-001 for the construction activities located at:

Regeneron - Childcare
777 Old Saw Mill River Road
Mount Pleasant, NY 10595 **County: WESTCHESTER**

Pursuant to Environmental Conservation Law (ECL) Article 17, Titles 7 and 8, and ECL Article 70, discharges in accordance with GP-0-20-001 from the above construction site will be authorized **5** business days from **5/2/2022,** which is the date we received your final NOI, unless notified differently by the Department.

The permit identification number for this site is: **NYR11J643**. Be sure to include this permit identification number on any forms or correspondence you send us. When coverage under the permit is no longer needed, you must submit a Notice of Termination to the Department.

This authorization is conditioned upon the following:

1. The information submitted in the NOI received by the Department on **5/2/2022** is accurate and complete.

2. You have developed a Stormwater Pollution Prevention Plan (SWPPP) that complies with GP-0-20-001 which must be implemented as the first element of construction at the above-noted construction site.

3. Activities related to the above construction site comply with all other requirements of GP-0-20-001.

4. Payment of the annual $110 regulatory fee, which is billed separately by the Department in the late fall. The regulatory fee covers a period of one calendar year. In addition, since September 1, 2004, construction stormwater permittees have been assessed an initial authorization fee which is now $110 per acre of land disturbed and $675 per acre of future impervious area. The initial authorization fee covers the duration of the authorized disturbance.

5. Your SWPPP has been reviewed by the regulated, traditional land use control MS4 where your project is located and has been determined to be in substantive conformance with the requirements in the SPDES General Permit for Stormwater Discharges from MS4s.

6. When applicable, project review pursuant to the State Environmental Quality Review Act (SEQRA) has been satisfied.

7. You have obtained all necessary Department permits subject to the Uniform Procedures Act (UPA). You should check with your Regional Permit Administrator for further information.

***Note: Construction activities cannot commence until project review pursuant to SEQRA has been satisfied, when SEQRA is applicable; and, where required, all necessary Department permits subject to the UPA have been obtained.**

Please be advised that the Department may request a copy of your SWPPP for review.

Should you have any questions regarding any aspect of the requirements specified in GP-0-20-001, please contact Dave Gasper at (518) 402-8114.

Sincerely,

David Gasper

David Gasper
Environmental Engineer

cc: RWE - **3**
SWPPP Preparer
JMC, PLLC
Spina, Stephen
120 Bedford Road
Armonk, New York 10504

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SPDES GENERAL PERMIT
FOR STORMWATER DISCHARGES

From

CONSTRUCTION ACTIVITY

Permit No. GP- 0-20-001

Issued Pursuant to Article 17, Titles 7, 8 and Article 70

of the Environmental Conservation Law

Effective Date: January 29, 2020 Expiration Date: January 28, 2025

John J. Ferguson

Chief Permit Administrator

1-23-20

Authorized Signature Date

Address: NYS DEC
Division of Environmental Permits
625 Broadway, 4th Floor
Albany, N.Y. 12233-1750

PREFACE

Pursuant to Section 402 of the Clean Water Act ("CWA"), stormwater *discharges* from certain *construction activities* are unlawful unless they are authorized by a *National Pollutant Discharge Elimination System ("NPDES")* permit or by a state permit program. New York administers the approved State Pollutant Discharge Elimination System (SPDES) program with permits issued in accordance with the New York State Environmental Conservation Law (ECL) Article 17, Titles 7, 8 and Article 70.

An *owner or operator* of a *construction activity* that is eligible for coverage under this permit must obtain coverage prior to the *commencement of construction activity*. Activities that fit the definition of "*construction activity*", as defined under 40 CFR 122.26(b)(14)(x), (15)(i), and (15)(ii), constitute construction of a *point source* and therefore, pursuant to ECL section 17-0505 and 17-0701, the *owner or operator* must have coverage under a SPDES permit prior to *commencing construction activity*. The *owner or operator* cannot wait until there is an actual *discharge* from the *construction site* to obtain permit coverage.

***Note: The italicized words/phrases within this permit are defined in Appendix A.**

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
SPDES GENERAL PERMIT FOR STORMWATER DISCHARGES FROM CONSTRUCTION ACTIVITIES

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Part 1. PERMIT COVERAGE AND LIMITATIONS

A. Permit Application

This permit authorizes stormwater *discharges* to *surface waters of the State* from the following *construction activities* identified within 40 CFR Parts 122.26(b)(14)(x), 122.26(b)(15)(i) and 122.26(b)(15)(ii), provided all of the eligibility provisions of this permit are met:

1. *Construction activities* involving soil disturbances of one (1) or more acres; including disturbances of less than one acre that are part of a *larger common plan of development or sale* that will ultimately disturb one or more acres of land; excluding *routine maintenance activity* that is performed to maintain the original line and grade, hydraulic capacity or original purpose of a facility;

2. *Construction activities* involving soil disturbances of less than one (1) acre where the Department has determined that a *SPDES* permit is required for stormwater *discharges* based on the potential for contribution to a violation of a *water quality standard* or for significant contribution of *pollutants* to *surface waters of the State.*

3. *Construction activities* located in the watershed(s) identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

B. Effluent Limitations Applicable to Discharges from Construction Activities

*Discharge*s authorized by this permit must achieve, at a minimum, the effluent limitations in Part I.B.1. (a) – (f) of this permit. These limitations represent the degree of effluent reduction attainable by the application of best practicable technology currently available.

1. Erosion and Sediment Control Requirements - The *owner or operator* must select, design, install, implement and maintain control measures to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. The selection, design, installation, implementation, and maintenance of these control measures must meet the non-numeric effluent limitations in Part I.B.1.(a) – (f) of this permit and be in accordance with the New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016, using sound engineering judgment. Where control measures are not designed in conformance with the design criteria included in the technical standard, the *owner or operator* must include in the *Stormwater Pollution Prevention Plan* (“SWPPP”) the reason(s) for the

deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

a. **Erosion and Sediment Controls.** Design, install and maintain effective erosion and sediment controls to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. At a minimum, such controls must be designed, installed and maintained to:

   (i) *Minimize* soil erosion through application of runoff control and soil stabilization control measure to *minimize pollutant discharge*s;

   (ii) Control stormwater *discharge*s, including both peak flowrates and total stormwater volume, to *minimize* channel and *streambank* erosion and scour in the immediate vicinity of the *discharge* points;

   (iii) *Minimize* the amount of soil exposed during *construction activity*;

   (iv) *Minimize* the disturbance of *steep slopes*;

   (v) *Minimize* sediment *discharge*s from the site;

   (vi) Provide and maintain *natural buffer*s around surface waters, direct stormwater to vegetated areas and maximize stormwater infiltration to reduce *pollutant discharge*s, unless *infeasible*;

   (vii) *Minimize* soil compaction. Minimizing soil compaction is not required where the intended function of a specific area of the site dictates that it be compacted;

   (viii) Unless *infeasible*, preserve a sufficient amount of topsoil to complete soil restoration and establish a uniform, dense vegetative cover; and

   (ix) *Minimize* dust. On areas of exposed soil, *minimize* dust through the appropriate application of water or other dust suppression techniques to control the generation of pollutants that could be discharged from the site.

b. **Soil Stabilization**. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within fourteen (14) days from the date the current soil disturbance activity ceased. For construction sites that *directly discharge* to one of the 303(d) segments

listed in Appendix E or is located in one of the watersheds listed in Appendix C, the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven (7) days from the date the current soil disturbance activity ceased. See Appendix A for definition of *Temporarily Ceased*.

c. **Dewatering**. *Discharge*s from *dewatering* activities, including *discharge*s from *dewatering* of trenches and excavations, must be managed by appropriate control measures.

d. **Pollution Prevention Measures**. Design, install, implement, and maintain effective pollution prevention measures to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. At a minimum, such measures must be designed, installed, implemented and maintained to:

(i) *Minimize* the *discharge* of *pollutants* from equipment and vehicle washing, wheel wash water, and other wash waters. This applies to washing operations that use clean water only. Soaps, detergents and solvents cannot be used;

(ii) *Minimize* the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste, hazardous and toxic waste, and other materials present on the site to precipitation and to stormwater. Minimization of exposure is not required in cases where the exposure to precipitation and to stormwater will not result in a *discharge* of *pollutants*, or where exposure of a specific material or product poses little risk of stormwater contamination (such as final products and materials intended for outdoor use) ; and

(iii) Prevent the *discharge* of *pollutants* from spills and leaks and implement chemical spill and leak prevention and response procedures.

e. **Prohibited *Discharges*.** The following *discharge*s are prohibited:

(i) Wastewater from washout of concrete;

(ii) Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;

(iii) Fuels, oils, or other *pollutants* used in vehicle and equipment operation and maintenance;

(iv) Soaps or solvents used in vehicle and equipment washing; and

(v) Toxic or hazardous substances from a spill or other release.

f. Surface Outlets. When discharging from basins and impoundments, the outlets shall be designed, constructed and maintained in such a manner that sediment does not leave the basin or impoundment and that erosion at or below the outlet does not occur.

C. Post-construction Stormwater Management Practice Requirements

1. The *owner or operator* of a *construction activity* that requires post-construction stormwater management practices pursuant to Part III.C. of this permit must select, design, install, and maintain the practices to meet the *performance criteria* in the New York State Stormwater Management Design Manual ("Design Manual"), dated January 2015, using sound engineering judgment. Where post-construction stormwater management practices ("SMPs") are not designed in conformance with the *performance criteria* in the Design Manual, the *owner or operator* must include in the SWPPP the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

2. The *owner or operator* of a *construction activity* that requires post-construction stormwater management practices pursuant to Part III.C. of this permit must design the practices to meet the applicable *sizing criteria* in Part I.C.2.a., b., c. or d. of this permit.

a. Sizing Criteria for New Development

(i) Runoff Reduction Volume ("RRv"): Reduce the total Water Quality Volume ("WQv") by application of RR techniques and standard SMPs with RRv capacity. The total WQv shall be calculated in accordance with the criteria in Section 4.2 of the Design Manual.

(ii) Minimum RRv and Treatment of Remaining Total WQv: Construction activities that cannot meet the criteria in Part I.C.2.a.(i) of this permit due to site limitations shall direct runoff from all newly constructed impervious areas to a RR technique or standard SMP with RRv capacity unless infeasible. The specific site limitations that prevent the reduction of 100% of the WQv shall be documented in the SWPPP.

For each impervious area that is not directed to a RR technique or standard SMP with RRv capacity, the SWPPP must include documentation which demonstrates that all options were considered and for each option explains why it is considered infeasible.

In no case shall the runoff reduction achieved from the newly constructed impervious areas be less than the Minimum RRv as calculated using the criteria in Section 4.3 of the Design Manual. The remaining portion of the total WQv that cannot be reduced shall be treated by application of standard SMPs.

(iii) Channel Protection Volume ("Cpv"): Provide 24 hour extended detention of the post-developed 1-year, 24-hour storm event; remaining after runoff reduction. The Cpv requirement does not apply when:
(1) Reduction of the entire Cpv is achieved by application of runoff reduction techniques or infiltration systems, or
(2) The site discharges directly to tidal waters, or fifth order or larger streams.

(iv) *Overbank* Flood Control Criteria ("Qp"): Requires storage to attenuate the post-development 10-year, 24-hour peak discharge rate (Qp) to predevelopment rates. The Qp requirement does not apply when:
(1) the site discharges directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that *overbank* control is not required.

(v) Extreme Flood Control Criteria ("Qf"): Requires storage to attenuate the post-development 100-year, 24-hour peak discharge rate (Qf) to predevelopment rates. The Qf requirement does not apply when:
(1) the site discharges directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that *overbank* control is not required.

b. *Sizing Criteria* for *New Development* in Enhanced Phosphorus Removal Watershed

(i) Runoff Reduction Volume (RRv): Reduce the total Water Quality Volume (WQv) by application of RR techniques and standard SMPs with RRv capacity. The total WQv is the runoff volume from the 1-year, 24 hour design storm over the post-developed watershed and shall be

calculated in accordance with the criteria in Section 10.3 of the Design Manual.

(ii) Minimum RRv and Treatment of Remaining Total WQv: *Construction activities* that cannot meet the criteria in Part I.C.2.b.(i) of this permit due to *site limitations* shall direct runoff from all newly constructed *impervious areas* to a RR technique or standard SMP with RRv capacity unless *infeasible*. The specific *site limitations* that prevent the reduction of 100% of the WQv shall be documented in the SWPPP. For each *impervious area* that is not directed to a RR technique or standard SMP with RRv capacity, the SWPPP must include documentation which demonstrates that all options were considered and for each option explains why it is considered *infeasible.*

In no case shall the runoff reduction achieved from the newly constructed *impervious areas* be less than the Minimum RRv as calculated using the criteria in Section 10.3 of the Design Manual. The remaining portion of the total WQv that cannot be reduced shall be treated by application of standard SMPs.

(iii) Channel Protection Volume (Cpv): Provide 24 hour extended detention of the post-developed 1-year, 24-hour storm event; remaining after runoff reduction. The Cpv requirement does not apply when:
(1) Reduction of the entire Cpv is achieved by application of runoff reduction techniques or infiltration systems, or
(2) The site *discharge*s directly to tidal waters, or fifth order or larger streams.

(iv) *Overbank* Flood Control Criteria (Qp): Requires storage to attenuate the post-development 10-year, 24-hour peak *discharge* rate (Qp) to predevelopment rates. The Qp requirement does not apply when:
(1) the site *discharge*s directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that *overbank* control is not required.

(v) Extreme Flood Control Criteria (Qf): Requires storage to attenuate the post-development 100-year, 24-hour peak *discharge* rate (Qf) to predevelopment rates. The Qf requirement does not apply when:
(1) the site *discharge*s directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that *overbank* control is not required.

c. Sizing Criteria for Redevelopment Activity

(i) Water Quality Volume (WQv): The WQv treatment objective for *redevelopment activity* shall be addressed by one of the following options. *Redevelopment activities* located in an Enhanced Phosphorus Removal Watershed (see Part III.B.3. and Appendix C of this permit) shall calculate the WQv in accordance with Section 10.3 of the Design Manual. All other *redevelopment activities* shall calculate the WQv in accordance with Section 4.2 of the Design Manual.

(1) Reduce the existing *impervious cover* by a minimum of 25% of the total disturbed, *impervious area*. The Soil Restoration criteria in Section 5.1.6 of the Design Manual must be applied to all newly created pervious areas, or

(2) Capture and treat a minimum of 25% of the WQv from the disturbed, *impervious area* by the application of standard SMPs; or reduce 25% of the WQv from the disturbed, *impervious area* by the application of RR techniques or standard SMPs with RRv capacity., or

(3) Capture and treat a minimum of 75% of the WQv from the disturbed, *impervious area* as well as any additional runoff from tributary areas by application of the alternative practices discussed in Sections 9.3 and 9.4 of the Design Manual., or

(4) Application of a combination of 1, 2 and 3 above that provide a weighted average of at least two of the above methods. Application of this method shall be in accordance with the criteria in Section 9.2.1(B) (IV) of the Design Manual.

If there is an existing post-construction stormwater management practice located on the site that captures and treats runoff from the *impervious area* that is being disturbed, the WQv treatment option selected must, at a minimum, provide treatment equal to the treatment that was being provided by the existing practice(s) if that treatment is greater than the treatment required by options 1 – 4 above.

(ii) Channel Protection Volume (Cpv): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site.

(iii) *Overbank* Flood Control Criteria (Qp): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site.

(iv) Extreme Flood Control Criteria (Qf): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site

d. Sizing Criteria for Combination of Redevelopment Activity and New Development

Construction projects that include both New Development and Redevelopment Activity shall provide post-construction stormwater management controls that meet the sizing criteria calculated as an aggregate of the Sizing Criteria in Part I.C.2.a. or b. of this permit for the New Development portion of the project and Part I.C.2.c of this permit for Redevelopment Activity portion of the project.

D. Maintaining Water Quality

The Department expects that compliance with the conditions of this permit will control *discharge*s necessary to meet applicable *water quality standards*. It shall be a violation of the *ECL* for any discharge to either cause or contribute to a violation of *water quality standards* as contained in Parts 700 through 705 of Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York, such as:

1. There shall be no increase in turbidity that will cause a substantial visible contrast to natural conditions;

2. There shall be no increase in suspended, colloidal or settleable solids that will cause deposition or impair the waters for their best usages; and

3. There shall be no residue from oil and floating substances, nor visible oil film, nor globules of grease.

If there is evidence indicating that the stormwater *discharge*s authorized by this permit are causing, have the reasonable potential to cause, or are contributing to a violation of the *water quality standards*; the *owner or operator* must take appropriate corrective action in accordance with Part IV.C.5. of this general permit and document in accordance with Part IV.C.4. of this general permit. To address the *water quality standard* violation the *owner or operator* may need to provide additional information, include and implement appropriate controls in the SWPPP to correct the problem, or obtain an individual SPDES permit.

If there is evidence indicating that despite compliance with the terms and conditions of this general permit it is demonstrated that the stormwater *discharge*s authorized by this permit are causing or contributing to a violation of *water quality standards*, or if the Department determines that a modification of the permit is necessary to prevent a violation of *water quality standards*, the authorized *discharge*s will no longer be eligible for coverage under this permit. The Department may require the *owner or operator* to obtain an individual SPDES permit to continue discharging.

E. Eligibility Under This General Permit

1. This permit may authorize all *discharges* of stormwater from *construction activity* to *surface waters of the State* and *groundwaters* except for ineligible *discharges* identified under subparagraph F. of this Part.

2. Except for non-stormwater *discharges* explicitly listed in the next paragraph, this permit only authorizes stormwater *discharge*s; including stormwater runoff, snowmelt runoff, and surface runoff and drainage, from *construction activities*.

3. Notwithstanding paragraphs E.1 and E.2 above, the following non-stormwater discharges are authorized by this permit: those listed in 6 NYCRR 750-1.2(a)(29)(vi), with the following exception: "Discharges from firefighting activities are authorized only when the firefighting activities are emergencies/unplanned"; waters to which other components have not been added that are used to control dust in accordance with the SWPPP; and uncontaminated *discharge*s from *construction site* de-watering operations. All non-stormwater discharges must be identified in the SWPPP. Under all circumstances, the *owner or operator* must still comply with *water quality standards* in Part I.D of this permit.

4. The *owner or operator* must maintain permit eligibility to *discharge* under this permit. Any *discharges* that are not compliant with the eligibility conditions of this permit are not authorized by the permit and the *owner or operator* must either apply for a separate permit to cover those ineligible *discharges* or take steps necessary to make the *discharge* eligible for coverage.

F. Activities Which Are Ineligible for Coverage Under This General Permit

All of the following are **not** authorized by this permit:

1. *Discharge*s after *construction activities* have been completed and the site has undergone *final stabilization*;

2. *Discharge*s that are mixed with sources of non-stormwater other than those expressly authorized under subsection E.3. of this Part and identified in the SWPPP required by this permit;

3. *Discharges* that are required to obtain an individual SPDES permit or another SPDES general permit pursuant to Part VII.K. of this permit;

4. *Construction activities* or *discharges* from *construction activities* that may adversely affect an *endangered or threatened species* unless the *owner or*

operator has obtained a permit issued pursuant to 6 NYCRR Part 182 for the project or the Department has issued a letter of non-jurisdiction for the project. All documentation necessary to demonstrate eligibility shall be maintained on site in accordance with Part II.D.2 of this permit;

5. *Discharges* which either cause or contribute to a violation of *water quality standards* adopted pursuant to the *ECL* and its accompanying regulations;

6. *Construction activities* for residential, commercial and institutional projects:

   a. Where the *discharge*s from the *construction activities* are tributary to waters of the state classified as AA or AA-s; and

   b. Which are undertaken on land with no existing *impervious cover*; and

   c. Which disturb one (1) or more acres of land designated on the current United States Department of Agriculture ("USDA") Soil Survey as Soil Slope Phase "D", (provided the map unit name is inclusive of slopes greater than 25%), or Soil Slope Phase "E" or "F" (regardless of the map unit name), or a combination of the three designations.

7. *Construction activities* for linear transportation projects and linear utility projects:

   a. Where the *discharge*s from the *construction activities* are tributary to waters of the state classified as AA or AA-s; and

   b. Which are undertaken on land with no existing *impervious cover*; and

   c. Which disturb two (2) or more acres of land designated on the current USDA Soil Survey as Soil Slope Phase "D" (provided the map unit name is inclusive of slopes greater than 25%), or Soil Slope Phase "E" or "F" (regardless of the map unit name), or a combination of the three designations.

8. *Construction activities* that have the potential to affect an *historic property*, unless there is documentation that such impacts have been resolved. The following documentation necessary to demonstrate eligibility with this requirement shall be maintained on site in accordance with Part II.D.2 of this permit and made available to the Department in accordance with Part VII.F of this permit:

   a. Documentation that the *construction activity* is not within an archeologically sensitive area indicated on the sensitivity map, and that the *construction activity* is not located on or immediately adjacent to a property listed or determined to be eligible for listing on the National or State Registers of Historic Places, and that there is no new permanent building on the *construction site* within the following distances from a building, structure, or object that is more than 50 years old, or if there is such a new permanent building on the *construction site* within those parameters that NYS Office of Parks, Recreation and Historic Preservation (OPRHP), a Historic Preservation Commission of a Certified Local Government, or a qualified preservation professional has determined that the building, structure, or object more than 50 years old is not historically/archeologically significant.

      - 1-5 acres of disturbance - 20 feet
      - 5-20 acres of disturbance - 50 feet
      - 20+ acres of disturbance - 100 feet, or

   b. DEC consultation form sent to OPRHP, and copied to the NYS DEC Agency Historic Preservation Officer (APO), and
      (i) the State Environmental Quality Review (SEQR) Environmental Assessment Form (EAF) with a negative declaration or the Findings Statement, with documentation of OPRHP's agreement with the resolution; or
      (ii) documentation from OPRHP that the *construction activity* will result in No Impact; or
      (iii) documentation from OPRHP providing a determination of No Adverse Impact; or
      (iv) a Letter of Resolution signed by the owner/operator, OPRHP and the DEC APO which allows for this *construction activity* to be eligible for coverage under the general permit in terms of the State Historic Preservation Act (SHPA); or

   c. Documentation of satisfactory compliance with Section 106 of the National Historic Preservation Act for a coterminous project area:

(i) No Affect
(ii) No Adverse Affect
(iii) Executed Memorandum of Agreement, or

d. Documentation that:

(i) SHPA Section 14.09 has been completed by NYS DEC or another state agency.

9. *Discharge*s from *construction activities* that are subject to an existing SPDES individual or general permit where a SPDES permit for *construction activity* has been terminated or denied; or where the *owner or operator* has failed to renew an expired individual permit.

Part II. PERMIT COVERAGE

A. How to Obtain Coverage

1. An *owner or operator* of a *construction activity* that is not subject to the requirements of a regulated, traditional land use control MS4 must first prepare a SWPPP in accordance with all applicable requirements of this permit and then submit a completed Notice of Intent (NOI) to the Department to be authorized to discharge under this permit.

2. An *owner or operator* of a *construction activity* that is subject to the requirements of a *regulated, traditional land use control MS4* must first prepare a SWPPP in accordance with all applicable requirements of this permit and then have the SWPPP reviewed and accepted by the *regulated, traditional land use control MS4* prior to submitting the NOI to the Department. The *owner or operator* shall have the “MS4 SWPPP Acceptance” form signed in accordance with Part VII.H., and then submit that form along with a completed NOI to the Department.

3. The requirement for an *owner or operator* to have its SWPPP reviewed and accepted by the *regulated, traditional land use control MS4* prior to submitting the NOI to the Department does not apply to an *owner or operator* that is obtaining permit coverage in accordance with the requirements in Part II.F. (Change of *Owner or Operator*) or where the *owner or operator* of the *construction activity* is the *regulated, traditional land use control MS4* . This exemption does not apply to *construction activities* subject to the New York City Administrative Code.

B. Notice of Intent (NOI) Submittal

1. Prior to December 21, 2020, an owner or operator shall use either the electronic (eNOI) or paper version of the NOI that the Department prepared. Both versions of the NOI are located on the Department's website (http://www.dec.ny.gov/). The paper version of the NOI shall be signed in accordance with Part VII.H. of this permit and submitted to the following address:

   NOTICE OF INTENT
   NYS DEC, Bureau of Water Permits
   625 Broadway, 4th Floor
   Albany, New York 12233-3505

2. Beginning December 21, 2020 and in accordance with EPA's 2015 NPDES Electronic Reporting Rule (40 CFR Part 127), the *owner or operator* must submit the NOI electronically using the *Department's* online NOI.

3. The *owner or operator* shall have the SWPPP preparer sign the "SWPPP Preparer Certification" statement on the NOI prior to submitting the form to the Department.

4. As of the date the NOI is submitted to the Department, the *owner or operator* shall make the NOI and SWPPP available for review and copying in accordance with the requirements in Part VII.F. of this permit.

C. Permit Authorization

1. An *owner or operator* shall not *commence construction activity* until their authorization to *discharge* under this permit goes into effect.

2. Authorization to *discharge* under this permit will be effective when the *owner or operator* has satisfied all of the following criteria:

   a. project review pursuant to the State Environmental Quality Review Act ("SEQRA") have been satisfied, when SEQRA is applicable. See the Department's website (http://www.dec.ny.gov/) for more information,

   b. where required, all necessary Department permits subject to the *Uniform Procedures Act ("UPA")* (see 6 NYCRR Part 621), or the equivalent from another New York State agency, have been obtained, unless otherwise notified by the Department pursuant to 6 NYCRR 621.3(a)(4). *Owners or operators* of *construction activities* that are required to obtain *UPA* permits

must submit a preliminary SWPPP to the appropriate DEC Permit Administrator at the Regional Office listed in Appendix F at the time all other necessary *UPA* permit applications are submitted. The preliminary SWPPP must include sufficient information to demonstrate that the *construction activity* qualifies for authorization under this permit,

c. the final SWPPP has been prepared, and

d. a complete NOI has been submitted to the Department in accordance with the requirements of this permit.

3. An *owner or operator* that has satisfied the requirements of Part II.C.2 above will be authorized to *discharge* stormwater from their *construction activity* in accordance with the following schedule:

   a. For *construction activities* that are <u>not</u> subject to the requirements of a *regulated, traditional land use control MS4*:

      (i) Five (5) business days from the date the Department receives a complete electronic version of the NOI (eNOI) for *construction activities* with a SWPPP that has been prepared in conformance with the design criteria in the technical standard referenced in Part III.B.1 and the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C.; or

      (ii) Sixty (60) business days from the date the Department receives a complete NOI (electronic or paper version) for *construction activities* with a SWPPP that has <u>not</u> been prepared in conformance with the design criteria in technical standard referenced in Part III.B.1. or, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C., the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, or;

      (iii) Ten (10) business days from the date the Department receives a complete paper version of the NOI for *construction activities* with a SWPPP that has been prepared in conformance with the design criteria in the technical standard referenced in Part III.B.1 and the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C.

b. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4*:

(i) Five (5) business days from the date the Department receives both a complete electronic version of the NOI (eNOI) and signed "*MS4* SWPPP Acceptance" form, or

(ii) Ten (10) business days from the date the Department receives both a complete paper version of the NOI and signed "MS4 SWPPP Acceptance" form.

4. Coverage under this permit authorizes stormwater *discharges* from only those areas of disturbance that are identified in the NOI. If an *owner or operator* wishes to have stormwater *discharges* from future or additional areas of disturbance authorized, they must submit a new NOI that addresses that phase of the development, unless otherwise notified by the Department. The *owner or operator* shall not *commence construction activity* on the future or additional areas until their authorization to *discharge* under this permit goes into effect in accordance with Part II.C. of this permit.

D. General Requirements For Owners or Operators With Permit Coverage

1. The *owner or operator* shall ensure that the provisions of the SWPPP are implemented from the *commencement of construction activity* until all areas of disturbance have achieved *final stabilization* and the Notice of Termination ("NOT") has been submitted to the Department in accordance with Part V. of this permit. This includes any changes made to the SWPPP pursuant to Part III.A.4. of this permit.

2. The *owner or operator* shall maintain a copy of the General Permit (GP-0-20-001), NOI, *NOI Acknowledgment Letter*, SWPPP, MS4 SWPPP Acceptance form, inspection reports, responsible contractor's or subcontractor's certification statement (see Part III.A.6.), and all documentation necessary to demonstrate eligibility with this permit at the *construction site* until all disturbed areas have achieved *final stabilization* and the NOT has been submitted to the Department. The documents must be maintained in a secure location, such as a job trailer, on-site construction office, or mailbox with lock. The secure location must be accessible during normal business hours to an individual performing a compliance inspection.

3. The *owner or operator* of a *construction activity* shall not disturb greater than five (5) acres of soil at any one time without prior written authorization from the Department or, in areas under the jurisdiction of a *regulated, traditional land*

use control MS4, the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*). At a minimum, the *owner or operator* must comply with the following requirements in order to be authorized to disturb greater than five (5) acres of soil at any one time:

a. The *owner or operator* shall have a *qualified inspector* conduct **at least** two (2) site inspections in accordance with Part IV.C. of this permit every seven (7) calendar days, for as long as greater than five (5) acres of soil remain disturbed. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

b. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven (7) days from the date the current soil disturbance activity ceased. The soil stabilization measures selected shall be in conformance with the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016.

c. The *owner or operator* shall prepare a phasing plan that defines maximum disturbed area per phase and shows required cuts and fills.

d. The *owner or operator* shall install any additional site-specific practices needed to protect water quality.

e. The *owner or operator* shall include the requirements above in their SWPPP.

4. In accordance with statute, regulations, and the terms and conditions of this permit, the Department may suspend or revoke an *owner's or operator's* coverage under this permit at any time if the Department determines that the SWPPP does not meet the permit requirements or consistent with Part VII.K..

5. Upon a finding of significant non-compliance with the practices described in the SWPPP or violation of this permit, the Department may order an immediate stop to all activity at the site until the non-compliance is remedied. The stop work order shall be in writing, describe the non-compliance in detail, and be sent to the *owner or operator*.

6. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4*, the *owner or operator* shall notify the

regulated, traditional land use control MS4 in writing of any planned amendments or modifications to the post-construction stormwater management practice component of the SWPPP required by Part III.A. 4. and 5. of this permit. Unless otherwise notified by the *regulated, traditional land use control MS4*, the *owner or operator* shall have the SWPPP amendments or modifications reviewed and accepted by the *regulated, traditional land use control MS4* prior to commencing construction of the post-construction stormwater management practice.

E. Permit Coverage for Discharges Authorized Under GP-0-15-002

1. Upon renewal of SPDES General Permit for Stormwater Discharges from *Construction Activity* (Permit No. GP-0-15-002), an *owner or operator* of *a construction activity* with coverage under GP-0-15-002, as of the effective date of GP- 0-20-001, shall be authorized to *discharge* in accordance with GP- 0-20-001, unless otherwise notified by the Department.

   An *owner or operator* may continue to implement the technical/design components of the post-construction stormwater management controls provided that such design was done in conformance with the technical standards in place at the time of initial project authorization. However, they must comply with the other, non-design provisions of GP-0-20-001.

F. Change of Owner or Operator

1. When property ownership changes or when there is a change in operational control over the construction plans and specifications, the original *owner or operator* must notify the new *owner or operator*, in writing, of the requirement to obtain permit coverage by submitting a NOI with the Department. For *construction activities* subject to the requirements of a *regulated, traditional land use control MS4,* the original *owner or operator* must also notify the MS4, in writing, of the change in ownership at least 30 calendar days prior to the change in ownership.

2. Once the new *owner or operator* obtains permit coverage, the original *owner or operator* shall then submit a completed NOT with the name and permit identification number of the new *owner or operator* to the Department at the address in Part II.B.1. of this permit. If the original *owner or operator* maintains ownership of a portion of the *construction activity* and will disturb soil, they must maintain their coverage under the permit.

3. Permit coverage for the new *owner or operator* will be effective as of the date the Department receives a complete NOI, provided the original *owner or*

operator was not subject to a sixty (60) business day authorization period that has not expired as of the date the Department receives the NOI from the new *owner or operator*.

Part III. STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

A. General SWPPP Requirements

1. A SWPPP shall be prepared and implemented by the *owner or operator* of each *construction activity* covered by this permit. The SWPPP must document the selection, design, installation, implementation and maintenance of the control measures and practices that will be used to meet the effluent limitations in Part I.B. of this permit and where applicable, the post-construction stormwater management practice requirements in Part I.C. of this permit. The SWPPP shall be prepared prior to the submittal of the NOI. The NOI shall be submitted to the Department prior to the *commencement of construction activity*. A copy of the completed, final NOI shall be included in the SWPPP.

2. The SWPPP shall describe the erosion and sediment control practices and where required, post-construction stormwater management practices that will be used and/or constructed to reduce the *pollutants* in stormwater *discharges* and to assure compliance with the terms and conditions of this permit. In addition, the SWPPP shall identify potential sources of pollution which may reasonably be expected to affect the quality of stormwater *discharges*.

3. All SWPPPs that require the post-construction stormwater management practice component shall be prepared by a *qualified professional* that is knowledgeable in the principles and practices of stormwater management and treatment.

4. The *owner or operator* must keep the SWPPP current so that it at all times accurately documents the erosion and sediment controls practices that are being used or will be used during construction, and all post-construction stormwater management practices that will be constructed on the site. At a minimum, the *owner or operator* shall amend the SWPPP, including construction drawings:

    a. whenever the current provisions prove to be ineffective in minimizing *pollutants* in stormwater *discharges* from the site;

b. whenever there is a change in design, construction, or operation at the *construction site* that has or could have an effect on the *discharge* of *pollutants*;

c. to address issues or deficiencies identified during an inspection by the *qualified inspector,* the Department or other regulatory authority; and

d. to document the final construction conditions.

5. The Department may notify the *owner or operator* at any time that the SWPPP does not meet one or more of the minimum requirements of this permit. The notification shall be in writing and identify the provisions of the SWPPP that require modification. Within fourteen (14) calendar days of such notification, or as otherwise indicated by the Department, the *owner or operator* shall make the required changes to the SWPPP and submit written notification to the Department that the changes have been made. If the *owner or operator* does not respond to the Department's comments in the specified time frame, the Department may suspend the *owner's or operator's* coverage under this permit or require the *owner or operator* to obtain coverage under an individual SPDES permit in accordance with Part II.D.4. of this permit.

6. Prior to the *commencement of construction activity*, the *owner or operator* must identify the contractor(s) and subcontractor(s) that will be responsible for installing, constructing, repairing, replacing, inspecting and maintaining the erosion and sediment control practices included in the SWPPP; and the contractor(s) and subcontractor(s) that will be responsible for constructing the post-construction stormwater management practices included in the SWPPP. The *owner or operator* shall have each of the contractors and subcontractors identify at least one person from their company that will be responsible for implementation of the SWPPP. This person shall be known as the *trained contractor.* The *owner or operator* shall ensure that at least one *trained contractor* is on site on a daily basis when soil disturbance activities are being performed.

   The *owner or operator* shall have each of the contractors and subcontractors identified above sign a copy of the following certification statement below before they commence any *construction activity*:

   "I hereby certify under penalty of law that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the *qualified inspector* during a site inspection. I also understand that the *owner or operator* must comply with

the terms and conditions of the most current version of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater *discharge*s from *construction activities* and that it is unlawful for any person to cause or contribute to a violation of *water quality standards*. Furthermore, I am aware that there are significant penalties for submitting false information, that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations"

In addition to providing the certification statement above, the certification page must also identify the specific elements of the SWPPP that each contractor and subcontractor will be responsible for and include the name and title of the person providing the signature; the name and title of the *trained contractor* responsible for SWPPP implementation; the name, address and telephone number of the contracting firm; the address (or other identifying description) of the site; and the date the certification statement is signed. The *owner or operator* shall attach the certification statement(s) to the copy of the SWPPP that is maintained at the *construction site*. If new or additional contractors are hired to implement measures identified in the SWPPP after construction has commenced, they must also sign the certification statement and provide the information listed above.

7. For projects where the Department requests a copy of the SWPPP or inspection reports, the *owner or operator* shall submit the documents in both electronic (PDF only) and paper format within five (5) business days, unless otherwise notified by the Department.

B. Required SWPPP Contents

1. Erosion and sediment control component - All SWPPPs prepared pursuant to this permit shall include erosion and sediment control practices designed in conformance with the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016. Where erosion and sediment control practices are not designed in conformance with the design criteria included in the technical standard, the *owner or operator* must demonstrate *equivalence* to the technical standard. At a minimum, the erosion and sediment control component of the SWPPP shall include the following:

    a. Background information about the scope of the project, including the location, type and size of project

b. A site map/construction drawing(s) for the project, including a general location map. At a minimum, the site map shall show the total site area; all improvements; areas of disturbance; areas that will not be disturbed; existing vegetation; on-site and adjacent off-site surface water(s); floodplain/floodway boundaries; wetlands and drainage patterns that could be affected by the *construction activity*; existing and final contours ; locations of different soil types with boundaries; material, waste, borrow or equipment storage areas located on adjacent properties; and location(s) of the stormwater *discharge*(s);

c. A description of the soil(s) present at the site, including an identification of the Hydrologic Soil Group (HSG);

d. A construction phasing plan and sequence of operations describing the intended order of *construction activities*, including clearing and grubbing, excavation and grading, utility and infrastructure installation and any other activity at the site that results in soil disturbance;

e. A description of the minimum erosion and sediment control practices to be installed or implemented for each *construction activity* that will result in soil disturbance. Include a schedule that identifies the timing of initial placement or implementation of each erosion and sediment control practice and the minimum time frames that each practice should remain in place or be implemented;

f. A temporary and permanent soil stabilization plan that meets the requirements of this general permit and the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016, for each stage of the project, including initial land clearing and grubbing to project completion and achievement of *final stabilization*;

g. A site map/construction drawing(s) showing the specific location(s), size(s), and length(s) of each erosion and sediment control practice;

h. The dimensions, material specifications, installation details, and operation and maintenance requirements for all erosion and sediment control practices. Include the location and sizing of any temporary sediment basins and structural practices that will be used to divert flows from exposed soils;

i. A maintenance inspection schedule for the contractor(s) identified in Part III.A.6. of this permit, to ensure continuous and effective operation of the erosion and sediment control practices. The maintenance inspection

schedule shall be in accordance with the requirements in the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016;

j. A description of the pollution prevention measures that will be used to control litter, construction chemicals and construction debris from becoming a *pollutant* source in the stormwater *discharges*;

k. A description and location of any stormwater *discharges* associated with industrial activity other than construction at the site, including, but not limited to, stormwater *discharges* from asphalt plants and concrete plants located on the *construction site*; and

l. Identification of any elements of the design that are not in conformance with the design criteria in the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016. Include the reason for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

2. Post-construction stormwater management practice component – The *owner or operator* of any construction project identified in Table 2 of Appendix B as needing post-construction stormwater management practices shall prepare a SWPPP that includes practices designed in conformance with the applicable *sizing criteria* in Part I.C.2.a., c. or d. of this permit and the *performance criteria* in the technical standard, New York State Stormwater Management Design Manual dated January 2015

   Where post-construction stormwater management practices are not designed in conformance with the *performance criteria* in the technical standard, the *owner or operator* must include in the SWPPP the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

   The post-construction stormwater management practice component of the SWPPP shall include the following:

   a. Identification of all post-construction stormwater management practices to be constructed as part of the project. Include the dimensions, material specifications and installation details for each post-construction stormwater management practice;

b. A site map/construction drawing(s) showing the specific location and size of each post-construction stormwater management practice;

c. A Stormwater Modeling and Analysis Report that includes:
   (i) Map(s) showing pre-development conditions, including watershed/subcatchments boundaries, flow paths/routing, and design points;

   (ii) Map(s) showing post-development conditions, including watershed/subcatchments boundaries, flow paths/routing, design points and post-construction stormwater management practices;

   (iii) Results of stormwater modeling (i.e. hydrology and hydraulic analysis) for the required storm events. Include supporting calculations (model runs), methodology, and a summary table that compares pre and post-development runoff rates and volumes for the different storm events;

   (iv) Summary table, with supporting calculations, which demonstrates that each post-construction stormwater management practice has been designed in conformance with the *sizing criteria* included in the Design Manual;

   (v) Identification of any *sizing criteria* that is not required based on the requirements included in Part I.C. of this permit; and

   (vi) Identification of any elements of the design that are not in conformance with the *performance criteria* in the Design Manual. Include the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the Design Manual;

d. Soil testing results and locations (test pits, borings);

e. Infiltration test results, when required; and

f. An operations and maintenance plan that includes inspection and maintenance schedules and actions to ensure continuous and effective operation of each post-construction stormwater management practice. The plan shall identify the entity that will be responsible for the long term operation and maintenance of each practice.

3. Enhanced Phosphorus Removal Standards - All construction projects identified in Table 2 of Appendix B that are located in the watersheds identified in Appendix C shall prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the applicable *sizing criteria* in Part I.C.2. b., c. or d. of this permit and the *performance criteria,* Enhanced Phosphorus Removal Standards included in the Design Manual. At a minimum, the post-construction stormwater management practice component of the SWPPP shall include items 2.a - 2.f. above.

C. Required SWPPP Components by Project Type

Unless otherwise notified by the Department, *owners or operators* of *construction activities* identified in Table 1 of Appendix B are required to prepare a SWPPP that only includes erosion and sediment control practices designed in conformance with Part III.B.1 of this permit. *Owners or operators* of the *construction activities* identified in Table 2 of Appendix B shall prepare a SWPPP that also includes post-construction stormwater management practices designed in conformance with Part III.B.2 or 3 of this permit.

Part IV. INSPECTION AND MAINTENANCE REQUIREMENTS

A. General Construction Site Inspection and Maintenance Requirements

1. The *owner or operator* must ensure that all erosion and sediment control practices (including pollution prevention measures) and all post-construction stormwater management practices identified in the SWPPP are inspected and maintained in accordance with Part IV.B. and C. of this permit.

2. The terms of this permit shall not be construed to prohibit the State of New York from exercising any authority pursuant to the ECL, common law or federal law, or prohibit New York State from taking any measures, whether civil or criminal, to prevent violations of the laws of the State of New York or protect the public health and safety and/or the environment.

B. Contractor Maintenance Inspection Requirements

1. The *owner or operator* of each *construction activity* identified in Tables 1 and 2 of Appendix B shall have a *trained contractor* inspect the erosion and sediment control practices and pollution prevention measures being implemented within the active work area daily to ensure that they are being maintained in effective operating condition at all times. If deficiencies are identified, the contractor shall

begin implementing corrective actions within one business day and shall complete the corrective actions in a reasonable time frame.

2. For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and *temporary stabilization* measures have been applied to all disturbed areas, the *trained contractor* can stop conducting the maintenance inspections. The *trained contractor* shall begin conducting the maintenance inspections in accordance with Part IV.B.1. of this permit as soon as soil disturbance activities resume.

3. For construction sites where soil disturbance activities have been shut down with partial project completion, the *trained contractor* can stop conducting the maintenance inspections if all areas disturbed as of the project shutdown date have achieved *final stabilization* and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational.

C. Qualified Inspector Inspection Requirements

The *owner or operator* shall have a *qualified inspector* conduct site inspections in conformance with the following requirements:

[Note: The *trained contractor* identified in Part III.A.6. and IV.B. of this permit **cannot** conduct the *qualified inspector* site inspections unless they meet the *qualified inspector* qualifications included in Appendix A. In order to perform these inspections, the *trained contractor* would have to be a:

- licensed Professional Engineer,
- Certified Professional in Erosion and Sediment Control (CPESC),
- New York State Erosion and Sediment Control Certificate Program holder
- Registered Landscape Architect, or
- someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity].

1. A *qualified inspector* shall conduct site inspections for all *construction activities* identified in Tables 1 and 2 of Appendix B, with the exception of:

   a. the construction of a single family residential subdivision with 25% or less *impervious cover* at total site build-out that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres and is not located

in one of the watersheds listed in Appendix C and not directly discharging to one of the 303(d) segments listed in Appendix E;

b. the construction of a single family home that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres and is not located in one of the watersheds listed in Appendix C and not directly discharging to one of the 303(d) segments listed in Appendix E;

c. construction on agricultural property that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres; and

d. *construction activities* located in the watersheds identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

2. Unless otherwise notified by the Department, the *qualified inspector* shall conduct site inspections in accordance with the following timetable:

a. For construction sites where soil disturbance activities are on-going, the *qualified inspector* shall conduct a site inspection at least once every seven (7) calendar days.

b. For construction sites where soil disturbance activities are on-going and the *owner or operator* has received authorization in accordance with Part II.D.3 to disturb greater than five (5) acres of soil at any one time, the *qualified inspector* shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

c. For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and *temporary stabilization* measures have been applied to all disturbed areas, the *qualified inspector* shall conduct a site inspection at least once every thirty (30) calendar days. The *owner or operator* shall notify the DOW Water (SPDES) Program contact at the Regional Office (see contact information in Appendix F) or, in areas under the jurisdiction of a *regulated, traditional land use control MS4,* the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*) in writing prior to reducing the frequency of inspections.

d. For construction sites where soil disturbance activities have been shut down with partial project completion, the *qualified inspector* can stop conducting inspections if all areas disturbed as of the project shutdown date have achieved *final stabilization* and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational. The *owner or operator* shall notify the DOW Water (SPDES) Program contact at the Regional Office (see contact information in Appendix F) or, in areas under the jurisdiction of a *regulated, traditional land use control MS4,* the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*) in writing prior to the shutdown. If soil disturbance activities are not resumed within 2 years from the date of shutdown, the *owner or operator* shall have the *qualified inspector* perform a final inspection and certify that all disturbed areas have achieved *final stabilization,* and all temporary, structural erosion and sediment control measures have been removed*;* and that all post-construction stormwater management practices have been constructed in conformance with the SWPPP by signing the "*Final Stabilization*" and "Post-Construction Stormwater Management Practice" certification statements on the NOT. The *owner or operator* shall then submit the completed NOT form to the address in Part II.B.1 of this permit.

e. For construction sites that directly *discharge* to one of the 303(d) segments listed in Appendix E or is located in one of the watersheds listed in Appendix C, the *qualified inspector* shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

3. At a minimum, the *qualified inspector* shall inspect all erosion and sediment control practices and pollution prevention measures to ensure integrity and effectiveness, all post-construction stormwater management practices under construction to ensure that they are constructed in conformance with the SWPPP, all areas of disturbance that have not achieved *final stabilization,* all points of *discharge* to natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the *construction site*, and all points of *discharge* from the *construction site*.

4. The *qualified inspector* shall prepare an inspection report subsequent to each and every inspection. At a minimum, the inspection report shall include and/or address the following:

a. Date and time of inspection;

b. Name and title of person(s) performing inspection;

c. A description of the weather and soil conditions (e.g. dry, wet, saturated) at the time of the inspection;

d. A description of the condition of the runoff at all points of *discharge* from the *construction site*. This shall include identification of any *discharges* of sediment from the *construction site*. Include *discharges* from conveyance systems (i.e. pipes, culverts, ditches, etc.) and overland flow;

e. A description of the condition of all natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the *construction site* which receive runoff from disturbed areas. This shall include identification of any *discharges* of sediment to the surface waterbody;

f. Identification of all erosion and sediment control practices and pollution prevention measures that need repair or maintenance;

g. Identification of all erosion and sediment control practices and pollution prevention measures that were not installed properly or are not functioning as designed and need to be reinstalled or replaced;

h. Description and sketch of areas with active soil disturbance activity, areas that have been disturbed but are inactive at the time of the inspection, and areas that have been stabilized (temporary and/or final) since the last inspection;

i. Current phase of construction of all post-construction stormwater management practices and identification of all construction that is not in conformance with the SWPPP and technical standards;

j. Corrective action(s) that must be taken to install, repair, replace or maintain erosion and sediment control practices and pollution prevention measures; and to correct deficiencies identified with the construction of the post-construction stormwater management practice(s);

k. Identification and status of all corrective actions that were required by previous inspection; and

l. Digital photographs, with date stamp, that clearly show the condition of all practices that have been identified as needing corrective actions. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report being maintained onsite within seven (7) calendar days of the date of the inspection. The *qualified inspector* shall also take digital photographs, with date stamp, that clearly show the condition of the practice(s) after the corrective action has been completed. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report that documents the completion of the corrective action work within seven (7) calendar days of that inspection.

5. Within one business day of the completion of an inspection, the *qualified inspector* shall notify the *owner or operator* and appropriate contractor or subcontractor identified in Part III.A.6. of this permit of any corrective actions that need to be taken. The contractor or subcontractor shall begin implementing the corrective actions within one business day of this notification and shall complete the corrective actions in a reasonable time frame.

6. All inspection reports shall be signed by the *qualified inspector.* Pursuant to Part II.D.2. of this permit, the inspection reports shall be maintained on site with the SWPPP.

Part V. TERMINATION OF PERMIT COVERAGE

A. Termination of Permit Coverage

1. An *owner or operator* that is eligible to terminate coverage under this permit must submit a completed NOT form to the address in Part II.B.1 of this permit. The NOT form shall be one which is associated with this permit, signed in accordance with Part VII.H of this permit.

2. An *owner or operator* may terminate coverage when one or more the following conditions have been met:

   a. Total project completion - All *construction activity* identified in the SWPPP has been completed; and all areas of disturbance have achieved *final stabilization*; and all temporary, structural erosion and sediment control measures have been removed; and all post-construction stormwater management practices have been constructed in conformance with the SWPPP and are operational;

b. Planned shutdown with partial project completion - All soil disturbance activities have ceased; and all areas disturbed as of the project shutdown date have achieved *final stabilization*; and all temporary, structural erosion and sediment control measures have been removed; and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational;

c. A new *owner or operator* has obtained coverage under this permit in accordance with Part II.F. of this permit.

d. The *owner or operator* obtains coverage under an alternative SPDES general permit or an individual SPDES permit.

3. For *construction activities* meeting subdivision 2a. or 2b. of this Part, the *owner or operator* shall have the *qualified inspector* perform a final site inspection prior to submitting the NOT. The *qualified inspector* shall, by signing the "*Final Stabilization*" and "Post-Construction Stormwater Management Practice certification statements on the NOT, certify that all the requirements in Part V.A.2.a. or b. of this permit have been achieved.

4. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4* and meet subdivision 2a. or 2b. of this Part, the *owner or operator* shall have the *regulated, traditional land use control MS4* sign the "MS4 Acceptance" statement on the NOT in accordance with the requirements in Part VII.H. of this permit. The *regulated, traditional land use control MS4* official, by signing this statement, has determined that it is acceptable for the *owner or operator* to submit the NOT in accordance with the requirements of this Part. The *regulated, traditional land use control MS4* can make this determination by performing a final site inspection themselves or by accepting the *qualified inspector*'s final site inspection certification(s) required in Part V.A.3. of this permit.

5. For *construction activities* that require post-construction stormwater management practices and meet subdivision 2a. of this Part, the *owner or operator* must, prior to submitting the NOT, ensure one of the following:

a. the post-construction stormwater management practice(s) and any right-of-way(s) needed to maintain such practice(s) have been deeded to the municipality in which the practice(s) is located,

b. an executed maintenance agreement is in place with the municipality that will maintain the post-construction stormwater management practice(s),

c. for post-construction stormwater management practices that are privately owned, the *owner or operator* has a mechanism in place that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan, such as a deed covenant in the *owner or operator's* deed of record,

d. for post-construction stormwater management practices that are owned by a public or private institution (e.g. school, university, hospital), government agency or authority, or public utility; the *owner or operator* has policy and procedures in place that ensures operation and maintenance of the practices in accordance with the operation and maintenance plan.

Part VI. REPORTING AND RETENTION RECORDS

A. Record Retention

The *owner or operator* shall retain a copy of the NOI, NOI Acknowledgment Letter, SWPPP, MS4 SWPPP Acceptance form and any inspection reports that were prepared in conjunction with this permit for a period of at least five (5) years from the date that the Department receives a complete NOT submitted in accordance with Part V. of this general permit.

B. Addresses

With the exception of the NOI, NOT, and MS4 SWPPP Acceptance form (which must be submitted to the address referenced in Part II.B.1 of this permit), all written correspondence requested by the Department, including individual permit applications, shall be sent to the address of the appropriate DOW Water (SPDES) Program contact at the Regional Office listed in Appendix F.

Part VII. STANDARD PERMIT CONDITIONS

A. Duty to Comply

The *owner or operator* must comply with all conditions of this permit. All contractors and subcontractors associated with the project must comply with the terms of the SWPPP. Any non-compliance with this permit constitutes a violation of the Clean Water

Act (CWA) and the ECL and is grounds for an enforcement action against the *owner or operator* and/or the contractor/subcontractor; permit revocation, suspension or modification; or denial of a permit renewal application. Upon a finding of significant non-compliance with this permit or the applicable SWPPP, the Department may order an immediate stop to all *construction activity* at the site until the non-compliance is remedied. The stop work order shall be in writing, shall describe the non-compliance in detail, and shall be sent to the *owner or operator*.

If any human remains or archaeological remains are encountered during excavation, the *owner or operator* must immediately cease, or cause to cease, all *construction activity* in the area of the remains and notify the appropriate Regional Water Engineer (RWE). *Construction activity* shall not resume until written permission to do so has been received from the RWE.

B. Continuation of the Expired General Permit

This permit expires five (5) years from the effective date. If a new general permit is not issued prior to the expiration of this general permit, an *owner or operator* with coverage under this permit may continue to operate and *discharge* in accordance with the terms and conditions of this general permit, if it is extended pursuant to the State Administrative Procedure Act and 6 NYCRR Part 621, until a new general permit is issued.

C. Enforcement

Failure of the *owner or operator,* its contractors, subcontractors, agents and/or assigns to strictly adhere to any of the permit requirements contained herein shall constitute a violation of this permit. There are substantial criminal, civil, and administrative penalties associated with violating the provisions of this permit. Fines of up to $37,500 per day for each violation and imprisonment for up to fifteen (15) years may be assessed depending upon the nature and degree of the offense.

D. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for an *owner or operator* in an enforcement action that it would have been necessary to halt or reduce the *construction activity* in order to maintain compliance with the conditions of this permit.

E. Duty to Mitigate

The *owner or operator* and its contractors and subcontractors shall take all reasonable steps to *minimize* or prevent any *discharge* in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

F. Duty to Provide Information

The *owner or operator* shall furnish to the Department, within a reasonable specified time period of a written request, all documentation necessary to demonstrate eligibility and any information to determine compliance with this permit or to determine whether cause exists for modifying or revoking this permit, or suspending or denying coverage under this permit, in accordance with the terms and conditions of this permit. The NOI, SWPPP and inspection reports required by this permit are public documents that the *owner or operator* must make available for review and copying by any person within five (5) business days of the *owner or operator* receiving a written request by any such person to review these documents. Copying of documents will be done at the requester's expense.

G. Other Information

When the *owner or operator* becomes aware that they failed to submit any relevant facts, or submitted incorrect information in the NOI or in any of the documents required by this permit , or have made substantive revisions to the SWPPP (e.g. the scope of the project changes significantly, the type of post-construction stormwater management practice(s) changes, there is a reduction in the sizing of the post-construction stormwater management practice, or there is an increase in the disturbance area or *impervious area*), which were not reflected in the original NOI submitted to the Department, they shall promptly submit such facts or information to the Department using the contact information in Part II.A. of this permit. Failure of the *owner or operator* to correct or supplement any relevant facts within five (5) business days of becoming aware of the deficiency shall constitute a violation of this permit.

H. Signatory Requirements

1. All NOIs and NOTs shall be signed as follows:

    a. For a corporation these forms shall be signed by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

(i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or

(ii) the manager of one or more manufacturing, production or operating facilities, provided the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

b. For a partnership or sole proprietorship these forms shall be signed by a general partner or the proprietor, respectively; or

c. For a municipality, State, Federal, or other public agency these forms shall be signed by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes:

(i) the chief executive officer of the agency, or

(ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of EPA).

2. The SWPPP and other information requested by the Department shall be signed by a person described in Part VII.H.1. of this permit or by a duly authorized representative of that person. A person is a duly authorized representative only if:

a. The authorization is made in writing by a person described in Part VII.H.1. of this permit;

b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field,

superintendent, position of *equivalent* responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position) and,

c. The written authorization shall include the name, title and signature of the authorized representative and be attached to the SWPPP.

3. All inspection reports shall be signed by the *qualified inspector* that performs the inspection.

4. The MS4 SWPPP Acceptance form shall be signed by the principal executive officer or ranking elected official from the *regulated, traditional land use control MS4,* or by a duly authorized representative of that person.

   It shall constitute a permit violation if an incorrect and/or improper signatory authorizes any required forms, SWPPP and/or inspection reports.

I. Property Rights

The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property nor any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations. *Owners or operators* must obtain any applicable conveyances, easements, licenses and/or access to real property prior to *commencing construction activity*.

J. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

K. Requirement to Obtain Coverage Under an Alternative Permit

1. The Department may require any owner or operator authorized by this permit to apply for and/or obtain either an individual SPDES permit or another SPDES general permit. When the Department requires any discharger authorized by a general permit to apply for an individual SPDES permit, it shall notify the discharger in writing that a permit application is required. This notice shall

include a brief statement of the reasons for this decision, an application form, a statement setting a time frame for the owner or operator to file the application for an individual SPDES permit, and a deadline, not sooner than 180 days from owner or operator receipt of the notification letter, whereby the authorization to discharge under this general permit shall be terminated. Applications must be submitted to the appropriate Permit Administrator at the Regional Office. The Department may grant additional time upon demonstration, to the satisfaction of the Department, that additional time to apply for an alternative authorization is necessary or where the Department has not provided a permit determination in accordance with Part 621 of this Title.

2. When an individual SPDES permit is issued to a discharger authorized to *discharge* under a general SPDES permit for the same *discharge*(s), the general permit authorization for outfalls authorized under the individual SPDES permit is automatically terminated on the effective date of the individual permit unless termination is earlier in accordance with 6 NYCRR Part 750.

L. Proper Operation and Maintenance

The *owner or operator* shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the *owner or operator* to achieve compliance with the conditions of this permit and with the requirements of the SWPPP.

M. Inspection and Entry

The *owner or operator* shall allow an authorized representative of the Department, EPA, applicable county health department, or, in the case of a *construction site* which *discharges* through an *MS4*, an authorized representative of the *MS4* receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the owner’s or operator's premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of this permit;

2. Have access to and copy at reasonable times, any records that must be kept under the conditions of this permit; and

3. Inspect at reasonable times any facilities or equipment (including monitoring and control equipment), practices or operations regulated or required by this permit.

4. Sample or monitor at reasonable times, for purposes of assuring permit compliance or as otherwise authorized by the Act or ECL, any substances or parameters at any location.

N. Permit Actions

This permit may, at any time, be modified, suspended, revoked, or renewed by the Department in accordance with 6 NYCRR Part 621. The filing of a request by the *owner or operator* for a permit modification, revocation and reissuance, termination, a notification of planned changes or anticipated noncompliance does not limit, diminish and/or stay compliance with any terms of this permit.

O. Definitions

Definitions of key terms are included in Appendix A of this permit.

P. Re-Opener Clause

1. If there is evidence indicating potential or realized impacts on water quality due to any stormwater discharge associated with construction activity covered by this permit, the owner or operator of such discharge may be required to obtain an individual permit or alternative general permit in accordance with Part VII.K. of this permit or the permit may be modified to include different limitations and/or requirements.

2. Any Department initiated permit modification, suspension or revocation will be conducted in accordance with 6 NYCRR Part 621, 6 NYCRR 750-1.18, and 6 NYCRR 750-1.20.

Q. Penalties for Falsification of Forms and Reports

In accordance with 6NYCRR Part 750-2.4 and 750-2.5, any person who knowingly makes any false material statement, representation, or certification in any application, record, report or other document filed or required to be maintained under this permit, including reports of compliance or noncompliance shall, upon conviction, be punished in accordance with ECL §71-1933 and or Articles 175 and 210 of the New York State Penal Law.

R. Other Permits

Nothing in this permit relieves the *owner or operator* from a requirement to obtain any other permits required by law.

APPENDIX A – Acronyms and Definitions

Acronyms

APO – Agency Preservation Officer
BMP – Best Management Practice
CPESC – Certified Professional in Erosion and Sediment Control
Cpv – Channel Protection Volume
CWA – Clean Water Act (or the Federal Water Pollution Control Act, 33 U.S.C. §1251 et seq)
DOW – Division of Water
EAF – Environmental Assessment Form
ECL - Environmental Conservation Law
EPA – U. S. Environmental Protection Agency
HSG – Hydrologic Soil Group
MS4 – Municipal Separate Storm Sewer System
NOI – Notice of Intent
NOT – Notice of Termination
NPDES – National Pollutant Discharge Elimination System
OPRHP – Office of Parks, Recreation and Historic Places
Qf – Extreme Flood
Qp – Overbank Flood
RRv – Runoff Reduction Volume
RWE – Regional Water Engineer
SEQR – State Environmental Quality Review
SEQRA - State Environmental Quality Review Act
SHPA – State Historic Preservation Act
SPDES – State Pollutant Discharge Elimination System
SWPPP – Stormwater Pollution Prevention Plan
TMDL – Total Maximum Daily Load
UPA – Uniform Procedures Act
USDA – United States Department of Agriculture
WQv – Water Quality Volume

Definitions

All definitions in this section are solely for the purposes of this permit.

Agricultural Building – a structure designed and constructed to house farm implements, hay, grain, poultry, livestock or other horticultural products; excluding any structure designed, constructed or used, in whole or in part, for human habitation, as a place of employment where agricultural products are processed, treated or packaged, or as a place used by the public.

Agricultural Property –means the land for construction of a barn, *agricultural building*, silo, stockyard, pen or other structural practices identified in Table II in the "Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State" prepared by the Department in cooperation with agencies of New York Nonpoint Source Coordinating Committee (dated June 2007).

Alter Hydrology from Pre to Post-Development Conditions - means the post-development peak flow rate(s) has increased by more than 5% of the pre-developed condition for the design storm of interest (e.g. 10 yr and 100 yr).

Combined Sewer - means a sewer that is designed to collect and convey both "sewage" and "stormwater".

Commence (Commencement of) Construction Activities - means the initial disturbance of soils associated with clearing, grading or excavation activities; or other construction related activities that disturb or expose soils such as demolition, stockpiling of fill material, and the initial installation of erosion and sediment control practices required in the SWPPP. See definition for "*Construction Activity(ies)*" also.

Construction Activity(ies) - means any clearing, grading, excavation, filling, demolition or stockpiling activities that result in soil disturbance. Clearing activities can include, but are not limited to, logging equipment operation, the cutting and skidding of trees, stump removal and/or brush root removal. Construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility.

Construction Site – means the land area where *construction activity(ies)* will occur. See definition for "*Commence (Commencement of) Construction Activities"* and "*Larger Common Plan of Development or Sale" also.*

Dewatering – means the act of draining rainwater and/or groundwater from building foundations, vaults or excavations/trenches.

Direct Discharge (to a specific surface waterbody) - means that runoff flows from a *construction site* by overland flow and the first point of discharge is the specific surface waterbody, or runoff flows from a *construction site* to a separate storm sewer system

and the first point of discharge from the separate storm sewer system is the specific surface waterbody.

Discharge(s) - means any addition of any pollutant to waters of the State through an outlet or *point source*.

Embankment –means an earthen or rock slope that supports a road/highway.

Endangered or Threatened Species – see 6 NYCRR Part 182 of the Department's rules and regulations for definition of terms and requirements.

Environmental Conservation Law (ECL) - means chapter 43-B of the Consolidated Laws of the State of New York, entitled the Environmental Conservation Law.

Equivalent (Equivalence) – means that the practice or measure meets all the performance, longevity, maintenance, and safety objectives of the technical standard and will provide an equal or greater degree of water quality protection.

Final Stabilization - means that all soil disturbance activities have ceased and a uniform, perennial vegetative cover with a density of eighty (80) percent over the entire pervious surface has been established; or other equivalent stabilization measures, such as permanent landscape mulches, rock rip-rap or washed/crushed stone have been applied on all disturbed areas that are not covered by permanent structures, concrete or pavement.

General SPDES permit - means a SPDES permit issued pursuant to 6 NYCRR Part 750-1.21 and Section 70-0117 of the ECL authorizing a category of discharges.

Groundwater(s) - means waters in the saturated zone. The saturated zone is a subsurface zone in which all the interstices are filled with water under pressure greater than that of the atmosphere. Although the zone may contain gas-filled interstices or interstices filled with fluids other than water, it is still considered saturated.

Historic Property – means any building, structure, site, object or district that is listed on the State or National Registers of Historic Places or is determined to be eligible for listing on the State or National Registers of Historic Places.

Impervious Area (Cover) - means all impermeable surfaces that cannot effectively infiltrate rainfall. This includes paved, concrete and gravel surfaces (i.e. parking lots, driveways, roads, runways and sidewalks); building rooftops and miscellaneous impermeable structures such as patios, pools, and sheds.

Infeasible – means not technologically possible, or not economically practicable and achievable in light of best industry practices.

Larger Common Plan of Development or Sale - means a contiguous area where multiple separate and distinct *construction activities* are occurring, or will occur, under one plan. The term “plan” in “larger common plan of development or sale” is broadly defined as any announcement or piece of documentation (including a sign, public notice or hearing, marketing plan, advertisement, drawing, permit application, State Environmental Quality Review Act (SEQRA) environmental assessment form or other documents, zoning request, computer design, etc.) or physical demarcation (including boundary signs, lot stakes, surveyor markings, etc.) indicating that *construction activities* may occur on a specific plot.

For discrete construction projects that are located within a larger common plan of development or sale that are at least 1/4 mile apart, each project can be treated as a separate plan of development or sale provided any interconnecting road, pipeline or utility project that is part of the same “common plan” is not concurrently being disturbed.

Minimize – means reduce and/or eliminate to the extent achievable using control measures (including best management practices) that are technologically available and economically practicable and achievable in light of best industry practices.

Municipal Separate Storm Sewer (MS4) - a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

(i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to surface waters of the State*;*
(ii) Designed or used for collecting or conveying stormwater;
(iii) Which is not a *combined sewer*; and
(iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

National Pollutant Discharge Elimination System (NPDES) - means the national system for the issuance of wastewater and stormwater permits under the Federal Water Pollution Control Act (Clean Water Act).

Natural Buffer –means an undisturbed area with natural cover running along a surface water (e.g. wetland, stream, river, lake, etc.).

New Development – means any land disturbance that does not meet the definition of Redevelopment Activity included in this appendix.

New York State Erosion and Sediment Control Certificate Program – a certificate program that establishes and maintains a process to identify and recognize individuals who are capable of developing, designing, inspecting and maintaining erosion and sediment control plans on projects that disturb soils in New York State. The certificate program is administered by the New York State Conservation District Employees Association.

NOI Acknowledgment Letter - means the letter that the Department sends to an owner or operator to acknowledge the Department's receipt and acceptance of a complete Notice of Intent. This letter documents the owner's or operator's authorization to discharge in accordance with the general permit for stormwater discharges from *construction activity*.

Nonpoint Source - means any source of water pollution or pollutants which is not a discrete conveyance or *point source* permitted pursuant to Title 7 or 8 of Article 17 of the Environmental Conservation Law (see ECL Section 17-1403).

Overbank –means flow events that exceed the capacity of the stream channel and spill out into the adjacent floodplain.

Owner or Operator - means the person, persons or legal entity which owns or leases the property on which the *construction activity* is occurring; an entity that has operational control over the construction plans and specifications, including the ability to make modifications to the plans and specifications; and/or an entity that has day-to-day operational control of those activities at a project that are necessary to ensure compliance with the permit conditions.

Performance Criteria – means the design criteria listed under the "Required Elements" sections in Chapters 5, 6 and 10 of the technical standard, New York State Stormwater Management Design Manual, dated January 2015. It does not include the Sizing Criteria (i.e. WQv, RRv, Cpv, Qp and Qf) in Part I.C.2. of the permit.

Point Source - means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, vessel or other floating craft, or landfill leachate collection system from which *pollutants* are or may be discharged.

Pollutant - means dredged spoil, filter backwash, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand and industrial, municipal, agricultural waste and ballast discharged into water; which may cause or might reasonably be expected to cause pollution of the waters of the state in contravention of the standards or guidance values adopted as provided in 6 NYCRR Parts 700 et seq .

Qualified Inspector - means a person that is knowledgeable in the principles and practices of erosion and sediment control, such as a licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, New York State Erosion and Sediment Control Certificate Program holder or other Department endorsed individual(s).

It can also mean someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided that person has training in the principles and practices of erosion and sediment control. Training in the principles and practices of erosion and sediment control means that the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect has received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect shall receive four (4) hours of training every three (3) years.

It can also mean a person that meets the *Qualified Professional* qualifications in addition to the *Qualified Inspector* qualifications.

Note: Inspections of any post-construction stormwater management practices that include structural components, such as a dam for an impoundment, shall be performed by a licensed Professional Engineer.

Qualified Professional - means a person that is knowledgeable in the principles and practices of stormwater management and treatment, such as a licensed Professional Engineer, Registered Landscape Architect or other Department endorsed individual(s). Individuals preparing SWPPPs that require the post-construction stormwater management practice component must have an understanding of the principles of hydrology, water quality management practice design, water quantity control design, and, in many cases, the principles of hydraulics. All components of the SWPPP that involve the practice of engineering, as defined by the NYS Education Law (see Article 145), shall be prepared by, or under the direct supervision of, a professional engineer licensed to practice in the State of New York.

Redevelopment Activity(ies) – means the disturbance and reconstruction of existing impervious area, including impervious areas that were removed from a project site within five (5) years of preliminary project plan submission to the local government (i.e. site plan, subdivision, etc.).

Regulated, Traditional Land Use Control MS4 - means a city, town or village with land use control authority that is authorized to discharge under New York State DEC's

SPDES General Permit For Stormwater Discharges from Municipal Separate Stormwater Sewer Systems (MS4s) or the City of New York's Individual SPDES Permit for their Municipal Separate Storm Sewer Systems (NY-0287890).

Routine Maintenance Activity - means *construction activity* that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility, including, but not limited to:

- Re-grading of gravel roads or parking lots,
- Cleaning and shaping of existing roadside ditches and culverts that maintains the approximate original line and grade, and hydraulic capacity of the ditch,
- Cleaning and shaping of existing roadside ditches that does not maintain the approximate original grade, hydraulic capacity and purpose of the ditch if the changes to the line and grade, hydraulic capacity or purpose of the ditch are installed to improve water quality and quantity controls (e.g. installing grass lined ditch),
- Placement of aggregate shoulder backing that stabilizes the transition between the road shoulder and the ditch or *embankment*,
- Full depth milling and filling of existing asphalt pavements, replacement of concrete pavement slabs, and similar work that does not expose soil or disturb the bottom six (6) inches of subbase material,
- Long-term use of equipment storage areas at or near highway maintenance facilities,
- Removal of sediment from the edge of the highway to restore a previously existing sheet-flow drainage connection from the highway surface to the highway ditch or *embankment*,
- Existing use of Canal Corp owned upland disposal sites for the canal, and
- Replacement of curbs, gutters, sidewalks and guide rail posts.

Site limitations – means site conditions that prevent the use of an infiltration technique and or infiltration of the total WQv. Typical site limitations include: seasonal high groundwater, shallow depth to bedrock, and soils with an infiltration rate less than 0.5 inches/hour. The existence of site limitations shall be confirmed and documented using actual field testing (i.e. test pits, soil borings, and infiltration test) or using information from the most current United States Department of Agriculture (USDA) Soil Survey for the County where the project is located.

Sizing Criteria – means the criteria included in Part I.C.2 of the permit that are used to size post-construction stormwater management control practices. The criteria include; Water Quality Volume (WQv), Runoff Reduction Volume (RRv), Channel Protection Volume (Cpv), *Overbank* Flood (Qp), and Extreme Flood (Qf).

State Pollutant Discharge Elimination System (SPDES) - means the system established pursuant to Article 17 of the ECL and 6 NYCRR Part 750 for issuance of permits authorizing discharges to the waters of the state.

Steep Slope – means land area designated on the current United States Department of Agriculture ("USDA") Soil Survey as Soil Slope Phase "D", (provided the map unit name is inclusive of slopes greater than 25%) , or Soil Slope Phase E or F, (regardless of the map unit name), or a combination of the three designations.

Streambank – as used in this permit, means the terrain alongside the bed of a creek or stream. The bank consists of the sides of the channel, between which the flow is confined.

Stormwater Pollution Prevention Plan (SWPPP) – means a project specific report, including construction drawings, that among other things: describes the construction activity(ies), identifies the potential sources of pollution at the *construction site*; describes and shows the stormwater controls that will be used to control the pollutants (i.e. erosion and sediment controls; for many projects, includes post-construction stormwater management controls); and identifies procedures the *owner or operator* will implement to comply with the terms and conditions of the permit. See Part III of the permit for a complete description of the information that must be included in the SWPPP.

Surface Waters of the State - shall be construed to include lakes, bays, sounds, ponds, impounding reservoirs, springs, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Atlantic ocean within the territorial seas of the state of New York and all other bodies of surface water, natural or artificial, inland or coastal, fresh or salt, public or private (except those private waters that do not combine or effect a junction with natural surface waters), which are wholly or partially within or bordering the state or within its jurisdiction. Waters of the state are further defined in 6 NYCRR Parts 800 to 941.

Temporarily Ceased – means that an existing disturbed area will not be disturbed again within 14 calendar days of the previous soil disturbance.

Temporary Stabilization - means that exposed soil has been covered with material(s) as set forth in the technical standard, New York Standards and Specifications for Erosion and Sediment Control, to prevent the exposed soil from eroding. The materials can include, but are not limited to, mulch, seed and mulch, and erosion control mats (e.g. jute twisted yarn, excelsior wood fiber mats).

Total Maximum Daily Loads (TMDLs) - A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and *nonpoint source*s. It is a calculation of the maximum amount of a pollutant that a waterbody can receive on a daily basis and still meet *water quality standards*, and an allocation of that amount to the pollutant's sources. A TMDL stipulates wasteload allocations (WLAs) for *point source* discharges, load allocations (LAs) for *nonpoint source*s, and a margin of safety (MOS).

Trained Contractor - means an employee from the contracting (construction) company, identified in Part III.A.6., that has received four (4) hours of Department endorsed

training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the *trained contractor* shall receive four (4) hours of training every three (3) years.

It can also mean an employee from the contracting (construction) company, identified in Part III.A.6., that meets the *qualified inspector* qualifications (e.g. licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, New York State Erosion and Sediment Control Certificate Program holder, or someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity).

The *trained contractor* is responsible for the day to day implementation of the SWPPP.

Uniform Procedures Act (UPA) Permit - means a permit required under 6 NYCRR Part 621 of the Environmental Conservation Law (ECL), Article 70.

Water Quality Standard - means such measures of purity or quality for any waters in relation to their reasonable and necessary use as promulgated in 6 NYCRR Part 700 et seq.

APPENDIX B – Required SWPPP Components by Project Type

Table 1
Construction Activities that Require the Preparation of a SWPPP That Only Includes Erosion and Sediment Controls

The following construction activities that involve soil disturbances of one (1) or more acres of land, but less than five (5) acres:

- Single family home not located in one of the watersheds listed in Appendix C or not *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family residential subdivisions with 25% or less impervious cover at total site build-out and not located in one of the watersheds listed in Appendix C and not directly discharging to one of the 303(d) segments listed in Appendix E
- Construction of a barn or other *agricultural building*, silo, stock yard or pen.

The following construction activities that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land:

All construction activities located in the watersheds identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Installation of underground, linear utilities; such as gas lines, fiber-optic cable, cable TV, electric, telephone, sewer mains, and water mains
- Environmental enhancement projects, such as wetland mitigation projects, stormwater retrofits and stream restoration projects
- Pond construction
- Linear bike paths running through areas with vegetative cover, including bike paths surfaced with an impervious cover
- Cross-country ski trails and walking/hiking trails
- Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are not part of residential, commercial or institutional development;
- Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that include incidental shoulder or curb work along an existing highway to support construction of the sidewalk, bike path or walking path.
- Slope stabilization projects
- Slope flattening that changes the grade of the site, but does not significantly change the runoff characteristics

Table 1 (Continued) CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP THAT ONLY INCLUDES EROSION AND SEDIMENT CONTROLS

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Spoil areas that will be covered with vegetation
- Vegetated open space projects (i.e. recreational parks, lawns, meadows, fields, downhill ski trails) excluding projects that *alter hydrology from pre to post development* conditions,
- Athletic fields (natural grass) that do not include the construction or reconstruction of *impervious area* and do not *alter hydrology from pre to post development* conditions
- Demolition project where vegetation will be established, and no redevelopment is planned
- Overhead electric transmission line project that does not include the construction of permanent access roads or parking areas surfaced with *impervious cover*
- Structural practices as identified in Table II in the "Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State", excluding projects that involve soil disturbances of greater than five acres and construction activities that include the construction or reconstruction of impervious area
- Temporary access roads, median crossovers, detour roads, lanes, or other temporary impervious areas that will be restored to pre-construction conditions once the construction activity is complete

Table 2

CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP THAT INCLUDES POST-CONSTRUCTION STORMWATER MANAGEMENT PRACTICES

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Single family home located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family home that disturbs five (5) or more acres of land
- Single family residential subdivisions located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family residential subdivisions that involve soil disturbances of between one (1) and five (5) acres of land with greater than 25% impervious cover at total site build-out
- Single family residential subdivisions that involve soil disturbances of five (5) or more acres of land, and single family residential subdivisions that involve soil disturbances of less than five (5) acres that are part of a larger common plan of development or sale that will ultimately disturb five or more acres of land
- Multi-family residential developments; includes duplexes, townhomes, condominiums, senior housing complexes, apartment complexes, and mobile home parks
- Airports
- Amusement parks
- Breweries, cideries, and wineries, including establishments constructed on agricultural land
- Campgrounds
- Cemeteries that include the construction or reconstruction of impervious area (>5% of disturbed area) or *alter the hydrology from pre to post development* conditions
- Commercial developments
- Churches and other places of worship
- Construction of a barn or other *agricultural building* (e.g. silo) and structural practices as identified in Table II in the "Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State" that include the construction or reconstruction of *impervious area*, excluding projects that involve soil disturbances of less than five acres.
- Golf courses
- Institutional development; includes hospitals, prisons, schools and colleges
- Industrial facilities; includes industrial parks
- Landfills
- Municipal facilities; includes highway garages, transfer stations, office buildings, POTW's, water treatment plants, and water storage tanks
- Office complexes
- Playgrounds that include the construction or reconstruction of impervious area
- Sports complexes
- Racetracks; includes racetracks with earthen (dirt) surface
- Road construction or reconstruction, including roads constructed as part of the construction activities listed in Table 1

Table 2 (Continued)

CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP THAT INCLUDES POST-CONSTRUCTION STORMWATER MANAGEMENT PRACTICES

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Parking lot construction or reconstruction, including parking lots constructed as part of the construction activities listed in Table 1
- Athletic fields (natural grass) that include the construction or reconstruction of impervious area (>5% of disturbed area) or *alter the hydrology from pre to post development* conditions
- Athletic fields with artificial turf
- Permanent access roads, parking areas, substations, compressor stations and well drilling pads, surfaced with *impervious cover,* and constructed as part of an over-head electric transmission line project, wind-power project, cell tower project, oil or gas well drilling project, sewer or water main project or other linear utility project
- Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are part of a residential, commercial or institutional development
- Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are part of a highway construction or reconstruction project
- All other construction activities that include the construction or reconstruction of *impervious area* or *alter the hydrology from pre to post development* conditions, and are not listed in Table 1

APPENDIX C – Watersheds Requiring Enhanced Phosphorus Removal

Watersheds where *owners or operators* of construction activities identified in Table 2 of Appendix B must prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the Enhanced Phosphorus Removal Standards included in the technical standard, New York State Stormwater Management Design Manual ("Design Manual").

- Entire New York City Watershed located east of the Hudson River **-** Figure 1
- Onondaga Lake Watershed **-** Figure 2
- Greenwood Lake Watershed **-**Figure 3
- Oscawana Lake Watershed – Figure 4
- Kinderhook Lake Watershed – Figure 5

Figure 1 - New York City Watershed East of the Hudson

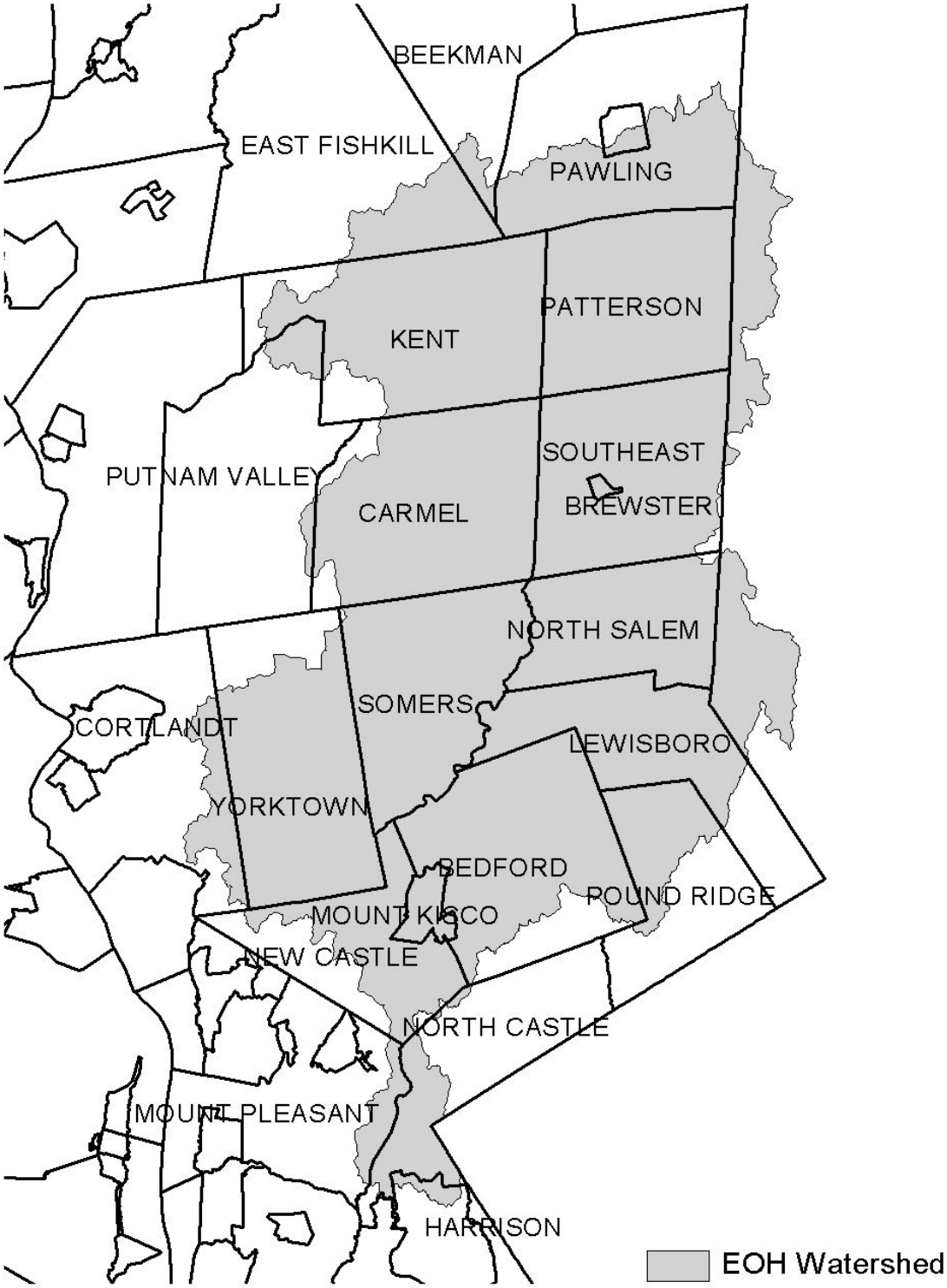


Figure 2 - Onondaga Lake Watershed

Figure 3 - Greenwood Lake Watershed

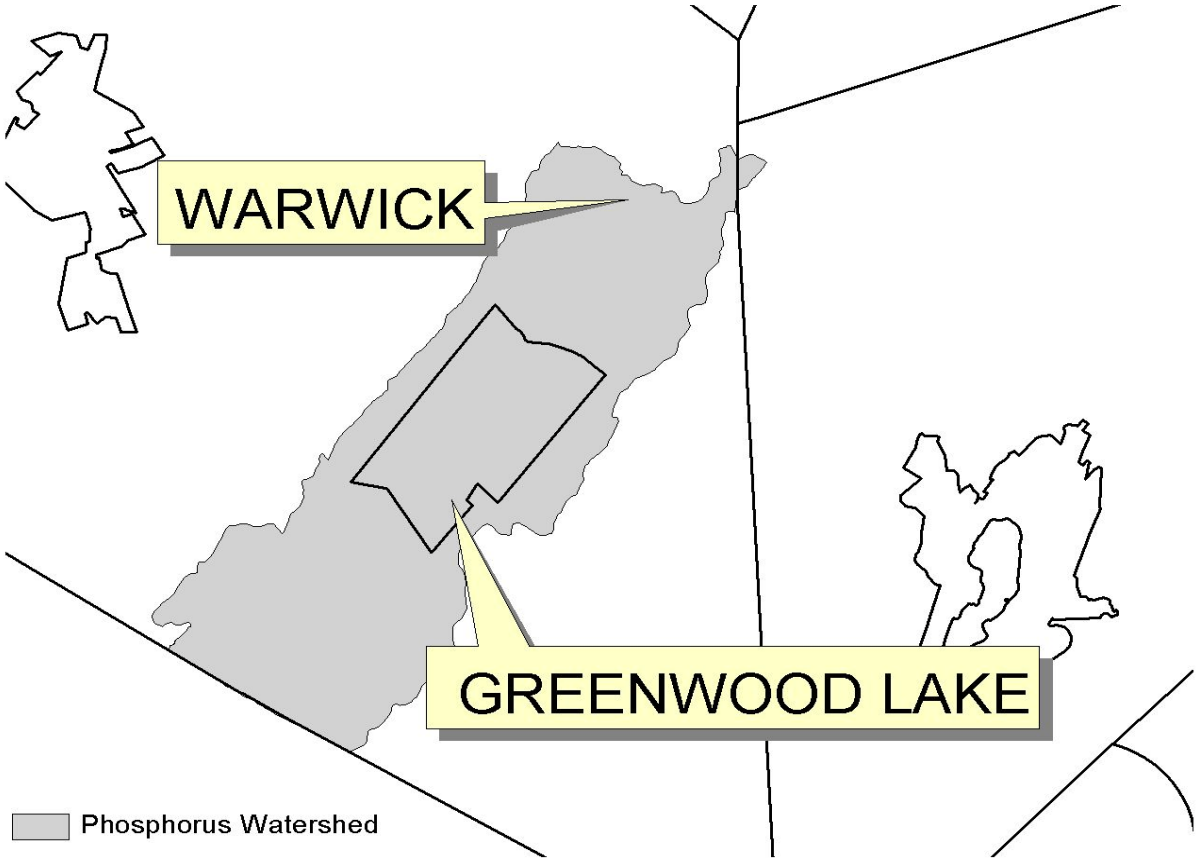


Figure 4 - Oscawana Lake Watershed

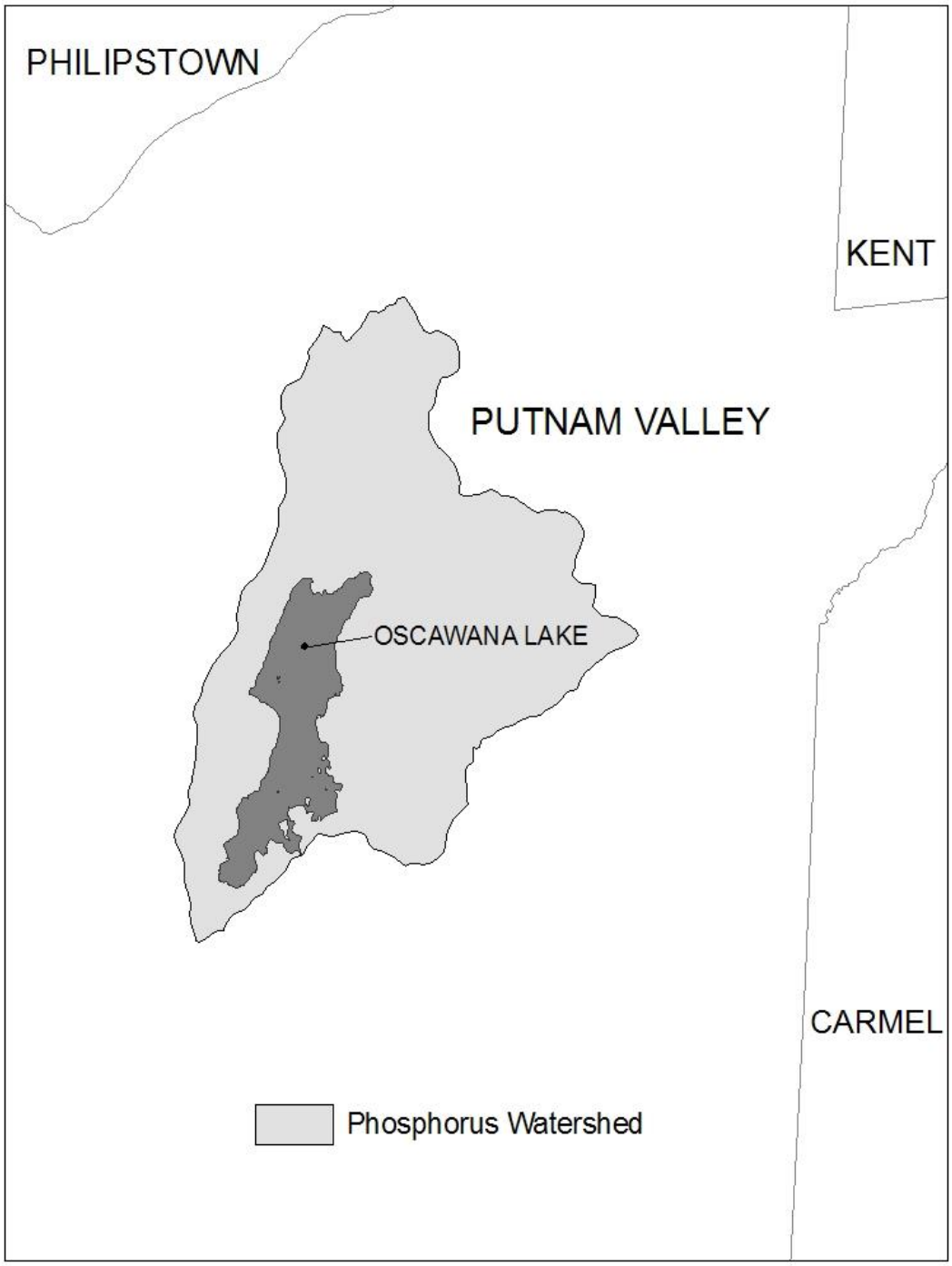
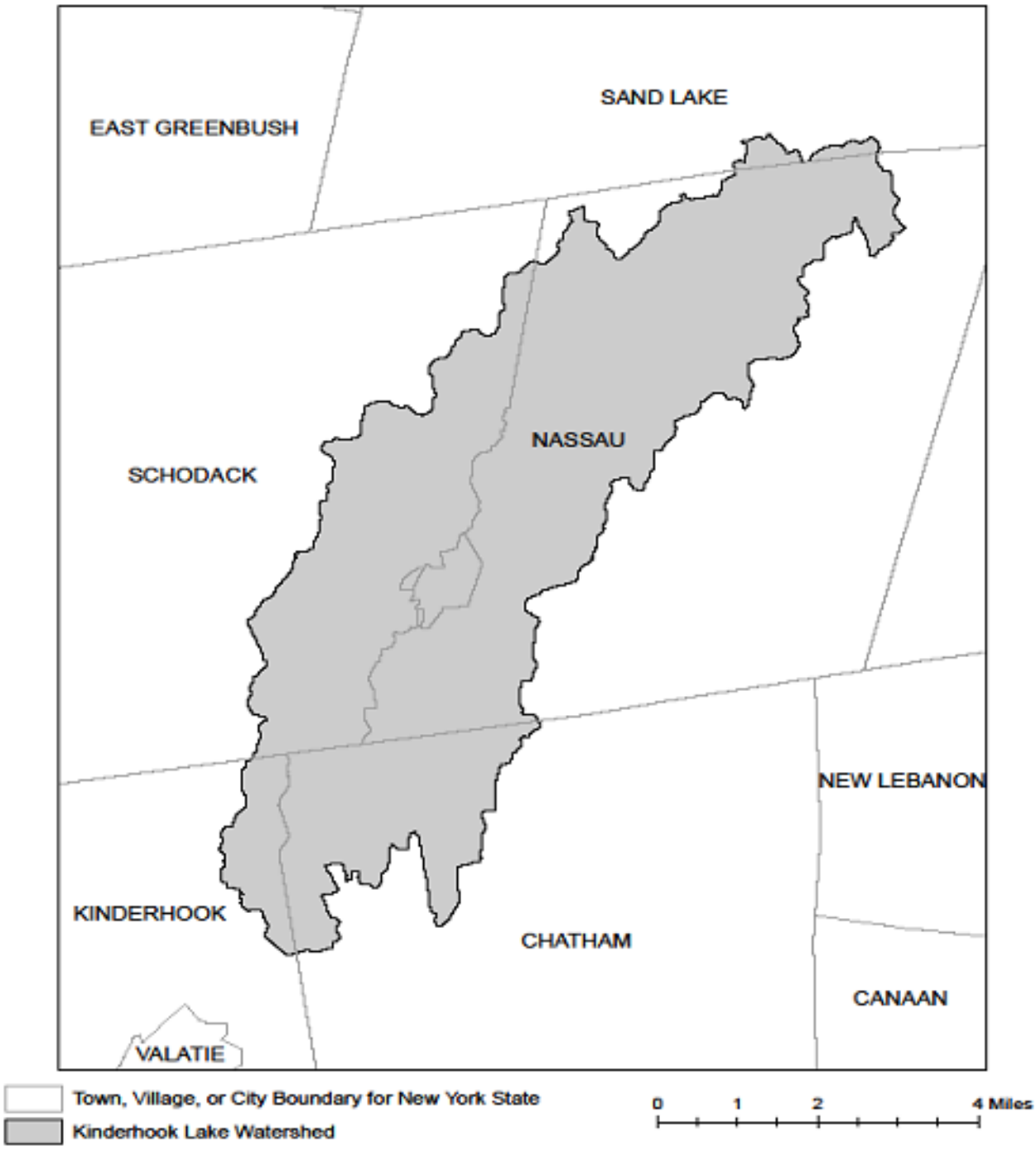


Figure 5 - Kinderhook Lake Watershed



APPENDIX D – Watersheds with Lower Disturbance Threshold

Watersheds where *owners or operators* of construction activities that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land must obtain coverage under this permit.

Entire New York City Watershed that is located east of the Hudson River **-** See Figure 1 in Appendix C

APPENDIX E – 303(d) Segments Impaired by Construction Related Pollutant(s)

List of 303(d) segments impaired by pollutants related to *construction activity* (e.g. silt, sediment or nutrients). The list was developed using "The Final New York State 2016 Section 303(d) List of Impaired Waters Requiring a TMDL/Other Strategy" dated November 2016. *Owners or operators* of single family home and single family residential subdivisions with 25% or less total impervious cover at total site build-out that involve soil disturbances of one or more acres of land, but less than 5 acres, and *directly discharge* to one of the listed segments below shall prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the New York State Stormwater Management Design Manual ("Design Manual"), dated January 2015.

COUNTY	WATERBODY	POLLUTANT
Albany	Ann Lee (Shakers) Pond, Stump Pond	Nutrients
Albany	Basic Creek Reservoir	Nutrients
Allegany	Amity Lake, Saunders Pond	Nutrients
Bronx	Long Island Sound, Bronx	Nutrients
Bronx	Van Cortlandt Lake	Nutrients
Broome	Fly Pond, Deer Lake, Sky Lake	Nutrients
Broome	Minor Tribs to Lower Susquehanna (north)	Nutrients
Broome	Whitney Point Lake/Reservoir	Nutrients
Cattaraugus	Allegheny River/Reservoir	Nutrients
Cattaraugus	Beaver (Alma) Lake	Nutrients
Cattaraugus	Case Lake	Nutrients
Cattaraugus	Linlyco/Club Pond	Nutrients
Cayuga	Duck Lake	Nutrients
Cayuga	Little Sodus Bay	Nutrients
Chautauqua	Bear Lake	Nutrients
Chautauqua	Chadakoin River and tribs	Nutrients
Chautauqua	Chautauqua Lake, North	Nutrients
Chautauqua	Chautauqua Lake, South	Nutrients
Chautauqua	Findley Lake	Nutrients
Chautauqua	Hulburt/Clymer Pond	Nutrients
Clinton	Great Chazy River, Lower, Main Stem	Silt/Sediment
Clinton	Lake Champlain, Main Lake, Middle	Nutrients
Clinton	Lake Champlain, Main Lake, North	Nutrients
Columbia	Kinderhook Lake	Nutrients
Columbia	Robinson Pond	Nutrients
Cortland	Dean Pond	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Dutchess	Fall Kill and tribs	Nutrients
Dutchess	Hillside Lake	Nutrients
Dutchess	Wappingers Lake	Nutrients
Dutchess	Wappingers Lake	Silt/Sediment
Erie	Beeman Creek and tribs	Nutrients
Erie	Ellicott Creek, Lower, and tribs	Silt/Sediment
Erie	Ellicott Creek, Lower, and tribs	Nutrients
Erie	Green Lake	Nutrients
Erie	Little Sister Creek, Lower, and tribs	Nutrients
Erie	Murder Creek, Lower, and tribs	Nutrients
Erie	Rush Creek and tribs	Nutrients
Erie	Scajaquada Creek, Lower, and tribs	Nutrients
Erie	Scajaquada Creek, Middle, and tribs	Nutrients
Erie	Scajaquada Creek, Upper, and tribs	Nutrients
Erie	South Branch Smoke Cr, Lower, and tribs	Silt/Sediment
Erie	South Branch Smoke Cr, Lower, and tribs	Nutrients
Essex	Lake Champlain, Main Lake, South	Nutrients
Essex	Lake Champlain, South Lake	Nutrients
Essex	Willsboro Bay	Nutrients
Genesee	Bigelow Creek and tribs	Nutrients
Genesee	Black Creek, Middle, and minor tribs	Nutrients
Genesee	Black Creek, Upper, and minor tribs	Nutrients
Genesee	Bowen Brook and tribs	Nutrients
Genesee	LeRoy Reservoir	Nutrients
Genesee	Oak Orchard Cr, Upper, and tribs	Nutrients
Genesee	Tonawanda Creek, Middle, Main Stem	Nutrients
Greene	Schoharie Reservoir	Silt/Sediment
Greene	Sleepy Hollow Lake	Silt/Sediment
Herkimer	Steele Creek tribs	Silt/Sediment
Herkimer	Steele Creek tribs	Nutrients
Jefferson	Moon Lake	Nutrients
Kings	Hendrix Creek	Nutrients
Kings	Prospect Park Lake	Nutrients
Lewis	Mill Creek/South Branch, and tribs	Nutrients
Livingston	Christie Creek and tribs	Nutrients
Livingston	Conesus Lake	Nutrients
Livingston	Mill Creek and minor tribs	Silt/Sediment
Monroe	Black Creek, Lower, and minor tribs	Nutrients
Monroe	Buck Pond	Nutrients
Monroe	Cranberry Pond	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Monroe	Lake Ontario Shoreline, Western	Nutrients
Monroe	Long Pond	Nutrients
Monroe	Mill Creek and tribs	Nutrients
Monroe	Mill Creek/Blue Pond Outlet and tribs	Nutrients
Monroe	Minor Tribs to Irondequoit Bay	Nutrients
Monroe	Rochester Embayment - East	Nutrients
Monroe	Rochester Embayment - West	Nutrients
Monroe	Shipbuilders Creek and tribs	Nutrients
Monroe	Thomas Creek/White Brook and tribs	Nutrients
Nassau	Beaver Lake	Nutrients
Nassau	Camaans Pond	Nutrients
Nassau	East Meadow Brook, Upper, and tribs	Silt/Sediment
Nassau	East Rockaway Channel	Nutrients
Nassau	Grant Park Pond	Nutrients
Nassau	Hempstead Bay	Nutrients
Nassau	Hempstead Lake	Nutrients
Nassau	Hewlett Bay	Nutrients
Nassau	Hog Island Channel	Nutrients
Nassau	Long Island Sound, Nassau County Waters	Nutrients
Nassau	Massapequa Creek and tribs	Nutrients
Nassau	Milburn/Parsonage Creeks, Upp, and tribs	Nutrients
Nassau	Reynolds Channel, west	Nutrients
Nassau	Tidal Tribs to Hempstead Bay	Nutrients
Nassau	Tribs (fresh) to East Bay	Nutrients
Nassau	Tribs (fresh) to East Bay	Silt/Sediment
Nassau	Tribs to Smith/Halls Ponds	Nutrients
Nassau	Woodmere Channel	Nutrients
New York	Harlem Meer	Nutrients
New York	The Lake in Central Park	Nutrients
Niagara	Bergholtz Creek and tribs	Nutrients
Niagara	Hyde Park Lake	Nutrients
Niagara	Lake Ontario Shoreline, Western	Nutrients
Niagara	Lake Ontario Shoreline, Western	Nutrients
Oneida	Ballou, Nail Creeks and tribs	Nutrients
Onondaga	Harbor Brook, Lower, and tribs	Nutrients
Onondaga	Ley Creek and tribs	Nutrients
Onondaga	Minor Tribs to Onondaga Lake	Nutrients
Onondaga	Ninemile Creek, Lower, and tribs	Nutrients
Onondaga	Onondaga Creek, Lower, and tribs	Nutrients
Onondaga	Onondaga Creek, Middle, and tribs	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Onondaga	Onondaga Lake, northern end	Nutrients
Onondaga	Onondaga Lake, southern end	Nutrients
Ontario	Great Brook and minor tribs	Silt/Sediment
Ontario	Great Brook and minor tribs	Nutrients
Ontario	Hemlock Lake Outlet and minor tribs	Nutrients
Ontario	Honeoye Lake	Nutrients
Orange	Greenwood Lake	Nutrients
Orange	Monhagen Brook and tribs	Nutrients
Orange	Orange Lake	Nutrients
Orleans	Lake Ontario Shoreline, Western	Nutrients
Orleans	Lake Ontario Shoreline, Western	Nutrients
Oswego	Lake Neatahwanta	Nutrients
Oswego	Pleasant Lake	Nutrients
Putnam	Bog Brook Reservoir	Nutrients
Putnam	Boyd Corners Reservoir	Nutrients
Putnam	Croton Falls Reservoir	Nutrients
Putnam	Diverting Reservoir	Nutrients
Putnam	East Branch Reservoir	Nutrients
Putnam	Lake Carmel	Nutrients
Putnam	Middle Branch Reservoir	Nutrients
Putnam	Oscawana Lake	Nutrients
Putnam	Palmer Lake	Nutrients
Putnam	West Branch Reservoir	Nutrients
Queens	Bergen Basin	Nutrients
Queens	Flushing Creek/Bay	Nutrients
Queens	Jamaica Bay, Eastern, and tribs (Queens)	Nutrients
Queens	Kissena Lake	Nutrients
Queens	Meadow Lake	Nutrients
Queens	Willow Lake	Nutrients
Rensselaer	Nassau Lake	Nutrients
Rensselaer	Snyders Lake	Nutrients
Richmond	Grasmere Lake/Bradys Pond	Nutrients
Rockland	Congers Lake, Swartout Lake	Nutrients
Rockland	Rockland Lake	Nutrients
Saratoga	Ballston Lake	Nutrients
Saratoga	Dwaas Kill and tribs	Silt/Sediment
Saratoga	Dwaas Kill and tribs	Nutrients
Saratoga	Lake Lonely	Nutrients
Saratoga	Round Lake	Nutrients
Saratoga	Tribs to Lake Lonely	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Schenectady	Collins Lake	Nutrients
Schenectady	Duane Lake	Nutrients
Schenectady	Mariaville Lake	Nutrients
Schoharie	Engleville Pond	Nutrients
Schoharie	Summit Lake	Nutrients
Seneca	Reeder Creek and tribs	Nutrients
St.Lawrence	Black Lake Outlet/Black Lake	Nutrients
St.Lawrence	Fish Creek and minor tribs	Nutrients
Steuben	Smith Pond	Nutrients
Suffolk	Agawam Lake	Nutrients
Suffolk	Big/Little Fresh Ponds	Nutrients
Suffolk	Canaan Lake	Silt/Sediment
Suffolk	Canaan Lake	Nutrients
Suffolk	Flanders Bay, West/Lower Sawmill Creek	Nutrients
Suffolk	Fresh Pond	Nutrients
Suffolk	Great South Bay, East	Nutrients
Suffolk	Great South Bay, Middle	Nutrients
Suffolk	Great South Bay, West	Nutrients
Suffolk	Lake Ronkonkoma	Nutrients
Suffolk	Long Island Sound, Suffolk County, West	Nutrients
Suffolk	Mattituck (Marratooka) Pond	Nutrients
Suffolk	Meetinghouse/Terrys Creeks and tribs	Nutrients
Suffolk	Mill and Seven Ponds	Nutrients
Suffolk	Millers Pond	Nutrients
Suffolk	Moriches Bay, East	Nutrients
Suffolk	Moriches Bay, West	Nutrients
Suffolk	Peconic River, Lower, and tidal tribs	Nutrients
Suffolk	Quantuck Bay	Nutrients
Suffolk	Shinnecock Bay and Inlet	Nutrients
Suffolk	Tidal tribs to West Moriches Bay	Nutrients
Sullivan	Bodine, Montgomery Lakes	Nutrients
Sullivan	Davies Lake	Nutrients
Sullivan	Evens Lake	Nutrients
Sullivan	Pleasure Lake	Nutrients
Tompkins	Cayuga Lake, Southern End	Nutrients
Tompkins	Cayuga Lake, Southern End	Silt/Sediment
Tompkins	Owasco Inlet, Upper, and tribs	Nutrients
Ulster	Ashokan Reservoir	Silt/Sediment
Ulster	Esopus Creek, Upper, and minor tribs	Silt/Sediment
Warren	Hague Brook and tribs	Silt/Sediment

303(d) Segments Impaired by Construction Related Pollutant(s)

Warren	Huddle/Finkle Brooks and tribs	Silt/Sediment
Warren	Indian Brook and tribs	Silt/Sediment
Warren	Lake George	Silt/Sediment
Warren	Tribs to L.George, Village of L George	Silt/Sediment
Washington	Cossayuna Lake	Nutrients
Washington	Lake Champlain, South Bay	Nutrients
Washington	Tribs to L.George, East Shore	Silt/Sediment
Washington	Wood Cr/Champlain Canal and minor tribs	Nutrients
Wayne	Port Bay	Nutrients
Westchester	Amawalk Reservoir	Nutrients
Westchester	Blind Brook, Upper, and tribs	Silt/Sediment
Westchester	Cross River Reservoir	Nutrients
Westchester	Lake Katonah	Nutrients
Westchester	Lake Lincolndale	Nutrients
Westchester	Lake Meahagh	Nutrients
Westchester	Lake Mohegan	Nutrients
Westchester	Lake Shenorock	Nutrients
Westchester	Long Island Sound, Westchester (East)	Nutrients
Westchester	Mamaroneck River, Lower	Silt/Sediment
Westchester	Mamaroneck River, Upper, and minor tribs	Silt/Sediment
Westchester	Muscoot/Upper New Croton Reservoir	Nutrients
Westchester	New Croton Reservoir	Nutrients
Westchester	Peach Lake	Nutrients
Westchester	Reservoir No.1 (Lake Isle)	Nutrients
Westchester	Saw Mill River, Lower, and tribs	Nutrients
Westchester	Saw Mill River, Middle, and tribs	Nutrients
Westchester	Sheldrake River and tribs	Silt/Sediment
Westchester	Sheldrake River and tribs	Nutrients
Westchester	Silver Lake	Nutrients
Westchester	Teatown Lake	Nutrients
Westchester	Titicus Reservoir	Nutrients
Westchester	Truesdale Lake	Nutrients
Westchester	Wallace Pond	Nutrients
Wyoming	Java Lake	Nutrients
Wyoming	Silver Lake	Nutrients

APPENDIX F – List of NYS DEC Regional Offices

Region	Covering the following counties:	DIVISION OF ENVIRONMENTAL PERMITS (DEP) Permit Administrators	DIVISION OF WATER (DOW) Water (SPDES) Program
1	Nassau and Suffolk	50 Circle Road Stony Brook, NY 11790 Tel. (631) 444-0365	50 Circle Road Stony Brook, NY 11790-3409 Tel. (631) 444-0405
2	Bronx, Kings, New York, Queens and Richmond	1 Hunters Point Plaza, 47-40 21st St. Long Island City, NY 11101-5407 Tel. (718) 482-4997	1 Hunters Point Plaza, 47-40 21st St. Long Island City, NY 11101-5407 Tel. (718) 482-4933
3	Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster and Westchester	21 South Putt Corners Road New Paltz, NY 12561-1696 Tel. (845) 256-3059	100 Hillside Avenue, Suite 1w White Plains, NY 10603 Tel. (914) 428 - 2505
4	Albany, Columbia, Delaware, Greene, Montgomery, Otsego, Rensselaer, Schenectady and Schoharie	1150 North Westcott Road Schenectady, NY 12306-2014 Tel. (518) 357-2069	1130 North Westcott Road Schenectady, NY 12306-2014 Tel. (518) 357-2045
5	Clinton, Essex, Franklin, Fulton, Hamilton, Saratoga, Warren and Washington	1115 State Route 86, Po Box 296 Ray Brook, NY 12977-0296 Tel. (518) 897-1234	232 Golf Course Road Warrensburg, NY 12885-1172 Tel. (518) 623-1200
6	HERKIMER, JEFFERSON, LEWIS, ONEIDA AND ST. LAWRENCE	STATE OFFICE BUILDING 317 WASHINGTON STREET WATERTOWN, NY 13601-3787 TEL. (315) 785-2245	STATE OFFICE BUILDING 207 GENESEE STREET UTICA, NY 13501-2885 TEL. (315) 793-2554
7	BROOME, CAYUGA, CHENANGO, CORTLAND, MADISON, ONONDAGA, OSWEGO, TIOGA AND TOMPKINS	615 ERIE BLVD. WEST SYRACUSE, NY 13204-2400 TEL. (315) 426-7438	615 ERIE BLVD. WEST SYRACUSE, NY 13204-2400 TEL. (315) 426-7500
8	CHEMUNG, GENESEE, LIVINGSTON, MONROE, ONTARIO, ORLEANS, SCHUYLER, SENECA, STEUBEN, WAYNE AND YATES	6274 EAST AVON-LIMA ROADAVON, NY 14414-9519 TEL. (585) 226-2466	6274 EAST AVON-LIMA RD. AVON, NY 14414-9519 TEL. (585) 226-2466
9	ALLEGANY, CATTARAUGUS, CHAUTAUQUA, ERIE, NIAGARA AND WYOMING	270 MICHIGAN AVENUE BUFFALO, NY 14203-2999 TEL. (716) 851-7165	270 MICHIGAN AVENUE BUFFALO, NY 14203-2999 TEL. (716) 851-7070

APPENDIX H

MAINTENANCE AGREEMENT

Stormwater Control Facility Maintenance Agreement

Whereas, the Municipality of_____ ("Municipality") and the _____ ("facility owner") want to enter into an agreement to provide for the long term maintenance and continuation of stormwater control measures approved by the Municipality for the below named project, and

Whereas, the Municipality and the facility owner desire that the stormwater control measures be built in accordance with the approved project plans and thereafter be maintained, cleaned, repaired, replaced and continued in perpetuity in order to ensure optimum performance of the components. Therefore, the Municipality and the facility owner agree as follows:

1. This agreement binds the Municipality and the facility owner, its successors and assigns, to the maintenance provisions depicted in the approved project plans which are attached as Schedule A of this agreement.

2. The facility owner shall maintain, clean, repair, replace and continue the stormwater control measures depicted in Schedule A as necessary to ensure optimum performance of the measures to design specifications. The stormwater control measures shall include, but shall not be limited to, the following: drainage ditches, swales, dry wells, infiltrators, drop inlets, pipes, culverts, soil absorption devices and retention ponds.

3. The facility owner shall be responsible for all expenses related to the maintenance of the stormwater control measures and shall establish a means for the collection and distribution of expenses among parties for any commonly owned facilities.

4. The facility owner shall provide for the periodic inspection of the stormwater control measures, not less than once in every five year period, to determine the condition and integrity of the measures. Such inspection shall be performed by a Professional Engineer licensed by the State of New York. The inspecting engineer shall prepare and submit to the Municipality within 30 days of the inspection, a written report of the findings including recommendations for those actions necessary for the continuation of the stormwater control measures.

5. The facility owner shall not authorize, undertake or permit alteration, abandonment, modification or discontinuation of the stormwater control measures except in accordance with written approval of the Municipality.

6. The facility owner shall undertake necessary repairs and replacement of the stormwater control measures at the direction of the Municipality or in accordance with the recommendations of the inspecting engineer.

7. The facility owner shall provide to the Municipality within 30 days of the date of this agreement, a security for the maintenance and continuation of the stormwater control measures in the form of (a Bond, letter of credit or escrow account).

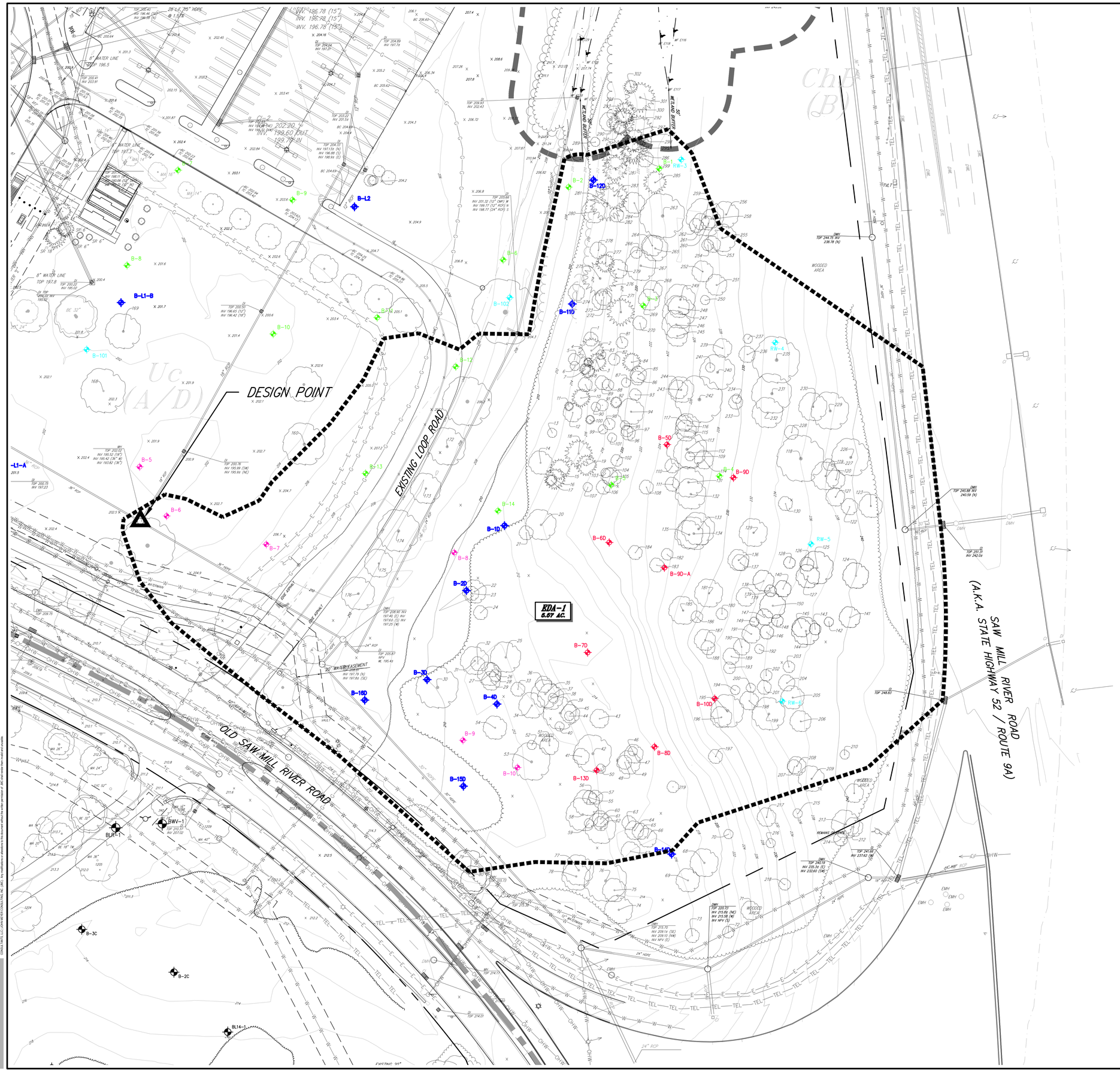
8. This agreement shall be recorded in the Office of the County Clerk, County of_____ together with the deed for the common property and shall be included in the offering plan and/or prospectus approved pursuant to _____.

9. If ever the Municipality determines that the facility owner has failed to construct or maintain the stormwater control measures in accordance with the project plan or has failed to undertake corrective action specified by the Municipality or by the inspecting engineer, the Municipality is authorized to undertake such steps as reasonably necessary for the preservation, continuation or maintenance of the stormwater control measures and to affix the expenses thereof as a lien against the property.

10. This agreement is effective_____

APPENDIX I

DRAWINGS



EXISTING DRAINAGE LEGEND

- EXISTING GRADE
- FLAGGED WETLANDS WITH FLAG NUMBERS
- EXISTING STONE WALL
- WATERSHED BOUNDARY LINE
- LIMIT OF SOIL GROUPS LINE
- FLOW PATH LINE

NOTES:

1. EXISTING CONDITIONS DEPICTED ON THIS PLAN HAVE BEEN TAKEN FROM SURVEY TITLED, "TOPOGRAPHIC AND UTILITY SURVEY," PREPARED BY JMC PLLC, DATED 01/26/2021, LAST REVISED 06/04/2021.
2. GEOTECHNICAL BORING/TEST PIT LOCATIONS DEPICTED ON THIS PLAN WERE TAKEN FROM THE GEOTECHNICAL REPORT TITLED, "STORMWATER UPDATE", DATED 04/08/2021, PREPARED BY CARLIN SIMPSON AND ASSOCIATES.
3. THE SOIL TYPES, HYDROLOGIC SOIL GROUPS AND BOUNDARY INFORMATION SHOWN ON THIS PLAN WERE TAKEN FROM THE UNITED STATES DEPARTMENT OFAGRICULTURE (USDA) WEB SOIL SURVEY
4. THE VERTICAL DATUM REFERENCED ON THE ABOVE NOTED TOPOGRAPHIC SURVEY AND FLOOD INSURANCE RATE MAP IS NAVD88.

No.	Revision	Date	By
A	TOWN PLANNING BOARD	11/12/2021	
B	ISSUED FOR DESIGN DEVELOPMENT	12/03/2021	
C	TOWN PLANNING BOARD	12/22/2021	
D	ISSUED FOR DD SIGN-OFF	01/07/2022	
E	TOWN PLANNING BOARD	02/10/2022	

Previous Editions Obsolete

PROPERTY OWNER:
REGENERON PHARMACEUTICALS, INC.
777 OLD SAW MILL RIVER ROAD
TARRYTOWN, NY 10591

ARCHITECT:
GENSLER
1700 BROADWAY, SUITE 400
NEW YORK, NY 10019

JMC Planning, Engineering, Landscape Architecture & Land Surveying, PLLC
JMC Site Development Consultants, LLC
John Meyer Consulting, Inc.
120 BEDFORD ROAD • ARMONK, NY 10504
voice 914.273.5225 • fax 914.273.2102
www.jmcpllc.com

JMC

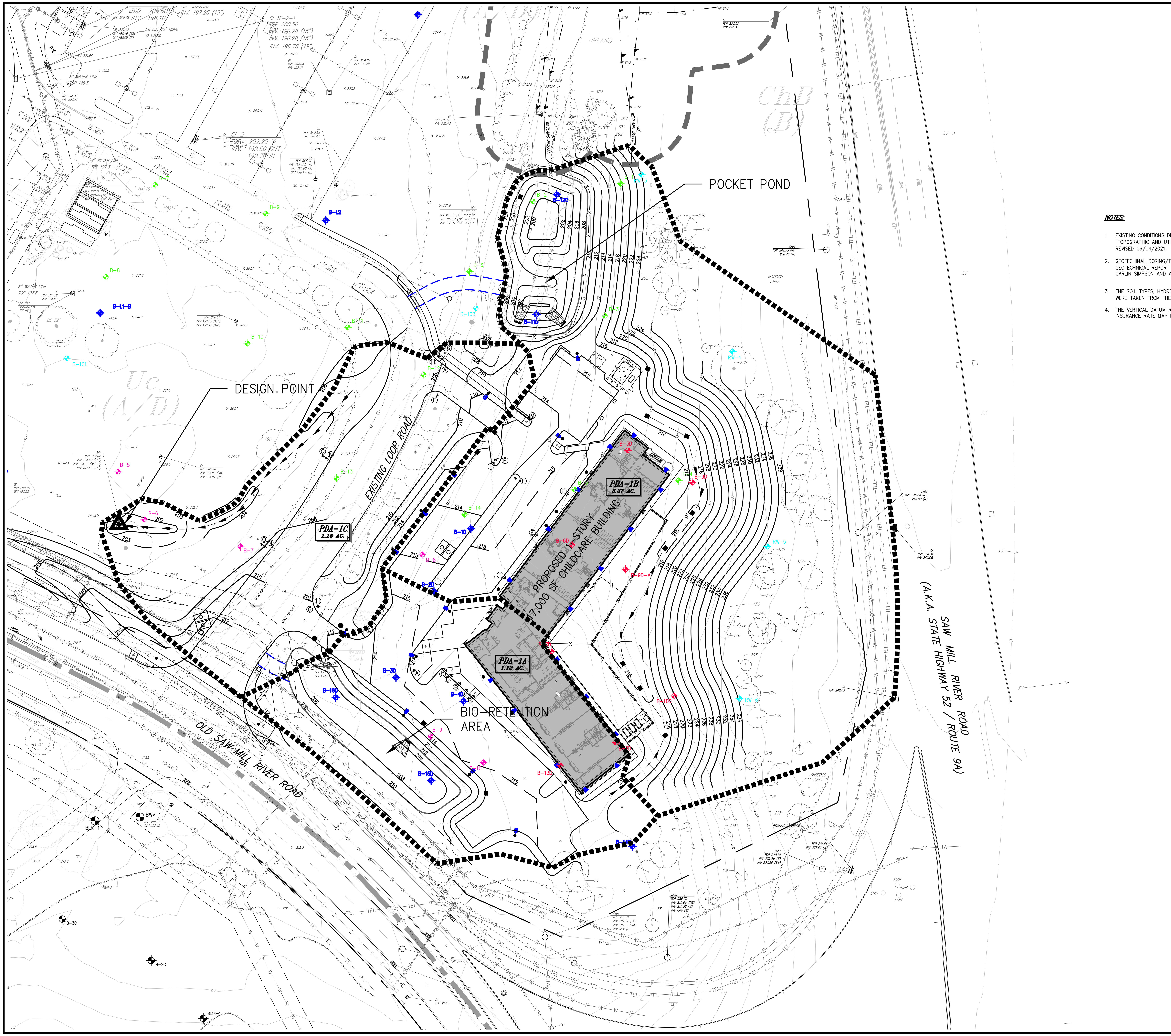
EXISTING DRAINAGE AREA MAP

REGENERON CHILDCARE
777 OLD SAW MILL RIVER ROAD
MOUNT PLEASANT, NY 10591

Drawn:	TC	Approved:	SS
Scale:	1" = 20'		
Date:	02/11/2021		
Project No:	20090-3		
20090-3-DRAINAGE	EDA	EDA.scr	

DA-1

NOT FOR CONSTRUCTION



PROPOSED DRAINAGE LEGEND

- EXISTING GRADE
- PROPOSED FINISHED GRADE
- FLAGGED WETLANDS WITH FLAG NUMBERS
- PROPOSED DITCH OR SWALE
- EXISTING STONE WALL
- DRAINAGE AREA BOUNDARY LINE
- LIMIT OF SOIL GROUPS LINE
- FLOW PATH LINE
- PROPOSED BUILDING LINE
- PROPOSED CONCRETE CURB
- PROPOSED MANHOLE (MH)
- EXISTING DRAIN INLET
- PROPOSED YARD INLET (YI)
- PROPOSED DRAIN INLET (DI)
- PROPOSED DOUBLE DRAIN INLET (DDI)
- PROPOSED COMBINATION INLET (CI)
- PROPOSED END SECTION (ES)
- PROPOSED WATER QUALITY STRUCTURE
- RIP RAP ENERGY DISSIPATOR

No.	Revision	Date	By
A	TOWN PLANNING BOARD	11/12/2021	
B	ISSUED FOR DESIGN DEVELOPMENT	12/03/2021	
C	TOWN PLANNING BOARD	12/22/2021	
D	ISSUED FOR DD SIGN-OFF	01/07/2022	----
E	TOWN PLANNING BOARD	02/10/2022	

Previous Editions Obsolete

NOTES:

1. EXISTING CONDITIONS DEPICTED ON THIS PLAN HAVE BEEN TAKEN FROM SURVEY TITLED, "TOPOGRAPHIC AND UTILITY SURVEY," PREPARED BY JMC PLLC, DATED 01/26/2021, LAST REVISED 06/04/2021.
2. GEOTECHINAL BORING/TEST PIT LOCATIONS DEPICTED ON THIS PLAN WERE TAKEN FROM THE GEOTECHNICAL REPORT TITLED, "STORMWATER UPDATE", DATED 04/08/2021, PREPARED BY CARLIN SIMPSON AND ASSOCIATES.
3. THE SOIL TYPES, HYDROLOGIC SOIL GROUPS AND BOUNDARY INFORMATION SHOWN ON THIS PLAN WERE TAKEN FROM THE UNITED STATES DEPARTMENT OFAGRICULTURE (USDA) WEB SOIL SURVEY
4. THE VERTICAL DATUM REFERENCED ON THE ABOVE NOTED TOPOGRAPHIC SURVEY AND FLOOD INSURANCE RATE MAP IS NAVD88.

APPLICANT/OWNER:
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PROPOSED DRAINAGE AREA MAP

REGENERON CHILDCARE
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ANY ALTERATION OF PLANS, SPECIFICATIONS, PLATS AND REPORTS BEARING THE SEAL OF A LICENSED PROFESSIONAL ENGINEER OR LICENSED LAND SURVEYOR IS A VIOLATION OF SECTION 7209 OF THE NEW YORK STATE EDUCATION LAW, EXCEPT AS PROVIDED FOR BY SECTION 7209, SUBSECTION 2.

Drawn:	TC	Approved:	SS
Scale:	1" = 30'		
Date:	02/11/2021		
Project No:	20090-3		
20090-3-DRAINAGE	PDA	PDA.scr	
Drawing No:	DA-2		

END OF SECTION

SECTION 01 51 36

TEMPORARY WATER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The Work of this Section includes, but is not limited to:
   1. Temporary potable water and fire protection to be provided to the new and existing buildings and temporary facilities (as applicable).
   2. Temporary bypassing as required. (See 3.01 A, B & C)

1.02 REFERENCE STANDARDS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section.

B. Comply with all industry standards and requirements of all Authorities having jurisdiction. If requirements specified conflicts with the requirements of Authorities having jurisdiction, the requirements of the Authority having jurisdiction applies.

1.03 USE CHARGES

A. Use charges for temporary water utilized for the new and/or existing building(s) will be the responsibility of the Owner. Use charges for temporary facilities will be borne by the Contractor.

1.04 QUALITY ASSURANCE

A. Provide a detailed installation and termination schedule for all items of work included in this Section. Notify the Site Engineer prior to the work taking place.

B. Arrange for Authorities having jurisdiction to inspect the temporary water before use.

PART 2 PRODUCTS

2.01 GENERAL

A. Materials used for temporary water shall be new and manufactured for potable water and shall be disinfected in accordance with the applicable AWWA standards for potable water.

PART 3 EXECUTION

3.01 PERFORMANCE REQUIREMENTS

A. The bypass of flows may be necessitated by the construction of the new systems or by construction operations.

B. Any temporary bypassing required shall be designed by a licensed New York State professional engineer at the sole responsibility and expense of the Contractor, and shall be approved by the Town and/or County as needed.

C. Arrange with Owner and all Authorities having jurisdiction, for a time when the water can be interrupted, if necessary, to make connections for temporary service(s) or bypass.

D. Relocate and modify facilities as required by progress of work.

E. Frequently inspect the installation and maintain same to ensure compliance with all applicable requirements.

3.02 REMOVAL

A. Remove temporary water service(s) when need for its use has ended, and make all required adjustments/repairs to existing system.

B. Arrange with Owner and all Authorities having jurisdiction, for a time when the water can be interrupted if necessary, for removal of the temporary service(s).

END OF SECTION

SECTION 01 51 37

TEMPORARY SEWER AND STORM BYPASS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The Work of this Section may include, but may not be not limited to:
   1. Temporary sanitary sewer and stormwater to be provided to the new and existing buildings and temporary facilities as required.
   2. Temporary sanitary sewer and stormwater bypassing as required. (See 3.01 A, B & C)

1.02 REFERENCE STANDARDS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section.

B. Comply with all industry standards and requirements of all Authorities having jurisdiction. If requirements specified conflicts with the requirements of Authorities having jurisdiction, the requirements of the Authority having jurisdiction applies.

1.03 USE CHARGES

A. As applicable, use charges utilized for the new and/or existing building(s) will be the responsibility of the Owner. Use charges for temporary facilities will be borne by the Contractor.

1.04 QUALITY ASSURANCE

A. Provide a detailed installation and termination schedule for all items of work included in this Section. Notify the Site Engineer prior to the work taking place.

B. Arrange for Authorities having jurisdiction to inspect the temporary sewer and stormwater drain before use.

C. Provide a plan for approval, showing the location of the temporary facilities and connections, demonstrating how the flows and/or bypass flows will be implemented and maintained.

PART 2 PRODUCTS

2.01 GENERAL

A. Materials used for temporary sewer and stormwater shall be manufactured for the intended purpose in accordance with all applicable regulations and industry standards.

PART 3 EXECUTION

3.01 PERFORMANCE REQUIREMENTS

A. The bypass of existing flows may be necessitated by the construction of the new systems or by construction operations.

B. Any temporary bypassing required shall be designed by a licensed New York State professional engineer at the sole responsibility and expense of the Contractor, and shall be approved by the Town and/or County as needed.

C. Arrange with Owner and all Authorities having jurisdiction, for a time when the facilities can be interrupted, if necessary, to make connections for temporary service(s) or bypass.

D. Relocate and modify facilities as required by progress of work.

E. Provide barriers to prevent flooding by runoff of stormwater during rain events and to prevent sediment from entering the systems.

F. Frequently inspect the installation and maintain same to ensure compliance with all applicable requirements.

3.02 REMOVAL

A. Remove temporary facilities when need for its use has ended, and make all required adjustments/repairs to existing system.

B. Arrange with Owner and all Authorities having jurisdiction, for a time when the sewer or stormwater can be interrupted if necessary, for removal of the temporary service(s).

END OF SECTION

SECTION 01 56 39

TEMPORARY TREE AND PLANT PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The Work of this Section includes, but is not limited to:

B. Temporary tree and plant protection for existing items to remain, and new installations.

1.02 REFERENCE STANDARDS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section.

B. The Contractor must abide by the conditions of any tree protection requirements, ordinances, and/or permits.

C. Comply with all industry standards and requirements of all Authorities having jurisdiction. If requirements specified conflicts with the requirements of Authorities having jurisdiction, the requirements of the Authority having jurisdiction applies.

1.03 QUALITY ASSURANCE

A. Provide a detailed installation and termination schedule for all items of work included in this Section. Notify the Site Engineer prior to the work taking place.

B. All designated modifications must be made to the temporary protection(s) after inspection by the Authority having jurisdiction.

PART 2 PRODUCTS

2.01 GENERAL

A. Materials used for temporary tree and plant protection shall be manufactured for the intended purpose in accordance with all applicable regulations and industry standards, and as detailed on the Plans.

PART 3 EXECUTION

3.01 PERFORMANCE REQUIREMENTS

A. General Requirements - The locations of trees and plants shown on the plans are not guaranteed to be exact, nor is it guaranteed that all are shown. The Contractor shall, however, be responsible for the protection of all trees and plants which are to remain, whether they are shown on the plans or not, and at his sole expense.

B. The Contractor shall also protect, throughout the course of construction, all such trees as are shown on the Drawings or marked by the Owner's Field Representative "To be Saved" or "To Remain". This shall include all landscaping, vegetation and natural features on public and private property. The Contractor shall use every precaution to prevent injury, damage, pollution, erosion or destruction of existing landscaping, vegetation and natural features, including watercourses, drainageways, ponds, lakes, swamps, woods and fields.

C. Protection for Trees - The Contractor shall install and maintain a properly supported protective fencing around each tree or group of trees that is to be saved. The fence shall be installed, as detailed on the Drawings, at the drip line of the tree(s) or as required by the Owner's Field Representative. Where locations of trees are such that a protective fencing is impractical, as determined by the Owner's Field Representative, the Contractor shall install an approved armor type protection around the trunk of the tree(s) as shown in detail on the Drawings and/or as directed by the Owner's Field Representative. All protection for trees shall be subject to the approval of the Owner's Field Representative.

D. Grading and/or Filling Around Trees - Grading and/or filling operations within the protective fencing or adjacent to armor protected trees shall be carried on with extreme care as approved

by the Owner's Field Representative. If the soil over the root area of the trees has been compacted, it shall be restored by the Contractor by proper cultivation to permit entrance of water and proper aeration of roots.

E. Cutting of Tree Roots and Limbs - Roots and limbs of trees are not to be cut unless authorized by the Owner's Field Representative. Should it become necessary to do so, the Contractor shall treat the remaining exposed portion of roots and/or limbs to prevent damage, loss or injury to the tree. All work shall be done in accordance with accepted horticultural practice and by personnel experienced in that field of work.

F. Damage - The Contractor shall be responsible for proper repair and/or restoration of all damage to existing trees, landscaping and natural features caused as a direct or indirect result of his operations, at his sole expense.

G. Provide barriers to prevent flooding by runoff of stormwater during rain events and to prevent sediment from accumulating. Protect tree root systems from damage, flooding, and erosion.

H. The protection of existing and newly installed trees and shrubs shall be ongoing, as necessitated by the construction operations. Modify protection as required by progress of work and as directed, at no additional cost to the Owner.

I. Frequently inspect the installation and maintain same to ensure compliance with all applicable requirements.

3.02 REMOVAL

A. Remove temporary facilities when need for its use has ended, and make all required adjustments/repairs to the surrounding area.

END OF SECTION

SECTION 01 57 13

TEMPORARY EROSION AND SEDIMENT CONTROL SWPPP AND SITE WATERING FOR DUST CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The Work of this Section includes, but is not limited to:

1. The Contractor has the sole responsibility for adequate Site Management planning, practices and procedures to meet or exceed the minimum criteria set forth in the New York State Department of Environmental Conservation (NYSDEC) SPDES General Permit For Stormwater Discharges From Construction Activity (Permit No. GP- 0-20-001), referenced elsewhere in this Section.
2. **Site Management** shall include site planning, preparation and management practices for
   a. Site Pollution Prevention measures such as construction access and road stabilization, truck washout, dust control, protection of vegetation intended to remain and winter stabilization.
   b. Erosion Control measures utilizing
      1) Runoff Controls such as shallow ditches, swales, check dams and diversions to manage stormwater runoff to and within the site, and
      2) Soil Stabilization measures to prevent the transport of eroded particles (sedimentation).
   c. Sediment Control measures intended for the capture, retention and control of sediment within the boundaries of the disturbed construction site.
3. The project's **Erosion & Sediment Control Plans** depict primarily perimeter controls by drainage area, including silt fence, storm drain inlet protection, buffer filter strips, temporary sediment traps and dewatering devices and other measures intended to provide the minimum erosion and sediment controls required to protect water quality from adverse impacts due to construction activity within each drainage area as delineated on the Erosion & Sediment Control Plans. The Contractor shall prepare and submit a **Site Management Plan** to address the work areas within the perimeter controls of each drainage area and shall update the Plan as required for all phases of construction. The Site Management Plan shall include all required items or measures for the prevention of site pollution, erosion control and/or sediment control.
4. The Contractor shall include in the Bid Price all items depicted on the project's Erosion & Sediment Control Plans as minimum perimeter controls, as well as all items or measures required for adequate Site Management during all phases of construction and/or during periods of inactivity. No additional payment will be made to the Contractor for required maintenance, repair, replacement, relocation or removal of site pollution prevention measures, erosion control measures, runoff controls, stabilization methods or sediment control practices as outlined in either the project's Erosion & Sediment Control Plans or the Contractor's Site Management Plan.
5. The Contractor shall acknowledge and bear sole responsibility for installing, constructing, repairing, replacing, inspecting and maintaining the erosion and sediment control practices included in plans and specifications.
6. The Contractor shall acknowledge and bear sole responsibility for **daily** monitoring, inspection, and evaluation of site conditions by an individual trained in erosion and sediment control. Particular attention shall be paid to areas of the site susceptible to erosion due to slopes or the composition of soils. Any and all deficiencies shall be addressed immediately, if possible, or within one business day. Additional items or measures required to prevent site pollution, soil erosion or sediment transport shall be installed, maintained, repaired, replaced, relocated or removed at the Contractor's sole expense.

7. The Contractor shall acknowledge and bear sole responsibility for maintaining the site on a **daily** basis in a manner that prevents erosion, at all times, regardless of construction operations, phasing, site logistics, periods of inactivity, weather conditions or other unforeseen conditions. The Contractor's daily operations and/or means and methods of construction shall not result in degradation of the site's erosion and sediment controls.
8. In accordance with the requirements of the NYSDEC SPDES General Permit, the Contractor shall provide an individual trained in erosion and sediment control per the requirements of the Permit to inspect the erosion and sediment control practices and pollution prevention measures being implemented **daily** to ensure that they are being maintained in effective operating condition at all times. If deficiencies are identified, the Contractor shall immediately, if possible or within one day, implement corrective actions.
9. Work may include the installation, maintenance, repair, replacement, relocation and/or removal of various Erosion and Sediment Control Practices as outlined in the New York State Standards and Specifications for Erosion and Sediment Control (Blue Book), most recent revision, as referenced elsewhere in this Section, and as listed in Table 2.1 through 2.4 in Appendix A of this section.
10. Mechanical street sweeping may be required as directed by the Owner's Representative or the Civil Engineer.

1.02 REFERENCE STANDARDS / REGULATORY REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section, as well as all applicable construction, fabrication and safety standards.

B. The Contractor shall comply with the requirements of all Authorities Having Jurisdiction, including all applicable Federal, State, County and Local laws, statutes, regulations, ordinances and permits relating to water quality standards, site and stormwater pollution prevention, erosion and sediment control, and dust control, including adherence to the requirements indicated in
   1. the NYSDEC State Pollutant Discharge Elimination System (SPDES) General Permit For Stormwater Discharges From Construction Activity, Permit No. GP-0-20-001, (https://www.dec.ny.gov/docs/water_pdf/constgp020001.pdf)
   2. the NYSDEC New York State Standards and Specifications for Erosion and Sediment Control (Blue Book), most recent revision, (https://www.dec.ny.gov/chemical/29066.html)
   3. the project's Erosion & Sediment Control Plans, Details and Specifications.

   In the event of a conflict between the requirements of these Specifications and the pollution prevention laws, statutes, regulations, ordinances and permits of Federal, State, County, Local or other Authorities Having Jurisdiction, the more restrictive guidelines shall govern.

C. The Owner shall obtain permit(s) required by Authorities Having Jurisdiction related to the project's Stormwater Pollution Prevention Plan (i.e. MS4 Stormwater permit).

D. In accordance with the terms of the NYSDEC SPDES General Permit, the Contractor shall certify in writing and agree to comply with the terms and conditions of the General Permit and agree to implement any corrective actions identified by the Owner, the Owner's Representative, the Owner's Qualified Inspector, the Civil Engineer, the Geotechnical Engineer, or any Authority Having Jurisdiction during a site inspection.

   Accordingly, the Contractor shall allow the Owner, the Owner's Representative, the Owner's Qualified Inspector, the Civil Engineer, the Geotechnical Engineer, or any Authority Having Jurisdiction to enter the site to test for compliance with the relevant permits, regulations, plans and specifications, including testing effluent limitations as applicable.

E. The Contractor shall understand and acknowledge that it is unlawful for any person to cause or contribute to a violation of water quality standards, and there are significant penalties for

non-compliance with the applicable regulations and permits, including the possibility of fine and imprisonment for knowing violations.

F. The Contractor shall acknowledge and bear sole responsibility for all costs relating to fines and delays relating to work stoppages resulting from failure to comply with the applicable permits, regulations, plans and specifications as referenced in this Section.

1.03 QUALITY ASSURANCE / SUBMITTALS

A. Provide a detailed installation and termination schedule for all items of work included in this Section. Notify the Civil Engineer prior to the work taking place.

B. Submit the following information a minimum of two (2) weeks prior to the onset of construction:
   1. A Site Management Plan detailing the Contractor's intended construction operations involving soil disturbance. The Contractor shall update the Site Management Plan as frequently as necessary, based on changes to the plan during the progress of construction to address the work areas within the perimeter controls of each drainage area, during all phases of construction. The Site Management Plan shall include the following:
      a. Construction Schedule outlining various phases of construction
      b. Site Pollution Prevention Plan detailing the plan, schedule and/or location for measures including
         - Storage, handling, application, usage, and disposal of pesticides, fertilizers, and petroleum products.
         - Vehicle and construction equipment staging and maintenance areas.
         - Sanitary facilities for on-site construction personnel.
         - Storage, cover, and isolation of construction materials including topsoil, and chemicals, to prevent runoff of pollutants and contamination of groundwater and surface waters.
         - A spill prevention and control plan which includes NYSDEC spill reporting and initial notification requirements.
         - Provision for adequate and lawful disposal for solid waste including woody debris, stumps, and other construction waste. Fill, woody debris, stumps and construction waste shall not be placed in regulated wetlands, streams or other surface waters.
         - Equipment refueling, which shall be located at least 100 feet from all wetlands, streams and other surface waters.
      c. Sequencing Plan for Erosion and Sediment Controls and water quality procedures for each drainage area delineated on the project's Erosion & Sediment Control Plans
      d. Inspection and Maintenance Plan for erosion and sediment control measures
      e. Plan for disposal of waste material.
   2. Product data for all materials proposed for use, including MSDS data where applicable.

C. No work shall be started until the Site Management Plan has been provided as a Submittal and accepted by the Owner's Representative and Civil Engineer.

D. Soil erosion and sediment controls, water pollution control practices and dust control measures shall, at all times, be satisfactory to all Authorities Having Jurisdiction. These Authorities may suspend the performance of any or all other construction until an unsatisfactory condition has been corrected, and such suspension shall not be the basis of any claim by the Contractor for additional compensation, nor for an extension of time to complete the Work.

E. If the Contractor's Site Management Plan is not sufficient to protect the site, including areas adjacent to the work, the Contractor shall provide additional items or measures to ensure the required protection at no additional cost to the Owner.

1.04 SCHEDULING

A. Sequencing Plan:

1. Contractor shall outline and submit a sequencing plan for the installation of erosion and sediment controls, water quality procedures and dust control measures for each drainage area in conformance with all stages of construction contained in the Contractor's overall Site Management Plan, for acceptance by the Owner's Representative and Civil Engineer.
2. Changes to the erosion control sequencing plan may be considered by the Owner's Representative and Civil Engineer only if presented in writing by the Contractor.

B. Inspection and Maintenance Plan for erosion and sediment control measures:
1. The Contractor shall prepare plans and schedules for temporary and permanent erosion and sediment control work including inspection frequency and maintenance procedures for each construction operation, in accordance with the requirements of the NYSDEC SPDES General Permit, the Sequence of Construction Notes on the project's Erosion & Sediment Control Plans, and the Site Management Plan including the Construction Schedule, and Sequencing Plan.
2. These plans and schedules shall be applicable to all work where soil disturbance will take place.

C. Then Site Management Plan shall include the Contractor's proposed method of erosion and sediment control and dust control on haul roads and borrow pits, and a plan for disposal of waste material.

D. Contractor shall be required to construct all permanent (post-construction) stormwater management practices at the earliest practicable time in the Construction Schedule.

E. Sequencing Plan for Erosion and Sediment Controls shall be updated at least weekly by the Contractor and provided to the Owner's Representative for acceptance, to reflect the actual work taking place on the Project.

F. Stabilization measure shall be established whenever any disturbed areas are idle for more than 7-days.

PART 2 PRODUCTS

2.01 SITE POLLUTION PREVENTION MEASURES

A. Site Pollution Prevention measures may include, but are not limited to, the following. Refer to the Project's Erosion & Sediment Control Plans and/or Appendix A of this Section for additional measures.

B. **CONSTRUCTION ACCESS/ROAD STABILIZATION**

Construction roads should be located to reduce erosion potential, minimize impact on existing site resources, and maintain operations in a safe manner. Highly erosive soils, wet or rocky areas, and steep slopes should be avoided whenever possible.

At any point where traffic will be entering or leaving a construction site to or from a public right-of-way or a portion of the site not under construction, a stabilized pad of aggregate underlain with geotextile shall be provided to reduce or eliminate the tracking of sediment outside the construction area.

C. **DUST CONTROL**

All construction roads, access points and other disturbed areas shall be maintained to prevent surface and air movement of dust. Construction operations should be scheduled to minimize the amount of area disturbed at one time. Buffer areas of vegetation should be left where practical. Temporary or permanent stabilization measures shall be installed where possible. Other dust control measures shall be applied in accordance with all applicable regulations of all Authorities Having Jurisdiction.

2.02 RUNOFF CONTROL MEASURES FOR EROSION CONTROL

A. Erosion Control measures (Runoff Control) may include, but are not limited to, the following. Refer to the Project's Erosion & Sediment Control Plans and/or Appendix A of this Section for additional measures.

B. **STONE CHECK DAMS**

Stone check dams shall be constructed to slow the velocity of stormwater within swales and ditches. They are small barriers or dams constructed of stone, bagged sand or gravel, or other durable materials across a drainageway to reduce erosion in a drainage channel by reducing the velocity of flow in the channel. Check dams shall be constructed in accordance with the New York State Standards and specifications for erosion & sediment control.

C. **CONSTRUCTION DITCH / DIVERSION SWALE**

A temporary excavated drainage way and/or swale to intercept sediment laden water and divert it to a sediment trapping device or to prevent runoff from entering disturbed areas by intercepting and diverting it to a stabilized outlet. Construction ditch and diversion swale shall be implemented in accordance with the New York State Standards and specifications for erosion & sediment control.

2.03 SOIL STABILIZATION MEASURES FOR EROSION CONTROL

A. Erosion Control measures (Soil Stabilization) may include, but are not limited to, the following. Refer to the Project's Erosion & Sediment Control Plans and/or Appendix A of this Section for additional measures.

B. **ANCHORED STABILIZATION MATTING**

Anchored stabilization mats are required when slopes exceed 3 horizontal to 1 vertical installation and anchoring shall be in accordance with the New York State Standards and specifications for erosion & sediment control and manufacturer recommendations. Matting shall be Tensar Roll Max BioNet C125 BN or approved equal.

C. **FIBER ROLL**

Fiber rolls shall be used to reduce sheet flow on slope. They shall be a minimum of 12" diameter and anchored every four feet.

Fiber rolls shall be installed in accordance with the New York State Standards and specifications for erosion and sediment control as well as manufacturer's recommendations.

D. **SEEDING**

Seeding and Grassing – All exposed areas of earth must be stabilized and seeded with a grass mix consisting of Creeping Red Fescue (30%) and Perennial Rye Grass (70%) at a rate of six (6) lbs. per 1,000 square feet. Total weed content shall not exceed 1.5% of total seed mixture.

E. Seeded areas shall be protected with mulch consisting of hay or straw which is free of weed seeds, shredded corn stalks, twigs, wood chips, bark or shavings, sawdust, wood fiber or other objectionable or deleterious material, and free from rot or mold. Salt hay is not acceptable.

F. **MULCHING**

Applying course plant restore or chips, or more suitable materials to cover the soil surface to provide initial erosion control while seeding is establishing. Mulch can also be used as a temporary stabilization in non-growing months.

1. Straw mulch should be applied at 2 tons/acre
2. Wood mulch should be applied at 10-20 ton/acre
3. Wood fiber cellulose should be applied at 1 ton/acre

G. **SURFACE ROUGHENING**

Roughening a bare soil surface by creating horizontal grooves across a slope, stair stepping or tracking of equipment to reduce runoff velocity.

2.04 SEDIMENT CONTROL MEASURES

A. Sediment Control measures may include, but are not limited to, the following. Refer to the Project's Erosion & Sediment Control Plans and/or Appendix A of this Section for additional measures.

B. **TEMPORARY SEDIMENT TRAPS**

Traps shall be constructed with a maximum contributing area of 5-acres. For areas within the perimeter controls depicted on the project's Erosion & Sediment Control Plans, it shall the Contractor's responsibility to provide locations, sizing, and calculations on the Site Management Plan in accordance with the guidelines outlined in the New York State Standards and Specifications for Erosion and Sediment Control (NYSDEC Blue Book, most recent revision). An acceptable method of dewatering shall be approved by the Owner's Representative and Civil Engineer prior to construction.

C. **SILT FENCE**

Silt fence shall be installed at the downhill side of soil disturbances parallel with a contour. Silt fence fabric shall be embedded a minimum of 6" below the ground in accordance with the appropriate details. Silt fence shall be wire reinforced. Filter cloth shall be either Filter X, Mirafi 100x, Stablinka Tlyon, or approved equal. Silt fence shall be installed as outline in the New York State Standards and specifications for erosion and sediment control.

D. **INLET PROTECTION**

A temporary barrier with low permeability, installed around inlets in the form of a fence, berm or excavation around an opening, or manufactured device, detaining water and thereby reducing the sediment content of sediment laden water by settling thus preventing heavily sediment laden water from entering a storm drain system. Inlet protection shall be executed in accordance with the project's Standard Construction Details and in accordance with the New York State Standards and Specifications for Erosion and Sediment Control (NYSDEC Blue Book, most recent revision).

PART 3 EXECUTION

3.01 GENERAL

A. The Owner's Representative and Civil Engineer will monitor the Contractor's erosion control work and methods. The area of bare soil exposed at any one time by construction operations shall be kept to a minimum.

B. All temporary and permanent erosion and sediment control practices shall be maintained and repaired by the Contractor as needed to ensure continued performance of their intended function, until the Project is finalized. If the overall function and intent of erosion control is not being met, the Owner's Representative and Civil Engineer will require the Contractor to provide additional temporary erosion control measures to correct conditions that develop during construction to obtain the desired results, with no additional payment being made to the Contractor. Costs shall be considered included in the price bid.

C. The Contractor shall conduct his operations to minimize erosion of soils and to prevent silting and muddying adjacent wetlands, ponds, rivers, streams, impoundments (lakes, reservoirs, etc.), lands adjacent to or affected by the Work, and adjacent facilities within the Work area.

D. Construction of drainage facilities and performance of the Contract Work which will contribute to the control of erosion and sedimentation shall be carried out in conjunction with the earthwork operations or as soon thereafter as practicable.

E. Clearing and grubbing operations shall be scheduled so that grading operations and permanent erosion control features can follow immediately thereafter, if the Project conditions permit, otherwise temporary erosion control measures will be required between successive construction stages.

F. The temporary control provisions shall be coordinated with the permanent erosion control features specified elsewhere in the Contract Documents to the extent practical to assure economical, effective and continuous erosion control throughout the construction and post construction period.

3.02 PROTECTION OF ADJACENT PROPERTIES

A. Properties and lands adjacent to the work of land disturbance shall be protected from sediment disposition and fugitive dust.

B. Perimeter controls may be required if damage to adjacent properties or land is possible, and may include but is not limited to:
   1. Vegetated buffer strip around lower perimeter of land disturbance, which may be used only where runoff in sheet flow is expected and should be at least twenty (20) feet in width.
   2. Sediment barriers such as erosion logs and silt fences.
   3. Sediment basins and porous landscape detention ponds.
   4. Combination of above measures and as shown on the Plans.

3.03 CONSTRUCTION

A. Limit of Area of Work - In general, the limit of the area of work in progress shall be commensurate with the Contractor's capability and progress in keeping the finished grading, mulching, seeding and other such permanent control measures current and in accordance with the accepted Schedule. Should seasonal limitations make such coordination unrealistic, as determined by the Owner's Representative, temporary erosion control measures shall be taken immediately by the Contractor.

B. Authority of Owner's Field Representative and Civil Engineer - The Owner's Field Representative and Civil Engineer shall have the authority to increase or decrease the surface area of erodible earth material exposed by the Contractor’s operations, and to direct the Contractor to provide immediate permanent or temporary pollution control measures to prevent contamination of adjacent streams or other watercourses, lakes, ponds, wetlands or other environmentally sensitive areas or areas of water impoundment.

C. Temporary Seeding and Grassing – All work of temporary grass establishment shall include, but not be limited to, scarifying the subgrade for a depth of two (2) inches, spreading four (4) inches of topsoil from approved stockpiles free of debris, roots, stones, etc., and hand raking to an even surface. Work must take place when the ground is not frozen or excessively moist.

   Grass seed mix for Erosion and Sediment Control may be applied by either mechanical or hydroseeding methods. Hydroseeding shall be performed in accordance with the ANSI A300 Best Management Practices for Tree and Shrub Planting, Transplanting, Maintenance and Care, produced by the International Society of Arboriculture (ISA). Refer to NYSDEC Standards and Specifications for Erosion and Sediment Control (Blue Book).

D. Drainageways - All drainageways shall be kept clear of debris or other obstructions. Ditches which are filled or partly inoperative shall be cleaned and made operative before the Contractor stops work for any day and, for the duration of the Work, they shall be maintained in a condition satisfactory to the Owner's Representative and Civil Engineer.

E. Sediment - Water from operations containing sediment shall be treated by filtration, sediment basins or other approved means sufficient to reduce the sediment content to not more than that of the stream or drainage system into which it is discharged.

F. Pollutants - Pollutants such as wash water from concrete mixing operations, fuels, oils, lubricants, and other harmful materials shall not be discharged into rivers, streams, ponds, wetlands, water impoundment areas, watercourses, drainageways, channels, drainage ditches, catch basins or drainage or sewer systems.

G. Dust Control - Throughout all operations covered by this Contract, the Contractor shall provide all necessary measures to control dust through the use of water, calcium chloride, or other approved material in accordance with the directions of the Owner's Representative and Civil Engineer, at such locations and during such periods as he may direct, or as may be required by local ordinance or Authorities.

H. Stabilization of Disturbed Areas:
   1. Temporary sediment control measures shall be established prior to soil disturbance, and if not possible, immediately after exposure/disturbance.
   2. Permanent erosion protection measures shall be established within five (5) days of final grading of areas.

I. Stabilization of Sediment and Erosion Control Measures:
   1. Sediment barriers, perimeter berms, and other measures intended to either trap sediment or prevent runoff from flowing over disturbed areas shall be constructed as a first step in grading and be made functional before land disturbance takes place.
   2. Earthen structures such as dams, berms and diversions shall be stabilized withing five (5) days of installation.
   3. Stormwater outlets shall also be stabilized prior to any upstream land disturbing activities.

J. Stabilization of Waterways and Outlets:
   1. All onsite stormwater conveyance channels used by the Contractor for temporary erosion control purposes shall be designed and constructed with adequate capacity and protection to prevent erosion during stormwater events.
   2. Stabilization adequate to prevent erosion shall also be provided at the outlets of all pipes and channels.

K. Storm Drain Inlet Protection: All storm drain inlets which are made operable during construction or which drain stormwater runoff shall be protected from sediment deposition by the use of filters.

L. Construction Access Routes:
   1. Wherever construction vehicles enter or leave a construction site, and where shown on the Plan or directed by the Owner's Representative or Civil Engineer, a stabilized construction entrance is required.
   2. Where sediment or spillage is accidentally transported onto a public road surface or internal site road, the roads shall be thoroughly cleaned when and as directed. Sediment and spillage shall be removed by shoveling or sweeping, and transported to a sediment controlled disposal area.
   3. Street washing will be allowed only after sediment or spillage is removed in this manner.

3.04 DISPOSITION OF TEMPORARY MEASURES

A. Contractor shall be responsible for maintaining temporary erosion control measures until such time the areas are permanently stabilized as determined by the Owner's Representative and Civil Engineer.

B. All temporary erosion and sediment control measures shall be disposed of off-site within thirty (30) days after final stabilization period is achieved and after temporary measures are no longer needed as determined by the Owner's Representative and Civil Engineer. This shall include but not be limited to removal of collected sediment from sediment basins and sumps.

C. Any damage to the site shall be repaired to the satisfaction of the Owner's Representative and Civil Engineer and at no cost to the Owner.

SECTION 01 57 13
TEMPORARY EROSION AND SEDIMENT CONTROL
SWPPP AND SITE WATERING FOR DUST CONTROL

APPENDIX A

Erosion and Sediment Control Practices Matrix

Excerpt from:

November 2016 New York State Standards and Specifications
For Erosion and Sediment Control

Table 2.1
Erosion and Sediment Control Practices Matrix
Site Planning, Preparation and Management

Practice	Primary Purpose	Site Characteristics	Construction Activity*	Associated Practices
Concrete Truck Washout	Collect Waste	Concrete construction	All	Stabilized Access
Construction Road Stabilization	Control sediment	All construction routes	A11	Dust control, temporary swales, temporary or permanent seeding
Dust Control	Stabilize soil	Access points, construction roads	1a,1b,2,3,4,6	Stabilized construction access, construction road stabilization
Protecting Vegetation During Construction	Preserve existing vegetation	Site specific	All	Recreational area improvement
Site Pollution Prevention	Manage waste	Site logistics	All	Those in this section
Stabilized Construction Access	Control sediment	Access points	All	Filter fence, construction road stabilization
Temporary Access Waterway Crossing	Prevent sediment	Streams and banks	All	Construction road stabilization, streambank protection
Winter Stabilization	Soil stabilization	Disturbed areas	All	Seeding, mulching, buffer strips
* See Erosion and Sediment Control Practice Matrix Construction Activity Key on page 2.15				

Table 2.2
Erosion and Sediment Control Practices Matrix
Erosion Control Part 1 - Runoff Control (See Section 3)

Practice	Primary Purpose	Site Characteristics	Construc-tion Activity	Associated Practices
Check Dam	Control runoff	Drainage area ≤ 2 Ac.	All	Lined waterway, rock outlet protection
Construction Ditch	Divert runoff	Drainage area ≤ 10 Ac.	All	Sediment traps, storm drain inlet protection, sediment basin, level spreader
Dewatering Sump Pit	Control sediment	Site specific	All	Sediment trap, sediment basin
Diversion	Intercept and divert run-off	Minimum 10 year de-sign Q	1a,2b,3b,4,5,6	Permanent seeding, rock outlet protection, flow spreader, sedi-ment basin
Earth Dike	Control runoff	Drainage area ≤ 10 ac.	1a,1b,1c,2,3,4 ,5,6,	Sediment trap, rock outlet pro-tection, sediment basin
Flow Diffuser	Control runoff	Minimum design Q = 10 yr. 24 hr.	1a,1b,1c,5,6	Seeding, sodding, land grading, diversion
Flow Spreader	Control runoff	Minimum design Q = 10 yr. 24 hr.	1a,1b,1c,5,6	Diversion, grassed waterway, construction ditch
Grade Stabilization Structure	Prevent erosion	Minimum design Q = 10 yr. 24 hr.	1d,1e,5,6	Permanent seeding, rock slope protection, structural stream-bank protection
Grassed Waterway	Convey runoff	Minimum 10 year de-sign Q	2a,3b,5,6	Rock outlet protection, vegetat-ed waterways, sediment basin, flow spreader
Lined Waterway (rock materials)	Convey runoff	Minimum design Q = 10 yr. 24 hr.	1a-c,2,3,4,5,6	Rock outlet protection, subsur-face drain
Paved Flume	Convey runoff	Minimum design Q = 10 yr. 24 hr.	1a,3,4,6	Rock outlet protection
Perimeter Dike/Swale	Divert runoff	Drainage area ≤ 5 Ac.	1a-c,2a,3a,5,6	Sediment trap, flow spreader, check dam, temporary seeding
Pipe Slope Drain	Convey runoff down slope	Drainage area ≤ 3.5 Ac.	1a,1d,5,6	Rock outlet protection
Rock Outlet Protection	Prevent erosion	Rock varies with pipe discharge	All	Diversion, grassed waterway, sediment basin, sediment traps
Storm Drain Diversion	Divert runoff	On-site drainage area > 50% total drainage area	1a,2,3,4,6	Sediment trap/basin
Subsurface Drain	Intercept and convey drainage water	1” Drainage Coefficient	1a,2,3,4,6	Rock outlet protection, land grading, retaining wall
Water Bars	Divert runoff	Slope areas < 100 ft. width	1b,1c,5	Rock outlet protection, flow spreader

* See Erosion and Sediment Control Practice Matrix Construction Activity Key on page 2.15

Table 2.3
Erosion and Sediment Control Practices Matrix
Erosion Control Part 2 - Soil Stabilization (See Section 4)

Practice	Primary Purpose	Site Characteristics	Construction Activity	Associated Practices
Anchored Stabilization Matting	Stabilize soil	Site specific	All, steep slopes	Seeding, topsoiling
Armored Slope and Channel Stabilization	Prevent erosion	Minimum design Q= 10 yr. 24 hr., velocity > 6 feet per second	1d,1e,1f	Live facines, live stakes, retaining walls
Branch Packing	Stabilize soil	Maximum 1.5:1 slopes	1d,5,6	Diversion, subsurface drain, temporary swale
Brush Layer	Stabilize soil	Site specific slopes	1d,1e,3,4,5,6	Rock slope protection, armored streambank protection
Brush Mattress	Stabilize soil	Stream bank slopes	1a, 6	Rock slope protection
Establishing Trees, Shrubs, and Vines	Stabilize soil	Site specific	All	Topsoiling, seeding, fertilizer application
Fertilizer Application	Promote seeding	Site specific	All	Seeding, mulching, topsoiling, land grading
Fiber Roll	Provide growth medium	Site specific	1d,1e,5	Live facines, live stakes
Land Grading	Stabilize soil	Site specific shaping	All	Topsoiling, subsurface drain, seeding
Lime Application	Stabilize soil	Site specific	All	Topsoiling, seeding
Live Crib Wall	Stabilize soil	Site specific	All	Retaining walls
Live Fascines	Stabilize soil	Max. 1.5:1 slope	1a,1d,1e,5,6	Diversion, seeding
Live Stakes	Stabilize soil	Site specific	1d,1e,4,5,6	Armored streambank protection, fiber roll
Loose Stabilization Blankets	Stabilize soil	Site Specific	All	Permanent and temporary seeding, Recreation area
Mulching	Stabilize soil	Site specific	All	Permanent and temporary seeding, Recreation area
Permanent Seeding for Construction Areas	Stabilize soil	Site specific	All	Surface roughening, top soiling, sodding
Recreation Area Seeding	Protect areas/soils	Site specific	All	Permanent seeding, mulching, topsoiling
Retaining Walls	Stabilize soil	Site specific constraints	1a,2,3,4,6	Rock slope protection, permanent seeding, subsurface drain

* See Erosion and Sediment Control Practice Matrix Construction Activity Key on page 2.15

Table 2.3 (Continued)
Erosion and Sediment Control Practices Matrix
Erosion Control Part 2 - Soil Stabilization (See Section 4)

Practice	Primary Purpose	Site Characteristics	Construction Activity	Associated Practices
Soil Restoration	Stabilize soil, promote infiltration	Compacted areas	All	Topsoiling, seeding
Stabilization of Sand and Gravel Pits	Stabilize soil	Site specific	1a,1c,3,4,5,6	Topsoiling, seeding
Stabilization With Sod	Stabilize soil	Need quick cover, aesthetics	2,3,4	Inlet protection, top soiling, permanent seeding
Surface Roughening	Stabilize soil	Construction slopes	All	Temporary seeding, permanent seeding, mulching
Temporary Seeding for Construction Areas	Stabilize soil	Site specific	All	Surface roughening, top soiling, sodding
Topsoiling and Amendments	Enhance growing conditions	Poor site soil characteristics	All	Surface roughening, temporary seeding, permanent seeding
Tree Revetment	Stabilize soil	Site specific	1d,1e	Armored streambank protection
Vegetated Gabions	Stabilize soil	Site specific	1a-e,2,3,4,5,6	Live cribwall, retaining wall
Vegetating Sand Dunes and Tidal Banks	Stabilize sand dunes	Sand dune reinforcement	1e, 2,3,4,5,6	Sediment trap, rock outlet, storm drain inlet protection
Vegetating Waterways	Stabilize soil	Site specific	2a,3b,5,6	Grassed waterways, permanent seeding

* See Erosion and Sediment Control Practice Matrix Construction Activity Key on page 2.15

Table 2.4
Erosion and Sediment Control Practices Matrix
Sediment Control (See Section 5)

Practice	Primary Purpose	Site Characteristics	Construction Activity	Associated Practices
Buffer Filter Strip	Filter sediment	Turbid sheet flow	All	Storm drain inlets, water conveyances
Compost Filter Sock	Filter sediment	Turbid sheet flow	All	Storm drain inlets, water conveyances
Dewatering Device	Discharge clean water	Turbidity in sediment basin	All	Sediment basins, sediment traps
Geotextitle Filter Bag	Filter sediment	Small areas, pumped	All	Subsurface drain, dewatering sump pit, buffer filter strip
Portable Sediment Tank	Retain sediment	16 times pump discharge	2a,3a,4	Sediment trap, sediment basin
Rock Dam	Trap sediment	Drainage area ≤ 50 Ac.	1a,1b,1c,2b3b,4,5,6	Rock outlet protection
Sediment Basin	Capture sediment	Drainage area ≤ 50 Ac.	1a,2b,3b,4,5,6	Rock outlet protection, temporary seeding
Sediment Dike	Capture sediment	Small disturbed areas	2a,2b,3a	Buffer filter strip, filter bag
Sediment Trap - Compost Sock	Trap sediment	Drainage area ≤ 5 Ac.	All	Seeding, sodding
Sediment Trap - Pipe Outlet	Trap sediment	Drainage area ≤ 5 Ac.	All	Sediment basin, rock outlet protection
Sediment Trap - Stone Outlet	Trap sediment	Drainage area ≤ 5 Ac.	All	Rock outlet protection
Silt Fence	Control sediment	2:1 slopes maximum, 50 ft. spacing	All	Straw bale dike
Storm Drain Inlet Protection - Excavated	Trap sediment	Drainage area ≤ 1 Ac.	1a,2,3,4,6	Sediment traps, storm drain diversion
Storm Drain Inlet Protection - Fabric	Trap sediment	Drainage area ≤ 1 Ac.	1a,2,3,4,6	Sediment traps, storm drain diversion
Storm Drain Inlet Protection - Inserts	Trap sediment	Drainage area ≤ 1 Ac.	1a,2,3,4,6	Sediment traps, storm drain diversion
Storm Drain Inlet Protection - Paved Surface	Trap sediment	Drainage area ≤ 1 Ac.	1a	Sediment traps, storm drain diversion
Storm Drain Inlet Protection - Stone and Block	Trap sediment	Drainage area ≤ 1 Ac.	2,3,4,6	Sediment traps, storm drain diversion
Straw Bale Dike	Control sediment	2:1 slopes maximum, 25 ft. spacing	All	Silt fence

* See Erosion and Sediment Control Practice Matrix Construction Activity Key on page 2.15

Table 2.4 (Continued)
Erosion and Sediment Control Practices Matrix
Sediment Control (See Section 5)

Practice	Primary Purpose	Site Characteristics	Construction Activity	Associated Practices
Turbidity Curtain	Control sediment	Calm water	1b,1d,1e,1f,5	Sediment traps, basins, seeding, mulching
Water structures/barriers	Control sediment	Large area for placement	1d,1e,1f,5	Armored streambank protection, retaining walls
* See Erosion and Sediment Control Practice Matrix Construction Activity Key on page 2.15				

END OF SECTION

SECTION 02 30 00

SUBSURFACE INVESTIGATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section relates to the subsurface investigations performed at the project site.

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION

3.01 GENERAL

A. Existing Subsurface Data - Subsurface investigations have been made at the site. The location of each exploration and the information obtained is shown on the boring and/or test pit logs and/or drawings and is for the general information and convenience of Bidders. This information is intended to supplement the Bidder's own investigations. The information obtained from these subsurface investigations is for general information only and is not a warranty of existing conditions. These are not part of the Contract Documents. Variations in subsurface conditions shall not affect the terms of the Contract.

The Contractor shall read the "Report on Subsurface Soil and Foundation Investigation" dated July 14, 2021, revised April 20, 2022, prepared by Carlin Simpson & Associates, for subsurface investigations to be fully aware of available subsurface information and current recommendations. No extra claim for ignorance shall be accepted. (Refer to the Geotechnical Engineer for additional information.)

B. Subsurface Information Not Guaranteed - Neither the Architect, Site Engineer, Geotechnical Engineer nor the Owner guarantees that materials disclosed by the subsurface investigations will actually be encountered at other locations. They further disclaim responsibility for the interpretation of the data. The data is supplied only for general information and is not guaranteed. The Contractor and/or Construction Manager is expected to examine the site and the record of the Contractor's investigations and detail the character of materials that may be encountered.

The information referred to herein is made available in good faith and is not intended as a substitute for personal investigation, interpretations and judgment by the Bidders.

C. Borings and/or Test Pits by Bidder - Permission may be granted upon request to make borings or dig test pits for the purpose of verifying conditions at the site. The locations and size of such exploratory holes will be subject to approval by the Owner. The cost of such explorations shall be borne by the Bidder.

D. The installation of certain materials and infrastructure including but not limited to earthwork operations, and hardscape and utility installations, may be subject to special subgrade preparation and construction requirements. Subgrade improvement measures and special construction requirements must be followed as may be indicated by the Geotechnical Engineer. The most stringent requirements shall be adhered to by the Contractor.

E. Examination of Site and Interpretation of Data - Bidders shall examine the site as well as all available information and then decide for themselves the character of materials to be encountered. Attention is directed to the fact that subsurface conditions may include different soils, hard or soft strata, obstructions that may be either natural or man made, or conditions different from those anticipated. No representations or warranties either as to the presence or absence of such different conditions or as to their nature and extent are made. The Bid should

include the influence of such features, and it shall be deemed to include all consideration of the risks involved.

F. The Contractor shall adhere to all requirements and directions of the Geotechnical and/or Site Engineer.

G. Work shall be performed in accordance with Town of Mount Pleasant requirements and all Authorities having jurisdiction.

H. Groundwater Information - Attention is also directed to the fact that groundwater may rise during wet weather or fall during dry weather. Varying groundwater levels may be expected and may affect construction operations including earthwork.

I. Geotechnical Engineer - The Geotechnical Engineer or designated representative may be present during ground intrusive activities. The Geotechnical Engineer will report to the Owner's Field Representative and advise on technical subsurface related items. The Geotechnical Engineer will interact with NYSDEC on behalf of the Owner, as applicable.

SECTION 02 30 00
SUBSURFACE INVESTIGATION

APPENDIX A

Soils investigation data is furnished for information only. Engineer and Owner disclaim responsibility for accuracy, true location and extent of soils investigation. They further disclaim responsibility for interpretation of data, such as soil bearing values, rock profiles, soil stability and presence, level and extent of underground water. Bidder is expected to examine the site and the record of investigations and determine for itself the character of materials that may be encountered.

CARLIN • SIMPSON & ASSOCIATES, LLC

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Kurt W. Anke
Eric J. Shaw

14 July 2021
Revised 20 April 2022

Regeneron Pharmaceuticals, Inc.
777 Old Saw Mill River Road
Tarrytown, New York 10591

Attn: Mr. W. John Powell & Mr. Michael Passaro

Re: Report on Subsurface Soil and Foundation Investigation
Regeneron Campus Expansion – Daycare Building
777 Old Saw Mill Road
Tarrytown, New York (CSA Job #20-166)

Regeneron Contract #2020-015103
Master Agreement 2019.038862
PO #815352

Dear Mr. Powell and Mr. Passaro:

In accordance with our proposals dated 15 April 2021 and 26 July 2021 and your subsequent authorization, we have completed a Subsurface Soil and Foundation Investigation for the referenced site. The purpose of this study was to determine the nature and engineering properties of the subsurface soil and groundwater conditions for the new construction, to recommend a practical foundation scheme, to determine the allowable bearing capacity of the site soils, and to preliminarily determine the soil permeability in the new stormwater management areas.

We understand that the planned construction will consist of new daycare building. Site development will also include new underground utilities, a soil slope, asphalt-paved driveways and parking areas, and a stormwater management system. To guide us in our study, you have provided us with site plans that indicate the existing site conditions and the location of the proposed construction.

Our scope of work for this project included the following:

1. Reviewed the proposed layout, the existing site conditions, the expected soil conditions, and planned this study.

2. Reviewed subsurface boring data from investigations performed by this office in March 2020, March 2016, and July/August 2011.

3. Retained General Borings Inc. to advance seventeen (17) borings for the planned construction (B-1D through B-16D).

4. Performed three (3) borehole infiltration tests for the proposed stormwater management system.

5. Retained General Borings Inc. to advance an additional five (5) borings and to install four (4) groundwater observation wells at the site.

6. Laid out the boring and well locations in the field, provided full time inspection of the explorations, obtained soil samples, and prepared detailed logs and a Boring Location Plan.

7. Performed soil identification tests on selected soil samples in our laboratory.

8. Analyzed the field and laboratory test data and prepared this report containing the results of this study.

1.0 SITE DESCRIPTION

The subject property, which is known as the Regeneron Pharmaceuticals Tarrytown Campus, is located at 777 Old Saw Mill River Road, in Tarrytown, Westchester County, New York. The planned construction is located in the eastern portion of the north campus. The planned construction site currently consists of grass landscape and becomes lightly to moderately wooded towards the eastern property line. The site grades in the planned construction area generally slope up from west to east. Surface elevations in the proposed construction area range from about elevation +206.0 to elevation +240.0.

2.0 PROPOSED CONSTRUCTION

We understand that the planned construction will consist of a new daycare building with a footprint of approximately 17,000 square feet. We anticipate that cuts ranging up to 11 feet and fills ranging up to 6 feet will be required to achieve the planned finished floor elevation of +217.25.

In order to achieve the planned site grades, a soil slope will be constructed to the east of the proposed building. The soil slope will range up to approximately 20 feet in height and has a planned inclination of 2.5 horizontal to 1 vertical (2.5H:1V).

The site development will also include new stormwater management areas. Based on the site plans, there is a proposed stormwater basin to the north of the planned building. The bottom of the basin has a planned invert of +200.0. In addition to the northern basin, a bioretention basin area is planned to the southwest of the proposed building with a proposed invert elevation of +208.0. The site development will also include new underground utilities and new paved driveways and parking areas.

The following evaluation is based on information that has been provided to our office as of the date of this report. Once the construction plans have been further developed, a copy of the plans should be forwarded to our office so that we can review them along with the recommendations in this report. At that time, any changes or additional recommendations can be provided, if required.

3.0 SUBSURFACE CONDITIONS

To determine the subsurface soil and groundwater conditions at the site, seventeen (17) borings (B-1D through B-16D) were performed for the referenced project in May 2021. An additional five (5) borings (DC-101 through DC-105) were performed at the site in December 2021. The borings were performed by General Borings, Inc. using hollow stem augers and split spoon sampling. Detailed boring logs have been prepared and are included in this report. The borings were completed under the full-time inspection of Carlin-Simpson & Associates. Our field engineer visually identified all of the soil samples obtained during the boring operations and select samples were tested in our laboratory.

As part of this study, we also reviewed nearby subsurface boring data from investigations that were performed by this office in March 2020, March 2016, and July/August 2011. The borings performed in March 2020 (B-1 through B-14) are shown in green, the borings performed in March 2016 (B-5 through B-10) are shown in pink, and the borings performed in July and August 2011 (B-101, B-102 and RW-3 through RW-6) are shown in light blue on the attached Boring Location Plan (Figure 1). A summary of the boring data is included in Table 2 below.

3.1 Soil and Rock

The soil descriptions shown on the boring logs are based on the Burmister Classification System. In this system, the soil is divided into three components: Sand (S), Silt ($) and Gravel (G). The major component is indicated in all capital letters, the lesser in lower case letters. The following modifiers indicate the quantity of each lesser component:

Modifier	Quantity
trace (t)	0 -10%
little (l)	10% - 20%
some (s)	20% - 35%
and (a)	35% - 50%

The subsurface soil and rock conditions encountered in the borings performed in May 2021 (B-1D through B-16D) and December 2021 (DC-101 through DC-105) can be summarized as follows:

Stratum 1 Topsoil — At the surface in each of the borings is topsoil that ranges from approximately 2 to 18 inches in thickness.

Stratum 2 Existing Fill — Below the topsoil in 6 of the borings is existing fill that generally consists of dark brown, brown coarse to fine SAND, little (to and) Silt, trace (to some) coarse to fine Gravel. Wood and organics were encountered with the fill at select boring locations. This stratum extends to depths ranging from 2’0” to 9’6” below the existing ground surface at the boring locations.

Stratum 3 Silty Sand with Gravel — Below the existing fill and beneath the topsoil in the remaining borings is loose to dense brown or orange brown coarse to fine SAND, little (to and) Silt, trace (to some) coarse to fine Gravel. This stratum extends to depths ranging from 4’6” to 18’0” below the existing ground surface. Eight (8) of the borings were

terminated in this stratum at depths ranging from 9'0" to 12'0" below the existing ground surface.

Stratum 4 Sand with Gravel — Underlying the silty sand with gravel in 5 of the borings is white, brown coarse to fine SAND, trace Silt, trace (to some) coarse to fine Gravel. This stratum extends to depths ranging from 7'0" to 25'0" below the existing ground surface. Borings B-2D and B-3D were terminated in this stratum at a depth of 9'0" below the existing ground surface.

Stratum 5 Weathered Bedrock — Beneath the silty sand with gravel in borings B-8D, B-10D, and DC-101 is highly to completely weathered Marble or Quartzite. This layer is soil like in state, however, there are denser pockets that likely cannot be conventionally excavated. The weathered rock was encountered beginning at depths of 12'6", 16'0", and 18'0" below the existing ground surface, respectively.

Stratum 6 Bedrock — Ten (10) boring locations were terminated upon auger refusal on probable bedrock at depths ranging from 7'0" to 25'0" below the existing ground surface.

The upper 5-feet of the bedrock surface was cored at boring locations B-5D and DC-103 starting at depths of 25'0" and 14'0" below the ground surface, respectively. The recovery of the rock cores was 95% and 100% with rock quality designations (RQD) of 80% and 100%, respectively. Based on the RQD values and visual inspection, the recovered cores are slightly weathered, in a massive, moderately jointed condition, and is good quality bedrock.

3.2 Groundwater

During the initial investigation in May 2021, groundwater was encountered in 16 of the 17 borings at depths ranging from 0'6" to 9'0" below the existing ground surface, which corresponds to groundwater levels ranging from approximately elevation +205.5 to elevation +227.5. Evidence of seasonal high groundwater (i.e. mottling) was encountered in borings B-13D and B-15D at depths of 2'6" and 3'0" below the existing ground surface, which correlates to elevation +211.5 and elevation +205.0, respectively. Groundwater observations for all relevant borings are summarized in Table 2 below.

During the supplemental investigation in December 2021, groundwater was encountered in 3 of the 5 borings at depths ranging from approximately 12'0" to 13'2" below the existing ground surface, which corresponds to groundwater levels ranging from approximately elevation +212.8 to elevation +218.0. In addition, observation wells were installed at 4 boring locations to monitor the groundwater conditions over time. The monitoring well observations are summarized in Table 1 below. The boring observations are summarized in Table 2 below.

Table 1 – Monitoring Well Observations

Well No.	Approximate Ground Surface Elevation	Groundwater Elevation Dec 2021	Groundwater Elevation Jan 2022	Groundwater Elevation 31 Mar 2021
W-101	+226.0	+212.8	+216.0	+218.7
W-102	+231.0	+218.0	+220.2	+221.2

Well No.	Approximate Ground Surface Elevation	Groundwater Elevation Dec 2021	Groundwater Elevation Jan 2022	Groundwater Elevation 31 Mar 2021
W-103	+229.0	+217.1	+218.0	+218.6
W-104	+229.0	Dry to +215.0	Dry to +214.0	Dry to +213.9

Groundwater has been encountered near the building area at depths ranging from 5'0" to 9'0" below the existing ground surface (elevations +220.8 to +207.0). We understand that the planned building finished floor elevation is +217.25. Therefore, the groundwater level will be up to approximately 4-feet above the planned finished floor elevation in areas. To prevent water from infiltrating the area during and post construction, a series of cutoff drains must be installed in the planned slope area to the east of the building to divert the groundwater and direct it to the stormwater management system. In addition, a footing drain and sub-slab drainage system will be required for the new building.

The proposed drainage systems are shown on the attached Conceptual Drainage System Plan (Figure 2) and cross sections (Figures 3 and 4). They are also discussed further in later sections of this report. The conceptual drawings within this report are for planning and budgeting purposes only. The final design of the drainage systems must be coordinated with the site grading plan. Separate drainage system design plans will be prepared by Carlin-Simpson & Associates for inclusion in the construction documents.

Groundwater on the subject site will be controlled by the topography and the underlying bedrock surface. During construction, we expect that perched or trapped water may be encountered within the existing fill, in the silty site soils, and/or along the soil/rock interface, especially during wet periods. Groundwater may also daylight through the cut slope during construction. Proper groundwater control measures will be required where water is encountered in the site excavations. In addition, preparation of wet subgrades with geotextile fabric and clean stone may be necessary for subgrade stabilization in areas. Furthermore, the building will require permanent sub-slab drainage and foundation drains. Recommendations for construction dewatering and for permanent dewatering are provided in later sections of this report.

Groundwater levels fluctuate seasonally and with storm events. Variations in the location of the long-term water table may also occur as a result of changes in precipitation, evaporation, surface water runoff, and other factors not immediately apparent at the time of this exploration.

3.3 Summary of Boring Observations

A summary of the boring observations is provided in Table 2 below.

Table 2 – Summary of Boring Observations

Boring No.	Approximate Ground Surface Elevation	Depth to Groundwater (Elevation)	Depth to Bottom of Existing Fill (Elevation)	Depth to Bedrock (Elevation)
B-1D	+211.2	0'6" (+210.7)	NE	AR @ 7'0" (+204.2)
B-2D	+209.7	0'6" (+209.5)	NE	NE to 9'0"
B-3D	+208.8	2'6" (+206.3)	NE	NE to 9'0"
B-4D	+212.0	5'0" (+207.0)	2'0" (+210.0)	NE to 9'0"

Boring No.	Approximate Ground Surface Elevation	Depth to Groundwater (Elevation)	Depth to Bottom of Existing Fill (Elevation)	Depth to Bedrock (Elevation)
B-5D	+224.0	5’0” (+219.0)	NE	C @ 25’0” (+199.0)
B-6D	+219.5	6’6” (+213.0)	9’6” (+210.0)	AR @ 16’0” (+203.5)
B-7D	+214.0	NE to 10’0”	5’0” (+209.0)	AR @ 10’0” (+204.0)
B-8D	+217.0	4’0” (+213.0)	NE	CWR @ 12’6” (+204.5) AR @ 16’0” (+201.0)
B-9D	+229.8	9’0” (+220.8)	NE	AR @ 16’6” (+213.3)
B-9D-A	+226.0	7’6” (+218.5)	NE	NE to 9’0”
B-10D	+230.0	2’6” (+227.5)	NE	CWR @ 16’0” (+214.0) AR @ 18’0” (+212.0)
B-11D	+211.8	6’0” (+205.8)	NE	NE to 12’0”
B-12D	+211.6	6’0” (+205.6)	NE	NE to 12’0”
B-13D	+214.0	7’0” (+207.0) SHGW @ 2’6” (+211.5)	2’6” (+211.5)	NE to 10’0”
B-14D	+216.0	5’0” (+211.0)	NE	NE to 9’0”
B-15D	+210.0	4’6” (+205.5)	2’0” (+208.0)	NE to 9’0”
B-16D	+208.0	2’3” (+205.8) SHGW @ 3’0” (+205.0)	NE	NE to 9’0”
Supplemental Borings Performed in December 2021				
DC-101	+226.0	13’2” (+212.8)	NE	CWR @ 18’0” (+208.0) AR @ 25’0” (+201.0)
DC-102	+231.0	13’0” (+218.0)	NE	AR @ 15’6” (+215.5)
DC-103	+229.0	11’11” (+217.1)	NE	C @ 14’0” (+215.0)
DC-104	+229.0	NE to +215.0	NE	AR @ 14’0” (+215.0)
DC-105	+220.0	NE to +212.0	7’0” (+213.0)	AR @ 8’0” (+212.0)
Additional Relevant Borings Completed in March 2020 (Shown in Green on BLP)				
B-1	+224.0	10’0” (+214.0)	NE	AR @ 28’6” (+195.5)
B-2	+208.0	6’6” (+201.5)	NE	AR @ 26’3” (+181.75)
B-3	+222.0	10’0” (+212.0)	NE	CWR @ 20’6” (+201.5) AR @ 21’6” (+200.5)
B-4	+230.0	13’0” (+217.0)	NE	AR @ 15’6” (+214.5)
B-5	+221.0	NWR	NE	C @ 13’0” (+208.0)
B-6	+207.0	8’0” (+199.0)	2’6” (+204.5)	AR @ 21’0” (+186.0)
B-7	+202.0	8’6” (+193.5)	2’0” (+200.0)	CWR @ 25’0” (+177.0) AR @ 27’0” (+175.0)
B-8	+201.5	7’6” (+194.0)	1’6” (+200.0)	CWR @ 25’0” (+176.5) AR @ 27’0” (+174.5)
B-9	+203.5	10’0” (+193.5)	NE	AR @ 30’9” (+172.8)
B-10	+201.5	5’0” (+196.5)	NE	AR @ 22’6” (+178.9)
B-11	+204.5	6’0” (+198.5)	NE	NE to 27’0”
B-12	+207.0	5’6” (+201.5)	2’6” (+204.5)	AR @ 26’4” (+180.7)
B-13	+207.0	9’0” (+198.0)	3’0” (+204.0)	NE to 22’0”

Boring No.	Approximate Ground Surface Elevation	Depth to Groundwater (Elevation)	Depth to Bottom of Existing Fill (Elevation)	Depth to Bedrock (Elevation)
B-14	+212.0	6'0" (+206.0)	2'0" (+210.0)	CWR @ 7'0" (+205.0) C @ 8'0" (+204.0)
Additional Relevant Borings Completed in March 2016 (Shown in Pink on BLP)				
B-5	+202.0	NE to 8'0"	NE	NE to 8'0"
B-6	+202.0	5'6" (+196.5)	NE	NE to 8'0"
B-7	+206.0	7'0" (+199.0)	5'0" (+201.0)	NE to 12'0"
B-8	+208.0	NE to 7'0"	5'6" (+202.5)	NE to 7'0"
B-9	+210.0	9'0" (+201.0)	NE	NE to 14'0"
B-10	+210.0	9'0" (+201.0)	5'0" (+205.0)	NE to 14'0"
Additional Relevant Borings Completed in July/August 2011 (Shown in Light Blue on BLP)				
B-101	+202.0	NE to 10'0"	NE	NE to 10'0"
B-102	+208.0	NE to 10'0"	NE	NE to 10'0"
RW-3	+222.0	9'0" (+213.0)	NE	AR @ 16'3" (+205.8)
RW-4	+232.0	12'0" (+220.0)	NE	AR @ 19'0" (+213.0)
RW-5	+236.0	12'0" (+224.0)	NE	AR @ 17'0" (+219.0)
RW-6	+236.0	16'0" (+220.0)	NE	AR @ 17'0" (+219.0)

NE – Not Encountered
NWR – No Water Reading
SHGW – Evidence of Seasonal High Groundwater
CWR – Completely Weathered Rock
AR – Auger Refusal on Probable Bedrock
C – Cored Bedrock

4.0 SUMMARY OF DESIGN RECOMMENDATIONS

Below is a summary of the major design and construction considerations for this project. Additional recommendations are provided in the following sections of this report.

- *Subsurface Conditions (Section 3.0)*
  - Existing fill was encountered in 15 of the 48 borings performed in the area of the proposed construction to depths ranging from of 1'6" to 9'6" below the existing ground surface (approximate elevations +212.0 to +200.0).
  - Groundwater was encountered in 41 of the 48 borings at depths ranging from 0'6" to 16'0" below the existing ground surface (approximate elevations +227.5 to +193.5).
  - Bedrock or probable bedrock was encountered in 29 of the 48 borings at depths ranging from 7'0" to 30'9" below the existing ground surface (elevations +219.0 to +172.8).

- *Building Area Preparation (Section 5.1)*
  - Surface materials (topsoil and vegetation) must be stripped from the building area.
  - Existing fill is not a suitable bearing material for support of new building foundations or floor slab. Where existing fill is present below the building subgrade elevation, it shall be completely removed and replaced with new engineer approved compacted fill.
  - The exposed building subgrade shall be densified with several passes of a large vibratory roller prior to placing compacted fill or once the planned building subgrade has been achieved in cut areas.
  - In the event that water infiltrates the building excavation, preparation of wet and sensitive subgrades with geotextile fabric and clean stone may also be necessary.
  - New backfill shall be compacted to at least 95% of its Maximum Modified Dry Density (ASTM D1557).

- *Building Foundation Recommendations (Section 5.2)*
  - The new foundations may be designed as spread footing type foundation bearing on virgin soil or engineer-approved compacted fill.
  - Net design bearing pressure is 4,000 psf.
  - Minimum depth for frost protection is 42 inches.
  - Seismic Site Class is D or Stiff Soil Profile.
  - A footing drain will be required for the east and north sides of the building.

- *Building Floor Slab Recommendations (Section 5.3)*
  - The virgin soil and new compacted fill can be used for support of the proposed floor slab.
  - The floor slab may be designed as slab on grade.
  - Modulus of subgrade reaction is 200 pci.
  - A sub-slab drainage system will be required.

- *Soil Slope and Cutoff Drains (Section 6.2)*
  - A 2.5H:1V soil slope is planned to the east of the new building.
  - Based on the subsurface conditions and grading plan, groundwater will daylight out of the proposed slope. A series of cutoff drains will be required to control the groundwater.

- *Additional Site Recommendations (Section 6.0)*
  - Pavement: Densified existing fill, virgin soil, and new compacted fill may be used to support the pavement.
  - Utilities: New utilities may bear in the densified existing fill, virgin soil, or new compacted fill.

5.0 BUILDING EVALUATION

We understand that the planned construction will consist of a new daycare building. We anticipate that cuts ranging up to 11 feet and fills ranging up to 6 feet will be required to achieve the planned finished floor elevation of +217.25. Borings B-5D through B-9D, borings B-4 and B-5, and boring DC-105 were performed in the planned building footprint. A summary of the boring observations can be found in Table 2. Four cross-sections have also been prepared and show the anticipated cuts and fills within the building area. Refer to Figures 3 and 4, which are attached.

Existing fill was encountered in borings B-6D, B-7D, B-13D, and DC-105 to depths of 9’6” (+210.0), 5’0” (+209.0), 2’0” (+211.5), and 7’0” (+213.0) below the existing ground surface, respectively. Existing fill was not encountered in the remaining building borings. The depth and extent of the existing fill are expected to be variable and may be deeper or shallower in unexplored areas of the site. The existing fill is not an acceptable bearing material for the new building foundations or floor slab. The consistency and density of the soil fill are not predictable. Certain areas may contain clean dense soils while other areas may contain loose material, void spaces, and/or debris. The existing soil fill creates the possibility of intolerable differential settlements under loading.

To prevent damaging and differential settlement where existing fill is present below the proposed finished floor subgrade elevation, the existing fill shall be completely removed from the building area and replaced with new engineer-approved compacted fill.

Provided that the existing fill is removed and replaced, and that the building area is prepared as outlined in this report, the new building may be supported on shallow spread footings bearing on the virgin soil or new engineer-approved compacted fill. Recommendations for preparation of the building area are provided in Section 5.1. Foundation recommendations for the new building are provided in Section 5.2 below. In addition, the proposed building floor slab may be designed as slab on grade bearing on new engineer-approved compacted or virgin soil. Floor slab recommendations can be found in Section 5.3 below.

5.1 Building Area Preparation

In order to prepare the site for construction, all surface materials, such as vegetation and topsoil, shall be removed from the planned building area, extending at least ten (10) feet beyond the new construction limits, where practical.

Removal of Existing Fill

As discussed above, the existing fill is not a suitable bearing material for the new building foundations and floor slab. Where existing fill is encountered in the building area, it must be completely removed and replaced as described below.

Based on the boring observations and the proposed construction, excavations on the order of 7-feet below the finished floor elevation are expected. Where existing fill is present below the planned subgrade elevation, the excavation shall extend through the existing fill down to the virgin soil. At the bottom of the excavation, the removal of the unsuitable material shall extend horizontally beyond the building limits a minimum distance of 1’0” plus a distance equal to the depth of the excavation below the planned foundation bearing elevation. For example, if the removal of the existing fill extends vertically 6’0” below the planned foundation bearing elevation, the excavation must extend horizontally a minimum of 7’0” (1’0” plus 6’0”) beyond the new building limits at that location.

The removal of the existing fill from the proposed building area shall be performed under the full time inspection of Carlin-Simpson & Associates. The on-site representative from Carlin-Simpson & Associates shall direct the contractor during this operation to ensure that all of the unsuitable material has been removed from the proposed building area.

During the removal of the unsuitable material, the contractor should segregate the potentially re-usable existing soil/fill material from the non-reusable fill (i.e. debris and topsoil). The on-site representative from Carlin-Simpson & Associates shall evaluate the suitability of the excavated materials for use as compacted fill during the excavation and prior to its re-use. Potentially usable fill should be stockpiled and covered with tarps or plastic sheeting for protection from excess moisture. Any fill material that is or becomes wet must be dried prior to its re-use.

Densification of Subgrade Soils (Proofrolling)

After the surface materials and existing fill have been removed and prior to the placement of new structural fill, the exposed subgrade soil must be graded level and proofrolled by several passes of a vibratory drum roller. Where existing fill is not present within the building area footprint, the existing soil subgrade that is either at or below the planned subgrade elevation shall be densified by proofrolling the subgrade by several passes of a large vibratory drum roller. The proofrolling is

necessary to densify the underlying soils. Proofrolling must be performed prior to the excavation for new foundations and/or the installation of new compacted fill.

A representative from Carlin-Simpson & Associates shall observe the proofrolling operation. If any excessive movement is noted during the proofrolling, the soft soil shall be removed and replaced with new compacted fill. The Carlin-Simpson & Associates representative shall be responsible for determining what material, if any, is to be removed and will direct the Contractor during this operation. The proofrolling may be eliminated, if in the opinion of the geotechnical engineer, the proofrolling will cause pumping or otherwise disturb the stability of the subgrade.

Handling Groundwater and Wet Subgrades

Groundwater was encountered within the building area at depths ranging from 5’0” to 9’0” below the existing ground surface (elevations +220.8 to +207.0). We understand that the planned finished floor elevation is +217.25. Therefore, the groundwater level ranges up to approximately 4-feet above the planned finished floor elevation for the building. Perched or trapped groundwater may also be present in the existing fill, the silty site soils, and/or along the soil/rock interface, especially during wet periods. To prevent water from infiltrating the building area during and post construction, a series of cutoff drains will be required in the planned slope area to the east of the building. The drains will divert the groundwater and direct it to the stormwater management system. This is discussed further in Section 6.2 of this report. Preliminary plans showing the proposed cutoff drains are also included in this report.

Proper groundwater control measures (i.e. sumps and pumps) will be required in the event that water is encountered in the building excavations. Where required, temporary groundwater control measures shall consist of one (1) or more sumps and pumps. The sumps shall consist of a perforated pipe at least eight (8) inches in diameter, surrounded by crushed stone and filter fabric. The sump pits must be installed just outside the planned excavation area and at least two (2) feet below the lowest anticipated subgrade elevation. The sumps and pumps must be set and in operation prior to excavating below the water table. The pumps shall be used to temporarily lower the surrounding groundwater level and keep the building excavation relatively dry.

In the event that the exposed subgrade soil within the planned building area becomes wet or soft, stabilizing the subgrade surface may be required in order to construct the foundations. To prepare the destabilized subgrade surface for the geotextile fabric and crushed stone, all groundwater, loose soil, and mud, must be removed from the area. Where necessary, sump pits and pumps should be used to remove the standing water and to control the groundwater during construction.

After the subgrade is prepared, the geotextile filter fabric should be laid out on the exposed subgrade. The geotextile filter fabric shall consist of Mirafi 500X or equivalent. Adjacent layers of geotextile filter fabric should be overlapped a minimum of 6 inches. As necessary, approximately 12 inches of 3/4-inch clean crushed stone will be installed on top of the filter fabric layer to provide a firm working surface, provide protection for the geotextile filter fabric, minimize pumping, and to stabilize the subgrade soil. Carlin Simpson and Associates will determine the need for stabilization and will direct the contractor during construction.

Installation of New Structural Fill

New fill required to achieve final grades shall consist of either engineer-approved on-site soil or imported sand and gravel. The new fill shall be placed in layers not exceeding one (1) foot in

thickness and each layer shall be compacted to at least 95% of its Maximum Modified Dry Density (ASTM D1557). Each layer must be compacted, tested, and approved by the Carlin-Simpson & Associates field representative prior to placing subsequent layers. The suitability of the on-site soil and rock for reuse as compacted fill is discussed in Section 6.6 below.

If imported structural fill will be required during construction, the imported structural fill shall meet the following specified gradation:

US Standard Sieve Size	Percent Finer by Weight
3-inch	100
No. 4	30-80
No. 40	10-50
No. 200	0-20

5.2 New Building Foundations

Once the planned building area has been prepared as described in Section 5.1 above, the new foundations may be constructed on the virgin site soils and new compacted fill using a net design bearing pressure as listed in Table 3 below.

All of the exterior footings shall bear at the minimum depth listed below for protection from frost. Interior column footings must also bear on virgin soil or new structural fill as described above. The footings shall have minimum dimensions as listed below.

Table 3 – Building Foundation Design Parameters

Description	Value
Foundation Bearing Material	Virgin Soil/ New Compacted Fill
Net Design Bearing Pressure	4,000 psf
Minimum Frost Depth	42 inches
Minimum Column Dimension	30 inches
Minimum Wall Dimension	18 inches

The excavations for the new foundations shall be performed under the full-time inspection of Carlin-Simpson & Associates. The on-site representative shall confirm that the foundation bearing material is capable of supporting the design bearing pressure.

Prior to the placement of formwork, reinforcement steel, and concrete, the bearing subgrade soil shall be cleaned of all loose soil and where soil is encountered at the subgrade elevation, it shall be compacted with several passes of a small vibratory drum trench compactor (i.e. Wacker Model RT560), a heavy vibratory plate tamper (i.e. Wacker BPU 3545A or equivalent), or "jumping jack" style tamper (i.e. Wacker Model BS 600). This must be performed under the observation of Carlin-Simpson & Associates. If instability is observed during the compaction of the bearing subgrade, the soft soil shall be removed and replaced with new compacted fill.

Foundation Drain

A footing drain must be placed around the exterior of the new building to prevent water from accumulating against the building. The footing drain will be required along the east and north sides

of the new building as shown on Figure 2. This drain shall consist of a 6-inch diameter, rigid wall perforated PVC pipe surrounded by at least 18 inches of 3/4-inch clean crushed stone. The stone shall be wrapped in a geotextile filter fabric, such as Mirafi 140N or equivalent. The foundation drainpipe shall be extended by gravity with solid 6-inch PVC pipe to the nearest stormwater manhole or catch basin with a backflow preventer installed on the discharge pipe. The outside face of the footing wall, where it extends below grade, should also be dampproofed. The footing drain is also shown on the attached cross-sections (Figures 3 and 4). Separate drainage system design plans will be prepared by Carlin-Simpson & Associates for inclusion in the construction documents.

5.3 Floor Slab on Grade

The floor slab may be designed as a slab on grade bearing on densified virgin soil or new engineer-approved structural fill. Floor slab design parameters are provided in Table 4 below. A layer of 3/4-inch crushed stone is recommended beneath the concrete slab for additional support and drainage. In addition, a vapor barrier should be installed below the slab.

Table 4 – Building Floor Slab Design Parameters

Description	Value
Slab Subgrade Material	Densified Virgin Soil/ New Structural Fill
Modulus of Subgrade Reaction (k)	200 pci
Crushed Stone Cushion Thickness:	12 inches

New fill for the floor slab shall consist of either suitable on-site soil or imported sand and gravel. Imported sand and gravel shall contain less than 20% material by weight passing a No. 200 sieve. The new fill shall be placed in layers not exceeding one (1) foot in loose thickness and each layer shall be compacted to at least 92% of its Maximum Modified Dry Density (ASTM D1557). Fill layers shall be compacted, tested, and approved before placing subsequent layers.

Floor Slab Underdrains

A permanent dewatering system consisting of a sub-slab underdrain system must be installed for the eastern portion of the proposed building. The underdrain system shall consist of one or more main drain lines with branching laterals at intervals of no more than 15 feet on center. A conceptual underdrain layout is shown on the attached Figure 2. Separate drainage system design plans will be prepared by Carlin-Simpson & Associates for inclusion in the construction documents.

The drainpipes shall consist of four (4) inch diameter rigid perforated PVC or HDPE pipes placed at the bottom of a 12-inch drainage stone layer below the floor slab. The drainpipe and crushed stone shall be separated from the surrounding soil using a geotextile filter fabric (Mirafi 140N or equivalent) to prevent soil from clogging the pipes. The edges of the filter fabric shall be folded on top of the stone fill. The subgrade should be graded (“pitched”) towards the underdrain. Water collected in the underdrain system shall be diverted to the stormwater management system.

Based on the site conditions, we expect that the underdrain system can be drained by gravity to the stormwater collection system. In the event that sumps and pumps are used, the sump pump system must be capable of operating continuously 24 hours a day and be equipped with a power supply back up system in the event of a power failure.

5.4 Settlement

Settlement of individual footings, designed in accordance with recommendations presented in this report, is expected to be within tolerable limits for the proposed structure. For footings placed on natural soils or new compacted fill approved by Carlin-Simpson & Associates and constructed in accordance with the requirements outlined in this report, maximum total settlement is expected to be on the order of 1-inch or less. Maximum differential settlement between adjacent columns or load bearing walls is expected to be ½-inch.

The above settlement values are based on our engineering experience with similar soil conditions and the anticipated structural loading. These estimated settlements are intended to guide the structural engineer with their design. It is critical that Carlin-Simpson & Associates be retained to observe the foundation bearing surfaces and to confirm the recommended bearing pressures during construction.

5.5 Seismic Design Considerations

From site-specific test boring data, the Site Class was determined from New York State Building Code Section 1613.2.2. The site-specific data used to determine the Site Class typically includes soil test borings to determine Standard Penetration resistances (N-values). Based on estimated average N-values in the upper 100 feet of soil profile, the site can be classified as Site Class D – Stiff Soil Profile.

New structures should be designed to resist stress produced by lateral forces computed in accordance with Section 1613 of the New York State Building Code. The values in Table 5 shall be used for this project.

Table 5 – Seismic Design Values

Description	Value
Mapped Spectral Response Acceleration for Short Periods, [Fig 1613.2.1 (1)]	S_S=0.295g
Mapped Spectral Response Acceleration at 1-Second Period, [Fig 1613.2.1 (2)]	S_1=0.061g
Site Coefficient [Table 1613.2.3 (1)]	F_a= 1.564
Site Coefficient [Table 1613.2.3 (2)]	F_v= 2.40
Max Considered Earthquake Spectral Response for Short Periods [Eq 16-36]	S_{MS}=0.461g
Max Considered Earthquake Spectral Response at 1-Second Period [Eq 16-37]	S_{M1}=0.147g
Design Spectral Response Acceleration for Short Periods [Eq 16-38]	S_{DS}=0.307g
Design Spectral Response Acceleration for 1-Second Period [Eq 16-39]	S_{D1}=0.098g

Since the proposed building is a daycare building, we expect that the structure has a Risk Category of III. Based on this assumption, the Seismic Design Category (SDC) is B. The Risk Category and SDC should be verified by the project structural engineer. In the event that the structure has a different Risk Category, the SDC should be updated in accordance with Section 1613 of the New York State Building Code.

Liquefaction Potential

Liquefaction is a phenomenon in which saturated or partially saturated soils lose strength and stiffness when subjected to earthquake-induced ground shaking. Ground shaking of sufficient

duration results in the loss of grain-to-grain contact and collapse of the soil skeleton which causes stresses in the soil to be completely transferred to the pore water fluid. Liquefaction is most often observed in saturated, loose sandy soils at depths shallower than 50 feet below the ground surface. Factors known to influence liquefaction potential include composition and thickness of soil layers, grain size, relative density, groundwater level, degree of saturation, and both intensity and duration of ground shaking.

The liquefaction potential was evaluated with the available data, including the SPT blow counts, soil classification, total unit weight, soil fines content, depth to groundwater, and depth to bedrock. We have determined the potential for liquefaction is negligible for the site and is unlikely to occur during a seismic event.

6.0 SITE EVALUATION

Our recommendations for the proposed site development including new stormwater management areas, new soil slope, new underground utilities, pavement for new driveways and parking areas, temporary construction excavations and excavation protection, and the suitability of the existing site soils for reuse as structural fill are provided below.

6.1 Stormwater Management Systems

The provided plans indicate that a stormwater basin is planned to the north of the proposed building. Borings B-11D and B-12D were performed for the new basin. In addition, historical borings B-2, B-3, B-6, B-102, and RW-3 were performed in the vicinity of the new basin. The planned bottom elevation of the basin is +200.0.

Groundwater was encountered in borings B-11D and B-12D at a depth of 6’0” below the existing ground surface (approximate elevations +205.8 and +205.6, respectively). Based on the boring data, the groundwater level is approximately 5 to 6 feet above the bottom of the basin, therefore infiltration testing was not performed in this area.

We understand that a second stormwater management area is also planned in the southern portion of the site. The planned bottom elevation of the bio-retention basin is +208.0. Borings B-15D and B-16D were performed in this basin area.

During the investigation, borings B-1D through B-4D, B-13D, and B-14D were also interspersed throughout the planned parking and landscape areas to the west of the proposed building for potential stormwater management areas. Groundwater was encountered in borings B-1D through B-4D and B-13D through B-16D at depths ranging from 0’6” to 7’0” below the existing ground surface (approximate elevations +211.0 to +205.5). Evidence of seasonal high groundwater (i.e. mottling) was encountered in borings B-13D and B-15D at depths of 2’6” and 3’0” below the existing ground surface (+211.5 and +205.0), respectively.

As part of this study, three (3) borehole infiltration tests were completed to evaluate the permeability of the site soils. The infiltration tests were performed in accordance with New York State Department of Environmental Conservation (NYSDEC) procedures. The results of the infiltration tests are summarized in Table 6 below and the vertical permeability rate (K_m) was calculated using the equation below.

$$K_m = 1.142R_t \times \frac{\left[Ln\left(\frac{h_1}{h_2}\right)\right]}{(t_2 - t_1)}$$

Table 6 - Infiltration Test Results

Infiltration Test No.	Approx. Ground Surface Elevation	Depth of Test Below Existing Ground Surface (Elevation)	Soil Description	Field Infiltration Rate	Calculated Vertical Permeability Rate, K_m
B-4D	+212.0	3'0" (+209.0)	Sand, some Silt	0.125 in/hr	0.0098 in/hr
B-14D	+216.0	3'0" (+213.0)	Sand, little Silt	8.0 in/hr	0.76 in/hr
B-15D	+210.0	2'6" (+207.5)	Sand, some Silt	0.25 in/hr	0.012 in/hr

The bottom of stormwater infiltration areas should be a minimum of two (2) feet above confining layers, seasonal high groundwater, or the existing groundwater table. Where stormwater management areas be planned, they should be evaluated on a case-by-case basis. The stormwater management systems must be designed in accordance with the applicable New York State Department of Environmental Conservation (NYSDEC) regulations and the New York State Stormwater Management Design Manual (January 2015). The testing requirements are outlined in Appendix D of the manual.

6.2 Soil Slope & Cutoff Drains

Based on the provided site plan, the current slope located along the eastern property line varies from 10 horizontal to 1.0 vertical (10H:1V) to 4.0 horizontal to 1.0 vertical (4H:1V). In order to achieve the proposed grades, the existing slope will be cut and steepened to approximately 2.5 horizontal to 1.0 vertical (2.5H:1V). The slope will range up to approximately 20 feet in height.

For slopes constructed in soil, we typically recommend a slope angle of 3.0H:1V or flatter. Steeper soil slopes could be prone to instability (i.e. sloughing or sliding) if not designed and constructed properly and/or if surface water and groundwater seepage are not properly controlled.

Since the groundwater on the site will be controlled by cutoff drains as described in the following section of this report, the slopes constructed on a 2.5H:1V angle as indicated on the grading plan are generally acceptable for the project site, provided that they are properly constructed, the construction is monitored by a qualified geotechnical engineer, surface water is directed away from the top of slope, groundwater seepage within the slope is properly mitigated, and appropriate vegetation is established on the completed slope.

The only exception is the area near the northern stormwater management basin (as shown in Cross Section D). In this area, the grading plan indicates a 2.5H:1V from elevation +224.0 to elevation +210.0 and then a 3H:1V slope from +210.0 to elevation +200.0 at the bottom of the basin. We recommend that the 3H:1V slope be extended up to at least elevation +215.0 to ensure that all water seepage from the slope occurs in the 3H:1V portion of the slope. Above elevation +215.0, the 2.5H:1V is acceptable.

In addition, crushed stone will be required along the slope in the area of the stormwater basin for slope stabilization where water seepage is expected. Specifically, 1-inch to 2-inch crushed stone

should be installed along the east side of the basin up to approximately elevation +215.0. This will be included on the drainage system design plans that will be prepared by Carlin-Simpson & Associates for inclusion in the construction documents.

Erosion control blankets or permanent turf reinforcement mats (TRM) should be used on all slopes steeper than 3H:1V to protect the slope from surface erosion. For all slopes, vegetation should be established as soon as possible after construction to help stabilize the slope and to minimize surface erosion. A landscape architect should be consulted for recommendations regarding the best type of vegetation for the slopes. The top of slope must be graded to redirect surface water away from the slope and to prevent sheet flow directly over the top of the slope. This can be achieved by constructing swales at the top of slope to redirect the water.

Cutoff Drains

The groundwater at the site will be controlled by the topography and underlying bedrock surface. Groundwater was encountered in the vicinity of the slope at depths ranging from 4'0" to 12'0" below the existing ground surface (approximate elevations +224.0 to +205.5). Based on the planned cut of the slope and the groundwater conditions at the site, we expect that the groundwater will daylight out of the new slope, unless proper groundwater control measures are implemented. Cross-sections showing the anticipated conditions are attached as Figures 3 and 4.

In order to construct a stable slope, the groundwater must be controlled. In our opinion, this can be accomplished by a series of cutoff drains installed in the slope. Cutoff drains consist of a trench of highly permeable soil or crushed stone running parallel to the slope. At the bottom of the drainage trench, a perforated drainpipe will collect the groundwater and divert it to the on-site stormwater management system.

The locations of the proposed cutoff drains and other drainage systems are shown on the attached Conceptual Drainage System Plan (Figure 2). Cross-section details (Figures 3 and 4) have also been prepared to show the cutoff drain locations and other drainage systems for this project. The conceptual drawings within this report are for planning and budgeting purposes only. Separate drainage system design plans will be prepared by Carlin-Simpson & Associates for inclusion in the construction documents.

A water withdrawal permit will be required from the NYSDEC since the permanent dewatering systems (cutoff drains, underdrains, and footing drain) will have the capacity to withdraw 100,000 gallons per day (gpd) and is expected to exceed 100,000 gpd at times (i.e. seasonally and/or during storm events). A determination will be made by the NYSDEC if any pre-treatment will be required prior to discharge into the stormwater collection system.

6.3 Utilities

New utilities may bear in the densified existing fill, virgin site soils, or new compacted fill. The bottom of all trenches should be excavated clean and shaped so a hard bottom is provided for the pipe support. If any soft or unsuitable soil conditions are encountered during construction, the unsuitable materials must be removed and replaced with new compacted fill.

For areas where existing fill is encountered within the utility excavations, the subgrade at bottom of the utility excavation shall be compacted in place with a vibratory drum trench compactor or "jumping jack" style tamper. Carlin-Simpson & Associates must evaluate these areas for the

presence of soft or unsuitable material within the existing fill matrix. If instability is observed, portions of this fill may have to be removed and replaced with new compacted fill. Carlin-Simpson & Associates will determine this during construction.

Groundwater may be encountered in the utility excavations in portions of the site. If the trench bottom becomes soft due to the inflow of surface water or trapped water, the soft soil shall be removed and the excavation filled with a minimum of six (6) inches of 3/4-inch clean crushed stone to provide a firm base for support of the pipe. Sump pits and pumps should be used to keep the excavations dry.

After the utility is installed, the trench must be backfilled with compacted fill. The fill shall consist of suitable on-site soil or imported sand and gravel. Imported fill shall contain less than 20% by weight passing a No. 200 sieve. Large rock fragments and boulders must not be placed directly against the pipe. Controlled compacted fill shall be placed in one (1) foot loose layers and each layer shall be compacted to at least 92% of its Maximum Modified Dry Density (ASTM D1557). The backfill must be free of topsoil, debris, and large boulders or rock fragments.

6.4 Pavement

We understand that the proposed construction will also include new paved parking areas and driveways. Based on the provided site plan, we expect that small cuts and fills will be required to achieve the planned subgrade elevations in the new pavement areas. The densified existing fill, virgin soil, and new compacted fill may be used to support the pavement.

Pavement Underdrains

We recommend a series of underdrains be installed at the stormwater inlet structures. The underdrain should extend a minimum of 25-feet from each stormwater inlet structure. Refer to the attached Conceptual Drainage System Plan (Figure 2) for conceptual drain locations and a typical underdrain detail.

The underdrain excavation should extend 2 feet below the bottom of the proposed asphalt section. Geotextile non-woven filter fabric (i.e. Mirafi 140N or equivalent) should then be placed on the subgrade and up the sidewalls of the excavation, completely lining the excavation. After the trench has been lined with filter fabric, a 4-inch perforated drainpipe should be installed.

The trench backfill shall consist of 3/4-inch clean crushed stone. Once the trench is backfilled, the filter fabric should be wrapped over the clean crushed stone. The asphalt pavement section may then be installed directly over the filter fabric.

Preparation of Pavement Areas

To prepare the new pavement areas, the existing surface materials (i.e. topsoil, vegetation, etc.) must be removed from the planned pavement areas. In the proposed pavement areas, the existing structures and debris resulting from the demolition of these structures must be completely removed from the new pavement area, extending at least five (5) feet beyond the new paving limits, where practical. After all debris has been removed, the exposed subgrade soil that is either at or below the planned subgrade elevation shall be proofrolled with a large vibratory drum roller (i.e. Dynapac 250 or equivalent) to densify the underlying soils. The on-site representative from Carlin-Simpson & Associates shall witness the proofrolling operation. If any excessive movement is noted

during the proofrolling, the soft or unsuitable soil shall be removed and replaced with new compacted fill.

Areas where existing fill is encountered shall be compacted in place. Carlin-Simpson & Associates must evaluate these areas for the presence of soft or unsuitable material within the existing fill matrix. Portions of this fill may have to be removed and replaced with new compacted fill. Carlin-Simpson & Associates will determine this during construction.

Where new fill is required to achieve final grades, it shall consist of either suitable on-site soil or imported sand and gravel. Imported sand and gravel shall contain less than 20% by weight passing a No. 200 sieve. New fill shall be placed in layers not exceeding one (1) foot in loose thickness and each layer shall be compacted to at least 92% of its Maximum Modified Dry Density (ASTM D1557).

Asphalt Pavement Section

After the planned subgrade has been proofrolled and new compacted fill has been placed as required, the new pavement subbase may be placed on the existing site soils, bedrock, and new compacted fill. A minimum of six (6) inches of dense graded aggregate (DGA) is recommended for the subbase layer for drainage and additional pavement support.

We recommend that the following pavement section be used for the parking lots and driveways. This pavement section is subject to local government approval.

2”	Asphalt Top Course	NYSDOT, Type 6F
2.5”	Asphalt Base Course	NYSDOT, Type 3
8”	Stone Subbase (DGA)	NYSDOT, Type 1
	Approved Compacted Subgrade (Minimum CBR = 10)	

Based on the boring data, we anticipate that the densified existing site soils, weathered bedrock, and new compacted fill will provide a CBR value that is equal to or greater than 10, which can adequately support the above pavement sections.

Rigid (Concrete) Pavement

We expect that the proposed construction may also include rigid concrete pavement in portions of the site. The new concrete pavement should be designed for light vehicles (autos, pickup trucks, vans) and occasional delivery or trash pick-up truck traffic. The following rigid concrete pavement section design is based on a 20-year design life and the anticipated traffic data. This pavement section is subject to local government approval.

5.5”	Concrete Section	4,000 psi
6”	Gravel Subbase Course	NYSDOT Type 4
	Approved Compacted Subgrade (Minimum CBR = 10)	

The rigid concrete pavement should be reinforced with welded wire fabric or reinforcing steel bars for crack control. Contraction joints should also be provided with a maximum spacing of 10 feet. The project structural engineer or the site engineer shall determine the type, size, and spacing of the reinforcement based on the anticipated loading.

6.5 Temporary Construction Excavations and Excavation Protection

Temporary construction excavations shall be conducted in accordance with the most recent OSHA guidelines or applicable federal, state or local codes. A qualified person should evaluate the excavations at the time of construction to determine the appropriate soil or rock type and the allowable slope configuration. Based on the boring data, we believe the site soil would have the following classifications as defined by the OSHA guidelines.

Soil Type	Possible Classification	Maximum Slope or Bench
Existing Fill	"C"	1½H:1V
Virgin Soil	"B" or "C"	1H:1V or 1½H:1V

Temporary support (i.e. trench boxes, sheeting and shoring, etc.) should be used for any excavation that cannot be sloped or benched in accordance with the applicable regulations, where necessary to protect adjacent utilities and structures, or where saturated soils or water seepage is encountered within the excavation. In the event that water is encountered within the excavation, an evaluation of the excavation's stability must be performed. Perched water or groundwater encountered within the excavation will destabilize the sides of the excavation. Temporary support will be required to stabilize the excavation. Dewatering of the excavation will also be required.

A New York State licensed professional engineer must design all temporary and permanent support systems. The contractor will select the shoring type and submit design calculations for the proposed shoring method to Carlin-Simpson & Associates for review.

The soil adjacent to the temporary support system will exert a horizontal pressure against the system. This pressure is based on the soil unit weight, the coefficient of active earth pressure, and the depth of the excavation. In addition, the surcharge loads from adjacent driveways, construction equipment, or stored materials near the excavation must be incorporated into the design of the support system, as applicable. The design parameters for temporary excavation support systems are listed in Table 7 below.

Table 7 – Temporary Support of Excavation Design Parameters

Description	Soil
Moist Unit Weight (pcf)	130
Friction Angle (ϕ, deg)	30
Cohesion (c, psf)	0
Active Earth Pressure Coefficient (k_a)[1]	0.33
Equivalent Fluid Pressure (pcf)	42.9
Passive Earth Pressure Coefficient (k_p)[1]	3.0

6.6 Suitability of the In-Situ Soil and Rock for Use as Compacted Fill

The suitability of each stratum for use as compacted fill is discussed below.

Stratum 1 Topsoil — Topsoil is not suitable for use as structural compacted fill. During the stripping operation, it may be stockpiled on site for later use in the landscaped areas or removed from the site.

Stratum 2 Existing Fill — The fill generally consists of dark brown, brown coarse to fine SAND, little (to and) Silt, trace (to some) coarse to fine Gravel. The existing fill is generally suitable for reuse, provided that it remains relatively dry for optimum compaction and that the debris is removed prior to reuse as compacted fill.

Stratum 3 Silty Sand with Gravel — Stratum 3 consists of brown or orange brown coarse to fine SAND, little (to and) Silt, little (to some) coarse to fine Gravel. This stratum is generally suitable for reuse as compacted fill, as long as it remains relatively dry for optimum compaction.

Stratum 4 Sand with Gravel — Stratum 4 consists of white, brown coarse to fine SAND, trace Silt, trace (to some) coarse to fine Gravel. This stratum is generally suitable for reuse as compacted fill, as long as it remains relatively dry for optimum compaction.

The boring data indicates that the on-site soils contain a varying percentage of silt (5% to 30%). The higher silt content soils will be moisture sensitive. If the soil becomes too wet, it will be difficult to achieve adequate compaction. In addition, the site soils that extend below the groundwater table are completely saturated and therefore, unsuitable for reuse.

Proper moisture conditioning of the soil will be required. New compacted fill should be within 2% (+/-) of its optimum moisture content at the time of placement. In the event that the on-site material is too wet at the time of placement and cannot be adequately compacted, the soil should be aerated and allowed to dry or the material removed and a drier cleaner fill material used. In the event that the on-site material is too dry at the time of placement and cannot be adequately compacted, water may be needed to increase the soil moisture content for proper compaction.

The in-situ soils which exist throughout the site may become soft and weave if exposed to excessive moisture and construction traffic. The instability will occur quickly when exposed to these elements and it will be difficult to stabilize the subgrade. We recommend that adequate site drainage be implemented early in the construction schedule and if the subgrade becomes wet, the contractor should limit construction activity until the soil has dried.

The minimum compaction requirements for the various areas of the site are summarized in Table 8 below.

Table 8 – Minimum Compaction Requirements

Area	Maximum Modified Dry Density (ASTM D1557)
Below Foundations	95%
Below Floor Slab	92%
Soil Slopes	95%
Pavement Areas	92%
Exterior Slabs and Sidewalks	92%
Utility Trenches	92%
Landscape Areas	90%

7.0 GENERAL

The findings, conclusions and recommendations presented in this report represent our professional opinions concerning subsurface conditions at the site. The opinions presented are relative to the dates of our site work and should not be relied on to represent conditions at later dates or at locations not explored. The opinions included herein are based on information provided to us, the data obtained at specific locations during the study and our past experience. If additional information becomes available that might impact our geotechnical opinions, it will be necessary for Carlin-Simpson & Associates to review the information, reassess the potential concerns, and re-evaluate our conclusions and recommendations.

Regardless of the thoroughness of a geotechnical exploration, there is the possibility that conditions between borings and test pits will differ from those encountered at specific boring or test pit locations, that conditions are not as anticipated by the designers and/or the contractors, or that either natural events or the construction process have altered the subsurface conditions. These variations are an inherent risk associated with subsurface conditions in this region and the approximate methods used to obtain the data. These variations may not be apparent until construction.

The professional opinions presented in this geotechnical report are not final. Field observations and foundation installation monitoring by the geotechnical engineer, as well as soil density testing and other quality assurance functions associated with site earthwork and foundation construction, are an extension of this report. Therefore, Carlin-Simpson & Associates should be retained by the Owner to observe all earthwork and foundation construction, to document that the conditions anticipated in this study actually exist, and to finalize or amend our conclusions and recommendations Carlin-Simpson & Associates is not responsible or liable for the conclusions and recommendations presented in this report if Carlin-Simpson & Associates does not perform the observation and testing services.

Therefore, in order to preserve continuity in this project, the Owner shall retain the services of Carlin-Simpson & Associates to provide full time geotechnical related monitoring and testing during construction. At a minimum, this shall include the observation and testing of the following: 1) the removal of existing fill and unsuitable soil, where required; 2) the proofrolling of the subgrade soil prior to the placement of new compacted fill; 3) the placement and compaction of controlled fill; 4) the excavation for the new foundations; 5) the construction of soil slopes and cutoff drains; 6) the installation of foundation drains, sub-slab drains, and pavement underdrains; and 7) the preparation of the subgrade for the floor slab and pavement areas.

This report has been prepared in accordance with generally accepted geotechnical engineering practice. No other warranty is expressed or implied. The evaluations and recommendations presented in this report are based on the available project information, as well as on the results of the exploration. Carlin-Simpson & Associates should be given the opportunity to review the final drawings and site plans for this project to determine if changes to the recommendations outlined in this report are needed. Should the nature of the project change, these recommendations should be re-evaluated.

This report is provided for the exclusive use of Regeneron Pharmaceuticals, Inc and the project specific design team and may not be used or relied upon in connection with other projects or by other third parties. Carlin-Simpson & Associates disclaims liability for any such third-party use or reliance without express written permission. Use of this report or the findings, conclusions or

recommendations by others will be at the sole risk of the user. Carlin-Simpson & Associates is not responsible or liable for the interpretation by others of the data in this report, nor their conclusions, recommendations or opinions.

If the conditions encountered during construction vary significantly from those stated in this report, this office should be notified immediately so that additional recommendations can be made.

Thank you for allowing us to assist you with this project. Should you have any questions or comments, please contact this office.

Very truly yours,

CARLIN-SIMPSON & ASSOCIATES, LLC

M. Anke

MEREDITH R. ANKE, P.E.
Project Engineer

ROBERT B. SIMPSON, P.E.

File No. 20-166 (DC)

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.				TEST BORING LOG					BORING NUMBER DC-101
Project: Proposed Daycare-Regeneron, 777 Old Saw Mill Rd, Tarrytown NY									**SHEET NO.:** 1 of 2
Client: Regeneron Pharmaceuticals, Inc.									**JOB NUMBER:** 20-166
Drilling Contractor: General Borings Inc.									**ELEVATION:** +226.0
GROUNDWATER					**CASING**	**SAMPLE**	**CORE**	**TUBE**	**DATUM:** Topo
DATE	**TIME**	**DEPTH**	**CASING**	**TYPE**	**HSA**	**SS**			**START DATE:** 16/Dec/21
16/Dec/21	**1140**	**21'8"**	**HSA**	**DIA.**	**3 1/4"**	**1 3/8"**			**FINISH DATE:** 16/Dec/21
16/Dec/21	**1155**	**17'6"**	**HSA**	**WGHT**		**140#**			**DRILLER:** T McGovern
20/Dec/21	**900**	**13'2"**	**MW**	**FALL**		**30"**			**INSPECTOR:** JP MW

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			2		**Topsoil** 0'6"	
1		**S-1**	5		Br cf S, t $, t cf G	Rec = 10"
			5			moist
2			8			
			6			
3		**S-2**	8		same, l (-) $	Rec = 10"
			20			moist
4			50/1"			boulder
5						
			20			
6		**S-3**	20		same, l cf G	Rec = 16"
			20			moist
7			20			
			23			
8		**S-4**	19		same	Rec = 13"
			15		**Brown coarse to fine SAND, trace Silt,**	moist
9			11		**little coarse to fine Gravel**	
10						
			11			
11		**S-5**	7		NR	Rec = 0
			8			
12			9			
13						
14						
15						
			15			
16		**S-6**	8		same	Rec = 16"
			9			wet
17			9			
18					18'0"	
19					**Gray, white coarse to fine GRAVEL**	
20					**little, coarse to fine Sand, trace Silt**	
			56		**(weathered rock)**	
21		**S-7**	50/2"		Gr, wt cf G l, cf S, t $ (weathered rock)	Rec = 4"
						wet
22						very dense

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.					TEST BORING LOG	BORING NUMBER DC-101
Project:			**Proposed Daycare-Regeneron, 777 Old Saw Mill Rd, Tarrytown NY**			**SHEET NO.:** 2 of 2
Client:			**Regeneron**			**JOB NUMBER:**
Depth (ft.)	**Casing Blows per Foot**	**Sample Number**	**Blows on Sample Spoon per 6"**	**Sym**	**IDENTIFICATION**	**REMARKS**
23					**Gray, white coarse to fine GRAVEL little, coarse to fine Sand, trace Silt (weathered rock)**	Auger chewed very dense
24						
25					25'0"	Auger refusal @ 25'0"
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
46						
47						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER DC-102
Project: Proposed Daycare-Regeneron, 777 Old Saw Mill Rd, Tarrytown NY		**SHEET NO.:** 1 of 1
Client: Regeneron Pharmaceuticals, Inc.		**JOB NUMBER:** 20-166
Drilling Contractor: General Borings Inc.		**ELEVATION:** +231.0

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 16/Dec/21
16/Dec/21	1450	13'0"	HSA	DIA.	3 1/4"	1 3/8"			FINISH DATE: 16/Dec/21
16/Dec/21	0815	13'0"	HSA	WGHT		140#			DRILLER: T McGovern
20/Dec/21	0900	Dry	MW	FALL		30"			INSPECTOR: JP

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			4		**Topsoil**	
1		**S-1**	7		Br cf S, l $, l (+) cf G	Rec = 13"
			14			moist
2			18			
			18			
3		**S-2**	50/4"		same	Rec = 5"
						moist
4						
5						
			16			
6		**S-3**	16		same	Rec = 15"
			37		**Brown coarse to fine SAND, little Silt,**	moist
7			27		**little (+) coarse to fine Gravel**	
			14			
8		**S-4**	12		same	Rec = 16"
			13			moist
9			13			
10						
			8			
11		**S-5**	8		same, lt br, wy	Rec = 14"
			13			moist
12			11			
13						
14						
15					15'0"	
		S-6	50/3"		**Highly weathered rock** 15'6"	Rec = 1
16						wet
						Auger refusal @ 15'6"
17						
18						
19						
20						
21						
22						

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.	TEST BORING LOG	BORING NUMBER DC-103
Project: Proposed Daycare-Regeneron, 777 Old Saw Mill Rd, Tarrytown NY		**SHEET NO.:** 1 of 1
Client: Regeneron Pharmaceuticals, Inc.		**JOB NUMBER:** 20-166
Drilling Contractor: General Borings Inc.		**ELEVATION:** +229.0

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 17 Dec 21
17-Dec	1110	13'5"	HSA	DIA.	3 1/4"	1 3/8"			FINISH DATE: 17 Dec 21
12/17/2021	1120	13'0"	HSA	WGHT		140#			DRILLER: T McGovern
12/20/2021	0845	11'11"	MW	FALL		30"			INSPECTOR: JP

Depth (ft.)	Casing Blows pre Foot	Sample Number	Blows on Sample Spoon per 6"	Syr	IDENTIFICATION	REMARKS
			3		**Topsoil** 0'3"	
1		S-1	7		Br cf S, l (+) $, l (+) cf G	Rec = 15"
			10			moist
2			11			
			11			
3		S-2	16		same	Rec = 12"
			18			moist
4			22			
5						
			10		**Brown coarse to fine SAND, little (+) Silt,**	
6		S-3	12		same **little (+) coarse to fine Gravel**	Rec = 15"
			12			moist
7			19			
			22			
8		S-4	30		same	Rec = 10"
			23			moist
9			13			
10						
			7			
11		S-5	10		same, l $	Rec = 7"
			11			wet @ tip
12			13			
13					13'0"	
					Highly weathered rock	
14					14'0"	Auger refusal @ 14'0"
15						
16						
		Run			**Light gray Quartzite, fresh, intact rock**	Run #1
17		#1				14'0"-19'0"
						Run = 60"
18						Rec = 60" = 100%
						RQD = 60" = 100%
19						
					End of Boring 19'0"	
20						
21						
22						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER DC-104

Project:	**Proposed Daycare-Regeneron, 777 Old Saw Mill Rd, Tarrytown NY**	**SHEET NO.:**	1 of 1
Client:	**Regeneron Pharmaceuticals, Inc.**	**JOB NUMBER:**	20-166
Drilling Contractor:	**General Borings Inc.**	**ELEVATION:**	+229.0

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM:	Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE:	17/Dec/21
20/Dec/21	815	Dry	HSA	DIA.	3 1/4"	1 3/8"			FINISH DATE:	20/Dec/21
				WGHT		140#			DRILLER:	T McGovern
				FALL		30"			INSPECTOR:	JP

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			3		**Topsoil** 0'5"	
1		**S-1**	6		Br cf S, l (+) $, l cf G	Rec = 16"
			14			moist
2			19			
			18			
3		**S-2**	30		same	Rec = 19"
			21			moist
4			14			
5						
			4			
6		**S-3**	5		same, l (-) $	Rec = 9"
			6		**Brown coarse to fine SAND, little Silt,**	moist
7			7		**little coarse to fine Gravel**	
			2			
8		**S-4**	3		same, l $	Rec = 11"
			4			moist
9			5			
10						
			9			
11		**S-5**	7		NR	Rec = 0
			11			
12			29			
13					13'0"	
					Highly weathered rock	
14					14'0"	
					End of Boring @ 14'0"	Auger refusal @ 14'0"
15						Probable bedrock
16						
17						
18						
19						
20						
21						
22						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER DC-105
Project: Proposed Daycare-Regeneron, 777 Old Saw Mill Rd, Tarrytown NY		**SHEET NO.:** 1 of 1
Client: Regeneron Pharmaceuticals, Inc.		**JOB NUMBER:** 20-166
Drilling Contractor: General Borings Inc.		**ELEVATION:** +220.0

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 20/Dec/21
Not Encountered				DIA.	3 1/4"	1 3/8"			FINISH DATE: 20/Dec/21
				WGHT		140#			DRILLER: T McGovern
				FALL		30"			INSPECTOR: JP

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			2		**Topsoil** 0'4"	
1		S-1	10		FILL (Br cf S, s (-) $, l cf G, w/wood)	Rec = 10"
			20			moist
2			50/1"			Boulder
					FILL (Brown coarse to fine SAND,	
3					**some (-) Silt, little coarse to fine Gravel,**	
			12		**with wood)**	
4		S-2	2		FILL (same)	Rec = 9"
			1			moist
5			4			
			3			
6		S-3	1		FILL (same, br, gr, lt or w/fibers orgs)	Rec = 10"
			3			moist
7			18		7'0"	
		S-4	50/6"		**Light orange, white coarse to fine SAND,**	Rec = 4"
8					**little Silt, little coarse to fine Gravel** 8'0"	moist
					End of Boring @ 8'0"	
9						Auger refusal @ 8'0"
						Probable bedrock
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-1D
Project: Proposed Daycare, Regeneron Campus, 777 Old Saw Mill River Rd		**SHEET NO.:** 1 of 1
Client: Regeneron Pharmaceuticals Inc		**JOB NUMBER:** 20-166
Drilling Contractor: General Borings Inc.		**ELEVATION:** +211.2

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 11/Mar/21
11/Mar/21		4'0"	HSA	DIA.	3 1/4"	1 3/8"			FINISH DATE: 11/Mar/21
11/Mar/21		0'6"	Open	WGHT		140#			DRILLER: T McGovern
				FALL		30"			INSPECTOR: Mike W

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			2			
1			4		**Topsoil** 0'8"	
		S-1	11		Br, gr cf S, l (+) $, l mf G	Rec = 18"
2			12		**Brown, gray coarse to fine SAND,**	moist
			12		**little (+) Silt, little medium to fine Gravel**	
3		S-2	11		same, s (-) $, l (-) mf G	Rec = 12"
			7			moist
4			7			
					4'6"	
5					**White coarse to fine SAND, trace Silt,**	
			1		**trace (+) fine Gravel**	
6		S-3	1		Wh cf S, t $, t (+) f G	Rec = 6"
			2			wet
7			25		7'0"	Auger refusal @ 7'0"
					End of Boring @ 7'0"	probable bedrock
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-2D

Project:	**Proposed Daycare, Regeneron Campus, 777 Old Saw Mill River Rd**	**SHEET NO.:**	1 of 1
Client:	**Regeneron Pharmaceuticals Inc**	**JOB NUMBER:**	20-166
Drilling Contractor:	**General Borings Inc.**	**ELEVATION:**	+209.7

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM:	Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE:	11/Mar/21
11/Mar/21	1200	2'0"	HSA	DIA.	3 1/4"	1 3/8"			FINISH DATE:	11/Mar/21
11/Mar/21	1300	0'6"	Open	WGHT		140#			DRILLER:	T McGovern
				FALL		30"			INSPECTOR:	Mike W

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			1		**Topsoil** 0'6"	
1		**S-1**	2		Gr, br cf S, t $, l mf G	Rec = 6"
			2			moist to wet
2			2			
			1			
3		**S-2**	9		same	Rec = 12"
			12			wet
4			16		**Gray, brown coarse to fine SAND,**	
					trace Silt, little medium to fine Gravel	
5						
			12			
6		**S-3**	8		same, t f G	Rec = 8"
			19			wet
7			14			
			16			
8		**S-4**	19		same	Rec = 12"
			20			wet
9			20		9'0"	
					End of Boring @ 9'0"	
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-3D
Project: Proposed Daycare, Regeneron Campus, 777 Old Saw Mill River Rd		**SHEET NO.:** 1 of 1
Client: Regeneron Pharmaceuticals Inc		**JOB NUMBER:** 20-166
Drilling Contractor: General Borings Inc.		**ELEVATION:** +208.8

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 11/Mar/21
11/Mar/21	1415	4'6"	HSA	DIA.	3 1/4"	1 3/8"			FINISH DATE: 11/Mar/21
12/Mar/21	800	2'6"	HSA	WGHT		140#			DRILLER: T McGovern
				FALL		30"			INSPECTOR: Mike W

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			1		**Topsoil** 0'6"	
1		**S-1**	3		Dk br cf S, s (+) $	Rec = 0"
			5			moist
2			4			
			5			
3		**S-2**	5		same	Rec = 12"
			6		**Dark brown coarse to fine SAND,**	moist to wet
4			8		**some (+) Silt**	
5						
			4			
6		**S-3**	4		same, l (-) mf G	Rec = 12"
			6		6'6"	wet
7			12		Br, gr cf S, t $, t (+) f G, w/seam of gr $	
			12		**Brown, gray coarse to fine SAND,**	
8		**S-4**	12		**trace Silt, trace (+) fine Gravel, with**	Rec = 18"
			13		**seam of gray Silt**	wet
9			13		9'0"	
					End of Boring @ 9'0"	
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-4D

Project:	Proposed Daycare, Regeneron Campus, 777 Old Saw Mill River Rd	**SHEET NO.:**	1 of 1
Client:	Regeneron Pharmaceuticals Inc	**JOB NUMBER:**	20-166
Drilling Contractor:	General Borings Inc.	**ELEVATION:**	+212.0

GROUNDWATER					CASING	SAMPLE	CORE	TUBE		
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			DATUM:	Topo
11/Mar/21	1435	NWE	Open	DIA.	3 1/4"	1 3/8"			START DATE:	11/Mar/21
12/Mar/21	1000	7'0"	Open	WGHT		140#			FINISH DATE:	11/Mar/21
15/Mar/21	1500	5'0"	Open	FALL		30"			DRILLER:	T McGovern
									INSPECTOR:	Mike W

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
1			2 5		**Topsoil** 0'8"	
2		S-1	8 12		**FILL (Dark brown coarse to fine SAND, some Silt, trace fine Gravel)** 2'0"	Rec = 18" moist
3		S-2	13 21		Dk br cf S, s (+) $	Rec = 12"
4			14 12			moist
5					**Dark brown coarse to fine SAND, some (+) Silt**	
6		S-3	5 8		same, gr, br a (-) $	Rec = 8"
7			14 19			moist to wet
8		S-4	13 17		same,gr a (+) $	Rec = 0"
9			15 21		9'0"	wet
10					**End of Boring @ 9'0"**	
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.	TEST BORING LOG	BORING NUMBER B-5D

Project:	**Proposed Daycare, Regeneron Campus, 777 Old Saw Mill River Rd**								**SHEET NO.:**	1 of 2
Client:	**Regeneron Pharmaceuticals Inc**								**JOB NUMBER:**	20-166
Drilling Contractor:	**General Borings Inc.**								**ELEVATION:**	+224.0
GROUNDWATER					**CASING**	**SAMPLE**	**CORE**	**TUBE**	**DATUM:**	Topo
DATE	**TIME**	**DEPTH**	**CASING**	**TYPE**	**HSA**	**SS**			**START DATE:**	12/Mar/21
12/Mar/21	**1200**	**7'6"**	**HSA**	**DIA.**	**3 1/4"**	**1 3/4"**			**FINISH DATE:**	12/Mar/21
12/Mar/21	**1300**	**5'0"**	**HSA**	**WGHT**		**140#**			**DRILLER:**	Scott
				FALL		**30"**			**INSPECTOR:**	Mike W

Depth (ft.)	Casing Blows pre Foot	Sample Number	Blows on Sample Spoon per 6"	S Y M	IDENTIFICATION	REMARKS
			2			
1			5		**Topsoil** 0'8"	
		S-1	8		Dk br cf S, s (-) $, t (+) f G	Rec = 12"
2			12			moist
			18			
3		**S-2**	18		same, l $	Rec = 4"
			24			moist
4			27		**Dark brown coarse to fine SAND, some (-) Silt, trace (+) fine Gravel**	
5						
		S-3	50/5"		same	Rec = 0"
6						moist
						spoon bouncing
7					7'0"	
8						
			47			
9		**S-4**	49		Gr, br cf S, t (+) $, t (+) f G	Rec = 0"
			54			wet
10			44			pushing cobble
			28			
11		**S-5**	13		same	Rec = 12"
			11			wet
12			10			
			28			
13		**S-6**	16		same, l mf G	Rec = 18"
			20			wet
14			18		**Gray, brown coarse to fine SAND, trace (+) Silt, trace (+) fine Gravel**	
15						
			23			
16		**S-7**	16		same, t $	Rec = 12"
			14			wet
17			19			
18						
19						
20						
			53			
21		**S-8**	34		same, l (+) mf G	Rec = 24"
			30			wet
22			51			

CARLIN - SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-5D
Project:	**Proposed Daycare, Regeneron Campus, 777 Old Saw Mill River Rd**	**SHEET NO.:** 2 of 2
Client:	**Regeneron Pharmaceuticals Inc**	**JOB NUMBER:** 20-166

Depth (ft.)	Casing Blows pre Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
23						
24					**Gray, brown coarse to fine SAND, trace (+) Silt, trace (+) fine Gravel**	
25		**S-9**	50/1"		25'0"	Rec = 0"
26						wet
27						
28		**Run #1**			**White Quartzite, massive, moderately jointed, slightly weathered**	Run #1 25'0"-30'0" Run = 60"
29						Rec = 95% RQD = 80%
30					30'0"	
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
46						
47						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-6D
Project: Proposed Daycare, Regeneron Campus, 777 Old Saw Mill River Rd		**SHEET NO.:** 1 of 1
Client: Regeneron Pharmaceuticals Inc		**JOB NUMBER:** 20-166
Drilling Contractor: General Borings Inc.		**ELEVATION:** +219.5

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 16/Mar/21
17/Mar/21	800	6'6"	HSA	DIA.	3 1/4"	1 3/8"			FINISH DATE: 16/Mar/21
				WGHT		140#			DRILLER: T McGovern
				FALL		30"			INSPECTOR: Mike W

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			3			
1			9		**Topsoil** 0'8"	
		S-1	8		FILL (Br, gr cf S, l $, l (+) cf G)	Rec = 12"
2			5			moist
			3			
3		**S-2**	4		FILL (same, br)	Rec = 0
			2			moist
4			4		**FILL (Brown, gray coarse to fine SAND, little Silt, little (+) coarse to fine Gravel)**	
5						
			4			
6		**S-3**	2		FILL (same, dk gr, br s $, w/a lot of organics)	Rec = 6"
			1			wet
7			5			
			1/12"			
8		**S-4**			FILL (same, br)	Rec = 12'
			1			wet
9			2			
					9'6"	
10						
			9			
11		**S-5**	23		Or br cf S, l $, s mf G	Rec = 6"
			13			wet
12			11			large piece of gravel in spoon
13					**Orange brown coarse to fine SAND, little Silt, some medium to fine Gravel**	
14						
15						
			21			
16		**S-6**	50/3"		same 16'0"	Rec = 3"
					End of Boring @ 16'0"	wet
17						Auger refusal @ 16'0"
18						
19						
20						
21						
22						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-7D
Project: Proposed Daycare, Regeneron Campus, 777 Old Saw Mill River Rd		**SHEET NO.:** 1 of 1
Client: Regeneron Pharmaceuticals Inc		**JOB NUMBER:** 20-166
Drilling Contractor: General Borings Inc.		**ELEVATION:** +214.0

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 15/Mar/21
				DIA.	3 1/4"	1 3/8"			FINISH DATE: 15/Mar/21
				WGHT		140#			DRILLER: T McGovern
				FALL		30"			INSPECTOR: JP

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			3		**Topsoil** 0'2"	
1		S-1	4		**FILL (Dark brown, gray coarse to fine SAND,**	Rec = 15"
			5		**and Silt, little coarse to fine Gravel, with**	moist
2			4		**organics)** 2'0"	
			12			
3		S-2	15		FILL (Gr, br cf S, l $, l (+) cf G)	Rec = 18"
			23		**FILL (Gray, brown coarse to fine SAND,**	moist
4			18		**little Silt, little (+) coarse to fine Gravel)**	
5					5'0"	
			10			
6		S-3	14		Wh, lt or cf S, t (+) $, l cf G	Rec = 9"
			19			wet
7			28		**White, light orange coarse to fine SAND,**	
			25		**trace (+) Silt, little coarse to fine Gravel**	
8		S-4	52		same	Rec = 14"
			31			wet
9			50			
10					10'0"	Auger refusal 10'0"
					End of Boring @ 10'0"	likely bedrock
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-8D
Project: Proposed Daycare, Regeneron Campus, 777 Old Saw Mill River Rd		**SHEET NO.:** 1 of 1
Client: Regeneron Pharmaceuticals Inc		**JOB NUMBER:** 20-166
Drilling Contractor: General Borings Inc.		**ELEVATION:** +217.0

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 15/Mar/21
15/Mar/21	1030	4'6"	HSA	DIA.	3 1/4"	1 3/8"			FINISH DATE: 15/Mar/21
15/Mar/21	1100	4'0"	Open	WGHT		140#			DRILLER: T McGovern
				FALL		30"			INSPECTOR: JP

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			2		**Topsoil** 0'2"	
1		S-1	6		Dk br cf S, a $, l cf G	Rec = 8"
			5		**Dark brown coarse to fine SAND,**	moist
2			50/3"		**and Silt, little coarse to fine Gravel** 1'9"	boulder
3					**Brown coarse to fine SAND, little Silt,**	
			4		**some (-) coarse to fine Gravel**	
4		S-2	5		Br cf S, l $, s (-) cf G	Rec = 14"
			10			wet
5			9		5'0"	
			5			
6		S-3	6		Dk br cf S, a $, l (-) cf G, w/org fibers	Rec = 4"
			2			wet
7			2			
			1			
8		S-4	1		No Rec	Rec = 0"
			2		**Dark brown coarse to fine SAND,**	wet
9			1		**and Silt, little (-) coarse to fine Gravel,**	
					with organic fibers	
10						
			8			
11		S-5	1		same, br l $, no cf G	Rec = 1"
			1			wet
12			1			
			10		12'6"	
13		S-6	50/5"		Wh, lt or cf S, t (+) $, l cf G	Rec = 10"
					Quartzite, Completely Weathered	wet
14					**White, light orange coarse to fine SAND,**	
					trace (+) Silt, little coarse to fine Gravel	
15						
		S-7	50/3"		same, weathered rock	Rec = 2"
16					16'0"	wet
					End of Boring @ 1'60"	Auger refusal @ 16'0"
17						likely bedrock
18						
19						
20						
21						
22						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-9D
Project: Proposed Daycare, Regeneron Campus, 777 Old Saw Mill River Rd		**SHEET NO.:** 1 of 1
Client: Regeneron Pharmaceuticals Inc		**JOB NUMBER:** 20-166
Drilling Contractor: General Borings Inc.		**ELEVATION:** +229.8

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 16/Mar/21
16/Mar/21	1230	9'0"	HSA	DIA.	3 1/4"	1 3/8"			FINISH DATE: 16/Mar/21
				WGHT		140#			DRILLER: T McGovern
				FALL		30"			INSPECTOR: Mike W

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			3			
1			6		**Topsoil** 0'8"	
		S-1	8		Br cf S, l (+) $, l (+) mf G	Rec = 12"
2			22			moist
			24			
3		**S-2**	28		same, s (-) cf G	Rec = 12"
			29			moist
4			37			
5						
			18			
6		**S-3**	21		same, l $	Rec = 18"
			24		**Brown coarse to fine SAND, little (+) Silt,**	moist to wet
7			23		**little (+) medium to fine Gravel**	
			17			
8		**S-4**	11		same, gr, br l $	Rec = 12"
			12			wet
9			11			
10						
			10			
11		**S-5**	6		same, gr,br	Rec = 0"
			5			wet
12			7			
13						
14						
			13			
15		**S-6**	17		same, gr	Rec = 18"
			18			wet
16			50/5"			
					16'6"	Auger refusal @ 16'6"
17					**End of Boring @ 16'6"**	
18						
19						
20						
21						
22						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-9D-A
Project: Proposed Daycare, Regeneron Campus, 777 Old Saw Mill River Rd		**SHEET NO.:** 1 of 1
Client: Regeneron Pharmaceuticals Inc		**JOB NUMBER:** 20-166
Drilling Contractor: General Borings Inc.		**ELEVATION:** +226.0

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 16/Mar/21
3/16/2021	14:30	7'6"	None	DIA.	3 1/4"	1 3/8"			FINISH DATE: 16/Mar/21
				WGHT		140#			DRILLER: T McGovern
				FALL		30"			INSPECTOR: Mike W

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
1						Environmental Boring
2						
3						
4					**Brown, gray coarse to fine SAND, little (+) Silt, little medium to fine Gravel**	
5						
6		S-1	11 11		Br, gr cf S, l (+) $, l mf G	Rec = 18"
7			13 15			moist
8		S-2	12 13		same, s (-) $	Rec = 20"
9			27 18		9'0"	wet
10					**End of Boring @ 9'0"**	
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-10D
Project: Proposed Daycare, Regeneron Campus, 777 Old Saw Mill River Rd		SHEET NO.: 1 of 1
Client: Regeneron Pharmaceuticals Inc		JOB NUMBER: 20-166
Drilling Contractor: General Borings Inc.		ELEVATION: +230.0

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 15/Mar/21
15/Mar/21	1500	2'6"	Open	DIA.	3 1/4"	1 3/8"			FINISH DATE: 15/Mar/21
				WGHT		140#			DRILLER: T McGovern
				FALL		30"			INSPECTOR: JP

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			3		**Topsoil** 0'2"	
1		**S-1**	6		Br, gr cf S, l $, l cf G	Rec = 8"
			11			moist
2			11			
			9			
3		**S-2**	9		same, br t (+) $	Rec = 12"
			10			moist
4			11			
5						
			7			
6		**S-3**	13		same, l $	Rec = 15"
			12			moist
7			13		**Brown, gray coarse to fine SAND, little Silt, little coarse to fine Gravel**	
			14			
8		**S-4**	15		same	Rec = 9"
			12			moist
9			22			
10						
			9			
11		**S-5**	8		same	Rec = 18"
			9			moist
12			8			
13						
14						
15						
			61			
16		**S-6**	75		same 16'0"	Rec = 10"
			30		Wh, lt or cf S, l (-) $, l cf G (weathered rock)	moist
17			50/3"		**White, light orange coarse to fine SAND, little (-) Silt, little coarse to fine Gravel (weathered rock)** 18'0"	
18						Auger refusal 18'0"
					End of Boring @ 18'0"	likely bedrock
19						
20						
21						
22						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-11D
Project: Proposed Daycare, Regeneron Campus, 777 Old Saw Mill River Rd		**SHEET NO.:** 1 of 1
Client: Regeneron Pharmaceuticals Inc		**JOB NUMBER:** 20-166
Drilling Contractor: General Borings Inc.		**ELEVATION:** +211.8

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 12/Mar/21
12/Mar/21	1050	6'0"	HSA	DIA.	3 1/4"	1 3/8"			FINISH DATE: 12/Mar/21
				WGHT		140#			DRILLER: Scott
				FALL		30"			INSPECTOR: Mike W

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			1			
1			3		**Topsoil** 1'0"	
		S-1	10		Br, gr cf S, l (+) $, t f G	Rec = 20"
2			19			moist
			23			
3		S-2	18		same, s (-) $, t (+) mf G	Rec = 18"
			18			moist
4			23			
5						
			21			
6		S-3	19		same, l (-) $, l mf G	Rec = 14"
			18		**Brown, gray coarse to fine SAND,**	moist to wet
7			14		**little (+) Silt, trace fine Gravel**	tip wet
			22			
8		S-4	12		same, l (+) mf G	Rec = 8"
			14			wet
9			23			
10						
			24			
11		S-5	26		same, l (+) mf G	Rec = 18"
			16			wet
12			13		12'0"	
					End of Boring @ 12'0"	
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-12D

Project:	**Proposed Daycare, Regeneron Campus, 777 Old Saw Mill River Rd**								**SHEET NO.:**	1 of 1
Client:	**Regeneron Pharmaceuticals Inc**								**JOB NUMBER:**	20-166
Drilling Contractor:	**General Borings Inc.**								**ELEVATION:**	+211.6
GROUNDWATER					**CASING**	**SAMPLE**	**CORE**	**TUBE**	**DATUM:**	Topo
DATE	**TIME**	**DEPTH**	**CASING**	**TYPE**	**HSA**	**SS**			**START DATE:**	12/Mar/21
12/Mar/21	**1025**	**6'6"**	**HSA**	**DIA.**	**3 1/4"**	**1 3/8"**			**FINISH DATE:**	12/Mar/21
12/Mar/21	**1045**	**6'0"**	**HSA**	**WGHT**		**140#**			**DRILLER:**	Scott
				FALL		**30"**			**INSPECTOR:**	Mike W

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			1			
1			5		**Topsoil** 1'0"	
		S-1	12		Br, or br cf S, l (-) $, s (-) mf G	Rec = 12"
2			18			moist
			31			
3		**S-2**	32		same, br gr	Rec = 12"
			33			moist
4			31			
					Brown, orange brown coarse to fine SAND, little (-) Silt, some (-) medium to fine Gravel	
5						
			17			
6		**S-3**	25		same, br, dk gr	Rec = 12"
			16			moist to wet
7			12			
			9			
8		**S-4**	10		dame, br, gr t (+) f G	Rec = 12"
			10			wet
9			11			
10						
		S-5A	18		same, br, gr 10'6"	Rec = 12"
11			17		Gr $ l, cf S, t f G	wet
		S-5B	18			
12			19		**Gray SILT little, coarse to fine Sand, trace Gravel** 12'0"	
					End of Boring @ 12'0"	
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-13D
Project: Proposed Daycare, Regeneron Campus, 777 Old Saw Mill River Rd		SHEET NO.: 1 of 1
Client: Regeneron Pharmaceuticals Inc		JOB NUMBER: 20-166
Drilling Contractor: General Borings Inc.		ELEVATION: +214.0

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 15/Mar/21
15/Mar/21	1545	7'0"	HSA	DIA.	3 1/4"	1 3/8"			FINISH DATE: 15/Mar/21
				WGHT		140#			DRILLER: T McGovern
				FALL		30"			INSPECTOR: JP

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			2		**Topsoil** 0'4"	
1		S-1	9		FILL (Dk br, or cf S, l (+) $, l cf G)	Rec = 19"
			9		**FILL (Dark brown, orange coarse to fine**	moist
2			9		**SAND, little (+) Silt, little coarse to fine**	
			9		**Gravel)** 2'6"	
3		S-2	11		Mttld Lt br, gr, or cf S, s $	Rec = 20"
			10			moist
4			11		**Mottled light brown, gray, orange**	
					coarse to fine SAND, some Silt	
5					5'0"	
			57			
6		S-3	50/2"		Br, or cf S, l $, a (-) cf G	Rec = 3"
			15			moist
7		S-4	20		same, l (-) $, s (-) cf G	Rec = 16"
			22		**Brown, orange coarse to fine SAND,**	wet
8			27		**little Silt, and (-) coarse to fine Gravel**	boulder
			27			
9		S-5	27		same, gr, br	Rec = 20"
			24			wet
10			29		10'0"	
					End of Boring @ 10'0"	
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-14D

Project:	**Proposed Daycare, Regeneron Campus, 777 Old Saw Mill River Rd**								**SHEET NO.:**	1 of 1
Client:	**Regeneron Pharmaceuticals Inc**								**JOB NUMBER:**	20-166
Drilling Contractor:	**General Borings Inc.**								**ELEVATION:**	+216.0
GROUNDWATER					**CASING**	**SAMPLE**	**CORE**	**TUBE**	**DATUM:**	Topo
DATE	**TIME**	**DEPTH**	**CASING**	**TYPE**	**HSA**	**SS**			**START DATE:**	16/Mar/21
16/Mar/21	**1520**	**5'6"**	**Open**	**DIA.**	**3 1/4"**	**1 3/8"**			**FINISH DATE:**	16/Mar/21
17/Mar/21	**800**	**5'0"**	**Open**	**WGHT**		**140#**			**DRILLER:**	T McGovern
				FALL		**30"**			**INSPECTOR:**	Mike W

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			3			
1			11		**Topsoil** 0'8"	
		S-1	7		Br cf S, l (+) $, l (+) mf G	Rec = 12"
2			6			moist
			5			
3		**S-2**	6		same, s (-) $	Rec = 12"
			3			moist
4			6			
					Brown coarse to fine SAND,	
5					**little (+) Silt, little (+) medium to fine**	
			4		**Gravel**	
6		**S-3**	4		same	Rec = 12"
			6			wet
7			24			
			13			
8		**S-4**	4		same	Rec = 0"
			5			wet
9			5		9'0"	pushing gravel
					End of Boring @ 9'0"	
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-15D
Project: Proposed Daycare, Regeneron Campus, 777 Old Saw Mill River Rd		**SHEET NO.:** 1 of 1
Client: Regeneron Pharmaceuticals Inc		**JOB NUMBER:** 20-166
Drilling Contractor: General Borings Inc.		**ELEVATION:** +210.0

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 16/Mar/21
16/Mar/21	1440	5'0"	Open	DIA.	3 1/4"	1 3/8"			FINISH DATE: 16/Mar/21
17/Mar/21	800	4'6"	Open	WGHT		140#			DRILLER: T McGovern
				FALL		30"			INSPECTOR: Mike W

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
1			3 6		**Topsoil** 0'8"	
2		S-1	10 19		**FILL (Dark gray coarse to fine SAND, and Silt, little (-) medium to fine Gravel)** 2'0"	Rec = 12" moist
3		S-2	15 16		Dk gr cf S, s (+) $, l mf G	Rec = 16"
4			16 18			moist
5					**Dark gray coarse to fine SAND, some (+) Silt, little medium to fine Gravel**	
6		S-3	4 8		same, a $	Rec = 14"
7			8 10			moist to wet
8		S-4	9 9		same	Rec = 12"
9			10 10		9'0"	wet
10					**End of Boring @ 9'0"**	
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-16D

Project:	**Proposed Daycare, Regeneron Campus, 777 Old Saw Mill River Rd**	**SHEET NO.:**	1 of 1
Client:	**Regeneron Pharmaceuticals Inc**	**JOB NUMBER:**	20-166
Drilling Contractor:	**General Borings Inc.**	**ELEVATION:**	+208.0

GROUNDWATER					CASING	SAMPLE	CORE	TUBE		
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			DATUM:	Topo
16/Mar/21	1400	4'0"	Open	DIA.	3 1/4"	1 3/8"			START DATE:	16/Mar/21
17/Mar/21	800	2'3"	Open	WGHT		140#			FINISH DATE:	16/Mar/21
				FALL		30"			DRILLER:	T McGovern
									INSPECTOR:	Mike W

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
1			2 8		**Topsoil** 0'8"	
2		**S-1**	6 5		Gr br cf S, a (-) $, l mf G **Gray brown coarse to fine SAND, and (-) Silt, little medium to fine Gravel**	Rec = 18" moist
3			9 13		same, s (-) $ 3'0"	
4		**S-2**	9 9		**Mottled Gray, orange, brown Clayey SILT trace (+), medium to fine Sand**	Rec - 18" moist to wet
5						mottled @ 5'0"
6		**S-3A** **S-3B**	4 44 18 22		Gr, or br slightly mttled Cy $ t (+), mf S 6'0" Gr, br cf S, l (-) $, l (+) mf G	Rec = 18" moist to wet
7						
8		**S-4**	12 21		same **Gray, brown coarse to fine SAND, little (-) Silt, little (+) medium to fine Gravel**	Rec = 12" wet
9			23 26		9'0"	
10					**End of Boring @ 9'0"**	
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.	TEST BORING LOG	BORING NUMBER B-2
Project: Proposed Regeneron TT Campus Expansion, Greenburgh NY		SHEET NO.: 1 of 2
Client: Regeneron Pharmaceuticals Inc		JOB NUMBER: 19-245
Drilling Contractor: General Borings Inc		ELEVATION: +210.0

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 26/Feb/20
26/Feb/20	1015	6'6"	HSA	DIA.	3 1/4"	1 3/8"			FINISH DATE: 26/Feb/20
				WGHT		140#			DRILLER: T. McGovern
				FALL		30"			INSPECTOR: CKS

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			2			
1			2		**Topsoil** 0'8"	
		S-1	17		Br, or br cf S, t (+) $, s cf G	Rec = 15"
2			23			moist
			27			
3		S-2	27		same, s $	Rec = 13"
			31			moist
4			37			
5						
			39			
6		S-3	30		same	Rec = 0
			28			moist
7			29			
			18			
8		S-4	20		same, l cf G	Rec = 10"
			23			moist to wet
9			20		**Brown, orange brown coarse to fine SAND, some Silt, some coarse to fine Gravel**	
10						
			11			
11		S-5	13		same, l (+) cf G	Rec = 11"
			31			wet
12			17			
13						
14						
15						
			18			
16		S-6	26		same	Rec = 20"
			25			wet
17			37			
18						
19						
20						
			15			
21		S-7	19		same, l $	Rec = 13"
			19			wet
22			12			

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.	TEST BORING LOG	BORING NUMBER B-2
Project: Proposed Regeneron TT Campus Expansion, Greenburgh NY		SHEET NO.: 2 of 2
Client: Regeneron Pharmaceuticals Inc		JOB NUMBER: 19-245

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
23						
24					**Gray coarse to fine SAND, trace (+) Silt, some coarse to fine Gravel**	
25						
			20			
26		**S-8**	41		Gr cf S, t (+) $, s cf G	Rec = 5"
			50/3"		26'3"	wet
27					**End of Boring @ 26'3"**	
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
46						
47						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-3
Project: Proposed Regeneron TT Campus Expansion, Greenburgh NY		**SHEET NO.:** 1 of 1
Client: Regeneron Pharmaceuticals Inc		**JOB NUMBER:** 19-245
Drilling Contractor: General Borings Inc		**ELEVATION:** +222.0

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 27/Feb/20
27/Feb/20	12:00	10'0"	HSA	DIA.	3 1/4"	1 3/8"			FINISH DATE: 27/Feb/20
				WGHT		140#			DRILLER: T. McGovern
				FALL		30"			INSPECTOR: CKS

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			2		**Topsoil** 0'6"	
1		**S-1**	9		Br cf S, s (-) $, s cf G	Rec = 18"
			14			moist
2			19			
			22			
3		**S-2**	22		same, 1 $	Rec = 20"
			27			moist
4			35			
5						
			8			
6		**S-3**	16		same	Rec = 15"
			19			moist
7			25			
			20			
8		**S-4**	25		same	Rec = 15"
			26		**Brown coarse to fine SAND,**	moist
9			25		**some (-) Silt, some coarse to**	
					fine Gravel	
10						
			11			
11		**S-5**	15		same	Rec = 8"
			13			wet
12			19			
13						
14						
15						
			7			
16		**S-6**	10		same	Rec = 0
			12			wet
17			14			
18						
19						
20						
			18		same 20'6"	probable bedrock
21		**S-7**	50/5"		**Completely weathered rock**	Rec = 7"
					21'6"	wet
22					**End of Boring @ 21'6"**	Auger refusal 21'6"

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-4
Project: Proposed Regeneron TT Campus Expansion, Greenburgh NY		**SHEET NO.:** 1 of 1
Client: Regeneron Pharmaceuticals Inc		**JOB NUMBER:** 19-245
Drilling Contractor: General Borings Inc		**ELEVATION:** +230.0

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 27/Feb/20
27/Feb/20	1200	13'0"	HSA	DIA.	3 1/4"	1 3/8"			FINISH DATE: 27/Feb/20
				WGHT		140#			DRILLER: T. McGovern
				FALL		30"			INSPECTOR: CKS

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
1			2 3			
			3		**Topsoil** 1'6"	
2		S-1	7		Br cf S, t $, s cf G	Rec = 15"
			6			moist
3		S-2	22			Rec = 18"
			19			moist
4			22			
5						
			30			
6		S-3	23		same, l cf G	Rec = 19"
			26			moist
7			26		**Brown coarse to fine SAND, trace Silt, some coarse to fine**	
			19			
8		S-4	17		same **Gravel**	Rec = 20"
			15			moist
9			15			
10						
			12			
11		S-5	8		same	Rec = 0
			6			
12			7			
13						
14						
15						
		S-6	50/0"		same 15'6"	Rec = 0
16					**End of Boring @ 15'6"**	wet
17						Auger refusal or probable bedrock @ 15'6"
18						
19						
20						
21						
22						

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.	TEST BORING LOG	BORING NUMBER B-5

Project:	**Proposed Regeneron TT Campus Expansion, Greenburgh NY**									**SHEET NO.:**	1 of 1
Client:	**Regeneron Pharmaceuticals Inc**									**JOB NUMBER:**	19-245
Drilling Contractor:	**General Borings Inc**									**ELEVATION:**	+221.0
GROUNDWATER					**CASING**	**SAMPLE**	**CORE**	**TUBE**		**DATUM**	Topo
DATE	**TIME**	**DEPTH**	**CASING**	**TYPE**	**HSA**	**SS**				**START DATE:**	26 Feb 20
No Water Reading				**DIA.**	**3 1/4"**	**1 3/8"**				**FINISH DATE:**	26 Feb 20
				WGHT		**140#**				**DRILLER:**	T. McGovern
				FALL		**30"**				**INSPECTOR:**	CKS

Depth (ft.)	Casing Blows pre Foot	Sample Number	Blows on Sample Spoon per 6"	Sy r	IDENTIFICATION	REMARKS
			2		**Topsoil** 0'6"	
1		**S-1**	10		Br cf S, l $, l cf G	Rec = 10"
			10			moist
2			9			
			11			
3		**S-2**	17		same, t $, s cf G	Rec = 13"
			19			moist
4			22			
5						
			25		**Brown coarse to fine SAND,**	
6		**S-3**	18		same **little Silt, little coarse to fine Gravel**	Rec = 0
			19			moist
7			17			
			16			
8		**S-4**	15		same, s cf G	Rec = 10"
			27			moist
9			12			
10						
11						
12						
13					13'0"	Auger refusal @ 13'0"
14						
15						
		Run			**Quartzite, blocky and seamy**	Run #1
16		**#1**			**slightly weathered**	13'0"-18'0"
						Run = 60"
17						Rec = 100%
						RQD = 45%
18					18'0"	
19					**End of Boring @ 18'0"**	
20						
21						
22						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-6
Project: Proposed Regeneron TT Campus Expansion, Greenburgh NY		**SHEET NO.:** 1 of 1
Client: Regeneron Pharmaceuticals Inc		**JOB NUMBER:** 19-245
Drilling Contractor: General Borings Inc		**ELEVATION:** +207.0

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	**DATUM:** Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			**START DATE:** 26/Feb/20
26/Feb/20	12:00	8'0"	HSA	DIA.	3 1/4"	1 3/8"			**FINISH DATE:** 26/Feb/20
				WGHT		140#			**DRILLER:** T. McGovern
				FALL		30"			**INSPECTOR:** CKS

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			2		**Topsoil** 0'6"	
1		S-1	2		FILL (Dk br cf S, s (+) $, t mf G)	Rec = 3"
			6		**FILL (Dark brown coarse to fine SAND,**	moist
2			7		**some (+) Silt, trace medium to fine Gravel)**	
			8		FILL (same) 2'6"	
3		S-2	20		Br, or br cf S, l $, s cf G	Rec = 0
			24			moist
4			25			
5						
			14			
6		S-3	20		same, a cf G	Rec = 15"
			32			moist
7			24			
			18			
8		S-4	21		same	Rec = 16"
			21			moist to wet
9			21			
					Brown, orange brown coarse to fine SAND,	
10					**little Silt, some coarse to fine Gravel**	
			15			
11		S-5	21		same, a cf G	Rec = 18"
			17			wet
12			24			
13						
14						
15						
			7			
16		S-6	16		same, gr	Rec = 5"
			13			wet
17			25			
18						
19						
20						
		S-7	50/0"		same	Rec = 0
21					21'0"	wet
					End of Boring @ 21'0"	Auger refusal @ 21'0"
22						

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.				TEST BORING LOG					BORING NUMBER B-7
Project: Proposed Regeneron TT Campus Expansion, Greenburgh NY									SHEET NO.: 1 of 2
Client: Regeneron Pharmaceuticals Inc									JOB NUMBER: 19-245
Drilling Contractor: General Borings Inc									ELEVATION: +202.0
GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 25/Feb/20
25/Feb/20	14:30	8'6"	HSA	DIA.	3 1/4"	1 3/8"			FINISH DATE: 25/Feb/20
				WGHT		140#			DRILLER: J. Wyant
				FALL		30"			INSPECTOR: CKS

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			2		**Topsoil** 0'6"	
1		**S-1**	6		**FILL (Brown coarse to fine SAND,**	Rec = 15"
			9		**little (-) Silt, some coarse to fine**	moist
2			12		**Gravel)** 2'0"	
			14			
3		**S-2**	16		Br cf S, t $, l (+) cf G	Rec = 14"
			14			moist
4			15			
5						
			9			
6		**S-3**	10		same	Rec = 15"
			10			moist
7			10			
			7			
8		**S-4**	7		same	Rec = 16"
			7			moist to wet
9			6			
10					**Brown coarse to fine SAND,**	
			4		**trace Silt, little (+) coarse to**	
11		**S-5**	4		same **fine Gravel**	Rec = 0
			3			wet
12			4			
13						
14						
15						
			4			
16		**S-6**	7		same	Rec = 15"
			8			wet
17			10			
18						
19						
20						
			9			
21		**S-7**	18		same	Rec = 12"
			20			wet
22			21			

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.	TEST BORING LOG	BORING NUMBER B-7
Project: Proposed Regeneron TT Campus Expansion, Greenburgh NY		SHEET NO.: 2 of 2
Client: Regeneron Pharmaceuticals Inc		JOB NUMBER: 19-245

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
23					**Brown coarse to fine SAND, trace Silt, little (+) coarse to fine Gravel**	
24						
25						
26		S-8	23 24		Completely weathered rock	Rec= 12" wet
27			24 26		27'0"	
28					**End of Boring @ 27'0"**	
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
46						
47						

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.	TEST BORING LOG	BORING NUMBER B-8

Project:	**Proposed Regeneron TT Campus Expansion, Greenburgh NY**								**SHEET NO.:**	1 of 2	
Client:	**Regeneron Pharmaceuticals Inc**								**JOB NUMBER:**	19-245	
Drilling Contractor:	**General Borings Inc**								**ELEVATION:**	+201.5	
GROUNDWATER					**CASING**	**SAMPLE**	**CORE**	**TUBE**	**DATUM:**	Topo	
DATE	**TIME**	**DEPTH**	**CASING**	**TYPE**	**HSA**	**SS**			**START DATE:**	25/Feb/20	
25/Feb/20	**1000**	**7'6"**	**None**	**DIA.**	**3 1/4"**	**1 3/8"**			**FINISH DATE:**	25/Feb/20	
				WGHT		**140#**			**DRILLER:**	J. Wyant	
				FALL		**30"**			**INSPECTOR:**	CKS	

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			2		**Topsoil** 0'4"	
1		**S-1**	6		**FILL (Brown coarse to fine SAND, little**	Rec = 15"
			12		**Silt, some coarse to fine Gravel)** 1'6"	moist
2			13		Br cf S, t $, l (+) cf G	
			13			
3		**S-2**	12		same	Rec = 18"
			13			moist
4			19			
5						
			11			
6		**S-3**	9		same	Rec = 0
			9		**Brown coarse to fine SAND, trace Silt,**	moist
7			9		**little (+) coarse to fine Gravel**	
			6			
8		**S-4**	6		same, t (+) $	Rec = 2"
			8			moist to wet
9			5			
10						
			3			
11		**S-5**	2		same, t (+) $	Rec = 2"
			3			wet
12			3			
13					13'0"	Dense drilling @ 13'0"
14						
15						
			20			
16		**S-6**	18		Gr cf S, s $, s cf G	Rec = 0
			15			wet
17			15			
18					**Gray coarse to fine SAND, some Silt,**	
					some coarse to fine Gravel	
19						
20						
			13			
21		**S-7**	13		same	Rec = 15"
			16			wet
22			17			

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.	TEST BORING LOG	BORING NUMBER B-8
Project: Proposed Regeneron TT Campus Expansion, Greenburgh NY		SHEET NO.: 2 of 2
Client: Regeneron Pharmaceuticals Inc		JOB NUMBER: 19-245

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
23						
24					**Gray coarse to fine SAND, some Silt, some coarse to fine Gravel**	
25						
			22		Gr cf S, s $, s cf G 25'6"	
26			31			Rec = 18"
			40		**Completely weathered rock**	wet
27		**S-8**	50/4"		27'0"	
					End of Boring @ 27'0"	
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
46						
47						

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.	TEST BORING LOG	BORING NUMBER B-9
Project: Proposed Regeneron TT Campus Expansion, Greenburgh NY		SHEET NO.: 1 of 2
Client: Regeneron Pharmaceuticals Inc		JOB NUMBER: 19-245
Drilling Contractor: General Borings Inc		ELEVATION: +203.5

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 24/Feb/20
24/Feb/20	1045	16'0"	HSA	DIA.	3 1/4"	1 3/8"			FINISH DATE: 24/Feb/20
				WGHT		140#			DRILLER: J. Wyant
				FALL		30"			INSPECTOR: KWA

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			2			
1			4		**Brown topsoil** 0'8"	
		S-1	6		Br cf S, s (+) $, t mf G	Rec = 18"
2			9			moist
			12			
3		S-2	14		Br cf S, l $, l cf G	Rec = 16"
			18			moist
4			12			
5						
			7			
6		S-3	7		same, t mf G	Rec = 17"
			7			moist
7			7			
			5			
8		S-4	8		same	Rec = 16"
			8			moist to wet
9			6			
10						
			1			
11		S-5	3		same	Rec = 10"
			2			wet
12			2			
13						
14						
15						
			3			
16		S-6	10		same; l (+) $, l (+) cf G	Rec = 16"
			11			wet
17			21			
18						
19						
20						
			15			
21		S-7	23		Gr cf S, l (-) $, l (+) cf G	Rec = 17"
			34			wet
22			17			

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.	TEST BORING LOG	BORING NUMBER B-9
Project: Proposed Regeneron TT Campus Expansion, Greenburgh NY		SHEET NO.: 2 of 2
Client: Regeneron Pharmaceuticals Inc		JOB NUMBER: 19-245

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
23						
24						
25						
26		S-8	4 4 7		Gr cf S, l (-) $, l (+) cf G	Rec = 10" wet
27			17			
28						
29						
30						
31		S-9	45 50/3"		Gr, same	Rec= 4" wet
32					**End of Boring @ 30'9"**	
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
46						
47						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-10
Project: Proposed Regeneron TT Campus Expansion, Greenburgh NY		**SHEET NO.:** 1 of 1
Client: Regeneron Pharmaceuticals Inc		**JOB NUMBER:** 19-245
Drilling Contractor: General Borings Inc		**ELEVATION:** +201.5

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	**DATUM:** Topo
DATE	**TIME**	**DEPTH**	**CASING**	**TYPE**	**HSA**	**SS**			**START DATE:** 24/Feb/20
24/Feb/20	**1545**	**10'0"**	**HSA**	**DIA.**	**3 1/4"**	**1 3/8"**			**FINISH DATE:** 24/Feb/20
		5'0"	**None**	**WGHT**		**140#**			**DRILLER:** J. Wyant
				FALL		**30"**			**INSPECTOR:** KWA

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			3		**Brown topsoil** 0'6"	
1		**S-1**	5		Br cf S, t (+) $, l (+) cf G	Rec = 16"
			8			moist
2			7			
			7			
3		**S-2**	9		same	Rec = 10"
			10			moist
4			6			
5					**Brown coarse to fine SAND, trace (+) Silt, little (+) coarse to fine Gravel**	
			2			
6		**S-3**	3		same	Rec = 12"
			5			wet
7			5			
			3			
8		**S-4**	3		same, t mf G	Rec = 9"
			3			wet
9			3			
10						
			3		same 10'6"	
11		**S-5**	15		Gr cf G a (+), cf S, s $	Rec = 13"
			14			wet
12			11			
13						
14						
15						
			7		**Gray coarse to fine Sand, some (+) Silt, some (+) coarse to fine Gravel**	
16		**S-6**	8		same	Rec = 3"
			9			wet
17			9			
18						
19						
20						
			10			
21		**S-7**	44		same	NR
			20/1"			wet
22					**End of Boring @ 22'6"** 22'6"	refusal on auger @ 22'6"

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.				TEST BORING LOG					BORING NUMBER B-11
Project: Proposed Regeneron TT Campus Expansion, Greenburgh NY									SHEET NO.: 1 of 2
Client: Regeneron Pharmaceuticals Inc									JOB NUMBER: 19-245
Drilling Contractor: General Borings Inc									ELEVATION: +204.5
GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 24/Feb/20
24/Feb/20	1540	6'0"	None	DIA.	3 1/4"	1 3/8"			FINISH DATE: 24/Feb/20
				WGHT		140#			DRILLER: J. Wyant
				FALL		30"			INSPECTOR: KWA

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			2			
1			5		**Brown topsoil** 0'8"	
		S-1	12		Br cf S, l $, t mf G	Rec = 14"
2			15			moist
			11			
3		S-2	16		same	Rec = 18"
			15		**Brown coarse to fine SAND,**	moist
4			11		**little Silt, trace medium to fine**	
					Gravel	
5						
			5			
6		S-3	6		same 6'0"	Rec = 18"
			5		Br cf S, s $, t f G	moist to wet
7			5			
			5			
8		S-4	4		same, t (-) f G	Rec = 18"
			4			wet
9			6			
10						
			6			
11		S-5	9		same	Rec = 3"
			8			wet
12			6			
					Brown coarse to fine SAND,	
13					**some Silt, trace fine Gravel**	
14						
15						
			4			
16		S-6	5		Gr cf S, s $, t f G	Rec = 13"
			8			wet
17			8			
18						
19						
20						
			11			
21		S-7	21		same	Rec = 3"
			18			wet
22			15			

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.	TEST BORING LOG	BORING NUMBER B-11
Project: Proposed Regeneron TT Campus Expansion, Greenburgh NY		SHEET NO.: 2 of 2
Client: Regeneron Pharmaceuticals Inc		JOB NUMBER: 19-245

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
23						
24						
25						
26		S-8	12 21 33 44		Gr cf S, s (-) $, t f G	Rec = 11" wet
27					27'0"	
					End of Boring @ 27'0"	
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
46						
47						

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.				TEST BORING LOG					BORING NUMBER B-12
Project: Proposed Regeneron TT Campus Expansion, Greenburgh NY									SHEET NO.: 1 of 2
Client: Regeneron Pharmaceuticals Inc									JOB NUMBER: 19-245
Drilling Contractor: General Borings Inc									ELEVATION: +207.0
GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 24/Feb/20
24/Feb/20	1245	5'6"	HSA	DIA.	3 1/4"	1 3/8"			FINISH DATE: 24/Feb/20
				WGHT		140#			DRILLER: J. Wyant
				FALL		30"			INSPECTOR: KWA

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			2		**Brown topsoil** 0'6"	
1		**S-1**	6		FILL (Br cf S, l (+) $, s cf G)	Rec = 13"
			15		**FILL (Brown coarse to fine SAND,**	moist
2			12		**little (+) Silt, some coarse to fine Gravel**	
			9		2'6"	
3		**S-2**	9		Br cf S, s (-) $, t (-) f G	Rec = 16"
			11			moist
4			11			
5						
			13			
6		**S-3**	12		Br cf S, l $, l cf G	Rec = 16"
			14			moist
7			12			
			10			
8		**S-4**	11		same	Rec = 12"
			13			moist to wet
9			9			
10						
			3		**Brown coarse to fine SAND,**	
11		**S-5**	5		same **some (-) Silt, trace (-) fine Gravel**	Rec = 14"
			5			wet
12			6			
13						
14						
15						
			6			
16		**S-6**	9		Gr cf S, L (+) $, t f G	Rec = 8"
			11			wet
17			11			
18						
19						
20						
			10			
21		**S-7**	20		same, t (+) cf G	Rec = 12"
			24			wet
22			28			

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.	TEST BORING LOG	BORING NUMBER B-12
Project: Proposed Regeneron TT Campus Expansion, Greenburgh NY		SHEET NO.: 2 of 2
Client: Regeneron Pharmaceuticals Inc		JOB NUMBER: 19-245

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
23						
24					**Gray coarse to fine SAND, little (+) Silt, little coarse to fine Gravel**	
25						
			8			
26		**S-8**	12		Gr cf S, l (+) $, l cf G	Rec = 10"
			50/4"		26'4"	wet
27					**End of Boring @ 26'4"**	Refusal on spoon @ 26'4"
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
46						
47						

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-13
Project: Proposed Regeneron TT Campus Expansion, Greenburgh NY		**SHEET NO.:** 1 of 1
Client: Regeneron Pharmaceuticals Inc		**JOB NUMBER:** 19-245
Drilling Contractor: General Borings Inc		**ELEVATION:** +207.0

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 25/Feb/20
25/Feb/20	15:30	9'0"	HSA	DIA.	3 1/4"	1 3/8"			FINISH DATE: 25/Feb/20
				WGHT		140#			DRILLER: J. Wyant
				FALL		30"			INSPECTOR: CKS

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			3			
1			4		**Topsoil** 0'8"	
		S-1	3		FILL (Br cf S, a $, l cf G)	Rec = 15"
2			4		**FILL (Brown coarse to fine SAND,**	moist
			8		**and Silt, little coarse to fine Gravel)**	
3		S-2	9		FILL (same) 3'0"	Rec = 20"
			8		Gr br cf S, a $, l cf G	moist
4			10			
5						
			5			
6		S-3	8		same	Rec = 10"
			6			moist
7			8			
			9			
8		S-4	10		same, s $, l (+) cf G	Rec = 12"
			11			moist
9			8			
10						
			6			
11		S-5	7		same, s $	Rec = 12"
			5		**Gray brown coarse to fine SAND,**	wet
12			8		**and Silt, little coarse to fine Gravel**	
13						
14						
15						
			7			
16		S-6	14		same	Rec = 15"
			12			wet
17			13			
18						
19						
20						
			12			
21		S-7	11		same	Rec = 18"
			16			wet
22			16		**End of Boring @ 22'0"** 22'0"	

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.	TEST BORING LOG	BORING NUMBER B-14

Project:	**Proposed Regeneron TT Campus Expansion, Greenburgh NY**								**SHEET NO.:**	1 of 1
Client:	**Regeneron Pharmaceuticals Inc**								**JOB NUMBER:**	19-245
Drilling Contractor:	**General Borings Inc**								**ELEVATION:**	+212.0
GROUNDWATER					**CASING**	**SAMPLE**	**CORE**	**TUBE**	**DATUM**	Topo
DATE	**TIME**	**DEPTH**	**CASING**	**TYPE**	**HSA**	**SS**	**NX**		**START DATE:**	26 Feb 20
2/26/2020	**1430**	**6'0"**	**HSA**	**DIA.**	**3 1/4"**	**1 3/8"**	**2 1/8"**		**FINISH DATE:**	26 Feb 20
				WGHT		**140#**			**DRILLER:**	T. McGovern
				FALL		**30"**			**INSPECTOR:**	CKS

Depth (ft.)	Casing Blows pre Foot	Sample Number	Blows on Sample Spoon per 6"	Sy r	IDENTIFICATION	REMARKS
			2		**Topsoil** 0'6"	
1		**S-1**	8			Rec = 10"
			9		**FILL (Dark brown coarse to fine SAND,**	moist
2			9		**some (+) Silt, trace medium to fine Gravel)** 2'0"	
			7			
3		**S-2**	11		Lt br cf S, l (+) $, s cf G	Rec = 18"
			12			moist
4			12			
					Light brown coarse to fine SAND,	
5					**little (+) Silt, some coarse to fine Gravel**	
			8			
6		**S-3**	12			Rec = 3"
			14			moist to wet
7			22		7'0"	
			25			
8		**S-4**	50/3"		**Completely weathered rock** 8'0"	Rec = 4"
						wet
9						Auger refusal @ 8'0"
10						
		Run			**Marble blocky and seamy**	Run #1
11		**#1**			**slightly weathered**	8'0"-13'0"
						Run = 60"
12						Rec = 100%
						RQD = 58%
13						
					End of Boring @ 13'0"	
14						
15						
16						
17						
18						
19						
20						
21						
22						

CARLIN - SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-5
Project: Proposed Stormwater Detention Basins - Mount Pleasant, New York		SHEET NO.: 1 of 1
Client: BioMed Realty Trust Inc.		JOB NUMBER: 15-83
Drilling Contractor: General Borings, Inc.		ELEVATION: +202.0

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 31 Mar 16
No water encountered				DIA.	3 1/4"	1 3/8"			FINISH DATE: 31 Mar 16
				WGHT		140#			DRILLER: J. Wyant
				FALL		30"			INSPECTOR: EJS

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			3		**Br Sandy Topsoil** 0'9"	Rec = 12"
1			3		Br cf S, l $, l (+) cf G	moist
		S-1	4			
2			14			
			15		same (s (+) cf G)	Rec = 10"
3		S-2	19			moist
			22			
4			4		**Brown coarse to fine SAND, little Silt,**	
			10		same **little (+) coarse to fine Gravel**	Rec = 12"
5		S-3	12			moist
			14			
6			15			
			11		same	Rec = 14"
7		S-4	7			moist
			16			
8			16		8'0"	
					End of Boring @ 8'0"	
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

CARLIN - SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-6
Project: Proposed Stormwater Detention Basins - Mount Pleasant, New York		SHEET NO.: 1 of 1
Client: BioMed Realty Trust Inc.		JOB NUMBER: 15-83
Drilling Contractor: General Borings, Inc.		ELEVATION: +202.0

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 31 Mar 16
31-Mar-16	0345	5'6"	HSA	DIA.	3 1/4"	1 3/8"			FINISH DATE: 31 Mar 16
				WGHT		140#			DRILLER: J. Wyant
				FALL		30"			INSPECTOR: EJS

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			2		**Br Sandy Topsoil** 0'9"	
1		S-1	6		Dk br cf S, l (+) $, l (+) cf G	Rec = 14"
			5			moist
2			6			
			6		Br cf S, l $, l cf G	Rec = 14"
3		S-2	12		**Brown coarse to fine SAND, little**	moist
			17		**Silt, little coarse to fine Gravel**	
4			19			
			6		same	Rec = 10"
5		S-3	10			wet
			10			
6			45			
			22		same	Rec = 12"
7		S-4	10			wet
			10			
8			9		8'0"	
					End of Boring @ 8'0"	
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

CARLIN - SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-7

Project: Proposed Stormwater Detention Basins - Mount Pleasant, New York									**SHEET NO.:**	1 of 1
Client: BioMed Realty Trust Inc.									**JOB NUMBER:**	15-83
Drilling Contractor: General Borings, Inc.									**ELEVATION:**	+206.0
GROUNDWATER					**CASING**	**SAMPLE**	**CORE**	**TUBE**	**DATUM:**	Topo
DATE	**TIME**	**DEPTH**	**CASING**	**TYPE**	**HSA**	**SS**			**START DATE:**	01 Apr 16
1-Apr-16	**0930**	**7'0"**	**HSA**	**DIA.**	**3 1/4"**	**1 3/8"**			**FINISH DATE:**	01 Apr 16
				WGHT		**140#**			**DRILLER:**	J. Wyant
				FALL		**30"**			**INSPECTOR:**	EJS

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			2		**Brown Sandy Topsoil** 0'8"	
1		**S-1**	4		Br cf S, l (+) $, l (+) cf G	Rev = 17"
			12			moist
2			8			
			7		same **Fill (Brown coarse to fine SAND, little (+)**	Rev = 17"
3		**S-2**	11		**Silt, little (+) coarse to fine Gravel)**	moist
			8			
4			8			
5					5'0"	
			2		Dk br $ l (+), cf S, slightly organic	Rev = 22"
6		**S-3**	4			moist
			5			
7			5			
			4		same **Dark brown SILT little (+), coarse**	Rev = 24"
8		**S-4**	4		**to fine Sand, slightly organic**	moist
			4			
9			5			
10					10'0"	
			10		Br cf S, l (+) $, l (+) cf G	Rev = 15"
11		**S-5**	7		**Brown coarse to fine SAND, little (+) Silt**	wet
			10		**little (+) coarse to fine Gravel**	
12			16		12'0"	
					End of Boring @ 12'0"	
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

CARLIN - SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-8

Project: Proposed Stormwater Detention Basins - Mount Pleasant, New York									**SHEET NO.:**	1 of 1
Client: BioMed Realty Trust Inc.									**JOB NUMBER:**	15-83
Drilling Contractor: General Borings, Inc.									**ELEVATION:**	+208.0
GROUNDWATER					**CASING**	**SAMPLE**	**CORE**	**TUBE**	**DATUM:**	Topo
DATE	**TIME**	**DEPTH**	**CASING**	**TYPE**	**HSA**	**SS**			**START DATE:**	01 Apr 16
No water encountered				**DIA.**	**3 1/4"**	**1 3/8"**			**FINISH DATE:**	01 Apr 16
				WGHT		**140#**			**DRILLER:**	J. Wyant
				FALL		**30"**			**INSPECTOR:**	EJS

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION		REMARKS
			2		**Brown Sandy Topsoil**	0'8"	
1		**S-1**	2		FILL (Br $ s (-), cf S, t f G)		Rec = 18"
			2				moist
2			4				
			6		FILL (same)		Rec = 18"
3		**S-2**	9				moist
			11		**FILL (Brown SILT some (-), coarse to**		
4			10		**fine Sand, trace fine Gravel)**		
5							
			6		FILL (same)	5'6"	Rec = 15"
6		**S-3**	14		Br cf S, l (+) $, l (+) cf G		moist
			18		**Brown coarse to fine SAND, little (+)**		
7			19		**Silt, little (+) coarse to fine Gravel**	7'0"	
					End of Boring @ 7'0"		
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							

CARLIN - SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-9

Project: Proposed Stormwater Detention Basins - Mount Pleasant, New York									**SHEET NO.:**	1 of 1
Client: BioMed Realty Trust Inc.									**JOB NUMBER:**	15-83
Drilling Contractor: General Borings, Inc.									**ELEVATION:**	+210.0
GROUNDWATER					**CASING**	**SAMPLE**	**CORE**	**TUBE**	**DATUM:**	Topo
DATE	**TIME**	**DEPTH**	**CASING**	**TYPE**	**HSA**	**SS**			**START DATE:**	01 Apr 16
1-Apr-16	**1130**	**9'0"**	**HSA**	**DIA.**	**3 1/4"**	**1 3/8"**			**FINISH DATE:**	01 Apr 16
				WGHT		**140#**			**DRILLER:**	J. Wyant
				FALL		**30"**			**INSPECTOR:**	EJS

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
1		S-1	2 3		**Brown Silty Topsoil** 0'10"	Rec = 20"
2			5 5		Br $ s (+), cf S, t (+) cf G	moist
3		S-2	6 9		same	Rec = 20" moist
4			9 12		**Brown SILT some (+), coarse to fine SAND, trace (+) coarse to fine Gravel**	
5						
6			6 4		same	Rec = 22" moist
7		S-3	4 5		7'0"	
8		S-4	4 4		Dk br $, a (+) cf S, t (-) mf G, trace organics **Dark Brown SILT, and (+) coarse to fine Sand, trace (-) medium to fine Gravel, with trace organics**	Rev = 22" moist
9			6 4			
10					9'6"	
11			7 9		Br cf S, l $, l (+) cf G **Brown coarse to fine SAND, little Silt, little (+) coarse to fine Gravel**	Rec = 22" wet
12		S-5	7 7			
13			6 5		same	Rec = 15" wet
14		S-6	5 6		14'0"	
15					**End of Boring @ 14'0"**	
16						
17						
18						
19						
20						
21						
22						

CARLIN - SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-10
Project: Proposed Stormwater Detention Basins - Mount Pleasant, New York		SHEET NO.: 1 of 1
Client: BioMed Realty Trust Inc.		JOB NUMBER: 15-83
Drilling Contractor: General Borings, Inc.		ELEVATION: +210.0

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 01 Apr 16
1-Apr-16	0110	9'0"	HSA	DIA.	3 1/4"	1 3/8"			FINISH DATE: 01 Apr 16
				WGHT		140#			DRILLER: J. Wyant
				FALL		30"			INSPECTOR: EJS

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			10		**Brown Silty Topsoil**	
1		S-1	7		0'11"	Rec = 17"
			6		FILL(Br $ l (+), cf S)	moist
2			6			
			7		FILL(same)	Rec = 16
3		S-2	7			moist
			9		**FILL(Brown SILT little (+),**	
4			8		**coarse to fine Sand)**	
5					5'0"	
			4		Br $ a, cf S, l (-) cf G	Rec = 15"
6		S-3	8			moist
			7		**Brown SILT and, coarse to fine**	
7			8		**SAND, little (-) coarse to fine Gravel**	
			10		same	Rec = 16"
8		S-4	11			moist
			16			
9			20		9'0"	
10						
			6		Br cf S, l (+) $, s cf G	Rec = 15"
11		S-5	10			wet
			10			
12			13		**Brown coarse to fine SAND, little**	
			10		same **(+) Silt, some coarse to fine Gravel**	Rec = 14"
13		S-6	11			wet
			13			
14			18		14'0"	
					End of Boring @ 14'0"	
15						
16						
17						
18						
19						
20						
21						
22						

CARLIN - SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-101

Project:	**Proposed Parking Area, Landmark @ Eastview , Greenburgh, NY**								**SHEET NO.:**	1 of 1
Client:	**Biomed Realty Trust**								**JOB NUMBER:**	11-89
Drilling Contractor:	**General Borings, Inc.**								**ELEVATION:**	
GROUNDWATER					**CASING**	**SAMPLE**	**CORE**	**TUBE**	**DATUM:**	
DATE	**TIME**	**DEPTH**	**CASING**	**TYPE**	**HSA**	**SS**			**START DATE:**	15 Jul 11
				DIA.	**3 1/4"**	**1 3/8"**			**FINISH DATE:**	15 Jul 11
No water encountered				**WGHT**		**140#**			**DRILLER:**	E.Delpriore
				FALL		**30"**			**INSPECTOR:**	KWA

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			4		**Topsoil** 0'6"	
1		**S-1**	17		Br cf S, s (-) $, a (-) cf G	Rec = 14"
			21			moist
2			24			
			25		Br cf S, l $, l (+) cf G	
3		**S-2**	26			Rec = 12"
			24			moist
4			23		**Brown coarse to fine SAND, little Silt, little (+) coarse to fine Gravel**	
5						
			10		same, l (+) cf G	
6		**S-3**	11			Rec = 14"
			9			moist
7			7			
8						
			6		same	
9		**S-4**	7			Rec = 13"
			5			moist
10			6		10'0"	
					End of Boring @ 10'0"	
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

CARLIN - SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-102

Project:	**Proposed Parking Area, Landmark @ Eastview , Greenburgh, NY**								**SHEET NO.:**	1 of 1
Client:	**Biomed Realty Trust**								**JOB NUMBER:**	11-89
Drilling Contractor:	**General Borings, Inc.**								**ELEVATION:**	
GROUNDWATER					**CASING**	**SAMPLE**	**CORE**	**TUBE**	**DATUM:**	
DATE	**TIME**	**DEPTH**	**CASING**	**TYPE**	**HSA**	**SS**			**START DATE:**	15 Jul 11
				DIA.	**3 1/4"**	**1 3/8"**			**FINISH DATE:**	15 Jul 11
No water encountered				**WGHT**		**140#**			**DRILLER:**	E.Delpriore
				FALL		**30"**			**INSPECTOR:**	KWA

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			3		**Topsoil** 0'6"	
1		**S-1**	6		Br cf S, s (-) $, l (+) cf G	Rec = 18"
			12			moist
2			13			
			17		Br cf S, s (-) $, l cf G	
3		**S-2**	28			Rec = 17"
			34		**Brown coarse to fine SAND, some (-)**	moist
4			35		**Silt, little coarse to fine Gravel**	
5						
			16		Br cf S, l $, l cf G	
6		**S-3**	17			Rec = 12"
			17			moist
7			15			
8						
			10		same, s (-) $	
9		**S-4**	9			Rec = 10"
			14			moist
10			15		10'0"	
					End of Boring @ 10'0"	
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

CARLIN - SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER RW-3

Project:	**Proposed Retaining Wall, Landmark at Eastview, Greenburgh, NY**								**SHEET NO.:**	1 of 1
Client:	**BioMed Realty Trust Inc.**								**JOB NUMBER:**	11-89
Drilling Contractor:	**General Borings, Inc.**								**ELEVATION:**	+222.0
GROUNDWATER					**CASING**	**SAMPLE**	**CORE**	**TUBE**	**DATUM:**	Topo
DATE	**TIME**	**DEPTH**	**CASING**	**TYPE**	**HSA**	**SS**			**START DATE:**	2 Aug 11
2 Aug 11	**1130**	**9'0"**	**Auger**	**DIA.**	**3 1/4"**	**1 3/8"**			**FINISH DATE:**	2 Aug 11
				WGHT		**140#**			**DRILLER:**	Erick D.
				FALL		**30"**			**INSPECTOR:**	EJS

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			4		**Dark brown sandy Topsoil** 0'8"	
1		**S-1**	6		Br cf S, t (+) $, l (+) cf G	Rec = 15"
			16			moist
2			24			
			22		same, l $	
3		**S-2**	23			Rec = 18"
			19			moist
4			18			
5						
			25		same, s $, s (-) cf G	
6		**S-3**	23			Rec = 17"
			18		**Brown coarse to fine SAND, little**	moist
7			18		**Silt, little (+) coarse to fine Gravel**	
8						
9						
10						
			12		same, l $, t (+) cf G	
11		**S-4**	18			Rec = 15"
			30			wet
12			29			
13						
14						
15						
			10		Br cf G s (+), cf S, l $ w/cobbles and boulder	
16		**S-5**	60		16'3"	Rec = 17"
					End of Boring @ 16'3"	wet
17						Auger refusal @ 16'3"
18						
19						
20						
21						
22						

CARLIN - SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER RW-4

Project:	**Proposed Retaining Wall, Landmark at Eastview, Greenburgh, NY**								**SHEET NO.:**	1 of 1
Client:	**BioMed Realty Trust Inc.**								**JOB NUMBER:**	11-89
Drilling Contractor:	**General Borings, Inc.**								**ELEVATION:**	+232.0
GROUNDWATER					**CASING**	**SAMPLE**	**CORE**	**TUBE**	**DATUM:**	Topo
DATE	**TIME**	**DEPTH**	**CASING**	**TYPE**	**HSA**	**SS**			**START DATE:**	2 Aug 11
2 Aug 11	**1150**	**12'0"**	**Auger**	**DIA.**	**3 1/4"**	**1 3/8"**			**FINISH DATE:**	2 Aug 11
				WGHT		**140#**			**DRILLER:**	Erick D.
				FALL		**30"**			**INSPECTOR:**	EJS

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			3		**Brown Sandy Topsoil** 0'6"	
1		**S-1**	4		Br cf S, l (+) $, l (+) cf G	Rec = 8"
			9			moist
2			10			
			18		same, s cf G	
3		**S-2**	25			Rec = 15"
			32			moist
4			29			
5						
			23		same	
6		**S-3**	18			Rec = 17"
			18			moist
7			16		**Brown coarse to fine SAND, little (+) Silt, some coarse to fine Gravel**	
8						
9						
10						
			9		same	
11		**S-4**	11			Rec = 17"
			11			very moist-wet
12			14			
13						
14						
15						
			15		same, a (+) $, t mf G	
16		**S-5**	16			Rec = 17"
			17			wet
17			19			
			20		same, l $, l cf G, w/weathered Gneiss	
18		**S-6**	19			Rec = 16"
			48		18'6"	wet
19					**End of Boring @ 19'0"**	Auger refusal @ 19'0"
20						
21						
22						

CARLIN - SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER RW-5

Project:	**Proposed Retaining Wall, Landmark at Eastview, Greenburgh, NY**									**SHEET NO.:**	1 of 1
Client:	**BioMed Realty Trust Inc.**									**JOB NUMBER:**	11-89
Drilling Contractor:	**General Borings, Inc.**									**ELEVATION:**	+236.0
GROUNDWATER					**CASING**	**SAMPLE**	**CORE**	**TUBE**		**DATUM:**	Topo
DATE	**TIME**	**DEPTH**	**CASING**	**TYPE**	**HSA**	**SS**				**START DATE:**	2 Aug 11
2 Aug 11	**1515**	**12'0"**	**Auger**	**DIA.**	**3 1/4"**	**1 3/8"**				**FINISH DATE:**	2 Aug 11
				WGHT		**140#**				**DRILLER:**	Erick D.
				FALL		**30"**				**INSPECTOR:**	EJS

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			5		**Brown sandy Topsil**	
1		**S-1**	8			Rec = 15"
			10		1'6"	moist
2			12		Br cf S, l $, l cf G	
3						
4						
5						
			27		Br cf S, l (+) $, l (-) cf G	
6		**S-2**	24			Rec = 20"
			25			moist
7			24			
8					**Brown coarse to fine SAND, little Silt, little coarse to fine Gravel**	
9						
10						
			13		same	
11		**S-3**	9			Rec = 17"
			9			very moist-wet
12			12			
13						
14						
15						
			13		Gr br cf S, l $, t cf G	
16		**S-4**	25			Rec = 12"
			59			wet
17					17'0"	Auger refusal @ 17'0"
					End of Boring @ 17'0"	
18						
19						
20						
21						
22						

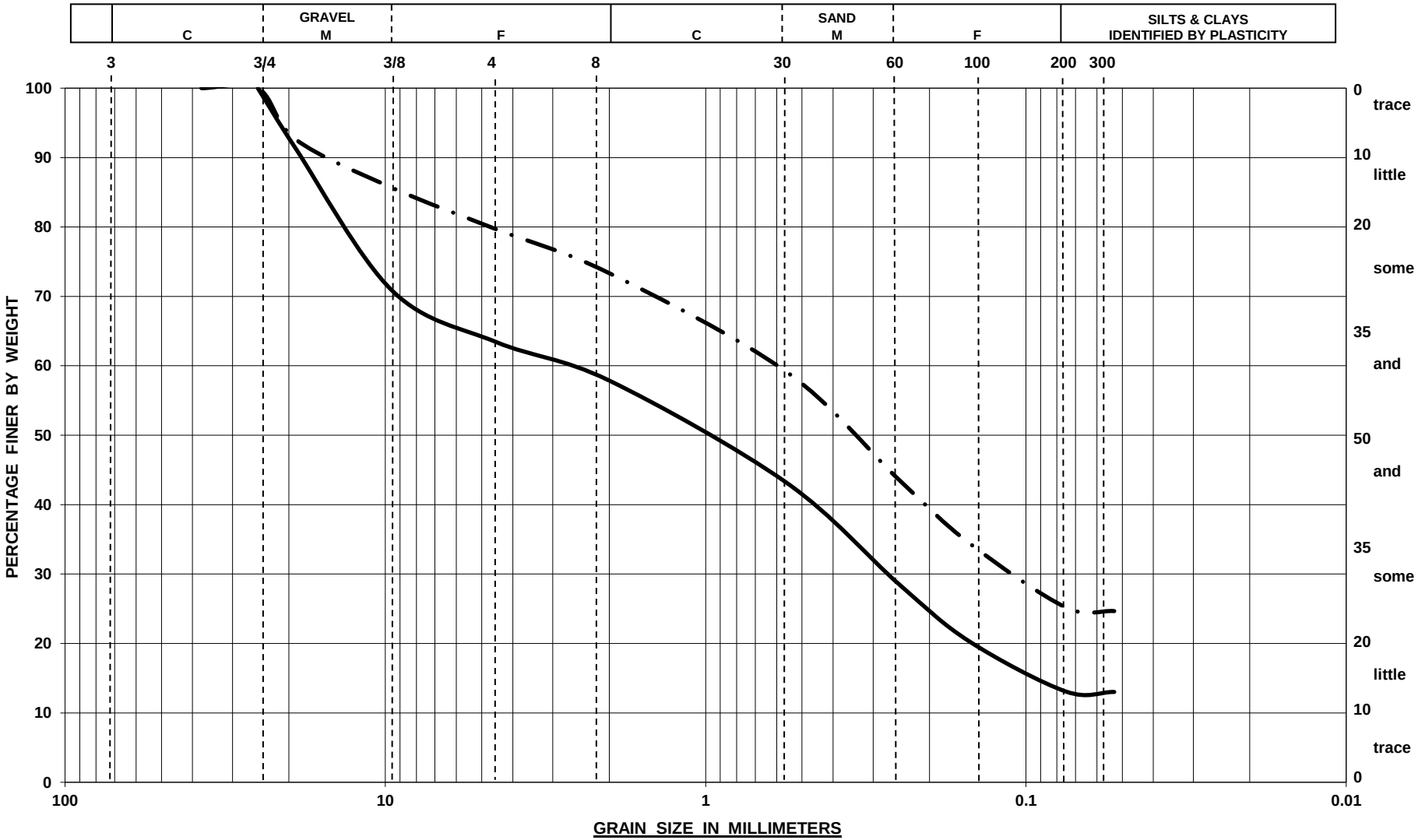
CARLIN - SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER RW-6

Project:	**Proposed Retaining Wall, Landmark at Eastview, Greenburgh, NY**								**SHEET NO.:**	1 of 1
Client:	**BioMed Realty Trust Inc.**								**JOB NUMBER:**	11-89
Drilling Contractor:	**General Borings, Inc.**								**ELEVATION:**	+236.0
GROUNDWATER					**CASING**	**SAMPLE**	**CORE**	**TUBE**	**DATUM:**	Topo
DATE	**TIME**	**DEPTH**	**CASING**	**TYPE**	**HSA**	**SS**			**START DATE:**	2 Aug 11
2 Aug 11	**1630**	**16'0"**	**Auger**	**DIA.**	**3 1/4"**	**1 3/8"**			**FINISH DATE:**	2 Aug 11
				WGHT		**140#**			**DRILLER:**	Erick D.
				FALL		**30"**			**INSPECTOR:**	EJS

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			2		**Brown sandy Topsoil** 0'2"	
1		**S-1**	4		Br cf S, l $, l cf G	Rec = 17"
			5			moist
2			8			
3						
4						
5						
			14		same, s (+) $, l cf G	
6		**S-2**	14			Rec = 16"
			14		**Brown coarse to fine SAND, some**	moist
7			14		**Silt, little coarse to fine Gravel**	
8						
9						
10						
			11		same, s (-) $	
11		**S-3**	10			Rec = 18"
			8			moist
12			9			
13						
14						
15						
			10		same	Rec = 8"
16		**S-4**	50			very moist-wet
						Auger refusal @ 17'0"
17					17'0"	
					End of Boring @ 17'0"	
18						
19						
20						
21						
22						

CARLIN-SIMPSON & ASSOCIATES
SAYREVILLE, NJ 08872

SIEVE ANALYSIS

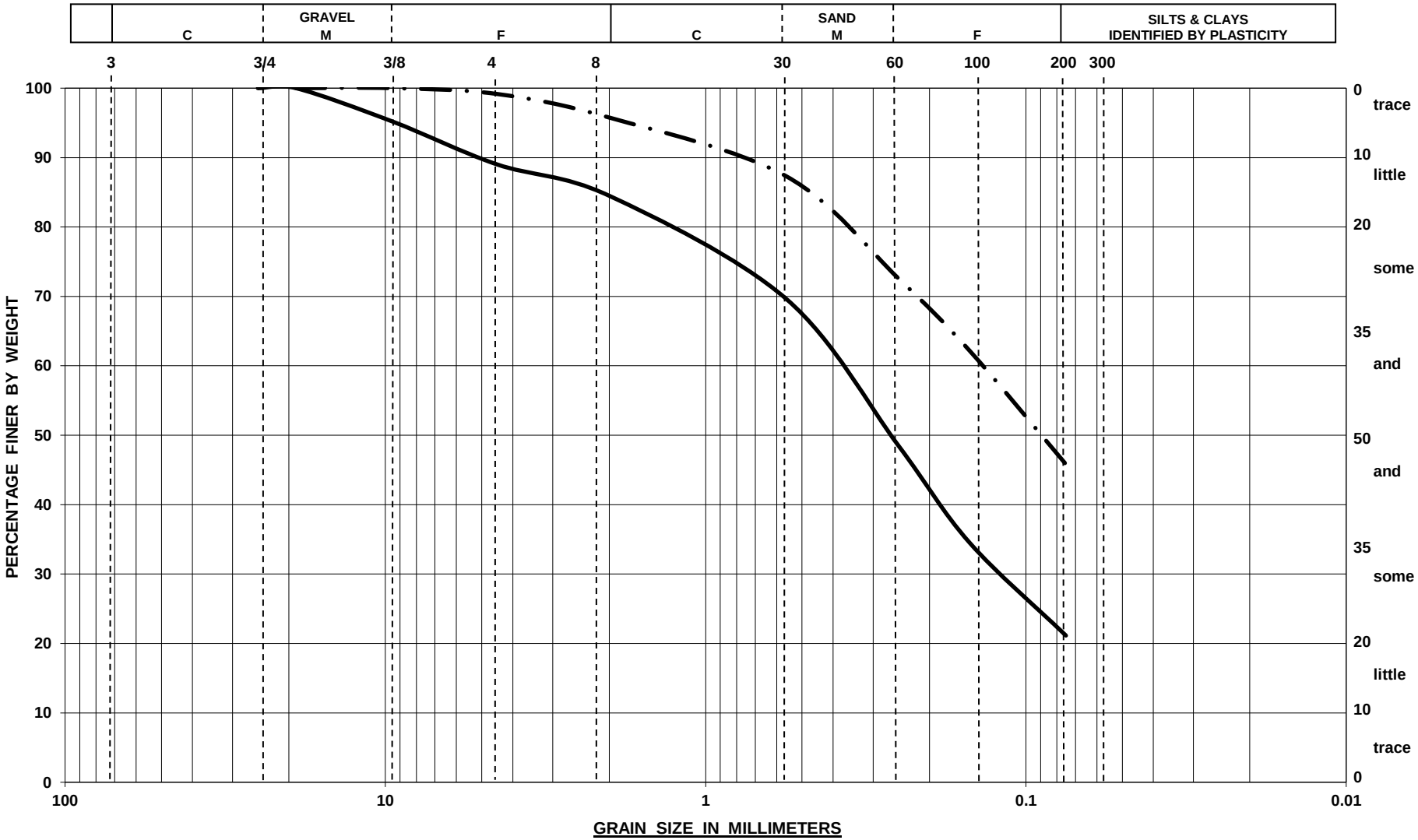


SYMBOL	BORING	SAMPLE	DEPTH	DESCRIPTION	NAT MC
———	B-9D	S-3	5'0" - 7'0"	Gray brown coarse to fine SAND, little Silt, and coarse to fine Gravel	5.3%
— · —	B-6D	S-4	7'0" - 9'0"	FILL (Brown gray coarse to fine SAND, some Silt, some coarse to fine Gravel	13.8%

PROJECT Regeneron, Proposed Daycare, Tarrytown, NY **BY** MJG **DATE** 30-Apr-21 **JOB NO** 20-166

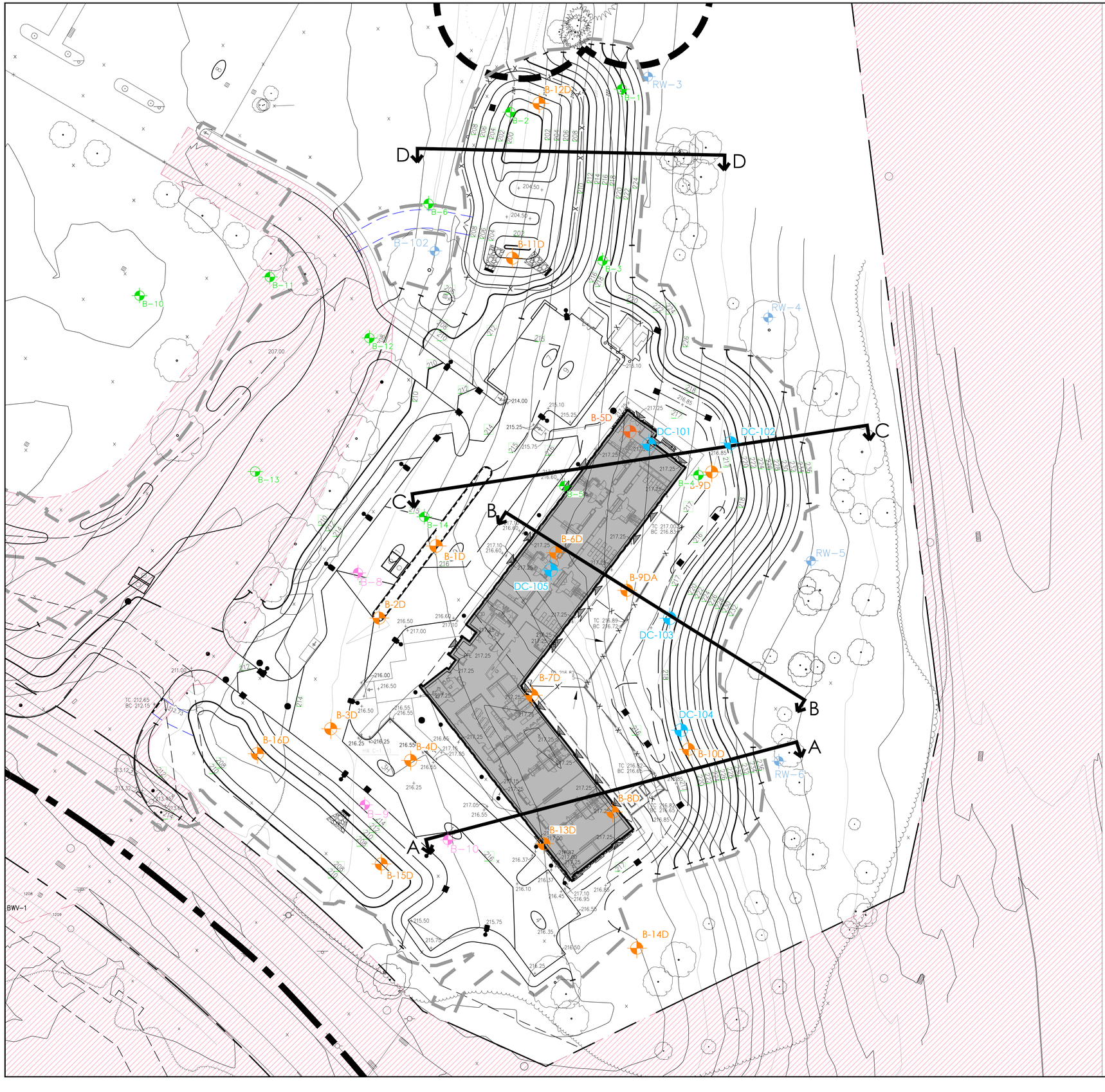
CARLIN-SIMPSON & ASSOCIATES
SAYREVILLE, NJ 08872

SIEVE ANALYSIS



SYMBOL	BORING	SAMPLE	DEPTH	DESCRIPTION	NAT MC
———	B-11D	S-2	2'0" - 4'0"	Brown gray coarse to fine SAND, some (-) Silt, little medium to fine Gravel	10.2%
— · —	B-15D	S-3	5'0" - 7'0"	Dark Gray coarse to fine SAND, and Silt, trace medium to fine Gravel	24.0%

PROJECT Regeneron, Proposed Daycare, Tarrytown, NY **BY** MJG **DATE** 30-Apr-21 **JOB NO** 20-166



GENERAL NOTES:

1. GENERAL LAYOUT WAS OBTAINED FROM A DRAWING PREPARED BY JMC, PLLC., DATED 22 MARCH 2022, ENTITLED "GRADING PLAN".
2. BORING LOCATIONS PERFORMED FOR THE PROPOSED BUILDING AND STORMWATER MANAGEMENT SYSTEM WERE SURVEYED BY JMC PLLC, WITH THE EXCEPTION OF B-13D, B-14D, B-15D AND B-16D, WHICH WERE LAID OUT IN THE FIELD BY CARLIN-SIMPSON & ASSOCIATES (CSA).
3. BORINGS B-1D THROUGH B-16D WERE PERFORMED BY GENERAL BORINGS INC, IN MAY 2021 UNDER THE FULL TIME INSPECTION OF CSA. BORINGS DC-101 THROUGH DC-105 WERE PERFORMED BY GENERAL BORINGS INC, IN DECEMBER 2021 UNDER THE FULL TIME INSPECTION OF CSA.
4. ALL LOCATIONS ARE APPROXIMATE.

LEGEND:

- BORING AND/OR WELL LOCATION PERFORMED IN DECEMBER 2021 (DC-100 SERIES)
- BORING LOCATION PERFORMED IN MARCH 2021 (BD SERIES)
- BORING LOCATION PERFORMED IN FEB 2020 (B-1 THROUGH B-14)
- BORING LOCATION PERFORMED IN MARCH 2016 (B-5 THROUGH B-10)
- BORING LOCATION PERFORMED IN 2011 (B-101, B-102, AND RW-3 TO RW-6)
- CROSS-SECTION LOCATION (SEE FIGURES 3 AND 4)

ROBERT B. SIMPSON, P.E.
PROFESSIONAL ENGINEER

BORING LOCATION PLAN

PROPOSED DAYCARE BUILDING
REGENERON CAMPUS
777 OLD SAW MILL RIVER ROAD
TARRYTOWN, NEW YORK

DRAWN: SR/MRA	SCALE: 1" = 30'
CHECKED: RBS	DATE: 04.15.2022
PROJECT NO.: 20-166	DWG NO.: FIG-1
APPROVED:	

CARLIN-SIMPSON AND ASSOCIATES, LLC
61 Main Street
Sayreville, NJ 08872

Consulting Geotechnical and Environmental Engineers

FOUNDATION DRAIN, CONNECT TO STORMWATER SYSTEM (TBD BY JMC)

SUB-SLAB DRAINAGE REQUIRED FOR EASTERN PORTION OF THE BUILDING

PAVEMENT UNDERDRAINS (TYP.)

CONCEPTUAL CUTOFF DRAINS, REFER TO DRAINAGE DESIGN PLANS FOR DETAILS

DC-101 DC-102 DC-103 DC-104 DC-105

B-1D B-2D B-3D B-4D B-5D B-6D B-7D B-8D B-9D B-9DA B-10D B-13D B-14D B-15D B-16D

B-8 B-9 B-10

RW-4 RW-5 RW-6

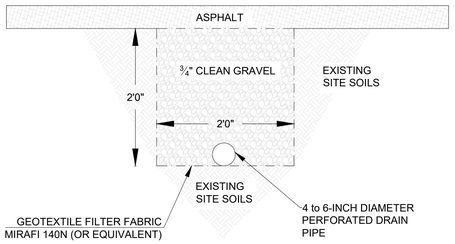
TC 217.00 BC 216.83

TC 216.89 BC 216.72

TC 216.82 BC 216.65

TC 216.52 BC 216.65

TC 212.65 BC 212.15



TYPICAL PAVEMENT UNDERDRAIN DETAIL

NO SCALE

NORTH

ROBERT B. SIMPSON, P.E.
PROFESSIONAL ENGINEER

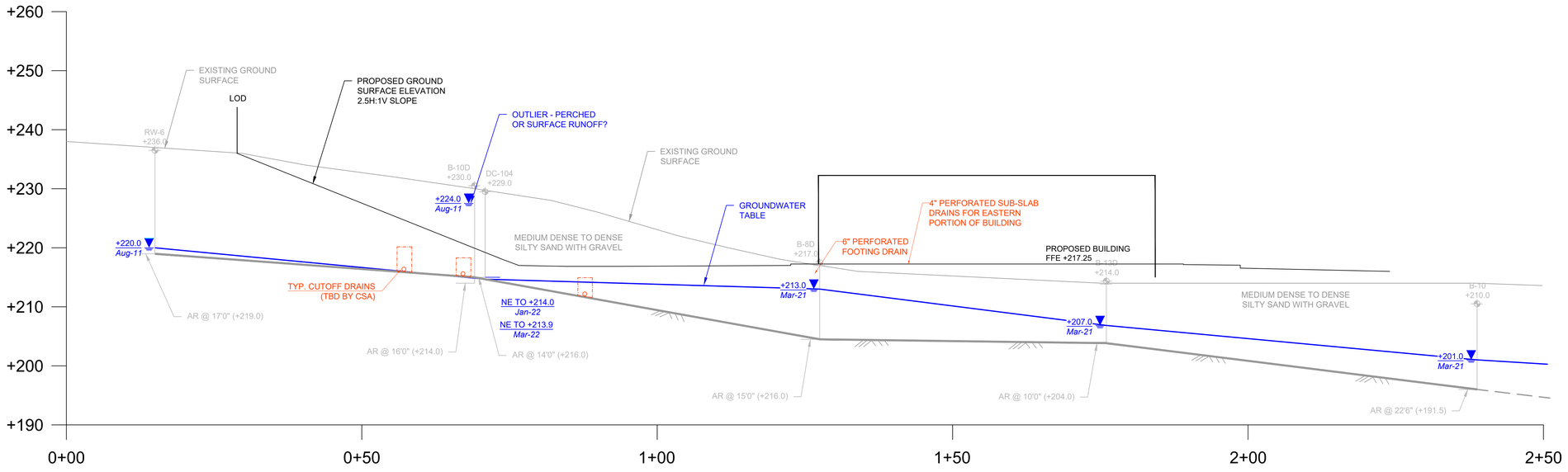
CONCEPTUAL DRAINAGE SYSTEM PLAN

PROPOSED DAYCARE BUILDING
REGENERON CAMPUS
777 OLD SAW MILL RIVER ROAD
TARRYTOWN, NEW YORK

DRAWN: SR/MRA	SCALE: 1" = 20'
CHECKED: RBS	DATE: 04.15.2022
PROJECT NO.: 20-166	DWG NO.: FIG-2
APPROVED:	

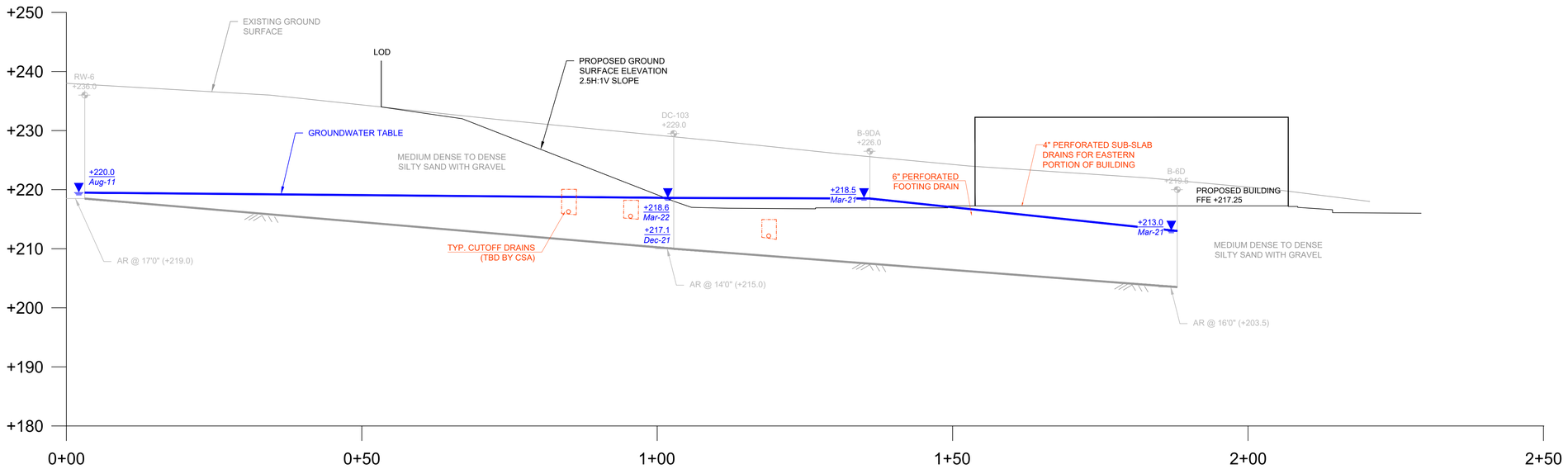
CARLIN-SIMPSON AND ASSOCIATES, LLC
61 Main Street
Sayreville, NJ 08872

Consulting Geotechnical and Environmental Engineers



CROSS-SECTION "A"

SCALE: 1" = 10'



CROSS-SECTION "B"

SCALE: 1" = 10'

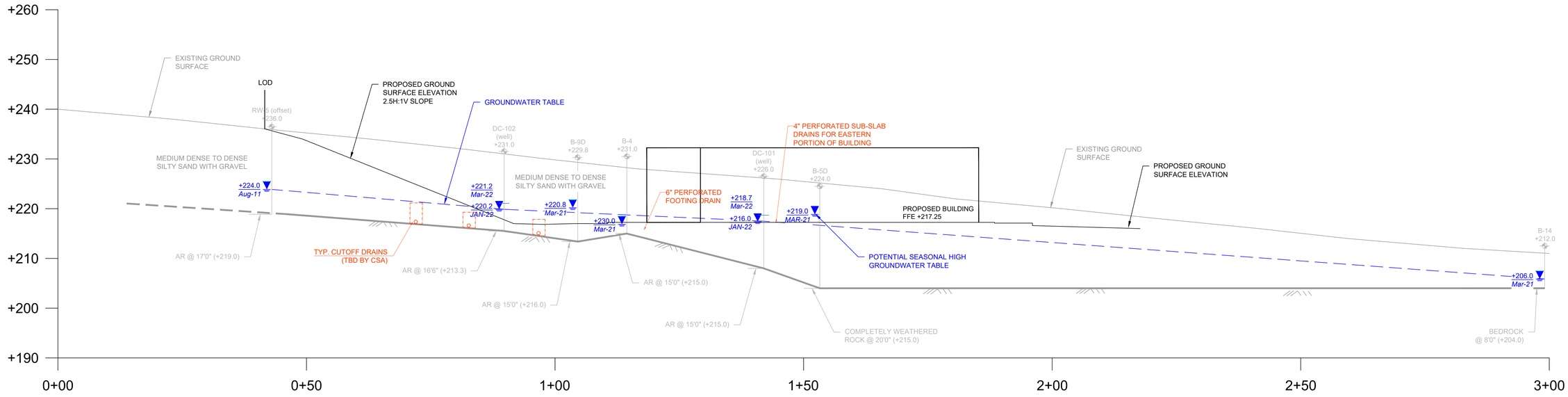
ROBERT B. SIMPSON, P.E.
PROFESSIONAL ENGINEER

CROSS-SECTIONS A AND B

PROPOSED DAYCARE BUILDING
REGENERON CAMPUS
777 OLD SAW MILL RIVER ROAD
TARRYTOWN, NEW YORK

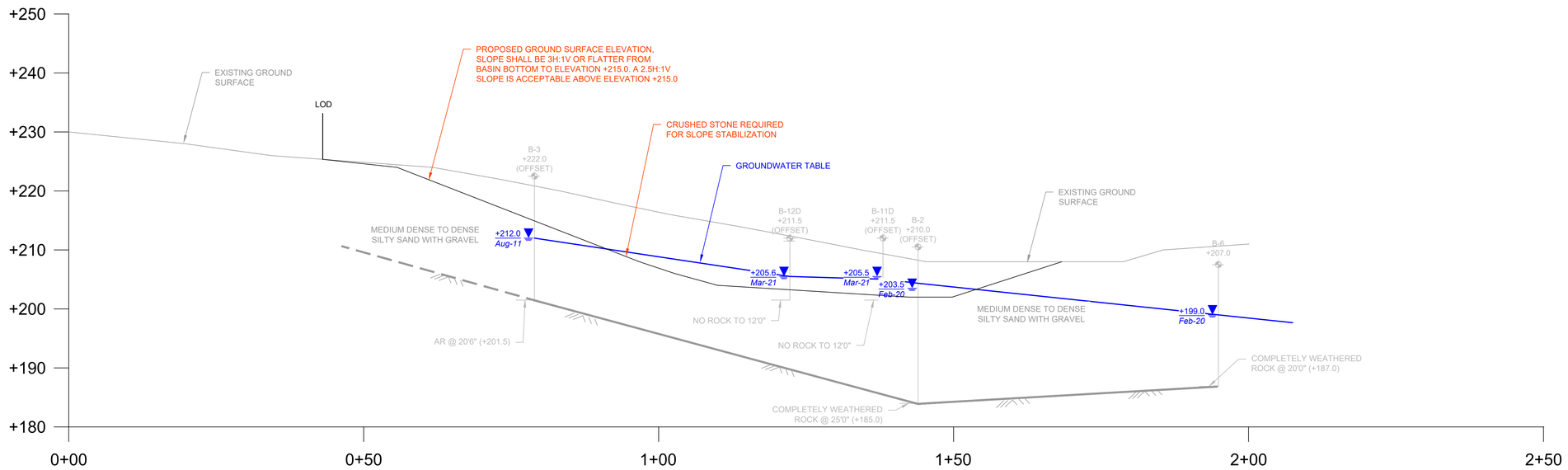
DRAWN: SR/MRA	SCALE: 1" = 10'
CHECKED: RBS	DATE: 04.15.2022
PROJECT NO.: 20-166	DWG NO.: FIG-3
APPROVED:	

CARLIN-SIMPSON AND ASSOCIATES
61 Main Street
Sayreville, NJ 08872
Consulting Geotechnical and Environmental Engineers



CROSS-SECTION "C"

SCALE: 1" = 10'



CROSS-SECTION "D"

SCALE: 1" = 10'

ROBERT B. SIMPSON, P.E.
PROFESSIONAL ENGINEER

CROSS-SECTIONS C AND D

PROPOSED DAYCARE BUILDING
REGENERON CAMPUS
777 OLD SAW MILL RIVER ROAD
TARRYTOWN, NEW YORK

DRAWN: SR/MRA	SCALE: 1" = 10'
CHECKED: RBS	DATE: 04.15.2022
PROJECT NO.: 20-166	DWG NO.: FIG-4
APPROVED:	

CARLIN-SIMPSON AND ASSOCIATES
61 Main Street
Sayreville, NJ 08872
Consulting Geotechnical and Environmental Engineers

SECTION 02 30 00
SUBSURFACE INVESTIGATION

END OF SECTION

SECTION 02 41 13

SELECTIVE SITE DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The Work of this Section may may be utilized where appropriate and may include, but may not be limited to:
   1. As Applicable: Removal of structures, obstructions, utilities, hardscapes, and pavements, as well as all items indicated on the Drawings to be removed or as required for construction.

1.02 REFERENCE STANDARDS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section, as well as all applicable construction, fabrication and safety standards.

B. The Contractor shall comply with the requirements of the permits and all applicable Federal, State, County, and Local statutes and ordinances.

1.03 QUALITY ASSURANCE

A. Provide a detailed installation and termination schedule for all items of work included in this Section. Notify the Site Engineer prior to the work taking place.

PART 2 NOT USED

PART 3 EXECUTION

3.01 GENERAL

A. General Requirements - Locations shown on Drawings are not guaranteed. The structures, utilities, and other features shown on the Drawings are those known to exist, but their locations are not guaranteed to be exact, nor is it guaranteed that all structures, utilities, and features are shown. The Contractor shall, however, be responsible for the protection of all items and features to remain, and shall be held responsible for any claim arising from damage, including but not limited to structures and utilities. Any damage shall be repaired or replaced as directed, at the sole expense of the Contractor.

B. Safeguards and Protection - The Contractor shall provide all necessary safeguards including the installation of shoring, structural supports, protective fencing and barriers, etc., as may be required to prevent damage to adjacent property, buildings, or injury to persons. All work shall be done in accordance with the requirements of the local building codes and the rules, regulations and ordinances of all other governing bodies having jurisdiction. The Contractor shall be held responsible for any claim arising from his failure to provide proper safeguards or for his failure to conduct his operation in a manner consistent with the rules, regulations and ordinances of those governing bodies having jurisdiction.

   At the end of each work day, the Contractor shall secure the site to ensure that all safety measures, including fences, barricades, etc. are in place and there are no unprotected hazards on or adjacent to the site.

   Construction fencing shall be maintained at all times during the construction operations in accordance with the requirements of OSHA and all Authorities having jurisdiction.

C. Replacement of Disturbed Ground Surfaces - The Contractor shall, at his own expense, repair or replace all ground surfaces, pavements, sidewalks, curbs, etc., which are to remain and which may become disturbed or damaged due to his operations. Said repair or replacement shall be satisfactory to the Owner's Field Representative and in accordance with the requirements of the governing body having jurisdiction.

D. Damage - The Contractor, at his own expense, shall make good, repair and/or replace all damage occurring as a direct or indirect result of his operations.

E. Notification of Utility Owners - Under 16 NYCRR 753 “Protection of Underground Facilities”, prior to the start of his work, the Contractor shall be required to notify the One-Call Notification System serving the area of the proposed Work and to contact and notify separately the owners of utilities that do not belong to the One-Call Notification System on file with the Central Registry of the County of Westchester so that all the various underground utility operators will be able to locate and mark the locations of their own utilities. Notification of operators of utilities must be made at least two (2) days and not more than ten (10) days prior to the start of any construction and as required by State and Local laws. No work by the Contractor shall commence until the operators have notified the Contractor that their utilities have been located. The Contractor shall be held responsible for any claims arising from his failure to make such notification, or for his failure to do the work in accordance with the rules and regulations of the governing Authorities and owners of the utilities involved.

F. Test Pits - Wherever the proposed utilities cross or connect to existing utilities, the Contractor will be required to hand excavate test pits and investigate proposed connections, to field verify the location and elevation of the existing utilities or structures. This work is to be done prior to any excavation. In the event of conflict between the existing utility and the proposed utility, the Contractor shall identify the conflict and notify the Owner's Field Representative and Site Engineer immediately for resolution. Any resulting modification in the utility design or location, shall be completed by the Contractor his sole expense.

G. Removal of Structures, Utilities and Obstructions - The Contractor shall remove and dispose of those existing structures, utilities and obstructions which interfere with the proposed construction as shown on the Drawings, and as determined in the field by the Owner's Field Representative. This may include, but not necessarily be limited to, (as applicable), buildings and building foundations, fences, guide rails, walls, poles, pole bases, catch basins, inlets, manholes, vaults, conduit, wiring, pipes and appurtenances, slabs, pavements, sidewalks, curbs, signs and sign supporting structures.

The Contractor shall remove only those items and structures that he has been authorized to remove, either by specific directions given on the Drawings or by written instructions given before or during the progress of the Work by the Owner's Field Representative.

All waste material obtained from the removal of structures, utilities and obstructions shall be legally disposed of off-site by the Contractor, subject to local codes.

The Contractor shall be held responsible for any claim arising from his removal of any existing item or structure without the required authorization specified herein.

H. Discontinuance of Utilities - Before any structure or building with utilities thereon is disposed of, the utilities shall be disconnected and removed. The Contractor shall perform the work of discontinuing the utilities in accordance with the requirements and directions of the Authorities having jurisdiction over the utilities involved.

I. Removal Outside Proposed Building Areas - In all areas outside the proposed building areas, existing foundations and slabs shall be removed completely, or to a minimum depth of three (3) feet below proposed finished grade as directed. If permitted by the Owner's Field Representative or Geotechnical Engineer, slabs that are to be left in place below the three (3) foot mark shall be thoroughly broken up and shall have twelve (12) inch square openings, five (5) feet on center, broken out completely, and these openings shall be backfilled with granular material.

J. Portions of Pavements, Curbs, etc., to Remain - In removing portions of pavements, curbs, sidewalks, driveways and similar items where the balance of such items is to remain, removal shall be to an existing joint. Where this is not practical, as determined by the Owner's Field Representative, removal shall be to a reasonably true line with vertical face, which shall be cut with a power driven concrete saw or by other approved mechanical line cutting methods.

K. Existing Services to be Maintained - In removing storm drain structures or sanitary sewer structures, all existing live storm drains or sanitary sewers connected to the structures shall be rebuilt and properly reconnected, and service shall be maintained during such construction operations.

L. Disposal of Material - All waste material obtained from the removal of structures and obstructions, including, but not limited to, concrete matted together by reinforcing, pipe, plaster, wood, paper, asphalt shingles, tanks, metal and miscellaneous debris, shall be legally disposed of off-site.

If permitted, pavement and concrete crushed to sizes approved by the Owner's Field Representative and Geotechnical Engineer for use as fill material may be stored on-site, if directed.

M. Protection of Existing Structures and Utilities - The Contractor shall be responsible throughout the course of the Work for protecting from injury or damage all existing structures and utilities which are to remain.

All existing gas and water lines, telephone and electric poles, wires, conduits, sewers, drains, culverts, hydrants and other utilities which are to remain shall be carefully supported, maintained in operation and protected by the Contractor from injury or damage.

The Contractor shall sling, support, shore up and secure in place all pipe or conduits, without damage thereto. The Contractor shall provide for and maintain, by means of suitable temporary channels or pipe, the flow of drainage and watercourses, whether on the surface or underground, which may be interrupted during and by progress of the Work. All works of drainage intercepted or disconnected shall be restored and made good or taken down and rebuilt to the extent made necessary by the new Work, and all temporary material required for such construction shall immediately be removed therefrom when no longer required.

N. Dead-End Pipe and/or Conduit to be Sealed - When pipe, conduits, sewers or drains are removed from trenches, leaving dead-ends in the ground, the Contractor shall carefully plug and bulkhead such ends in a manner satisfactory to the Owner's Field Representative and the utility owner.

O. Clean Up - The Contractor shall clean up and remove all refuse, rubbish, scrap materials, unsuitable materials and debris caused by his operations so that, at all times, the site of the Work shall present a neat, orderly and workmanlike appearance. Materials from the Contractor's operations shall not be allowed to accumulate and cause hazardous or unsightly conditions.

P. Restoration - Where and as directed by the Owner's Field Representative, the Contractor shall replace all surfaces disturbed and shall restore paving, curbing, sidewalks, driveways, gutters, shrubbery, fences, grassed areas, sod and other surfaces disturbed to a condition equal to or better than that which existed before the Work began, furnishing all labor, material, and equipment necessary thereto.

The Contractor shall, at said Contractor's own expense and to the satisfaction of the Owner's Field Representative, clean up and correct unsightliness, inconvenience, hazard or damage caused by water, mud, stones, dust, rubbish, construction debris, traffic, workmen or the general operations. Wheel tracks, paths, puddles, damaged growth, ragged edges, undesirable spoil from excavation and rough slopes are to be removed, obliterated, corrected, graded, leveled, patched or smoothed. All adjacent areas that have been damaged or that require regrading shall be smoothed and worked to make the Project area blend into existing conditions.

Unsightliness extending onto adjacent private or public property shall be corrected to the satisfaction of both the owner of the adjacent property and the Owner's Field Representative, and no private agreements allowing a waiver of clean up will be recognized.

END OF SECTION

SECTION 03 30 53

MISCELLANEOUS CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The Work of this Section shall apply to all items of cast-in-place concrete to be installed under the Civil/Site Development Work and may include, but may not be limited to:
   1. Storm, Sanitary and Water Utilities.
   2. Headwall(s).
   3. Encasements.
   4. Thrust and Anchor Blocks.
   5. Concrete Curbs and Sidewalks.
   6. Miscellaneous Foundations, Concrete Pads, and Concrete Bases not specified elsewhere.

1.02 REFERENCE STANDARDS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section, as well as all applicable construction, fabrication and safety standards.

B. Comply with all industry standards and requirements of all Authorities having jurisdiction. If requirements specified conflicts with the requirements of Authorities having jurisdiction, the requirements of the Authority having jurisdiction applies.
   1. ASTM A-615 - Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
   2. ASTM A-185 - Steel Welded Wire Reinforcement, Plain, for Concrete.
   3. AASHTO M-148 - Liquid Membrane-Forming Compounds for Curing Concrete.
   4. AASHTO M-85 - Portland Cement.
   5. AASHTO M-6 - Fine Aggregate for Hydraulic Cement Concrete.

1.03 SUBMITTALS

A. General: Submit samples and manufacturer's product data sheets, installation instructions, reference guidelines, etc. in accordance with Division 01 General Requirements Submittal Section.

B. Design Mixtures: Submit preliminary mix designs for review prior to initial concrete placement. For each concrete mixture, submit alternate design mixtures when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments. Maintain mix designs approved for the project with Project Contract Documents.

C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Construction Joint Layout: Indicate proposed construction joints required for construction. Location of construction joints is subject to approval.

E. Test Data and Reports: Submit qualified testing data and reports that confirms compliance with specified performance requirements.

F. Provide Material Certificates signed by the respective manufacturer or supplier.

1.04 QUALITY ASSURANCE

A. Where appropriate, prior to placement, third party reinforcement inspection is required.

B. As applicable, on the day of placement, concrete testing shall be performed by an independent testing agency for slump, air entrainment and compressive strength. Provide the number of cylinders directed.

C. Notify the Site Engineer prior to work taking place.

PART 2 PRODUCTS

2.01 CLASS "A" CONCRETE

A. Class "A" Concrete shall be air-entrained, ready-mixed concrete, 4,000 PSI twenty-eight (28) day compressive strength and shall conform to AASHTO M-85.

B. Cement - shall be Portland cement, Type I or II, conforming to AASHTO Designation M-85. Cement shall be by an American manufacturer.

C. Fine Aggregate (sand) - shall conform to AASHTO Designation M-6 having clear, hard, durable, uncoated grains, free from deleterious substances and shall range in size from fine to coarse within the following percentages by weight:

Passing 3/8" Sieve	100%
Passing No. 4 Sieve	95 - 100%
Passing No. 16 Sieve	45 - 85%
Passing No. 50 Sieve	10 - 30%
Passing No. 100 Sieve	2 - 10%

D. Coarse Aggregate - shall conform to AASHTO Designation M-80 and shall be free of deleterious matter or coatings. Gradation must be within the following percentages by weight:

Passing 1-1/2" Sieve	100%
Passing 1" Sieve	95 - 100%
Passing 1/2" Sieve	25 - 60%
Passing No. 4 Sieve	0 - 10%

E. Water - shall be clean and fresh, free from salt, grease, acids, alkalis, organic materials or other deleterious materials. When possible, water shall be from a municipal system.

F. Reinforcement - shall be new deformed billet steel bars free of loose rust, conforming to ASTM Designation A-615, Grade 60, with minimum yield of 60,000 psi. Wire fabric shall conform to the "Standard Specifications for Welded Steel Wire Fabric for Concrete Reinforcement" ASTM Designation A-185.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

A. General Requirements - Unless indicated otherwise, site concrete shall be Class "A" concrete having a twenty-eight (28) day compressive strength of 4,000 psi.

There shall be no less than six (6) sacks of cement per cubic yard. The concrete shall contain no more than six (6) gallons of water per sack of cement, and shall produce a slump of not more than four (4) inches. Air content shall be 7% (+1%).

The use of accelerators shall not be used unless prior approval is received from the Owner's Field Representative.

Where concrete surfaces are exposed and visible in the finished work, such as in the construction of curbs and sidewalks, the cement used shall be of the same brand and from a single source, so that the item of construction will be uniform in color.

B. Forms - shall be acceptable steel or lumber, straight and free from warp or other irregularities that will adversely affect the installation. Forms shall be carefully set to the proper shape, lines and dimensions as shown on the Drawings and/or as directed by the Owner's Field Representative and shall be sufficiently tight, thoroughly braced and secured in place so that there will be no leakage of mortar or displacement of forms during placing of the concrete.

Prior to placing the concrete, the contact surfaces of the forms shall be given a light coating of form oil that will not discolor the concrete.

Forms shall remain in place until concrete has hardened and acquired sufficient strength to safely support dead and live loads. Form removal shall be carried out in such a manner to ensure complete safety and integrity of the structure.

C. Reinforcement - shall be accurately cut, placed and rigidly held in position by means of bar supports, spacers, ties or other acceptable means in such manner that the reinforcing will not displace when the concrete is poured. When reinforcing bars must be spliced, there shall be sufficient lap to develop the strength of the bar by bond.

D. Concrete Protection for Reinforcement - The steel reinforcement shall be protected by the thickness of concrete as indicated on the details of the Drawings. Where not otherwise specified or directed, the thickness of concrete over the reinforcement (clear dimensions) shall be as follows:
   1. For concrete deposited against ground without the use of forms - not less than three (3) inches.
   2. For concrete exposed to the weather or exposed to the ground but placed in forms - not less than two (2) inches.
   3. For concrete placed in slabs and walls not exposed to the ground or to the weather - not less than one and one half (1-1/2) inches.
   4. In all cases, the thickness of concrete over reinforcement shall be at least equal to the diameter of the reinforcing bars.

E. Keyways and Joints - shall be provided where and as shown in detail on the Drawings. Keyways and joints not indicated on the Drawings shall be as approved by the Owner's Representative and/or Site Engineer.

F. Placement - Unless specified otherwise, concrete three (3) or more inches thick shall be placed and consolidated with mechanical vibrators used in the concrete by skilled workman, properly supervised. Vibrators shall not be moved laterally or used to transport concrete. Vibrators shall be used to merge successive layers and prevent cold joints. Concrete shall be consolidated to maximum density, free of honeycombing and trapped air. Hand spading shall be used in corners and angles of forms while concrete is plastic. During placement operations, concrete shall be thoroughly consolidated and worked well around and into thorough contact with the steel being careful not to disturb the location of the reinforcing. Over-working and over-vibration which may cause segregation shall be avoided.

   When concrete is to placed on the ground surface, the subgrade shall be moistened prior to placing the concrete, except during cold weather periods when freezing is likely to occur. Concrete shall be placed in the form as near to its final position as practicable. Concrete shall be placed in layers to prevent honeycombing. Proper chutes, troughs and other approved devices shall be used to minimize free fall of concrete and to convey concrete to the proper locations. In no case shall concrete be deposited from a height that will separate the aggregates.

   Concrete shall be deposited within thirty (30) minutes after mixing, as nearly as practicable, in its final position to avoid segregation due to rehandling or flowing.

G. Cold Weather Requirements - Adequate equipment shall be provided for heating the concrete materials and protecting the concrete during freezing and near-freezing weather. No frozen materials or materials containing ice shall be used.

   All concrete materials and all reinforcement, forms, fillers and ground in which the concrete is to come in contact, shall be free from frost. Whenever the temperature of the surrounding air is below 40 degrees F. all concrete placed in the forms shall have a temperature between 70 degrees F. and 80 degrees F., and adequate means shall be provided for maintaining a temperature of not less than 70 degrees F. for three (3) days or 50 degrees F. for five (5) days

except when high early strength concrete is authorized for use, in which case, the temperature shall be maintained at not less than 70 degrees F. for two (2) days or 50 degrees F. for three (3) days or for as much more time as is necessary to insure proper curing of the concrete. The housing, covering or other protection used in connection with curing shall remain in place and intact at least 24 hours after the artificial heating is discontinued. No dependence shall be placed on salt or other chemicals for the prevention of freezing.

H. Finishing - As soon as the face forms are removed, all fins and other projections shall be removed carefully and offsets leveled and rubbed with carborundum where necessary. Pointing and filling voids shall be done only under the direction of the Owner's Field Representative. Finished concrete surfaces shall be clean, smooth, free of honeycombing, spauling, ragged edges and laitance. Finishing of concrete shall be done only by experienced concrete finishers.

I. Curing - Concrete shall be protected from the sun and kept moist for at least seven (7) days. During this period, concrete shall be maintained above 70 degrees F. for at least three (3) days or above 50 degrees F. for at least five (5) days. Exposed concrete shall be kept thoroughly wetted during the first week, and covered with polyethylene or heavy paper. Liquid membrane curing meeting the requirements of AASHTO Designation M-148 may be used upon approval of the Owner's Field Representative.

J. Protection - Every precaution shall be taken by the Contractor to protect finished surfaces from stains, abrasions or damage of any kind. Adequate protection shall be provided against injurious action by sun, wind or freezing temperatures. Fresh concrete shall be thoroughly protected from damage due to heavy rain, flowing water, freezing temperatures and mechanical injury.

3.02 DEFECTIVE CONCRETE

A. Concrete work that is not formed as indicated or is not true to alignment, or is not plumb or level, or is not true to grades or levels, is frozen, or has voids or rock pockets, or has saw dust or stains, wood or debris embedded in it, or does not fully conform to the Contract Documents, shall be considered as defective and shall be removed and replaced by the Contractor to the limits indicated by the Owner's Representative or Site Engineer at no additional cost to the Owner, with work that conforms to the Contract Documents.

END OF SECTION

SECTION 26 0530

WIRING METHODS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents, as listed on the Table of Contents and including General and Supplementary Conditions and Division 01, General Requirements, shall be included in, and made part of, this Section.

1.2 DESCRIPTION OF WORK

A. The following general systems and equipment shall be provided as a minimum, but not necessarily limited to the following:

1. Conductors – medium voltage.
2. Conduit.
3. Manholes – precast.
4. Underground duct bank system.

1.3 RELATED WORK

A. For work to be included as part of this Section, to be furnished and installed by the Electrical Subcontractor, refer to the Related Work section of Specification Section 26 0510.

B. Carefully examine all of the Contract Documents, criteria sheets and all other Sections of the specifications for requirements which affect work under this Section, whether or not such work is specifically mentioned in this Section.

1.4 WARRANTY

A. Attention is directed to provisions of the General Requirements, Supplementary General Requirements and Section 26 0510 regarding guarantees and warranties for the work under this Contract.

1.5 SUBMITTALS

A. Prepare and submit shop drawings in accordance with the requirements hereinbefore specified, and with Section 01 3300 – Submittal Procedures in the manner described therein, modified as indicated in Section 26 0510 and as noted hereinafter.

B. All shop drawings shall have clearly marked the appropriate specification number or drawing designation, for identification of the submittal.

C. Disposition of shop drawings shall not relieve the Electrical Subcontractor from the responsibility for deviations from drawing or specifications, unless he has submitted in writing a letter itemizing or calling attention to such deviations at time of submission and secured written approval from the Engineer, nor shall such disposition of shop drawings relieve the Electrical Subcontractor from responsibility for errors in shop drawings or schedules.

D. Shop drawings shall include, but shall not be limited to, the following:

1. Conductors – medium voltage
2. Conduit.
3. Manholes – precast.

4. Underground duct bank system – routing.
5. Sleeve-seal systems.

PART 2 – PRODUCTS

2.1 CONDUCTORS – MEDIUM VOLTAGE

A. General

1. The medium voltage cable shall be single conductor, ethylene-propylene rubber (EPR) insulated, shielded and jacketed power cable for medium voltage applications, and shall be in accordance with NEC Article 328. Cables shall be UL listed and designated as MV-105. Cable shall be able to withstand a fault at the magnitude indicated in the short circuit study for at least 5 seconds.
2. The cable shall be in compliance with the latest applicable edition of the following Industry Standards:

    a. AEIC CS-8
    b. ICEA S-93-639/NEMA WC-74
    c. UL 1072
    d. NFPA 70

3. Each components of the cable assembly shall contain less than 300 ppm of lead.

B. Manufacturers

1. Medium voltage conductors shall be manufactured by one of the following:

    a. General Cable
    b. Southwire
    c. Superior Essex
    d. Okonite

C. Cable Description

1. Conductor: The Class B concentric copper conductor size shall be as listed on the drawings and meet ASTM B3, and ASTM B8 or ASTM B496.
2. Strand Screen: The strand screen shall consist of an extruded semiconducting Polymeric layer over the conductor.
3. Insulation: The high quality EPR compound shall be lead free thermosetting elastomer. The insulation shall comply with the referenced specifications and shall be as follows:

Rated Voltage (Phase to Phase) kV	Conductor Size AWG or MCM	Insulation Thickness (Mils)
15	2 – 1,000	220 (133%)

D. Insulation Shielding

1. The semi-conducting insulation shielding shall be triple extruded. The thermosetting material shall meet the requirements of the referenced specifications. Extruded semi-conducting thermoplastic systems will not be acceptable.

E. Metallic Shielding

1. The minimum non-magnetic, metallic shield shall conform to UL 1072, except that a helically applied copper tape shall be at least 5 mils thick and have a minimum lap of 25%.

F. Jacket

1. A PVC jacket shall be tightly extruded over the underlying core. The jacket shall be PVC and shall comply with the referenced specifications. The overall jacket shall be printed at intervals not exceeding 24" with the following information:

   a. Manufacturer's name
   b. Plant of manufacture (Designation Code)
   c. Trade name
   d. Insulation type and thickness
   e. Conductor size and type ("Cu")
   f. Maximum working voltage and insulation level
   g. UL Type designation of cable (MV-105)
   h. UL identification - ("UL")
   i. UL rating(s), as applicable
   j. Year of manufacture

G. Factory Tests

1. Tests on completed cable shall be in accordance with AEIC CS-8 and ICEA S-93-639. Certified test reports shall be provided at time of shipment. These certified copies shall include copies of actual production test values. If the cable is drawn from a previously manufactured inventory program, Certificates of Compliance and documentation of AEIC CS-6 Qualification shall be provided prior to shipment. The cable shall also be tested as described under Part 3 of these specifications.

H. Packaging

1. Each cable length shall be durably sealed before shipment to prevent entrance of moisture. Reels and reel markings shall comply with AEIC CS-8 and ICEA S-93-639. The Electrical Contractor shall provide the manufacturer with suitable shipping lengths subject to a ±0.5% tolerance.

I. Installation

1. New cables shall be pulled through existing and new ductbanks as indicated on the drawings. Cable tension shall be monitored and shall not exceed the manufacturer's limitations.
2. Extreme caution shall be exercised while pulling cable, since energized feeders shall be present in existing manholes and ductbanks.
3. Cable racks and porcelain insulators shall be installed in new manholes. The cable racks shall be bonded to the grounding system. Cables shall be properly racked in the manholes, utilizing the cable racks and porcelain insulators. In existing manholes, the existing cable racks shall be reviewed by the Owner. If cable racks are deemed inadequate, the Electrical Contractor shall furnish and install new cable racks and supports, as required, in each existing manhole and bond same to grounding system.

J. Cable Splicing and Termination Kits

1. Modular, Reconnectable Splice and Termination Kits

   a. Power cable spices and terminations for shielded solid dielectric plastic cables shall be factory engineered kits containing all necessary components to reinstate primary cable insulation, metallic shielding and grounding systems and overall jacket to the equivalent of the cable itself.
   b. Modular spices and terminations shall form a 600 ampere, separable, insulated connection. Splices shall be 15 kV and meet the requirements of ANSI/IEEE Standard 386.

c. When assembled on cables, the spice or termination shall be capable of passing the electrical test requirements of IEEE 48-1975, IEEE 404-1986 and water immersion test of ANSI-C 119.2-1974.

1) Splice and termination kit manufacturer shall provide a test report demonstrating compliance with the above requirement.

d. Splice and termination kit manufacturer shall provide on-site demonstrations for the Electrical Subcontractor and shall provide supervision of each splice.
e. Splices and terminations shall be manufactured by 3M or approved equal.

2. All "X" and "Y" joints shall have auxiliaries, lead sleeves, compound filled.
3. All joints and cables within manholes shall be fireproofed with 3M-77 or Ply-Arc tape.

2.2 METALLIC CONDUIT

A. General

1. Raceways for feeders shall be metallic, rigid metal conduit subject to the restrictions of the National Electrical Code.

B. PVC Coated Rigid Metal Conduit (PVC-RMC)

1. PVC-RMC shall be permitted under all conditions subject to the restrictions of the National Electrical Code.
2. All fittings shall be threaded.
3. PVC-RMC and threads shall be hot-dipped galvanized inside and out. the interior galvanizing shall be listed per UL-6. The exterior galvanizing shall be listed per UL6 as primary corrosion protection.
4. Thread protectors shall be used on the exposed threads of the PVC coated conduit.
5. PVC-RMC shall be utilized at penetrations into manholes. PVC Schedule 40 conduit shall be converted to PVC-RMC within 5’ of the manhole.
6. PVC-RMC conduits shall comply the following:

a. All sections of UL-6
b. ANSI C80.1
c. NEMA RN-1 2005 standard.

7. PVC-RMC shall be manufactured by Calbond, ABB / OCAL or equal.

2.3 PLASTIC CONDUIT

A. Direct buried plastic conduit shall be Schedule 40 and concrete encased in duct banks. Conduit shall be composed of PVC, UL listed and shall conform to NEMA Standards.

B. PVC Schedule 40 conduit shall be furnished in corrosive atmosphere areas.

C. All penetrations through floor slabs, foundation walls or manhole walls shall be rigid steel conduits.

D. PVC expansion and deflection fittings shall be rated for direct burial and concrete encasement and shall be made of neoprene jacket with stainless steel straps. Fittings used for PVC conduit expansion and deflection for up to 4” conduit shall be ABB NM-XD Series or equal.

E. Plastic conduit and fittings shall be manufactured by one of the following:

1. Allied/Heritage

2. Cantex
3. ABB / Carlon
4. Prime

2.4 MANHOLES, ELECTRIC

A. Furnish and install, where indicated on the drawings, heavy duty precast reinforced concrete manholes for telecommunications and power.

B. Manholes shall have minimum internal dimensions as indicated below:

1. Electric manholes: 12'-0" by 6'-0" with a minimum head room of 6'-0".

C. Concrete Minimum Compressive Strength

1. 5000 psi at 28 days in accordance with ASTM, reinforced in accordance with ASTM specification of H-20 loading.

D. Joints between sections shall have self-aligning V-grooves and asphaltic butyl compound joint sealant.

E. Precast units shall be manufactured by Oldcastle Precast Group, American Precast, or approved equal.

F. Manholes shall be completely water resistant. All openings and penetrations shall be provided with proper seals to prevent moisture and water penetration within the manhole.

G. Frames and covers shall be cast iron heavy duty type, suitable for H-20 street loading and have machined bearing surfaces. Electric manholes shall have a minimum clear opening of 36" diameter. The word Electric as applicable shall be cast on upper side of each cover. MasterSeal HLM500, liquid, cold-applied elastomeric waterproofing membrane system shall be provided on the exterior side of the manhole.

H. Masonry collar shall be provided with extension rings as necessary to match the new final grade elevations to allow a flush cover to grade installation.

I. Manholes shall be provided with the following accessories. All steel components shall be hot dipped galvanized.

1. 7/8" pulling irons.
2. Heavy duty adjustable notched channel cable racks, arms, and free moving porcelain saddle insulators. Provide racks at maximum 3'-0" intervals.
3. Provide a 10'-0" long copper clad steel drive ground rod in each manhole, extended 6" above manhole floor. All exposed non-current carrying metal accessories, and parts in manhole shall be connected to this ground rod via bare #6 AWG copper conductors.
4. Bond ground rod to the structural rebar with a #4/0 bare copper ground conductor.
5. Sump pits with 12” square cast iron grating.

J. All spare conduits shall be provided with a blank duct plug. The blank duct plug shall be as manufactured by Tyco Electronics.

K. Underground piping passing through manhole walls, shall have penetration closures of the modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the conduit and wall opening. Links shall be loosely assembled with bolts to form a continuous belt around the conduit and with a pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide an absolutely

watertight seal between the conduit and wall, reducing chances of cathodic reaction between these members.

2.5 UNDERGROUND DUCT SYSTEM

A. Electrical Subcontractor shall furnish and install raceways and fittings for an underground duct system, as indicated on the drawings and specified herein.

B. Trade size of raceways shall be as per drawings for various systems.

C. Concrete, reinforcing rods, etc., shall be furnished and installed under this Section. The Electrical Subcontractor shall consult a structural engineer for proper placement and quantities of reinforcing rods.

D. Concrete shall be red dyed utilizing red dye mixed into the concrete.

E. Raceways shall transform from PVC to rigid steel conduit within 5'-0" of a manhole. Galvanized steel conduit shall be required within 10'-0" of either side of foundation wall. Electrical Subcontractor shall furnish and install proper coupling(s) to accommodate aforementioned transition.

F. Where offsets are required to clear obstructions and other underground services, a maximum of a 5° angle will be allowed at duct joints with prior approval of the Engineer.

G. Ducts shall be installed so as to drain to manholes.

H. All raceways as previously described shall utilize a mandrel of sufficient size to thoroughly clear raceways of all obstructions prior to installation of any wiring.

I. All concrete construction, excavation and backfill for the underground duct bank system shall be by the General Contractor.

J. Warning tape shall be provided on all duct systems to indicate route during installation.

PART 3 - EXECUTION

3.1 COOPERATION AND WORK PROGRESS

A. The Electrical work shall be carried on under the usual construction conditions, in conjunction with all other work at the site. The Electrical Subcontractor shall cooperate with the Architect, General Contractor, all other Subcontractors and equipment suppliers working at the site. The Electrical Subcontractor shall coordinate the work and proceed in a manner so as not to delay the progress of the project.

B. The Electrical Subcontractor shall coordinate his work with the progress of other Trades so that he will complete his work as soon as conditions permit. Any overtime hours worked or additional costs incurred due to lack of or improper coordination with other Trades or the Owner by the Electrical Subcontractor, shall be assumed by him without any additional cost to the Owner.

C. The Electrical Subcontractor shall furnish information on all equipment that is furnished under this Section but installed under another Section to the installing Subcontractor as specified herein.

D. The Electrical Subcontractor shall provide all materials, equipment and workmanship to provide for adequate protection of all electrical equipment during the course of construction of the project. This shall also include protection from moisture and all foreign matter. The Electrical

Subcontractor shall also be responsible for damage which he causes to the work of other Trades, and he shall remedy such injury at his own expense.

E. Waste materials shall be removed promptly from the premises. All material and equipment stored on the premises shall be kept in a neat and orderly fashion. Material or equipment shall not be stored where exposed to the weather. The Electrical Subcontractor shall be responsible for the security, safekeeping and damages, including acts of vandalism, of all material and equipment stored at the job site.

F. The Electrical Subcontractor shall be responsible for unloading all electrical equipment and materials delivered to the site. This shall also include all large and heavy items or equipment which require hoisting. Consult with the General Contractor for hoisting/crane requirements.

G. It shall be the responsibility of the Electrical Subcontractor to coordinate the delivery of the electrical equipment to the project prior to the time installation of equipment will be required; but he shall also make sure such equipment is not delivered too far in advance of such required installation, to ensure that possible damage and deterioration of such equipment will not occur. Such equipment stored for an excessively long period of time (as determined in the opinion of the Architect) on the project site prior to installation may be subject to rejection by the Architect.

3.2 INSTALLATION

A. General

1. Unless specifically noted or indicated otherwise, all equipment and material specified in Part 2 of this specification or indicated on the drawings shall be installed under this Contract whether or not specifically itemized herein. This Section covers particular installation methods and requirements peculiar to certain items and classes or material and equipment.
2. The Electrical Subcontractor shall obtain detailed information from manufacturers of equipment provided under Part 2 of this specification as to proper methods of installation.
3. The Electrical Subcontractor shall obtain final roughing dimensions and other information as needed for complete installation of items furnished under other Sections or furnished by the Owner.
4. The Electrical Subcontractor shall keep fully informed of size, shape and position of openings required for material and equipment provided under this and other Sections. Ensure that openings required for work of this Section are coordinated with work of other Sections. Provide cutting and patching as necessary.
5. All miscellaneous hardware and support accessories, including support rods, nuts, bolts, screws and other such items, shall be of a galvanized or cadmium plated finish or of another approved rust-inhibiting coating.
6. All conduit work shall be carefully cleaned and dried inside before temporarily sealing the conduits for future conductor installation use.
7. Where conduits are exposed to the weather, PVC-RMC shall be provided. PVC – RMC shall be installed by a factory trained Certified installer. PVC-RMC fittings, exposed threads and damaged coatings shall be field coated with Thomas & Betts – OCAL “Heat Cure Patch”
8. Size of rigid steel conduit, intermediate metal conduit, electrical metallic tubing and flexible metallic conduit shall be as shown on the drawings.

B. Medium Voltage Conductors

1. Provide the voltage rating, size, conductor material and number of cables indicated on the drawings.
2. Install cable identification tags on each cable at each point of access.
3. Install cables in continuous lengths whenever possible. Splices are permitted only at manholes and other points of access.

4. While pulling the cable, the maximum pulling tension as provided by the cable manufacturer shall not be exceeded. The pulling tension shall be monitored using dynamometer and recorded.
5. While pulling the cable, each individual conductor shall be attached to the pulling lead with the ball bearing swivel enabling each conductor to turn independently while being pulled.
6. While pulling the cable, cable lubricating compound(s) as recommended by manufacturer shall be used.
7. While pulling, each cable in the set shall be positively identified by a method selected by General Contractor.
8. Provide continuous insulation shielding through all splices and ground shielding at each splice and termination unless otherwise indicated on drawings.
9. In manholes or other accessible common enclosures, wrap each cable with fire retardant tape in accordance with manufacturer's instructions. To prevent unraveling, the fireproofing tape shall be random wrapped the entire length of the fireproofing with pressure sensitive glass cloth electrical tape.

C. Underground Conduits

1. Steel conduits in ground or in concrete duct banks shall be field coated with asphaltum or shall have additional outside factory coating of polyvinyl chloride or phenolic-resin-epoxy material or other equally flexible and chemical resistant material. Couplings and damaged areas of coated conduits shall be field-coated with same compound as conduits. Joints shall be threaded.
2. Joints in conduits and fittings shall be watertight and shall meet the requirements of manufacturer's installation recommendations. Threaded portions of steel conduits not encased in concrete, and adjoining ends of conduits, couplings and fittings shall be coated with asphaltum after installation. Connections between conduits of different types shall be made in an approved manner, using adapters and other materials and methods recommended by conduit manufacturers.
3. All metal conduit buried in the earth or fill shall be PVC coated galvanized steel , including couplings.
4. Excavation, shoring, bracing, backfilling and grading will be provided by the General Contractor. Trenches shall be evenly graded so that conduits slope uniformly a minimum 3" per 100'-0", without horizontal or vertical waves. Unless specified otherwise, conduit shall slope uniformly from (1) manhole to the next or from a high point between manholes to prevent pooling of water. Conduits run from building to manhole shall slope toward manhole to avoid water draining into the building. Avoid low points between manholes or upturned elbows.
5. Run conduits straight between manholes and upturned elbows. Unavoidable bends in nonmetallic conduits shall be made by assembling couplings at a slight angle if resulting radius is at least 100'-0". For radii less than 100'-0", use 5° angle couplings or 5° factory-made bend sections. Conduit shall terminate in end bells where raceway enters manholes. All conduit bends for telecommunication ductbanks shall be 12'-6" radius sweeps. Conduit bends for power cable conduits shall be minimum 36" radius.
6. Support multiple conduit runs and banks on preformed nonmetallic spacing block separators on minimum 5’-0” centers. Separator containing metal shall have metal non-continuous and shall not form a magnetic loop. Unless otherwise shown on the drawings, spacing between exterior surfaces of conduits shall be as follows:

    a. 3" between conduits containing cables operating at more than 600 volts
    b. Space conduit separators to prevent sagging of raceway and breaking of couplings and watertight seals, to maintain deformation of conduit at separators to 0.10" or less. Secure with cords where necessary. Do not use tie wires, reinforcing rods or other metallic materials.

7. Stagger conduit couplings so that couplings on adjacent conduits do not lie on the same transverse plane. Space end bells 9" center-to-center at manhole wall face for 4"

conduits and space proportionately for other sizes. Transition to end bell spacing shall start 10'-0" from face of manhole wall. Conduit slope shall equal that of main bank. Make new conduit entrances into manholes and building walls consistent with grading requirements and entrances. Waterproof all conduit entrances into manholes and buildings as required by the Architect.

8. Concrete for conduit envelopes shall be as required or as specified under Division 03. Concrete shall extend a minimum 3" beyond exterior surface of each conduit in bank. Coordinate work of this Section with that of Division 03.
9. Concrete envelopes between manholes shall be poured in a single operation. Where more than (1) pour is necessary, provide 3/4" reinforcing rod dowels extending 18" into concrete on each side of joint. Dowels shall be coated with bonded adhesive prior to the second pour. Concrete envelopes installed over extensive area of disturbed earth shall have a separate concrete base.
10. Concrete envelopes that cross other conduits or pipelines or are run under roads and driveways shall be reinforced. Provide reinforcement where envelopes connect to manhole and building walls. Concrete envelopes that terminate for future extension shall have dowels as specified for joints between pours. Reinforcement shall be as required; consult with Structural Engineer.
11. Trenches shall not be backfilled until concrete envelopes have had sufficient time to set. After concrete envelopes have set, nonmetallic conduits shall be cleared with mandrel of the same size as the conduit.
12. Where conduits cross under existing roadways, walks or other paved areas, steel conduits may be driven instead of conduits in trenches. After installation, paved grass areas and other areas disturbed shall be restored to original condition.
13. Cap ends of spare conduits 5'-0" beyond pavement and protect them from mechanical damage. Mark the location of conduit ends with concrete monuments, 6" in diameter by 18" long, set flush in the ground with "S/C" indented in the top.
14. Arrange multiple conduits as shown on the drawings. Make minor changes in location, or cross-sectional arrangement as necessary. Where conduit runs cannot be installed as shown because of conditions not discoverable prior to digging of trenches, request the Architect's instructions before further work is done. Coordinate this work with other outside service work.
15. Seal active and spare conduits with oakum or other plastic expandable compound until conductors are ready for installation.

3.3 MATERIALS AND WORKMANSHIP

A. All materials and equipment shall be new and unused and shall meet requirements of the latest Standards of NEMA, UL, IPCEA, ANSI and IEEE. Equipment shall have components required or recommended by OSHA, applicable NFPA documents and shall be UL listed and labeled.

B. Despite references in the specifications or on the drawings to materials or pieces of equipment by name, make or catalog number, such references shall be interpreted as establishing standards of quality for materials and performance.

C. Finish of materials, components and equipment shall not be less than Industry good practice. When material or equipment is visible or subject to corrosive or atmospheric conditions, the finish shall be as approved by the Architect.

D. Provide proper access to material or equipment that requires inspection, replacement, repair or service. If proper access cannot be provided, confer with the Architect as to the best method of approach to minimize effects of reduced access.

E. All work shall be installed in a neat and workmanlike manner and shall be done in accordance with all Local and State Codes.

F. The Owner will not be responsible for material, equipment or the installation of same before testing and acceptance.

END OF SECTION

SECTION 26 56 00

EXTERIOR LIGHTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The Work of this Section may include, but may not be limited to:
   1. Installation of new exterior lighting on new concrete foundations including poles and luminaires.
   2. Installation of new exterior wall mounted lighting on building exterior.
   3. Providing necessary electrical pull boxes, conduit, wiring, making of electrical splices and connections, and energizing the lights.
   4. All trenching, excavation, bedding and backfilling necessary and required for the installation of conduit, pull boxes, foundations and all other items necessary for the complete installation.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section, as well as all applicable construction, fabrication and safety standards.

B. The Contractor shall read the Geotechnical Report prepared by Carlin Simpson & Associates, "Report on Subsurface Soil and Foundation Investigation" dated July 14, 2021, revised April 20, 2022 for subsurface investigations to be fully aware of available subsurface information and current recommendations. No extra claim for ignorance shall be accepted.

1.03 REFERENCE STANDARDS

A. Comply with all industry standards and requirements of all Authorities having jurisdiction. If requirements specified conflicts with the requirements of Authorities having jurisdiction, the requirements of the Authority having jurisdiction applies.

B. The Contractor is required to obtain all permits and pay all fees for all work contained herein, which shall be included in the Contract Sum.

PART 2 - PRODUCTS

2.01 GENERAL

A. Materials and workmanship shall be in accordance with all Authorities having jurisdiction and of the best quality and free from all defects. Materials, sizes and methods of construction, not specifically covered in this Specification or indicated on the Drawings, shall be at least equal to or better than the Code Standards and as approved by the Owner's Field Representative.

2.02 SHOP DRAWINGS

A. The materials to be used in the construction shall be those indicated on the Drawings, specified herein or as required by the Authority having jurisdiction. The Contractor shall supply to the Site Engineer, prior to installation, certificates of compliance for the materials used. The Contractor shall also submit shop drawings and catalog cuts of all items and appurtenances for review by the Site Engineer, including but not limited to precast concrete foundations and pull boxes, poles, luminaires, and conduit.

2.03 CONDUIT

A. PVC - Unless indicated or directed otherwise, PVC conduit for buried installations shall be heavy-wall Schedule 40 polyvinyl chloride (PVC) conduit, shall conform to NEMA Standards, and be UL listed in conformance with the National Electric Code for the use intended. Conduit, fittings and cement shall be produced by the same manufacturer. Material must have a minimum tensile strength of 7,000 psi and compressive strength of 8,600 psi. Conduit shall be Carlon PV-DUIT or approved equal.

B. Metal - Unless indicated or directed otherwise, metal conduit shall be best grade, thick wall, threaded galvanized steel rigid conduit, bearing the manufacturer's trade-mark and the Underwriter's label, free from burrs, blisters, splits or other defects or blemishes. The galvanizing shall be by the hot-dipped sherardized or metalized process. After galvanizing, the conduit shall be protected both inside and outside by the addition of a clear enamel or similar coating for exposed installations and bitumastic asphalt compound on the outside for buried installations.

2.04 CONCRETE FOUNDATIONS

A. All materials for concrete and the composition of the mix including reinforcement shall conform to the requirements of Section 03 3053 of these Specifications entitled, "Miscellaneous Cast-in-Place Concrete". If precast concrete foundations are used, they will require review and approval by the Site Engineer. Refer to the details for the lighting standard foundation(s) on the plans, which may be prepared by Others.

B. Anchor bolts and nuts for all poles shall be furnished by the Contractor.

C. Conduit bends shall be as required and/or as shown on the details of the Drawings.

2.05 ELECTRICAL PULL BOXES

A. The electrical pull boxes to be used in the installation of the lighting system shall be of reinforced concrete construction, furnished complete with roadway type cast iron frames and covers, as may be shown and detailed on the drawings.

B. Electrical pull boxes shall be designed to accommodate an H-20 loading.

2.06 POLES AND LUMINAIRES

A. Poles and luminaires to be furnished, shall be as shown and detailed on the Drawings.

2.07 CABLES AND WIRES

A. All cables and wires including neutrals, shall be in accordance with the National Electric Code and local code standards, and shall be insulated with cross-link polyethylene insulation, UL Type XHHW.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Prior to bidding, the Contractor will be required to become aware of the nature and extent of the electrical work which may be performed by the Others, and specifically in regard to how it will affect the work that the Contractor will be doing under the site lighting work.

B. The Contractor shall also make himself aware of any site work items and operations which are to be performed by Others and which will also affect the work that he will be doing under the site lighting work.

C. The Contractor shall install exterior lighting and appurtenances in the locations shown on the Drawings and/or as directed by the Owner's Field Representative. Materials shall be of the type and sizes specified and shall be laid accurately to line and grade. Structures shall be accurately located and properly oriented.

D. The lighting standards to be installed on the building shall be in accordance with the schedule and/or detail on the Plans, and as required by the manufacturer.

E. All materials, construction and installation shall conform to the requirements of the National Electric Code, National Board of Fire Underwriters, Electric Company and all governmental bodies having jurisdiction. The work shall conform to all local and special laws and/or ordinances concerning such installations, and to any special requirements set forth herein.

F. Prior to the installation of any lighting, the Contractor must coordinate with the Owner's Field Representative. The layout of the lighting system must be approved by the Owner's Field Representative and all Authorities having jurisdiction prior to any work taking place.

3.02 EXCAVATION AND BACKFILL

A. The provisions of Section 31 2316 "Excavation, Trenching and Backfilling Including Rock Removal and Dewatering" shall govern work under this Section.

3.03 STORAGE AND HANDLING

A. Storage - Storage of lighting system and appurtenances on the job shall be in accordance with the manufacturers' recommendations, subject to the approval of the Owner's Field Representative.

B. Handling - All materials and appurtenances shall be protected against impact, shock and free fall, and only equipment of sufficient capacity and proper design shall be used in handling the materials and appurtenances.

3.04 DAMAGE AND DISTURBANCE

A. General - Materials or appurtenances which are defective from any cause, including damage caused by handling, and determined by the Owner's Field Representative as unrepairable, shall be unacceptable for installation and shall be replaced by the Contractor at no cost to the Owner.

Materials or appurtenances that are damaged or disturbed through any cause prior to acceptance of the Work, shall be repaired, realigned or replaced by the Contractor as directed by the Owner's Field Representative, at the Contractor's expense.

3.05 CONDUIT

A. General - All wiring shall be installed in conduit. Minimum depth of cover over all underground conduit shall be two (2) feet or as directed.

Conduit sizes shall be shown on the Drawings, but where not shown, the size of conduit shall be no smaller than as required by the National Electric Code for the number and size of wires and cables contained therein. No conduit shall be smaller than one and one half (1 1/2) inch diameter.

All bends shall be made with radii as long as practical, but in no case shall they be less than that allowed by the National Electric Code. Bends shall be made with the specified radii when and where indicated on the Drawings.

Conduit runs shall be straight as is practical and shall be pitched wherever possible to eliminate traps and pockets in the runs which might collect dirt or moisture.

All conduit shall be installed with a pull line to facilitate installation of cables.

B. PVC Conduit - PVC conduit shall be joined by means of solvent cement joints in accordance with the manufacturer's recommendations. Conduit shall be cut square and deburred prior to joining.

Conduit may be bent on the job providing approved heat bending equipment is used. Bending shall be performed so as not to distort or diminish the cross-section of the conduit.

C. Metal Conduit - The ends of all metal conduit shall be cut square, and reamed to remove all burrs and obstructions. When conduit ends are threaded, reaming shall be done after the threads are cut. Reaming shall be performed with a proper reamer, and not with makeshift tools.

All joints shall be made with approved galvanized threaded couplings, and the ends of the conduit shall butt squarely and solidly into the coupling.

Approved insulated grounding bushings shall be provided wherever conduit ends are exposed or open and are not to be capped or plugged.

All buried conduit shall be painted with a bitumastic asphalt compound.

3.06 CONCRETE FOUNDATIONS

A. Foundations for the lighting standards may be cast-in-place or precast with the required number of conduit bends, reinforcing, and anchor bolts as shown on the details of the Drawings. If precast concrete foundations are to be used, the Contractor shall provide anchor bolts to the fabricator of the foundations for installation at the time of pour.

If cast-in-place concrete foundations are to be used, the contractor must check the anchor bolt installation before the concrete is poured.

Concrete foundations shall be accurately located and constructed, and anchor bolts properly positioned so that the lighting standards will be in the proper and desired alignment and the luminaires all oriented in the proper direction

The top of the foundations shall be carefully leveled and finished neatly so that the lighting standard when installed, will be vertical and plumb. Shimming beyond the limits recommended by the pole manufacturer, in order to plumb the lighting standards, shall be cause for rejection of the installation. Thin mortar leveling courses will not be allowed under the base of the lighting standard. The installation shall conform to the requirements of the pole manufacturer.

3.07 UNDERGROUND ELECTRICAL PULL BOXES

A. The underground electrical pull box cover shall be placed flush with finished grade surface, and the boxes shall be installed only in areas where there will be no vehicular traffic.

3.08 FINAL TESTS AND INSPECTION

A. Upon completion of the Work and before final acceptance, the lighting system(s) shall be subjected to an inspection in the presence of the Civil Engineer, Owner's Field Representative and all Authorities having jurisdiction, to demonstrate the complete operation of the system(s) as intended. The Work shall not be considered complete until all requirements for line, grade, cleanliness, and workmanship have been met.

END OF SECTION

SECTION 31 10 00

SITE PREPARATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. The Work of this Section includes, but is not limited to:
   1. Construction, establishment and maintenance of temporary soil erosion sediment and dust control measures.
   2. Coordination with Owner and Authorities having jurisdiction.
   3. Construction layout.
   4. Clearing and grubbing.
   5. As applicable, removal and abandonment of structures, obstructions, debris and/or utilities.
   6. Protection and support of existing structures, hardscapes, and utilities to remain.
   7. Protection of existing trees, landscaping and natural features to remain.
   8. Stabilized construction access.
   9. Staging areas.
   10. Clean-up and restoration.
   11. Securing the site, including but not limited to temporary construction fencing and gates.
   12. Refer to the following Sections for additional information:
      a. Section 01 41 00 "Regulatory Requirements"
      b. Section 01 57 13 "Temporary Erosion and Sediment Control, Stormwater Pollution Control and Site Watering for Dust Control"
      c. Section 02 41 13 "Selective Site Demolition"
      d. Section 31 11 00 "Clearing and Grubbing and Selective Tree and Shrub Removal"

1.03 QUALITY ASSURANCE

A. Provide a detailed installation and termination schedule for work included in this Section. Notify the Site Engineer and all Authorities having jurisdiction prior to work taking place.

B. Comply with all industry standards and requirements of all Authorities having jurisdiction, including but not limited to the Geotechnical Engineer. If requirements specified conflicts with the requirements of Authorities having jurisdiction, the requirements of the Authority having jurisdiction applies.

C. The Contractor is required to obtain all permits and pay all fees for all work contained herein, which shall be included in the Contract Sum.

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION

3.01 CONSTRUCTION LAYOUT

A. General Requirements - The Contractor shall provide all work required in connection with the layout for construction of the Site Work. The Contractor shall be responsible for establishing property lines, easement lines, base lines, control points and benchmarks which shall be maintained and protected throughout the life of the Contract. The Contractor shall employ a licensed land surveyor, registered in the State of New York, to do the layout work, who shall establish locations, alignments, elevations, reference marks, ties, off-set lines, batter boards, etc., needed by the Contractor during the progress of the Work, and from time to time to verify such marks by instrument or other appropriate means. The Owner will provide a survey of the property and a Layout Plan.

B. Check of Layout Work by Owner's Field Representative and/or Engineer - The Owner's Field Representative and/or Engineer shall be permitted, at all times, to check the locations, alignments, elevations, reference marks, batter boards, etc., set by the Contractor, who shall correct any errors in lines, elevations, reference marks, batter boards, etc., that may be disclosed by such check. Such a check shall not be construed to be an approval of the Contractor's work and shall not relieve or diminish in any way the responsibility of the Contractor for the accurate and satisfactory construction and completion of the entire Work.

C. Contractor to Protect and Maintain Control Points - The Contractor shall be responsible for protecting and maintaining the points that he has established and also any control points that may be furnished by the Owner.

D. Contractor's Responsibility - The Contractor shall make, check, and be responsible for all measurements and dimensions necessary for the proper construction and installation of all items of work. The Contractor shall be responsible for the finished Work in conformance with the lines, grades and locations called for on the Drawings, and he shall correct all errors caused by improper layout of the Work or due to errors by his personnel at no additional cost to the Owner.

E. Payment - No additional payment will be made for construction layout; compensation shall be considered as included in the Contract Sum.

3.02 MAINTENANCE AND PROTECTION OF TRAFFIC AND PEDESTRIANS

A. The Contractor shall maintain traffic and protect pedestrians as required during the course of construction in such a manner satisfactory to the Owner's Field Representative and Authorities having jurisdiction. The Contractor shall comply with all rules and regulations of those governing bodies having jurisdiction within the site and on adjacent roadways, and he shall obtain all required permits and pay all fees, deposits and charges in connection with same.

B. The Contractor shall regulate and maintain pedestrian and vehicular traffic, post construction signs, install temporary walkways, fencing and lighting, and do such work as necessary and required for the proper safeguarding and handling of all traffic and protection of the public, in accordance with the Plans and Specifications and as shown, specified or ordered by the Owner’s Field Representative and all Authorities having jurisdiction.

C. The Contractor shall be required to submit to the Owner’s Field Representative for approval, in conjunction with his construction schedule, the method by which he plans to maintain traffic and protect pedestrians, as outlined herein. If, at any time before or during the progress of the Work, the Owner’s Field Representative deems it necessary to revise the schedule relative to maintenance and protection of traffic and pedestrians in order to expedite the Work, he may do so, and said revisions shall not be made the basis of any claim by the Contractor.

D. The Contractor shall, at all times, conduct his operations in a manner that will ensure protection of the public, businesses and Owner from injury to persons or damage to property. Disruption and inconvenience to the public, businesses and Owner shall be kept to a minimum during all phases of the construction, and work shall be performed and completed as expeditiously as possible.

E. Before construction is started and during the progress of the work, the Contractor shall prepare and erect, remove and reinstall and relocate approved construction signs to properly direct vehicular and pedestrian traffic at such points as may be directed by the Owner’s Field Representative and the governing authority having jurisdiction.

F. The Contractor shall supply and maintain all lights, flashers, fences, barricades, steel plates, trained personnel to guide traffic, and/or other protection devices necessary to adequately protect traffic and pedestrians during construction.

G. The Contractor shall not obstruct or interfere with the maintenance and operation of public or private utilities such as water, sewer, storm drains, fire alarm, street lights, traffic, electric, gas

and telephone. Proper access shall, at all times, be maintained to manholes, catch basins, hydrants, valves, splice boxes, fire alarm boxes and traffic control units.

H. The Contractor shall keep the traveled ways, both within and adjacent to the job site, free of construction material and debris such as spilled earth, stone or other objectionable material which may have fallen from transporting vehicles. Any material deposited on traveled ways as a result of the Contractor's operations shall be removed immediately by the Contractor to the satisfaction of the Owner's Field Representative and the governing body.

I. All traveled ways both pedestrian and vehicular, within the job site shall be properly maintained by the Contractor. Traveled ways shall be kept free of potholes, bumps, depressions or any other irregularities which occur as a result of the Contractor's operations and which disrupt the movement of traffic or pedestrians, as determined by the Owner's Field Representative. Refer to the plans and/or Construction Management Plan for phasing requirements, as applicable.

J. Before leaving the job site at the end of each work day, the Contractor shall provide for adequate and safe means of egress and ingress for vehicular and pedestrian traffic during non-working hours.

K. Special attention shall be given to providing satisfactory and safe travel ways for vehicular and pedestrian traffic over weekends and holidays.

L. Failure by the Contractor to properly maintain traffic and protect the public during construction will be reason for the Owner to suspend work until such time as proper measures are taken by the Contractor to correct unsatisfactory conditions, and such suspension of work shall not be made the basis of any claim by the Contractor.

M. The Contractor shall comply with all rules and regulations of those governing bodies having jurisdiction on the adjacent roadways, and he shall obtain all required permits and pay all fees, deposits and charges in connection with same. Unless stated otherwise, should police officers be required as determined by the Authority having jurisdiction, they shall be at the Contractor's expense.

3.03 STABILIZED CONSTRUCTION ACCESS

A. General Requirements - The Contractor shall install and maintain a temporary stabilized construction access to prevent the tracking or flowing of sediment onto the adjacent area and/or Public Right-of-Way.

Unless indicated otherwise, the stabilized construction access shall consist of a minimum six (6) inch compacted thickness of 1 1/2" to 2" crushed stone placed over geotextile filter fabric, Mirafi 140N or approved equal, to prevent pumping of the subsoil, installed on an approved compacted subgrade. Minimum dimensions of the stabilized construction access shall be fifty (50) feet in length and fifteen (15) feet in width unless otherwise shown or specified on the Drawings.

Minimum dimensions of the stabilized construction access shall be as detailed on the Plans.

The Contractor will be required to maintain and periodically top dress the construction access with additional clean stone or additional length as conditions warrant, as determined by the Owner's Field Representative and at no additional cost to the Owner. All sediment spilled, dropped, or tracked into the adjacent areas or Public Right-of-Way shall be removed by the Contractor immediately and the areas cleaned.

B. Should the construction access roads be inadequate as stand-alone practices as determined by the Owner's Field Representative, additional sediment and erosion control measures shall be utilized at no additional cost to the Owner (i.e. vehicle washdown areas).

3.04 STAGING AREAS

A. As required, the Contractor shall install and maintain temporary staging areas where directed by the Owner's Field Representative.

The staging areas shall be secured with appropriate construction fencing and gates. Protection shall be provided to prevent damage to underlying surfaces and/or utilities, and appropriate protections shall be provided for adjacent facilities and natural features as shown on the Plans or as directed.

Any damage incurred shall be repaired or replaced in kind to the satisfaction of the Owner's Field Representative and at the Contractor's expense.

3.05 MAINTENANCE

A. Where appropriate, the Contractor shall be responsible for the installation and maintenance of temporary facilities such as steel plates, ramps, etc, to ensure safe, adequate, and interrupted means of traffic and pedestrian flow.

B. Work shall also include snow removal as required.

3.06 CLEAN UP AND RESTORATION

A. Clean Up - The Contractor shall clean up and remove all refuse, rubbish, scrap materials, unsuitable materials and debris caused by his operations so that, at all times, the site of the Work shall present a neat, orderly and workmanlike appearance. Materials from the Contractor's operations shall not be allowed to accumulate and cause hazardous or unsightly conditions.

B. Restoration - Where and as directed by the Owner's Field Representative, the Contractor shall replace all surfaces disturbed and shall restore paving, curbing, sidewalks, driveways, gutters, shrubbery, fences, gravel and grassed areas, sod and other surfaces disturbed to a condition equal to or better than that which existed before the Work began, furnishing all labor, material, and equipment necessary thereto.

C. The Contractor shall, at said Contractor's own expense and to the satisfaction of the Owner's Field Representative, clean up and correct unsightliness, inconvenience, hazard or damage caused by water, mud, stones, dust, rubbish, construction debris, traffic, workmen or the general operations. Wheel tracks, paths, puddles, damaged growth, ragged edges, undesirable spoil from excavation and rough slopes are to be removed, obliterated, corrected, graded, leveled, patched or smoothed. All adjacent areas that have been damaged or that require regrading shall be smoothed and worked to make the Project area blend into existing conditions.

D. Unsightliness extending onto adjacent areas or private or public property shall be corrected to the satisfaction of both the owner of the adjacent property and the Owner's Field Representative, and no private agreements allowing a waiver of clean up will be recognized.

END OF SECTION

SECTION 31 11 00

CLEARING AND GRUBBING AND SELECTIVE TREE AND SHRUB REMOVAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The Work of this Section includes, but is not limited to:
   1. Clearing and grubbing and removal of all vegetation and debris.
   2. Removal of shrubs, trees and stumps designated or directed for removal.
   3. Refer to the Plans for wetland buffer mitigation required under this Contract.

1.02 REFERENCE STANDARDS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section, as well as all applicable construction, fabrication and safety standards.

B. The Contractor shall comply with the requirements of the permits and all applicable Federal, State, County, and Local statutes and ordinances relating to the prevention and abatement of soil erosion, sediment and dust, including adherence to the requirements indicated in the Stormwater Pollution Prevention Plan (SWPPP), and the Soil Erosion and Sediment Control Schedule, Plans and Details.

1.03 QUALITY ASSURANCE

A. Provide a detailed installation and termination schedule for all items of work included in this Section. Notify the Site Engineer prior to the work taking place.

PART 2 NOT USED

PART 3 EXECUTION

3.01 GENERAL

A. General Requirements - Except for the existing trees which have been designated or marked "To Be Saved" or "To Remain", the required areas shall be cleared of trees, logs, stumps, brush, vegetation, rubbish and other perishable or objectionable materials as directed. Their locations shown on the plans are not guaranteed to be exact, nor is it guaranteed that all are shown. The Contractor shall remove all trees, shrubs, and plantings, and perform clearing and grubbing as directed, whether shown on the plans or not, including the removal of trees beyond those identified on the plans, at the sole expense of the Contractor.

   All stumps and roots shall be removed in their entirety.

   Except in areas to be excavated, stump holes and other holes from which obstructions are removed shall be backfilled with suitable materials and compacted in accordance with the Contract Documents.

B. Where erosion is likely to be a problem, clearing and grubbing operations shall be scheduled so that grading operations and permanent erosion control features can follow immediately thereafter, if the Project conditions permit, otherwise temporary erosion control measures will be required between successive construction stages. Refer to Section 01 5713 of these Specifications. No work shall be started until the Erosion Control Schedule and methods of operations have been accepted by the Owner's Field Representative and Site Engineer.

C. The limit of the area of clearing and grubbing shall be commensurate with the Contractor's capability and progress in keeping the finished grading, mulching, seeding and other such permanent control measures current and in accordance with the accepted Schedule. Should seasonal limitations make such coordination unrealistic, as determined by the Owner's Field Representative, temporary erosion control measures shall be taken immediately by the Contractor.

D. Disposal - All material obtained from clearing and grubbing shall become the property of the Contractor and shall be legally disposed of off-site, subject to local codes.

END OF SECTION

SECTION 31 14 13
EARTH STRIPPING AND STOCKPILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The Work of this Section includes, but is not limited to:
   1. Stripping of earth and topsoil and stockpiling for reuse or disposal.

1.02 REFERENCE STANDARDS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section, as well as all applicable construction, fabrication and safety standards.

B. The Contractor shall comply with the requirements of the permits and all applicable Federal, State, County, and Local statutes and ordinances relating to the prevention and abatement of soil erosion, sediment and dust, including adherence to the requirements indicated in the Stormwater Pollution Prevention Plan (SWPPP), and the Soil Erosion and Sediment Control specifications, plans and details. Refer to Section 01 5713 of these Specifications.

C. The Contractor shall read the Geotechnical Report for subsurface investigations prepared by Carlin-Simpson & Associates, " Report on Subsurface Soil and Foundation Investigation" dated July 14, 2021, revised April 20, 2022, to be fully aware of available subsurface information and current recommendations. No extra claim for ignorance shall be accepted.

1.03 QUALITY ASSURANCE

A. Provide a detailed installation and termination schedule for all items of work included in this Section. Notify the Site Engineer prior to the work taking place.

PART 2 PRODUCTS NOT USED

PART 3 EXECUTION

3.01 GENERAL

A. General Requirements – Topsoil shall be stripped and required earth shall be salvaged prior to beginning excavating, fill or hauling operations by excavating and stockpiling the material at designated locations on Drawings or as designated by Site Engineer in a manner that will facilitate measurement, minimize sediment damage, and not obstruct natural drainage. The locations of stockpiles may vary during construction. The Contractor shall make no claims for extra compensation regardless of the number of times stockpiles are moved and protected by the Contractor.

B. Stripping – The Contractor shall strip the area to be excavated of all undesirable material, as directed by the Owner's Field Representative, and he shall legally dispose of the stripped material off-site.

C. After approval of the stripping operation in a "cut" area, excavation shall be made of the existing material to the lines and grades shown on the Contract Drawings or as directed. Refer to Section 31 2316 of these Specifications.

   Material encountered during excavation which is not suitable for the proposed construction shall be excavated to the depths specified by the Owner's Field Representative and/or Geotechnical Engineer and legally disposed of off-site. Material suitable for use in fills or backfills, and in quantities sufficient for those purposes shall be stockpiled and protected at on-site locations approved by the Owner's Field Representative.

D. Stripping of Topsoil - Topsoil where present, shall be stripped for its full depth within the entire limits of earthwork including the proposed building areas.

   Topsoil shall not be stripped beneath the spread of the branches of trees designated "To Be Saved" or "To Remain" unless directed otherwise by the Owner's Field Representative.

Topsoil stripping shall be completed prior to the start of general excavation in the area.

The Contractor shall use proper equipment in the stripping and removal so as to prevent incorporation of foreign or undesirable material into the material to be salvaged.

E. Stockpiling of Topsoil - Topsoil suitable for reuse shall be kept separate from other material, stored and stockpiled on the site in locations approved by the Owner's Field Representative. The Contractor shall place a silt fence or other acceptable erosion control device around stockpiles and shall cover them as directed.

F. Deficiency of Topsoil - If there is not a sufficient quantity of topsoil present on the site the Contractor shall supply from off-site source(s), the necessary quantity of topsoil to complete the topsoil operations as specified herein and on the Drawings. Specifications for topsoil furnished from off-site source(s) shall be as specified under the Article of the Specifications relating to seeding and grass establishment. All such topsoil shall be furnished under the Contract Sum.

G. Excess of Topsoil - If there is an excess of topsoil, it shall be legally disposed of off-site by the Contractor. The Contractor shall verify with the Owner's Field Representative the quantity of topsoil he estimates is to be stockpiled on the site for reuse and the quantity of topsoil which is to be disposed of. Should the Contractor dispose of too much topsoil, any deficiencies shall be replaced by the Contractor at his own expense.

H. Spreading of Topsoil - Topsoil shall be spread over the specified areas as soon as grading operations have been completed. The Contractor shall place topsoil to a minimum depth of six (6) inches on all slopes, planting areas, areas to be seeded, etc., first scarifying the subgrade to a depth of two (2) inches for the bonding of the topsoil with the subsoil. Topsoil shall be raked to an even surface and cleared of all debris, roots, stones and other unsatisfactory material.

I. Immediately upon completion of topsoil operations, slopes and all other areas to be seeded shall be seeded in accordance with the Article of the Specifications relating to seeding and grass establishment.

J. No stockpile shall exceed ten (10) feet in height.

K. All stockpiles shall be protected from sediment transport by surface roughening, watering, and perimeter silt fencing. Refer to Soil Erosion and Sediment Control Plans and Details on the Drawings, and Section 01 5713 of these Specifications.

L. Upon completion of the project or when approved by the Site Engineer, remove surplus subsoil and topsoil from site. Grade and prepare stockpile area as necessary for planting or seeding.

M. All work of this Section shall be included in the Base Bid. No extra compensation will be made.

END OF SECTION

SECTION 31 22 13

GRADING AND SUBGRADE PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The Work of this Section includes, but is not limited to:
   1. Rough grading and regrading to subgrade surface elevations of developed areas.
   2. Preparation of subgrade to include fine grading, compaction and proof-rolling.
   3. Complying with the directions of the Geotechnical Engineer.

1.02 REFERENCE STANDARDS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section, as well as all applicable construction, fabrication and safety standards.

B. Comply with requirements of the Stormwater Pollution Prevention Plan (SWPPP) and Soil Erosion and Sediment Control specification, plans and details. Refer to Section 01 5713 of these Specifications.

C. The Contractor shall read the Geotechnical Report prepared by Carlin Simpson & Associates, "Report on Subsurface Soil and Foundation Investigation" dated July 14, 2021, revised April 20, 2022, for subsurface investigations to be fully aware of available subsurface information and current recommendations. No extra claim for ignorance shall be accepted.

D. Comply with all industry standards and requirements of all Authorities having jurisdiction. If requirements specified conflicts with the requirements of Authorities having jurisdiction, the requirements of the Authority having jurisdiction applies.
   1. ASTM C-33 – Standard Specification for Concrete Aggregates.
   2. ASTM D-1557 – Part 2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cf).

1.03 QUALITY ASSURANCE

A. Provide a detailed installation and termination schedule for all items of work included in this Section. Notify the Site Engineer prior to the work taking place.

B. The installation of certain materials and infrastructure including but not limited to earthwork operations, and hardscape and utility installations, may be subject to special subgrade preparation and construction requirements. Subgrade improvement measures and special construction requirements must be followed as indicated by the Geotechnical Engineer. The most stringent requirements in the Contract Documents shall be adhered to by the Contractor.

C. The Contractor shall make sufficient checks during the grading operations to ensure the elevations are within the specified tolerances.

PART 2 PRODUCTS NOT USED

PART 3 EXECUTION

3.01 GENERAL

A. The Contractor is responsible for reporting any conditions encountered during construction which materially differ from those shown on the Drawings or indicated in the Specifications. These conditions shall be reported prior to continuing the related construction work.

B. The Contractor shall coordinate and complete his work in such a manner as to interfere as little as possible with all other contractors and/or subcontractors who may be working on the site.

C. The Contractor shall be responsible, at all times, for carrying out all grading operations in a safe and prudent manner so that all persons and property will be protected from hazard. The Contractor shall comply with all applicable safety and protection laws, rules and regulations of all Federal, State, County and Local Authorities having jurisdiction.

D. During grading operations, subgrades shall be shaped, sloped and maintained to facilitate drainage of surface water. Existing drainage routes shall not be choked or obstructed until new ones are available. Temporary culverts, pumps or other equipment shall be used to facilitate drainage if necessary. No extra payment will be made to the Contractor. Cost to be included in the price bid.

3.02 GRADING TOLERANCE

A. Contractor shall be responsible for laying out and installing all subgrades to the proper cross sections and in accordance with the lines and grades as specified on the Drawings and in accordance with the directions of the Site Engineer. Subgrades which are not constructed to the proper section, grade and/or alignment shall be corrected by repair or replacement by the Contractor at no additional cost to the Owner.

B. All subgrade surfaces prior to fine grading shall be graded to within ± one tenth (0.1) foot of the required subgrade surface elevations. This ± one tenth (0.1) foot tolerance shall balance, so that the surface can later be fine graded without adding or removing material.

C. Uniform levels and slopes shall be provided between elevations shown on the Drawings and between proposed elevations and existing elevations shown to be maintained. Abrupt changes in slopes shall be rounded in accordance with the directions of the Site Engineer.

3.03 PROOF-ROLLING AND PREPARATION OF SUBGRADE SURFACES

A. General Requirements – Immediately prior to installation, all subgrade surfaces shall be densified by proof-rolling with a large self-propelled vibratory drum roller satisfactory to the Geotechnical and/or Site Engineer making at least four (4) passes covering the entire graded area to locate and permit timely correction of subgrade deficiencies which are likely to adversely affect the performance of the structure or pavement. Proofrolling must be witnessed by the Geotechnical Engineer.

B. Cut Sections - In cut sections, proof-rolling of the subgrade surface shall be done to determine the location and extent of areas below the subgrade surface that may require subgrade undercutting. Should any portion of the cut subgrade surface fail to provide satisfactory support for the proof-rolling operation, the Site Engineer or Geotechnical Engineer may order that corrective undercut and backfill work be done. Refer to Section 31 2316 for subgrade undercutting.

C. Embankment / Fill Sections - In embankment / fill sections, proof-rolling of the subgrade surface shall be done to determine the uniformity of the compaction below the subgrade surface and to locate subgrade deficiencies requiring corrective work. Any deficiencies discovered during proof-rolling operations shall be corrected in a manner satisfactory to the Site Engineer or Geotechnical Engineer. After all corrective work has been completed, the surface shall be proof-rolled again. Corrective work shall not be considered complete and acceptable until the subgrade shows satisfactory and uniform response to the proof-rolling operations. All work necessary and required to correct subgrade deficiencies in embankment / fill sections shall be at the Contractor's expense.

D. Prior to installation, the subgrade surface shall be prepared by filling in wheel ruts, erosions and all other ground disturbances, regardless of cause, and the ground surface shall be fine graded so that after compaction the subgrade surface will be at the proper elevation (±0.05') to accommodate the structure or pavement.

E. Fine Grading - Fine grading of the subgrade shall be performed in sections, working the equipment perpendicular to the contours and constructing the respective valleys and ridges in accordance with the Drawings. Particular care shall be exercised with the grades of the valleys which lead to drain inlets and catch basins. Fine grading shall not be done when the ground is excessively wet or frozen.

F. Compaction - Fine grading of the subgrade shall be accompanied by proper compaction to the extent that the upper twelve (12) inches of subgrade shall have a density of 92% modified

proctor or as directed by the Geotechnical Engineer. Compaction shall be done by means of a roller weighing not less than ten (10) tons or other compaction equipment satisfactory to the Site or Geotechnical Engineer.

Approved compacted subgrade - minimum CRB = 10.

G. Subgrade Approval - The Site Engineer or Geotechnical Engineer must approve the subgrade prior to placement of the initial pavement course or structure. Installation of all or any portion of the work without subgrade approval is done at the Contractor's risk.

H. Protection of Approved Subgrade - Approval of the subgrade shall not relieve the Contractor of his responsibility to protect the subgrade from damage caused from excessive moisture, rutting from trucks or heavy equipment or from any other cause, and any damage occurring to the subgrade either before or during the paving operations shall be corrected by the Contractor at his own expense.

END OF SECTION

SECTION 31 23 16

EXCAVATION, TRENCHING AND BACKFILLING INCLUDING ROCK REMOVAL AND DEWATERING

PART 1 GENERAL / EXECUTION

1.01 SECTION INCLUDES

A. The Work of this Section includes, but is not limited to:
   1. Trenching and excavation necessary for construction**.**
   2. Bedding, backfill, and compaction, including furnishing approved bedding material and additional suitable backfill material as required.
   3. Rock excavation, removal, handling, and incorporation into fills and embankments as allowed or required, including use of explosives to assist in rock removal where appropriate and as permitted.
   4. Earth protection during construction.
   5. Designing, furnishing, installing, monitoring, maintaining, and removing temporary excavation support and protection systems (i.e. sheeting, shoring and bracing) as necessary and required.
   6. Designing, furnishing, installing, monitoring, maintaining, and removal of dewatering for excavations and trenches as necessary and required.
   7. Removal and disposal off-site of unsuitable and/or surplus excavated material.
   8. Complying with the directions of the Geotechnical Engineer.
   9. Where appropriate, refer to Plans by the MEP, Lighting Consultant, Structural Engineer, Geotechnical Engineer, and/or Landscape Architect for requirements associated with work indicated on their Drawings, Details, and Specifications.

B. The Contractor is responsible for the design of construction dewatering and excavation support systems. Design and installation of these systems must be coordinated.

1.02 REFERENCE STANDARDS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section, as well as all applicable construction, fabrication and safety standards.

B. Comply with requirements of the Stormwater Pollution Prevention Plan (SWPPP) and Soil Erosion and Sediment Control specification, plans, and details, and the Contractor's accepted schedule. Refer to Section 01 5713 of these Specifications.

C. The Contractor shall read the Geotechnical Report for subsurface investigations prepared by Carlin-Simpson & Associates, " Report on Subsurface Soil and Foundation Investigation" dated July 14, 2021, revised April 20, 2022, to be fully aware of available subsurface information and current recommendations. No extra claim for ignorance shall be accepted.

D. Comply with all industry standards and requirements of all Authorities having jurisdiction. If requirements specified conflicts with the requirements of Authorities having jurisdiction, the requirements of the Authority having jurisdiction applies.
   1. ASTM C-33 – Standard Specification for Concrete Aggregates.
   2. ASTM D-1557 – Part 2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cf).

E. Town of Mount Pleasant Code Article IV, Explosives, Ammunition and Blasting Agents.

F. 29 Code of Federal Regulations Ch. XVII Section 1910.109.

G. Explosive Materials Code, NFPA No. 495, National Fire Prevention Association.

1.03 SUBMITTALS

A. Shop Drawings: Include plans, elevations, sections, details, and calculations of fabrications for sheeting and shoring and method for dewatering, certified by a professional engineer who is legally licensed to practice in the State in which the Project is located. Where appropriate,

consideration must be included in the design to accommodate the needs and requirements of the adjacent facilities in the proximity where the sheeting and shoring is proposed.

B. Submittals relating to blasting (if the Contractor determines that blasting is a preferable method for rock removal and if blasting is allowed), must also be certified and designed by a professional engineer who is legally licensed to practice in the State in which the Project is located, which shall include but not limited to pre-construction survey and blasting plan, etc. Consideration must be included in the design to accommodate the needs and requirements of the adjacent facilities in the proximity where the blasting is proposed, and/or as required by the Owner.

1.04 QUALITY ASSURANCE

A. Provide a detailed installation and termination schedule for all items of work included in this Section. Notify the Site Engineer and Geotechnical Engineer prior to the work taking place.

B. Determine all environmental effects associated with the proposed work and safeguard those concerns as regulated by Law and all others, by reasonable and practical methods.

C. The Contractor shall adhere to all applicable local requirements pertaining to noise.

D. The installation of certain materials and infrastructure including but not limited to earthwork operations, and hardscape and utility installations, may be subject to special subgrade preparation and construction requirements. Subgrade improvement measures and special construction requirements must be followed as indicated by the Geotechnical Engineer. The most stringent geotechnical requirements stated in the Geotechnical Report or any other place in the Contract Documents shall be adhered to by the Contractor.

E. Should there be a deficiency of suitable material obtained from excavation of the site as determined by the Geotechnical Engineer, such additional material which is necessary and required shall be furnished from an off-site source and tested to the required standard for clean fill. In the event that such deficiency of suitable material is the result of the Contractor's failure to properly schedule the Work, stockpile the proper amount of suitable excavated material, properly protect stockpiled material from moisture or disturbance, or if the Contractor in any way, causes suitable material to become unsuitable for use as fill material because of his operations, such deficiency shall be corrected by the Contractor at his sole expense.

F. When drilling and blasting are permitted, the Contractor must employ licensed personnel, and adhere to all Local, County, State and OSHA Regulations regarding the use and storage of explosives, and he shall acquire all necessary insurance, permits and licenses. The Contractor shall be responsible for all damages due either directly or indirectly to such operations. Blasting, when permitted, shall be done only at such times as approved and under such conditions and restrictions imposed by any Authority having jurisdiction.

The drilling and blasting techniques shall be such that the resulting material conforms to the maximum size requirement for use in construction.

1.05 TRENCHING, BEDDING AND BACKFILLING

A. The Contractor shall be responsible for trench excavation of whatever material encountered, and there will be no extra compensation for any excavation, regardless of the character or type of soils or materials encountered. All excavation under this Contract shall be considered as "Unclassified Excavation" and this material shall be further classified as "Suitable Material" or "Unsuitable Material" as directed by the Geotechnical Engineer and as described in this Specification.

B. The type of materials to be used in bedding and backfilling and the method of placement shall conform to the requirements of these Specification, details on the Plans and the Geotechnical Engineer.

C. The Contractor shall protect the excavation at all times during construction. Movement of construction equipment, vehicles and loads over and adjacent to any trench shall be done at the Contractor's risk.

D. Method of Trenching - Trench excavation shall be done with excavating machinery, except in such places where work performed in this manner will injure trees, buildings or existing utilities or structures, or where the use of machinery is specifically forbidden, in which case hand methods shall be employed.

E. Preparation of Bottom of Trench - The trench bottoms shall be prepared to conform to the details on the Drawings and as specified herein. Special precautions shall be exercised to insure that pipe and conduit, when installed, will not rest on rock, masonry or any other materials which would present a non-uniform foundation. For bell and spigot pipe, bell holes shall be provided at each pipe joint to prevent bearing on the bell of the pipe. Where two or more pipes or conduits are to be laid in the same trench, the Contractor shall excavate the trench so that all pipe and conduit are laid on undisturbed or approved properly compacted material.

F. Unsuitable Material at Bottom of Trench - When the material at the bottom of a trench is unsuitable, as determined by the Geotechnical Engineer or the Owner's Field Representative, it shall be removed to such depth as directed, and backfilled with suitable and properly compacted granular material obtained from the Project excavation, or from borrow material if it is not available within the Project. Compaction of this replacement material shall be not less than 95% Maximum Modified Density (ASTM Designation D-1557), or as indicated by the Geotechnical Engineer.

G. Excavation Below Required Grade - If removal of unsuitable material and replacement with suitable material is required as a result of the Contractor's operations or negligence, it shall be the Contractor's responsibility to correct the condition at his own cost and expense, and no additional payment shall be made to the Contractor for removal and replacement of such material. Removal and replacement of material without written authorization, is performed at the Contractor's risk.

   Excavation carried below the required level without the authorization of the Owner's Field Representative shall be backfilled by the Contractor at his expense with suitable compacted granular material as directed by the Owner's Field Representative. Compaction of backfill material shall be as specified herein.

H. Unsuitable Excavated Material - Unsuitable excavated material shall be disposed of by the Contractor off-site according to all regulations.

I. Surplus Excavated Material - Excavated material which is not required for trench backfill shall be legally disposed of off-site by the Contractor. In general, suitable surplus excavated material may be used as fill material on the site.

J. Dewatering: The Contractor shall furnish a sufficient pumping plant and shall provide and maintain at his own expense satisfactory drainage wherever needed in the trench and other excavations during the progress of the Work and at its completion for final inspection. No pipe or other structure shall be laid in water and water shall not be allowed to flow or rise under any concrete or other masonry. All water pumped or bailed from the trench or other excavation shall be treated as necessary and conveyed in proper manner to a suitable point of discharge. The flow in all sewers, drains and watercourses encountered on the Work and in gutters along the sides of or across the Work shall be entirely provided for, both temporarily and permanently, as required, by the Contractor at his expense. All offensive water shall be removed from the Work at once. See paragraph 1.12 for additional information.

K. Sheeting, Shoring, and Bracing: Refer to paragraph 1.11.

1.06 EXCAVATION, GENERAL

A. The Contractor shall be responsible for all excavation of whatever material encountered, and there will be no extra compensation for any excavation, regardless of the character of the subsoil. All excavation under this Contract shall be considered as "Unclassified Excavation" and this material shall be further classified as "Suitable Material" or "Unsuitable Material" as directed by the Geotechnical Engineer as follows:
   1. Unclassified excavation shall be defined as removal of all material of any nature whatsoever, including fill material, topsoil, pavements, hardscapes, rock and earth.
   2. Suitable on-site material shall be defined as material whose composition is satisfactory for use in embankment or fill construction. In general, any mineral (inorganic) soil, including their mixtures with blasted or broken rock, as approved by the Geotechnical Engineer and similar materials of natural or man-made origin, shall be considered as suitable materials.
   3. Suitable fill supplied by the Contractor from an off-site source shall be clean sand and gravel containing less than 20% by weight passing a No. 200 sieve.
   4. All off-site soil materials to be used as fill or backfill will be evaluated, based on information submitted by the Contractor to the Geotechnical Engineer, in accordance with current environmental practice in the State of New York. The material shall be analytically tested in accordance with the NYSDEC recommended sampling requirements for imported fill prior to delivery at the site and shall meet the NYSDEC Soil Cleanup Objectives (SCOs) for Unrestricted Use or Residential Use. The evaluation of the material will be based on site characterization data and/or chemical test results submitted by the Contractor to the Geotechnical Engineer. Materials may be rejected for use based on the results of the evaluation. Off-site materials which are rejected for use, if brought to the site, shall be removed by the Contractor at his own expense. If any material leaves the site, the Contractor shall not bring material back on-site without first providing new chain of custody documentation, and performing and providing new analytical soil testing results.
   5. Unsuitable material shall be defined as any material containing vegetation or organic matter, such as muck, peat, organic silt, topsoil or sod, that is not satisfactory for use in embankment or fill construction or for support of permanent structures. Certain man-made deposits such as landfill may also be determined to be unsuitable material.
   6. Classification of all material excavated will be made by the Geotechnical Engineer, whose decision shall be final and binding upon the Contractor.
   7. Should the Contractor encounter unusual material, he shall immediately notify the Geotechnical Engineer, who will examine the material, classify it and advise the Contractor as to the method of handling. Unauthorized removal of material before it has been classified by the Geotechnical Engineer is done at the Contractor's risk.

B. After approval of the stripping operation in a "cut" area, excavation shall be made of the existing material to the lines and grades shown on the Contract Drawings. Material encountered during excavation which is not suitable for the proposed construction shall be excavated to the depths specified by the Geotechnical Engineer. Material suitable for use in fills or backfills, and in quantities sufficient for those purposes shall be stockpiled at approved on-site locations.

C. The Contractor shall be responsible for the proper scheduling of the Work and stockpiling suitable excavated material as necessary and required for use in the embankment or fill areas. Material which is stockpiled shall be properly protected by the Contractor so that its use will not be impaired. The Contractor shall place a silt fence or other acceptable erosion control device around stockpiles.

1.07 ROCK EXCAVATION

A. General Requirements - If rock is encountered, the Contractor shall excavate, remove and dispose of rock within the limits specified and in accordance with the Drawings and Specifications and/or as ordered by the Geotechnical Engineer.

B. Any discrepancy with plans and specifications regarding amount, type and depth of rock to be removed shall immediately be brought to the attention of the Geotechnical Engineer. A revised removal plan and schedule shall subsequently be provided and followed by the Contractor, at no additional cost to the Owner.

C. Unless otherwise specified or directed, rock excavation shall be carried to a minimum level of six (6) inches below subgrade surface and shall be removed a minimum level of three (3) feet in planting areas. The subgrade shall then be brought to a smooth subgrade surface with suitable, approved material and compacted to the specified density.

D. All removal, processing and handling of rock shall be considered included in the amount bid. No additional compensation shall be made.

1.08 BLASTING GENERAL REQUIREMENTS

A. Where rock cuts are necessary, the Contractor shall excavate, remove and dispose of rock within the limits specified and in accordance with the Drawings and Specifications and as approved by the Geotechnical Engineer or Owner's Representative.

B. Unless otherwise specified or directed rock excavation shall be carried to subgrade surface. Subgrade surface shall be defined as follows:
   1. Building Areas - footings, grade beams, and floor slabs.
   2. Utility Pipes and Structures - bottom of bedding, base course, or other subbase materials.
   3. Pavement, Sidewalks and Hardscapes - bottom of base course or other subbase materials.

C. Shattered Rock - if, in the course of rock excavation, the rock below grade is shattered due to over-drilling or over-blasting, and the Geotechnical Engineer considers such shattered rock to be unfit for support of structures, the shattered rock shall be removed and the excavation backfilled with concrete, screened gravel or crushed stone, as the Geotechnical Engineer directs. All such removal and backfilling shall be done by and at the expense of the Contractor.

D. Slope Preservation - In the event that rock cuts requiring drilling and blasting will be exposed after the Project is completed, all necessary precautions shall be exercised to preserve the rock in the finished slope in a natural undamaged condition, with the surface remaining reasonably straight and clean. Blast holes shall be drilled at the inclination of slope along the line of the proposed finished slope. An approved system of blasting shall be employed. The spacing of the blast holes and the method of blasting required should be dependent upon the quality and the structure of the rock encountered and the method of blasting used in approaching the slope. The Contractor shall adjust his operations to obtain the required slope conditions, as called for on the Drawings and as specified herein.

E. If the Contractor determines that blasting is a preferable method for rock removal and if blasting is allowed, rock blasting shall not be performed within five (5) feet of the finished rock slope. The remaining five (5) feet of rock shall be removed using rock hammers to achieve the finished rock slope as required.

F. In areas where rock has not been sufficiently blasted either horizontally or vertically, the Contractor shall employ whatever methods necessary to remove rock to the limits required on the project plans and/or specifications. This could include the use of localized blasting, excavators, trenchers, hydraulic hammers, splitters, rippers, or other specialized equipment.

G. Rock drilling and blasting will result in dust emissions. To minimize, such emissions, the Contractor shall utilize blasting mats, dust control materials and water the areas.

1.09 BLASTING QUALIFICATIONS

A. If the Contractor determines that blasting is a preferable method for rock removal and if blasting is allowed, prior to the start of any rock blasting under this Contract, the Contractor shall indicate his capability of performing this type of work by submitting qualifications of personnel

or firms who will be executing the blasting work. In order to prove capability and qualifications, the Contractor must include, but not be limited to the following:

1. Meeting and complying with all applicable local, state, and federal standards set forth in regulations covering the explosives phase of the work.
2. The Supervisor for blasting work employed by the Contractor or other firm engaged by the Contractor to perform blasting work on this project must be the holder of all applicable State and local licenses for blasting.
3. General qualifications and evidence of experience sufficient to be “accepted” by the Owner’s Representatives. Furnish evidence of successfully completing projects of this type and sensitivity within the last ten years. Evidence furnished shall indicate explosives operations in the blasting and excavation of rock at construction sites located in an area as heavily populated as this project site or in the immediate proximity of occupied buildings.
4. As applicable, show having successfully completed at least ten (10) projects of a similar nature or magnitude where his blasting operation was monitored by three component portable seismographs stationed in adjacent structures.
5. Submit the names and addresses of at least ten (10) projects of similar character and magnitude completed within the past five (5) years on which he has performed as the Explosives Contractor; attached also shall be the names of Architects, Engineers, General Contractors, and/or Construction Managers for these projects.
6. Present evidence of having obtained all permits as required and as specified in the General Conditions, General Requirements and the Special Conditions. The Contractor shall coordinate the work with all local, state, and federal agencies concerned, particularly any applicable State or Local Agencies having direct jurisdiction over blasting activities.

1.10 BLASTING

A. If the Contractor determines that blasting is a preferable method for rock removal and if blasting is allowed, prior to the issuance of a Building Permit, the Contractor shall prepare a Blasting Control Plan in accordance with the Town of Mount Pleasant requirements, prepared by a licensed Blasting Contractor in accordance with all applicable regulations and requirements and acceptable to the Building Inspector or other governing agency. The blasting control plan shall be submitted to the Owner and the Geotechnical Engineer for review.

B. The services of a qualified Vibration Consultant/Seismologist shall be employed by the Contractor.

C. Pre-blast surveys: Pre-blast surveys of all structures are required within 500 feet of the site that may be affected by blast vibrations. The Contractor's Vibration Consultant shall perform a pre-blast survey for the various structures surrounding the site, including on-site buildings, appurtenances, residential homes, and commercial buildings. This survey will include but not be limited to:

1. Photographs
2. Video Tape
3. Testing of Water Wells
4. Property Surveys (i.e. walls, slabs, structures, etc.)

The Vibration Consultant will notify by Certified Mail all residents and businesses located within 500 feet of the blast center regarding pre-blast survey walk-thru dates and times.

D. The Consultant’s field representatives will furnish a daily verbal report on all vibration obtained for each blast to the Owner’s Representatives, Geotechnical Engineer, Contractor, and any other individual specifically designated by the Owner.

E. A brief weekly letter report will be furnished to the Owner within four (4) working days after the final working day of that week at the site. The brief weekly letter report will be subsequently augmented by a typed, bound report cataloging, on a chronological basis, all of the results obtained as well as a full explanatory report and opinion.

F. Each typed report will contain a typed summary sheet showing the results for each blast and the following information:
   1. Date
   2. Time
   3. Instrument Location
   4. Distance and Direction of Instrument from Blast
   5. Number of Delays
   6. Total Weight (pounds)
   7. Maximum Weight Per Delay
   8. Peak Particle Velocity Criteria as defined, State and local codes.

G. The instrumentation used to record the vibration emanating from the blasting activity shall have the following capabilities.
   1. Portability
   2. The capability or recording in three mutually perpendicular planes (Transverse, Vertical and Longitudinal)
   3. Have a useful frequency range (flat response from 2-200 Hz)
   4. The seismometer case resonance should be beyond the pass band of the instrument (greater than the useful frequency range)
   5. Be equipped with the capability to provide immediate calculation subsequent to the discharge of a given blast.
   6. Be equipped with a variable calibrated attenuator to increase or decrease the sensitivity range of the instrument.

H. When drilling and blasting are necessary, the Contractor must employ licensed personnel, and adhere to all Local, County, State, and OSHA Regulations regarding the use and storage of explosives, and he shall acquire all necessary insurance, permits and licenses. The most stringent regulations shall apply. The Contractor shall be responsible for all damages due either directly or indirectly to such operations.

I. Prior to the commencement of any drilling or blasting operation, a project meeting relative to the method, manner and procedure of blasting operations shall be held at the site with the Owner, the Contractor, the project blaster, the blasting consultant, and representatives of all concerned agencies, including utility companies.

J. The Contractor shall assume full responsibility for the safety of the blasting operations and perform the work in the manner that will ensure the safety of personnel and that of existing structures, buildings, and new construction. The Contractor shall be fully responsible for the restoration and/or replacement of all utilities, equipment, buildings or structures damaged by his operations at no cost to the Owner.

K. Review by the Owner's Representatives, the Engineer, or their consultants, of the Contractor's blast design shall not relieve the Contractor of his responsibilities for obtaining adequate rock breakage, to plan and monitor the blasting and to protect adjacent structures and utilities from damage.

L. Wherever explosives are used, they shall be of such character and strength and in such amounts as is permitted by the State and local laws and ordinances and all respective agencies having jurisdiction over them. In special cases the right is reserved for the Owner and those agencies to specify the maximum size of the charges.

M. Blasting shall be done only at such time as the Owner and those regulatory agencies shall approve and under such restrictions as they may impose. Prior to each blast, the surrounding property owners must be notified in writing by the Contractor at least 24 hours prior to the blast being executed.

N. The Contractor shall notify the Building Inspector and Police Department of impending blasts as required by the Town of Mount Pleasant requirements.

O. The Contractor shall provide all labor, materials and equipment to complete the required rock excavation and removal of blasted material in accordance with the Contract Documents. The Contractor shall himself be, or obtain the services of a qualified Explosives Contractor. This work shall include, but not be limited to:
   1. Examination of all pertinent Plans and Specifications, as well as visit the site, in order to ascertain to his own satisfaction, the conditions under which he must perform the work and he agrees he will make no claim for damages or other compensation should he find conditions during progress of the work different from those calculated or anticipated by him.
   2. The Drawings indicate the highest elevations to which the excavations shall be carried regardless of the bearing capacity of encountered material. If bedrock is to support piers, footings, walls, etc.; the excavation shall continue until rock is encountered which satisfies the requirements of the Engineer. When in the Engineer's opinion any excavated area does not satisfy the bearing capacity requirements, the excavations shall continue to such greater depth as may be directed.
   3. Excavations made to lower elevations than indicated on the Drawings unless authorized as indicated in the paragraph above, are made by the Contractor without additional compensation. Excavations, which are carried to lower depths than required, shall be filled to the required elevations with suitable material as defined by the Engineer.
   4. The Contractor shall at his own expense make arrangements with the local authorities to provide adequate personnel to prevent unauthorized persons from entering the danger zone. He shall coordinate his operation with proper local authorities to provide necessary, signs, barricades, etc., to restrict traffic from the danger zone. This shall be coordinated through the Owner's Representatives.

P. Perform all blasting as required. Blasting charges shall be limited so as not to damage the existing utilities, structures, and buildings in the general vicinity. The Contractor is solely and entirely responsible for the safety of such utilities, structures and buildings in the general vicinity and liable for any damage or injury caused thereby or resulting there from.
   1. Without in any way limiting the agreement, the handling, transportation, storage and use of explosives shall conform to the requirements of governmental authorities having jurisdiction and shall follow all applicable provisions as adopted by the Institute of makers of Explosives, OSHA and present Local Regulations including the State of New York.
   2. The quantity of explosives used in any charge shall be controlled by observations of permanent recording portable seismographs placed by the services of a qualified Vibration Consultant/Seismologist employed by the Contractor, capable of recording ground vibration. These instruments will be placed as shown on the site plan attached to the Blasting Program Report.
   3. All blasting at this site shall be conducted so that the resulting ground vibrations within the any existing buildings (on-site and off-site) and utilities does not exceed a Resultant Peak Particle Velocity as set forth in the Section 1.3 Reference Standards and recorded on the seismic instrument located at the closest proximity to the blasting activity.
   4. The Peak Particle Velocity emanating from any blast will meet the Town of Mount Pleasant blasting requirements and/or any applicable site-specific criteria developed by the Owner's vibration consultant.
   5. Blasting near fresh concrete shall meet the following criteria:

Concrete Age	PPV (in/sec)
>7 days	1.25
3-7 days	1.00
1-3 days	0.50
0-24 hours	0.25

   6. In the event the resulting ground vibrations from any blast that exceeds the vibration criteria at this instrument location, the blasting activities shall cease until the Contractor contacts the owner and makes a significant adjustment in his loading pattern including

hole spacing, depth of holes, delay sequence and poundage per delay interval. The blaster will be kept informed on the vibration results at each location in order to preclude this type of occurrence.

7. The use of explosives shall be limited to labor skilled in their use and all work shall be performed under the direct supervision of licensed blasters. Blasting programs including the amount and type of explosives and the number and type of delays to be used shall be submitted to and approved by the Owner's Representative. The Blaster, for each blast detonated on each working day, shall maintain a Daily Log. This log shall include the date, exact time of firing, number of holes, depth of holes, total poundage used, the distribution of instantaneous and millisecond delay caps, poundage per delay and location of spacing of drill holes. This log shall be submitted to the Owner's Representatives at the end of each working day.
8. No larger quantities of explosives or blasting caps shall be stored at the site at any time than will be required for one day's work. There shall be no on-site overnight storage of explosives or blasting caps and delivery shall be in accordance with all applicable rules and regulations of the State of New York and the local governing agency.
9. During blasting operations, flying debris shall be controlled by the use of woven steel wire mats or other suitable means in order to contain this material within a safe area so as to prevent damage to the adjacent utilities, structures and buildings in the immediate area or to block the use of adjacent areas. Consent by the Owner or Owner's Representatives to these means shall not relieve the Contractor of responsibility to execute the work safely or select other means that will avoid damage or prevent the use of the adjacent facilities. The Contractor shall pay any fines imposed for violation of local ordinances relating to the use of explosives.
10. It is to be noted here that blasting mats of sufficient number to restrict rock movement to a safe area must be used on all blasts conducted at this site.

Q. All of the blasts shall be drilled and loaded in order to achieve the optimum rock breakage desired for this work and to facilitate its removal from the site or for re-use as compacted fill.
   1. The Contractor shall exercise extreme care in the drilling and blasting operations so that the remaining rock remains stable and to reduce over break to a practical minimum.
   2. Immediately subsequent to the discharge of each blast, the recorded results of ground vibrations will be analyzed to determine the Resultant Peak Particle Velocity level emanating from that particular blast.

1.11 SUBGRADE UNDERCUTTING

A. General Requirements - The Geotechnical Engineer shall inspect the areas of cut to determine if any undercut excavation is required and the extent of such undercutting. The Contractor shall, upon written authorization, excavate, remove and dispose of any such unsuitable material and replace same with compacted fill material in accordance with these Specifications to proper grade as called for on the Drawings.

B. Payment - No additional payment will be made for such undercut excavation and replacement with suitable material as directed; compensation shall be considered as included in the Contract Sum.

1.12 SHEETING, SHORING AND BRACING

A. Requirements - At his own expense, the Contractor shall furnish, install and maintain such sheeting, shoring, bracing and cofferdamming, etc., as may be needed to support the sides and roofs of excavations and to prevent any earth or rock movements which might in any way diminish or affect the necessary width of the excavation, endanger the safety of persons, injure or delay the Work, or jeopardize the safety of adjacent pavements, property, buildings or other structures. The Contractor shall retain a NYS licensed Professional Engineer to design these systems. The work of sheeting, shoring and bracing shall, at all times, be in accordance with the requirements of all Authorities having jurisdiction, including OSHA.

B. Contractor to be Solely Responsible - The Contractor shall be entirely and solely responsible for the adequacy and sufficiency of all supports and of all sheeting, bracing, shoring, cofferdamming, etc. The Contractor shall assume entire and sole liability for damages on account of injury to persons, adjacent pavements, and public and private property including, but not limited to, the work under construction, buildings and other structures, which injury shall result directly or indirectly from the Contractor's failure to install or to leave in place adequate and sufficient supports, sheeting, bracing, shoring, cofferdamming, etc.

1.13 DEWATERING

A. Dewatering of Excavations - It is expected that dewatering of certain trenching and excavations will be required.

At a minimum, dewatering should be expected during installation of the cutoff drains in the cut slope to the east of the building and during excavation of the stormwater management area to the north of the building.

Whether dewatering is required will depend on such factors as the time of the year, the amount of precipitation, the actual nature of the soil, and the natural groundwater level at each excavation. Where water is encountered, the Contractor may attempt to control groundwater levels with open pumping using a system of ditches and sumps. However, control of groundwater shall be accomplished utilizing the design prepared by the Contractor's professional engineer that will preserve the strength of the foundation soils, will not cause instability of the excavation or slopes, will not cause erosion problems, and will not result in damage to existing structures. Where necessary to accomplish these purposes, the water level shall be lowered in advance of excavation by a dewatering system.

B. At certain locations, it is anticipated that a combination of deep wells and sumps/pumps may be required for dewatering inside and outside the excavation. The design and installation of the dewatering system must be coordinated with the design and installation of the excavation protection system at these locations. It is the Contractor’s responsibility to install dewatering systems that will protect the subgrade from softening and will prevent undermining, washout, and damage from water infiltration and/or accumulation

C. Whatever method of groundwater control is used (e.g., ditches, sumps, well points, etc.), the groundwater level shall be maintained at least two (2) feet below the bottom of the excavation.

D. Off-Site discharge shall adhere to all Local, State and Federal regulations.

E. The on-site treatment of the dewatered groundwater shall be performed in accordance with the Town and/or State requirements prior to discharge. As applicable, the treatment system shall be setup in a manner to allow for the collection of pre- and post-treatment samples if required.

F. Open pumping with ditches and sumps, if it results in boils, loss of fines, softening of the ground, or instability of slopes, will not be permitted. If wells or well points are to be used, they shall be installed with suitable screens and filters so that continuous pumping of fines does not occur. The discharge shall be arranged to facilitate collection of samples by the Geotechnical Engineer, if required by Authorities having jurisdiction. The Geotechnical Engineer will be present for excavation operations to determine if sufficient control of ground water levels is being maintained.

G. Method of Disposal - The water from the excavations shall be filtered to catch sediment, and disposed of in such a manner as will not cause injury or damage to the public health, public or private property, nearby water courses, drainage ways, water impoundment areas, the work contemplated or in progress, surfaces of the streets, nor cause any interference with the use of the same. The disposal of this water shall be done in a manner satisfactory to the Site Engineer, the Geotechnical Engineer, and Authorities having jurisdiction.

1.14 BEDDING

A. General Requirements - Bedding in trench for pipe and conduit shall be as shown in detail on the Drawings and as specified herein. Requirements for bedding shall be as follows:

B. Refer to Geotechnical Report for bedding of utilities under the following conditions:
   1. Utilities underlain by peat/organic silt.
   2. Utilities in rock, boulder and debris fill.
   3. Utilities in existing soil fill and virgin soil.

C. Standard Bedding - shall consist of bedding the pipe or conduit on a properly prepared foundation of natural undisturbed earth for trench excavation in cut areas and properly compacted earth for trench excavation in fill areas as shown in detail on the Drawings. The bed shall have recesses to receive the bell of bell and spigot pipe.

D. Select Bedding - shall consist of a bed of properly compacted granular bedding material (sand or crushed stone as specified) having a compacted thickness of at least six (6) inches below the bottom of the pipe or conduit and extending around the pipe or conduit for at least 30% of its diameter or rise. The layer of bedding material shall be shaped to fit the pipe or conduit for at least 15% of the outside diameter or rise of the pipe or conduit and shall have recesses shaped to receive the bell of bell and spigot pipe. Sand bedding shall be clean, well-graded sand consisting of hard, durable particles free from lumps of clay, loam and all other deleterious substances. Crushed stone bedding shall be well-graded crushed stone conforming to ASTM Designation C-33, size No. 67. When Select Bedding is specified, the Contractor shall furnish, place and compact all necessary and required select bedding material at no additional cost.

   Select Bedding shall be used for all polyethylene and polyvinyl chloride pipe and conduit installation. Except for polyethylene and polyvinyl chloride pipe and conduit installation, and unless otherwise shown on the details of the Drawings, specified or directed by the Owner's Field Representative or Geotechnical Engineer, Standard Bedding may be use.

1.15 BACKFILLING

A. General Requirements - Upon approval by the Geotechnical Engineer of bedding and by the Site Engineer for pipe installation, and after proper inspection and tests have been made, excavations shall be backfilled by the Contractor with the type of backfill material specified. Excavations shall be backfilled and compacted as specified herein and in accordance with the details of the Drawings using the following materials:
   1. Standard Backfill - shall consist of on-site material (earth) approved by the Geotechnical Engineer. Should there be a deficiency of proper on-site material for backfilling, the Contractor shall furnish, place and compact additional suitable backfill material, at no additional cost.
   2. Select Backfill - shall consist of granular material (sand or crushed stone as specified) as approved by the Geotechnical Engineer. Sand shall consist of clean, well graded, hard, durable particles, free of lumps of clay, loam and all other deleterious substances. Crushed stone shall consist of well graded crushed stone conforming to ASTM Designation C-33, Size No. 67. When Select Backfill is specified, the Contractor shall furnish, place and compact all necessary and required select backfill material at no additional cost.

B. Refer to Report by Geotechnical Engineer for backfilling of trenches under the following conditions:
   1. Utilities underlain by peat/organic silt.
   2. Utilities in rock, boulder and debris fill.
   3. Utilities in existing soil fill and virgin soil.

C. All backfill material shall be free from large stones, clods, topsoil, sod, frozen earth, wood or any other objectionable material as determined by the Geotechnical Engineer.

D. For all polyethylene and polyvinyl chloride pipe and conduit installation, Select Backfill shall be used to backfill the trench until there is a minimum of six (6) inches of cover over the pipe or conduit. Above this level, and unless specified otherwise or directed, Standard Backfill may be used.

E. Except for polyethylene and polyvinyl chloride pipe and conduit installation and unless otherwise shown on the details of the Drawings, specified, or directed, Standard Backfill may be used.

Where use of Standard Backfill is permitted, the material used to backfill the trench up to a level two (2) feet above the top of the pipe shall be approved clean earth and shall contain no stone or broken rock greater than one (1) inch in size. Above a level two (2) feet higher than the top of pipe, the material used for backfill shall be approved material, which may contain not more than fifteen (15) percent stone or broken rock with no stone or piece thereof exceeding four (4) inches in size. Such stone or broken rock shall be thoroughly mixed with the earth so that there will be no voids in the backfill.

F. Placement and Compaction - Backfill for trenches shall be placed evenly and carefully around and over the pipe or conduit in six (6) inch maximum layers. Each layer shall be thoroughly and carefully compacted until twelve (12) inches of cover exists over the pipe or conduit. The remainder of the backfill may then be placed and compacted in maximum twelve (12) inch layers. Each layer shall be compacted by approved mechanical tamping machines.

Backfill shall be compacted to not less than 95% Maximum Modified Density, or as directed by the Geotechnical Engineer, in accordance with ASTM Designation D-1557 in the manner herein described.

Backfill shall proceed up to the lines and grades as shown on the Drawings and/or as directed. Backfill areas which settle shall be corrected by the Contractor at the Contractor's expense.

G. Removal of Sheeting - During backfill operations, no sheeting which is to be removed shall, at any time, extend into the backfill which is being compacted. The sheeting shall be withdrawn so as to always be above the backfill.

Any voids created while removing sheeting shall be immediately corrected by filling with select backfill material and compacting to the required density by the Contractor.

H. Protection - The Contractor shall be responsible for safeguarding all pipes, conduits and structures being backfilled, and any damage occurring to same either during the backfilling operations or after the backfilling operations have been completed shall be corrected by the Contractor at the Contractor's expense

END OF SECTION

SECTION 31 23 23

FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The Work of this Section includes, but is not limited to:
   1. Filling of designated areas on the site.
   2. Formation and compaction of fill sections and embankments to the designed elevations.
   3. Refer to the Geotechnical Engineer's plan(s) and specification(s) for slope stabilization requirements necessary for the construction of the steep slope to be located in the rear of the proposed building as shown on the plans.
   4. Dewatering as necessary and required, including protection of work.
   5. Earth protection during construction.
   6. Complying with the directions of the Geotechnical Engineer.

1.02 REFERENCE STANDARDS / REGULATORY REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section, as well as all applicable construction, fabrication and safety standards.

B. Comply with requirements of the Stormwater Pollution Prevention Plan (SWPPP) and Soil Erosion and Sediment Control specifications, plans, and details, and the Contractor's accepted schedule. Refer to Section 01 5713 of these Specifications.

C. The Contractor shall read the Geotechnical Report prepared by Carlin Simpson & Associates, "Report on Subsurface Soil and Foundation Investigation" dated July 14, 2021, revised April 20, 2022, for subsurface investigations to be fully aware of available subsurface information and current recommendations. No extra claim for ignorance shall be accepted.

D. Comply with all industry standards and requirements of all Authorities having jurisdiction. If requirements specified conflicts with the requirements of Authorities having jurisdiction, the requirements of the Authority having jurisdiction applies.
   1. ASTM D-1557 – Part 2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cf).

1.03 QUALITY ASSURANCE / SUBMITTALS

A. Refer to Section 31 2316 for work that may be required prior to commencement of fill or embankment operations.

B. Provide a detailed installation and termination schedule for all items of work included in this Section. Notify the Site Engineer and Geotechnical Engineer prior to the work taking place.

C. The installation of certain materials and infrastructure including but not limited to earthwork operations, and hardscape and utility installations, may be subject to special subgrade preparation and construction requirements. Subgrade improvement measures and special construction requirements must be followed as indicated by the Geotechnical Engineer. The most stringent geotechnical requirements stated in the Geotechnical Report or any other place in the Contract Documents shall be adhered to by the Contractor.

D. Should there be a deficiency of suitable material obtained from excavation of the site as determined by the Geotechnical Engineer, such additional fill material which is necessary and required shall be furnished from an off-site source and tested to the required standard for clean fill at the Contractor's expense. In the event that such deficiency of suitable material is the result of the Contractor's failure to properly schedule the Work, stockpile the proper amount of suitable excavated material, properly protect stockpiled material from moisture or disturbance, or if the Contractor in any way, causes suitable material to become unsuitable for use as fill material because of his operations, such deficiency shall be corrected by the Contractor at his sole expense.

PART 2 PRODUCTS

2.01 GENERAL

A. Fill supplied by the Contractor from an off-site source shall be clean sand and gravel containing less than 20 percent by weight passing a No. 200 sieve. All fill shall meet with the approval of the Geotechnical Engineer. (Refer to 3.02 C)

PART 3 EXECUTION

3.01 GENERAL

A. Prior to placing fill, the Contractor shall make sufficient checks on the topographic conditions to satisfy himself that the existing elevations are as shown by the topographic survey and on the Contract Drawings. Should any discrepancies be found they shall be reported in writing prior to commencement of any work. The Contractor shall also check the plan utility elevations to insure they are in the same datum.

B. The Contractor is responsible for reporting any conditions encountered during construction which materially differ from those shown on the Drawings or indicated in the Specifications. These conditions shall be reported prior to continuing the related construction work.

C. The Contractor shall coordinate, cooperate and complete his work in such a manner as to interfere as little as possible with all other contractors and/or subcontractors who may be working on the site.

D. The Contractor shall locate existing underground utilities in the area of the Work before starting operations. Where utilities are to remain in place he shall provide adequate means of protection during his operations. The Contractor shall notify all utility owners and all Authorities having jurisdiction seventy-two (72) hours prior to the start of work.

E. The Contractor shall carry out filling operations and embankment to the required elevations which conform with the grades as shown on the Drawings.

F. Refer to the Geotechnical Engineer's plan(s) and specification(s) for slope stabilization requirements necessary for the construction of the steep slope to be located in the rear of the proposed building as shown on the plans.

G. All earthwork operations shall be carried out under the control of the Geotechnical Engineer retained by the Owner at the Owner's expense. The Geotechnical Engineer will have technical personnel on the site, who will conduct as many tests as they feel necessary to insure proper control of the moisture, density, compaction and other qualities of the Work. The Contractor shall abide by the results of such tests and the recommendations of the Geotechnical Engineer in the full conduct of the Work and in the correction of conditions which are unsatisfactory and not in accordance with the Drawings and Specifications. The Work will not be accepted until certified by the Geotechnical Engineer to be in compliance with the Drawings and Specifications.

H. During filling operations, pits, cuts, excavation areas and/or embankments shall be shaped, sloped and maintained to facilitate drainage of surface water. Existing drainage routes shall not be choked or obstructed until new ones are available. Temporary culverts, pumps or other equipment shall be used to facilitate drainage.

I. Where steep slopes or abrupt grade changes occur, temporary berms or dikes shall be installed at the top to direct the flow of water to control point(s) to be transported downslope by slopes drain(s). Slope drains shall be constructed with an apron at the top to direct the water and rubble stone at the bottom to prevent scouring the soil.

J. The Contractor shall be responsible, at all times, for carrying out all filling and embankment operations in a safe and prudent manner so that all persons and property will be protected from hazard. The Contractor shall comply with all applicable safety and protection laws, rules and regulations of all Federal, State, County and Local Authorities having jurisdiction.

K. No extra payment will be made to the Contractor for fill and associated work required under this Contract. Costs shall be included in the amount bid.

3.02 EMBANKMENT / FILL

A. The Contractor shall be responsible for all fill and embankment construction regardless of the material encountered or the character of the subsoil, as directed by the Geotechnical Engineer. There will be no extra compensation to the Contractor. All fill and embankment work under this Contract shall be considered as included in the amount bid.

B. General Requirements - Suitable material removed from excavations, as determined by the Geotechnical Engineer shall be used as directed in the formation of fill sections, embankments, subgrade, etc.

1. Suitable on-site material shall be defined as material whose composition is satisfactory for use in embankment or fill construction. In general, any mineral (inorganic) soil, including their mixtures with blasted or broken rock, as approved by the Geotechnical Engineer and similar materials of natural or man-made origin, shall be considered as suitable materials.
2. Unsuitable material shall be defined as any material containing vegetation or organic matter, such as muck, peat, organic silt, topsoil or sod, that is not satisfactory for use in embankment or fill construction or for support of permanent structures. Certain man-made deposits such as landfill may also be determined to be unsuitable material.

The Geotechnical Engineer may direct that excavated material from certain areas or certain strata is unsuitable for use under paved areas but that such material may be suitable for deposit in deep fills or embankment areas outside of the paved areas.

The Geotechnical Engineer may also direct that excavated material from certain areas or certain strata is unsuitable for use on the site, and such unsuitable material shall be disposed of off-site as herein specified, under the Contract Sum.

C. Borrow Material - As required, the Contractor shall supply any clean required borrow material from off-site source(s), under the Contract Sum.

All off-site materials to be used will be evaluated, based on information submitted by the Contractor to the Geotechnical Engineer, in accordance with current environmental practice in the State of New York. The material shall be analytically tested in accordance with the NYSDEC recommended sampling requirements for imported fill prior to delivery at the site and shall meet the NYSDEC Soil Cleanup Objectives (SCOs) for Unrestricted Use or Residential Use. The evaluation of the material will be based on site characterization data and/or chemical test results submitted by the Contractor to the Geotechnical Engineer. Materials may be rejected for use based on the results of the evaluation. Off-site materials which are rejected for use, if brought to the site, shall be removed by the Contractor at his own expense.

All fill shall meet with the approval of the Geotechnical Engineer.

Fifty (50) pound bag samples of each material to be used as fill shall be submitted to the Geotechnical Engineer ten (10) days prior to commencing filling operations. The Geotechnical Engineer shall also have the opportunity to visit and inspect the proposed borrow area prior to its use. This material shall not be used as fill until approved by the Geotechnical Engineer.

Final acceptance of fill material shall rest with the Geotechnical Engineer, whose decision shall be final and binding upon the Contractor. The acceptance of any sample material by the Geotechnical Engineer shall not relieve the Contractor of the responsibility to have all fill material used conform to the approved samples.

D. Compaction of Embankment Foundation - Prior to placing fill, the Contractor shall compact to a depth of one (1) foot, the exposed embankment foundation to the densities hereinafter specified, by proof-rolling with a large self-propelled roller satisfactory to the Geotechnical Engineer. The cost of all such work shall be included in the Contract Sum.

E. Placing of Fill - Fill shall be placed and compacted to the required elevations (adjusted to subgrade) indicated on the Drawings. Fill shall be compacted with a large self-propelled roller, satisfactory to the Geotechnical Engineer.

Fill sections and embankments shall be constructed in accordance with the recommendations of the Geotechnical Engineer.

When fill is to be placed in existing paved areas, the Contractor shall scarify, break and remove the pavement prior to placing the fill as approved by the Site Engineer or Geotechnical Engineer.

When fill is to be placed on existing slopes steeper than 4 horizontal to 1 vertical, the existing slope shall be benched in accordance with the details shown on the Drawings and/or as approved by the Geotechnical Engineer. In all slope areas, fill material shall be bladed into the adjacent existing material for a horizontal distance of at least five (5) feet. All methods employed in the placing of fill on existing slopes shall be subject to the approval of the Geotechnical Engineer. Embankments shall be pitched to provide drainage at the close of each day's operations. In no case shall the slope of fill construction exceed a ratio of 3 horizontal to 1 vertical, except as specifically shown on the plans, or approved by the Geotechnical Engineer.

F. Compaction of Fill - Prior to commencing fill operations, the Contractor shall supply data on the compaction equipment to the Geotechnical Engineer.

Prior to compaction, each layer shall be leveled off by use of blade graders or bulldozers with adequate power for the work involved. The entire area of each layer shall be compacted by making no less than four (4) passes over the area with a large self-propelled roller or other mechanical means satisfactory to the Geotechnical Engineer.

Place backfill and fill soil materials in layers not more than twelve (12) inches in loose depth for material compacted by heavy compaction equipment, and not more than four (4) inches in loose depth for material compacted by hand-operated equipment. Compaction shall be continued until each layer is thoroughly consolidated to the required degree of compaction for its full width.

Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D-1557:

1. Under structures, building slabs and steps, compact each layer of backfill or fill soil material at 95 percent.
2. For soil slope areas, compact each layer of backfill or fill soil material at 95 percent.
3. For utility trenches, compact each layer of initial and final backfill soil material at 95 percent.
4. Under walkways, pavements, and hardscapes, compact each layer of backfill or fill soil material at 92 percent.
5. Under turf or unpaved areas, compact each layer of backfill or fill soil material at 90 percent.

The use of hauling equipment to obtain partial compaction may be acceptable, however compaction meeting the satisfaction of the Geotechnical Engineer for each lift will be required. Construction and hauling equipment shall be routed evenly over the area in order to avoid the creation of ridges, hollows and zones of non-uniform density.

Compaction requirements shall be in accordance with the recommendations of the Geotechnical Engineer.

G. Frost - No fill shall be placed when the fill material, the embankment foundation or the previous lift on which fill is to be placed is frozen. In the event that any fill which has already been placed or the embankment foundation shall become frozen before the next lift is placed, it shall be scarified and recompacted or removed, to the approval of the Geotechnical Engineer.

H. Moisture - If, in the opinion of the Geotechnical Engineer, fill material becomes too wet for the required compaction, prior to commencing or continuing compaction operations, the fill shall be dried by a method approved by the Geotechnical Engineer. If the fill material becomes too dry for the required compaction, the fill shall be moistened prior to commencing or continuing compaction operations, by a method approved by the Geotechnical Engineer.

I. Protection of Fill - Protection of all compacted lifts shall be the responsibility of the Contractor. Damage to any compacted lift, including those lifts previously tested and approved by the Owner's Field Representative and/or the Geotechnical Engineer, occurring at any time during the course of construction, caused by equipment, from moisture entering the embankment, or from any other cause whatsoever, shall be fully repaired by the Contractor prior to placement of overlaying materials, at his own expense and to the complete satisfaction of the Owner's Field Representative and/or the Geotechnical Engineer.

In the event of heavy rains, the Contractor shall suspend fill operations immediately and shall take all necessary steps to keep the site as well drained as possible. Fill operations shall not be resumed until the moisture content of the fill is such as to permit compliance with these Specifications.

All corrective work or operations necessary to maintain proper moisture control of the fill material shall be at the expense of the Contractor.

END OF SECTION

SECTION 31 32 00

STORMWATER BASIN MAINTENANCE PATH

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The work of this section includes but is not limited to:
   1. Installation of the Geoweb® geocell system for load support for the maintenance access path(s) as shown and detailed on the Plans and as specified herein.
   2. Refer to Section 32 15 40 for crushed stone surfacing and infill.
   3. Refer to Section 31 22 13 for for grading and subgrade preparation.
   4. Refer to Section 32 11 16 for subbase course.

1.02 REFERENCE STANDARDS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section, as well as all applicable construction, fabrication and safety standards.

B. Comply with requirements of the Stormwater Pollution Prevention Plan (SWPPP) and Soil Erosion and Sediment Control specification, plans, and details, and the Contractor's accepted schedule. Refer to Section 01 5713 of these Specifications.

C. The Contractor shall read the Geotechnical Report for subsurface investigations prepared by Carlin-Simpson & Associates, " Report on Subsurface Soil and Foundation Investigation" dated July 14, 2021, revised April 20, 2022, to be fully aware of available subsurface information and current recommendations. No extra claim for ignorance shall be accepted.

D. Comply with all industry standards and requirements of all Authorities having jurisdiction. If requirements specified conflicts with the requirements of Authorities having jurisdiction, the requirements of the Authority having jurisdiction applies. (NYSDOT: New York State Department of Transportation.)

E. American Association of State Highway and Transportation Officials (AASHTO)
   1. AASHTO M 218 - Steel Sheet, Zinc-Coated (Galvanized) for Corrugated Steel Pipe.
   2. AASHTO M 288 - Geotextile Specification for Highway Applications

F. American Society of Testing and Materials (ASTM)
   1. ASTM D 1505 - Density of Plastics by the Density-Gradient Technique.
   2. ASTM D 1603 - Standard Test for Carbon Black in Olefin Plastics
   3. ASTM D 1693 - Environmental Stress-Cracking of Ethylene Plastics.
   4. ASTM D 5199 - Measuring Nominal Thickness of Geotextiles and Geomembranes.
   5. ASTM D 5885 – Standard Test Method for Oxidative Induction Time of Polyolefin Geosynthetics by High-Pressure Differential Scanning Calorimetry.
   6. ASTM E 41 - Terminology Relating to Conditioning.

G. US Army Corps of Engineers (USACE)
   1. Technical Report GL-86-19, Appendix A.

1.03 SUBMITTALS

A. Shop Drawings: Provide catalog cuts. Include details of fabrications and materials, including accessory items, for all items and appurtenances.

B. Manufacturer's Certificate of Analysis: Manufacturer shall supply certificate of analysis containing the following test results for the Geoweb® geocell material used for project: Base Resin Lot Number(s), Resin Density per ASTM-1505, Production Lot Number(s), Material Thickness, Short Term Seam Peel Strength, and percentage of Carbon Black.

C. Submit qualifications certifying the installer experience in the installation of the Geoweb® system.

D. No material will be considered as an equivalent to the geocell material specified herein unless it meets all requirements of this specification. Manufacturers seeking to supply equivalent material must submit records, data, independent test results, samples, certifications, and documentation deemed necessary by the Engineer to prove equivalency. The Engineer shall approve or disapprove other Manufacturers materials in accordance with the General Conditions after submission and review of provided information. All substitute materials submitted shall be subject to independent lab testing at the Contractor's expense.

1.04 QUALITY ASSURANCE

A. Provide a detailed installation and termination schedule for all items of work included in this Section. Notify the Site Engineer prior to the work taking place.

B. Pre-Installation Meeting: Prior to installation of any materials, conduct a pre-installation meeting to discuss the scope of work and review installation requirements. The pre-installation meeting shall be attended by all parties involved in the installation of the Geoweb® geocell system.

C. The Geoweb® geocell material shall be provided from a single Manufacturer for the entire project.

D. The Manufacturer's Quality management system shall be certified and in accordance with ISO 9001:2015 and CE certification. Substitute materials submitted shall provide a certification that the manufacturing process is part of an ISO program. Certification is required specifically stating that their testing facility is certified and in accordance with ISO. An ISO certification for the substitute material will not be acceptable unless it is proven it pertains specifically to the geocell manufacturing operations.

E. The Manufacturer shall provide certification of compliance to all applicable testing procedures and related specifications upon the Owner's written request. Request for certification shall be submitted no later than the date of order placement. The Manufacturer shall have a minimum of 20 years experience producing Geoweb® geocell material.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in Manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and Manufacturer.

B. The materials shall be stored in accordance with Manufacturer's instructions. The materials shall be protected from damage and out of direct sunlight.

C. The materials shall be delivered, unloaded and installed in a manner to prevent damage.

1.06 WARRANTY

A. The Manufacturer shall warrant each Geoweb® geocell section that it ships to be free from defects in materials and workmanship at the time of manufacture. The Manufacturer's exclusive liability under this warranty or otherwise will be to furnish without charge to the original f.o.b. point a replacement for any section which proves to be defective under normal use and service during the 10-year period which begins on the date of shipment. The Manufacturer reserves the right to inspect any defective section in order to verify the defect and ascertain its cause.

B. This warranty shall not cover defects attributable to causes or occurrences beyond the Manufacturer's control and unrelated to the manufacturing process, including, but not limited to, abuse, misuse, mishandling, neglect, improper storage, improper installation, improper alteration or improper application.

C. The Contractor shall warranty installation for a period of one (1) year from the time of acceptance.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

A. Presto Geosystems, PO Box 2399, Appleton, Wisconsin 54912, (800) 548 3424, info@prestogeo.com, www.prestogeo.com, or approved equal.

2.02 GEOWEB® GEOCELL SYSTEM

A. Manufacturing Certification
   1. The manufacturer shall have earned a certificate of registration, which demonstrates that its quality-management system for its Geoweb® geocell system is currently registered to the ISO 9001:2015 and CE quality standards.

B. Base Materials
   1. Polyethylene Stabilized with Carbon Black
      a. Density shall be 58.4 to 60.2 lbs/ft³ in accordance with ASTM D1505.
      b. Environmental Stress Crack Resistance (ESCR) shall be 5000 hours in accordance with ASTM D1693.
      c. Ultra-Violet light stabilization with carbon black.
      d. Carbon Black content shall be 1.5 to 2 percent by weight, through addition of a carrier with certified carbon black content, in accordance with ASTM D1603.
      e. Carbon black shall be homogeneously distributed throughout material, in accordance with ASTM D5596.
      f. The manufacturer shall have an in-place quality control to prevent irregularities in strip material.

C. Cell Properties
   1. Individual cells shall be uniform in shape and size when expanded.
   2. Individual cell dimensions (nominal) shall be plus or minus 10%.
   3. GW30V-Cell
      a. Length shall be 11.3 inches.
      b. Width shall be 12.6 inches.
      c. Nominal area shall be 71.3 in² plus or minus 1%.
      d. Nominal cell depth shall be 6 inches.

D. Strip Properties and Assembly
   1. Perforated Textured Strip/Cell
      a. Strip sheet thickness shall be 50 mils (1.27 mm), minus 5 percent, plus 10 percent in accordance with ASTM D5199. Determine thickness flat, before surface disruption.
      b. Polyethylene strips shall be textured surface with a multitude of rhomboidal (diamond shape) indentations.
      c. Textured sheet thickness shall be 60 mils, plus or minus 6 mils (1.52 mm plus or minus 0.15 mm).
      d. Indentation surface density shall be 140 to 200 per in².
      e. Perforated with horizontal rows of 0.4 inch diameter holes.
      f. Perforations within each row shall be 0.75 inches on-center.
      g. Horizontal rows shall be staggered and separated 0.50 inches relative to hole centers.
      h. Edge of strip to nearest edge of perforation shall be a minimum of 0.3 inches.
      i. Centerline of spot weld to nearest edge of perforation shall be a minimum of 0.7 inches.
      j. A slot with a dimension of 3/8 inch x 1-3/8 inch is standard in the center of the non-perforated areas and at the center of each weld.

E. Assembly of Cell Sections
   1. Fabricate using strips of sheet polyethylene each with a length of 142 inches and a width equal to cell depth.

2. Connect strips using full depth ultrasonic spot-welds aligned perpendicular to longitudinal axis of strip.
3. Ultrasonic weld melt-pool width shall be 1.0 inch maximum.
4. Weld spacing for GW30V-cell sections shall be 17.5 inches plus or minus 0.10 inch.

F. Cell Seam Strength Tests
1. Minimum seam strengths are required by design and shall be reported in test results. Materials submitted with average or typical values will not be accepted. Written certification of minimum strengths must be supplied to the Engineer at the time of submittals.
2. Short-Term Seam Peel-Strength Test
   a. Cell seam strength shall be uniform over full depth of cell.
   b. Minimum seam peel strength shall be 480 lbf for 6 inch depth.
3. Long-Term Seam Peel-Strength Test
   a. Conditions: Minimum of 7 days in a temperature-controlled environment that undergoes change on a 1 hour cycle from room temperature to 130 degrees F.
   b. Room temperature shall be in accordance with ASTM E41.
   c. Test samples shall consist of two, 4 inch wide strips welded together.
   d. Test sample consisting of 2 carbon black stabilized strips shall support a 160 pound load for test period.

2.03 INTEGRAL COMPONENTS

A. ATRA® Stake Clip
1. The ATRA® Stake Clip is a molded, high-strength polyethylene device available in standard (0.5 inch) and metric (10-12 mm) versions.
2. ATRA® Stake Clips are installed as an end cap on standard (0.5 inch) and metric (10-12 mm) steel reinforcing rods to form ATRA® Anchors.

B. ATRA® Key
1. ATRA® Keys shall be constructed of polyethylene and provide a high strength connection with minimum pull-through of 275 lbs.
2. ATRA® Keys shall be used to connect Geoweb® panels together at each interleaf and end to end connection.
3. Metal staples and zip ties are not an acceptable panel connection method.

2.04 STAKE ANCHORAGE

A. ATRA® Anchors
1. ATRA® Anchors shall consist of standard (0.5 inch) or metric (10-12 mm) steel reinforcing rod with an ATRA® Stake Clip attached as an end cap.
2. ATRA® Anchors shall be assembled by inserting the ATRA® Stake Clip onto the reinforcing rod so that the end is flush with the top of the ATRA® Stake Clip. Prior to attaching the ATRA® Stake Clip, the reinforcing rod shall be beveled and free from all burrs.
3. Stake length shall be as shown in the Contract Documents.

B. ATRA® Driver and ATRA® Gad
1. The ATRA® driver shall be Hilti, Model TE-1000 electric impact hammer.
2. The ATRA® gad shall be constructed of heat-treated alloy steel shaft and aluminum head. The head shall fit directly over the arms of the ATRA® Anchors or ATRA® Speed Stakes.
3. The ATRA® driver increases installation rates by driving anchors faster while decreasing worker fatigue.

2.05 INFILL MATERIALS AND ADDITIONAL COMPONENTS

A. Infill material, subbase, and surface wearing course shall be as specified in Section 32 1540.

B. Mirafi geogrid base course reinforcement shall be Type Miragrid XL.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify site conditions are as indicated on the drawings. Notify the Engineer if site conditions are not acceptable. Do not begin preparation or installation until unacceptable conditions have been corrected.

B. Verify layout of structure is as indicated on the drawings. Notify the Engineer if layout of structure is not acceptable. Do not begin preparation or installation until unacceptable conditions have been corrected.

3.02 INSTALLATION OF LOAD SUPPORT SYSTEM

A. Prepare subgrade and install the Geoweb® load support system in accordance with Manufacturer's instructions.

B. Subgrade Preparation (See Section 31 2213.)
   1. Excavate and shape foundation soils as indicated on the drawings.
   2. Ensure foundation soil meets minimum strength requirements through proof rolling or other conventional method as approved by the Engineer. If unacceptable foundation soils are encountered, excavate and replace with suitable quality material as directed by the Engineer.
   3. Install geotextile separation layer on prepared surfaces ensuring required overlaps are maintained and outer edges of the geotextile are buried in accordance with the Manufacturer's recommendations.

C. Subbase Preparation and Installation (See Section 32 1540.)
   1. Ensure that the subgrade soil meets the minimum strength requirements for installation of the subbase.
   2. Place additional subbase materials to the required depth as specified in the Contract Documents.
   3. Compact to a minimum 95% Standard Proctor or as directed.

D. Geoweb® Section Placement and Connection
   1. Place Geoweb® sections and verify all sections are expanded uniformly to required dimensions and that outer cells of each section are correctly aligned. Interleaf or overlap edges of adjacent sections. Ensure upper surfaces of adjoining Geoweb® sections are flush at joint and adjoining cells are fully aligned at the cell wall slot.
   2. Connect the Geoweb® sections with ATRA® Keys at each interleaf and end to end connection. Insert the ATRA® Key through the cell wall slot before inserting through the adjacent cell. Turn the ATRA® Key 90 degrees to lock the panels together.

E. Anchorage with ATRA® Anchors
   1. Position collapsed Geoweb® sections into place and partially drive ATRA® Anchors in the outer edge cells and expand sections into place. Partially drive ATRA® Anchors in the perimeter cells to keep sections fully expanded.
   2. With Geoweb® sections fully expanded, drive ATRA® Anchors so the arm of the anchor engages with the top of the Geoweb® cell wall.
   3. Anchorage pattern and stake length shall be as indicated on the Contract Documents.

F. Crushed Aggregate Infill Placement (See Section 32 1540.)
   1. Place the specified infill with suitable material handling equipment.
   2. Infill material shall be free-flowing and not frozen when placed in the Geoweb® sections.
   3. Overfill cells with infill material. Limit the drop height of infill material to avoid damage or displacement of the cell wall.
   4. Level surface approximately 2 inches above cell walls. Maintain a 2 inch wear surface over the Geoweb® sections to prevent damage to the cell walls.
   5. Compact infill to a minimum of 95% Standard Proctor or as directed.

6. Shape compacted surface to required elevation as indicated on the drawings.

G. Wearing Surface (See Section 32 1540.)
1. Ensure a minimum 2 in overfill is placed and compacted over the Geoweb® sections prior to placing the wearing surface.

END OF SECTION

SECTION 31 37 00

RIP RAP ENERGY DISSIPATOR

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

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

B. Comply with requirements of the Stormwater Pollution Prevention Plan (SWPPP) and Soil Erosion and Sediment Control specification, plans, and details, and the Contractor's accepted schedule. Refer to Section 01 5713 of these Specifications.

C. The Contractor shall read the Geotechnical Report for subsurface investigations prepared by Carlin-Simpson & Associates, " Report on Subsurface Soil and Foundation Investigation" dated July 14, 2021, revised April 20, 2022, to be fully aware of available subsurface information and current recommendations. No extra claim for ignorance shall be accepted.

1.02 SUMMARY

A. The Work of this Section includes, but is not limited to the installation of rip-rap apron/energy dissipator where shown on the Drawings or necessitated by construction.

PART 2 - PRODUCTS

2.01 STONES

A. The stones for the rip-rap shall be as required and directed for the application, and be hard and angular in shape, resistant to weathering and reasonably free from soil, shale and organic materials. The type and gradation of the materials furnished for use in rip-rap shall be approved by the Owner's Field Representative.

Stone size and gradation of the material (percent of total by weight) furnished for use in rip-rap shall be as follows, and as approved by the Site Engineer:

1. Stone Filling (Fine), NYSDOT Item #620.02, typically in the range of 2" to 4".
   a. Smaller than 8 in., 90-100.
   b. Larger than 3 in., 50-100.
   c. Smaller than No. 10 Sieve, 0-10.
2. Stone Filling (Light), NYSDOT Item #620.03, typically in the range of 4" to 9".
   a. Lighter than 100 lbs., 90-100.
   b. Larger than 6 in., 50-100.
   c. Smaller than 1/2 in., 0-10.
3. Stone Filling (Medium), NYSDOT Item #620.04, typically in the range of 12" to 24".
   a. Heavier than 100 lbs., 50-100.
   b. Smaller than 4 in., 0-10.
4. Stone Filling (Heavy), NYSDOT Item #620.05, typically in the range of 24" to 36".
   a. Heavier than 600 lbs., 50-100.
   b. Smaller than 6 in., 0-10.

Refer to the plan detail(s) for the median stone diameter required (d50) or as directed by the Site Engineer.

B. Material shall contain less than 20% of stones with a ratio of maximum to minimum dimension greater than three.

C. Material shall contain a sufficient amount of stones smaller than average stone size to fill in the spaces between larger stones.

D. Depth shall be as detailed on the Drawings and shall be at least 1 1/2 times the stone diameter.

E. Recycled materials are not acceptable for use.

2.02 BEDDING

A. Mirafi filter fabric FW404 or approved equal shall be placed prior to placing rip rap. If directed, a six (6) inch layer of granular bedding material shall also be installed. Refer to the detail(s) on the plans.

2.03 ACCEPTANCE OF MATERIAL

A. Stone from approved off-site stockpiles will be accepted on the contract site delivery ticket. Each delivery shall identify the supplier's name, supplier's granular source number (GSN), date, stockpile number, and NYSDOT Item number.

PART 3 - EXECUTION

3.01 PREPARTION

A. Clear proposed riprap area of brush, trees and stumps, and grade to a smooth surface. Prepare areas in accordance with Section 31 1100 and Section 31 2316.

3.02 INSTALLATION

A. The ground surface on which the rip-rap is to be placed shall be dressed and graded to a smooth surface. All soft and spongy materials shall be removed to the depths shown on the Drawings or as directed by the Owner's Field Representative and replaced with approved material.

B. Filled areas shall be compacted in accordance with the applicable provisions of these Specifications.

C. Rip-rap shall be placed on a bedding of compacted sand or gravel if shown in detail on the Drawings. Prevent mixing of bedding material with subgrade. Bedding material shall be placed in the specified thickness of each layer in one operation using methods which will not cause segregation of the particle size. Contamination of bedding material by natural soils or other materials shall be prevented, but if contamination occurs, the material shall be removed and replaced at no additional cost to the Owner.

D. Install filter fabric in accordance with manufacture's instructions and as may be shown on the Plan detail.

E. The stones shall then be placed on the bedding material so that the dimension approximately equal to the layer thickness is perpendicular to the ground surface and the weight of the stone is carried by the underlying material.

F. The rip-rap shall be properly aligned and placed so as to eliminate void spaces between the adjacent stones with smaller stone fragments filling the space between the larger ones, so as to result in the minimum practicable percentage of voids. The stones shall be so placed and distributed so that there will be no pockets of uniform size material.

G. Rearranging of individual stones will be required to the extent necessary to secure the specified results.

H. The stone filling shall be in conformance with the lines, grades, and thicknesses shown in the Contract Documents.

3.03 ACCEPTANCE

A. Inspection to determine final acceptance will be made by the Site Engineer, upon Contractor's request. Provide notification at least ten (10) working days before requested inspection date.
   1. Areas will be acceptable provided all requirements have been complied with.
   2. No individual areas shall have bare spots or unacceptable cover.

END OF SECTION

SECTION 32 11 16

SUBBASE COURSES INCLUDING AGGREGATE BASE COURSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The Work of this Section includes, but is not limited to:
   1. Installation of subbase course(s) and aggregate base course(s) where specified, including all associated items and operations necessary and required.
   2. Finishing and testing as necessary and required.

1.02 REFERENCE STANDARDS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section, as well as all applicable construction, fabrication and safety standards.

B. Comply with requirements of the Stormwater Pollution Prevention Plan (SWPPP) and Soil Erosion and Sediment Control specification, plans, and details, and the Contractor's accepted schedule. Refer to Section 01 5713 of these Specifications.

C. The Contractor shall read the Geotechnical Report for subsurface investigations prepared by Carlin-Simpson & Associates, " Report on Subsurface Soil and Foundation Investigation" dated July 14, 2021, revised April 20, 2022, to be fully aware of available subsurface information and current recommendations. No extra claim for ignorance shall be accepted.

D. Comply with all industry standards and requirements of all Authorities having jurisdiction. If requirements specified conflicts with the requirements of Authorities having jurisdiction, the requirements of the Authority having jurisdiction applies. (NYSDOT: New York State Department of Transportation.)
   1. NYSDOT 703-01 – Fine Aggregates.
   2. NYSDOT 703-02 – Coarse Aggregates.
   3. NYSDOT 304.05 – Type 4 Base/Subbase Course.
   4. NYSDOT 304.11 – Type 1, Base/Subbase Course.
   5. AASHTO No. 57 – Choker Course
   6. AASHTO No. 2 – Base/Subbase/Filter Layer.
   7. ASTM D-448 – Pea-Gravel Drainage Layer

1.03 SUBMITTALS

A. Shop Drawings: Provide catalog cuts. Include details of fabrications and materials as applicable, including accessory items, for all items and appurtenances.

1.04 QUALITY ASSURANCE

A. Provide a detailed installation and termination schedule for all items of work included in this Section. Notify the Site Engineer prior to the work taking place.

PART 2 PRODUCTS

2.01 SUBBASE COURSE/AGGREGATE BASE COURSE

A. General Requirements - The Contractor shall construct a properly prepared subgrade/aggregate base course, in conformity with the lines, grades, compacted thicknesses and typical sections shown on the Drawings and as specified herein.

B. Materials and Construction Details - Materials and construction details shall conform to the applicable requirements of the New York State Department of Transportation (NYSDOT) Specifications, or other Authorities having jurisdiction, as follows:
   1. NYSDOT 703-01 – Fine Aggregates.
   2. NYSDOT 703-02 – Coarse Aggregates.
   3. NYSDOT 304.05 – Type 4 Base/Subbase Course.

4. NYSDOT 304.11 – Type 1, Base/Subbase Course.
5. AASHTO No. 57 – Choker Course
6. AASHTO No. 2 – Base/Subbase/Filter Layer.
7. ASTM D-448 – Pea-Gravel Drainage Layer

C. Recycled Milled Asphalt - If the use of recycled milled asphalt from the existing parking areas on campus is permitted for use, the only use authorized would be as roadway base or parking lot base. Reusing asphalt millings is not acceptable for use for fill or in pipe trenches.

Unless indicated otherwise, the utilization of recycled asphalt milling from off-campus sources is not permitted.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

A. The Contractor shall install all subbase courses including aggregate base courses as specified in the locations and to the grades as shown on the Drawings and/or as directed by the Owner's Field Representative. Materials, methods of construction, and type and thickness of courses shall be as shown on the Drawings and as specified herein.

B. Materials and methods for construction shall conform to the New York State Department of Transportation specifications, and/or the specifications of the Municipality or Agency having control.

C. The Contractor shall be responsible for laying out and installing all base courses in the correct locations and to the proper cross sections and in accordance with the lines and grades as specified herein and on the Drawings and/or in accordance with the directions of the Site Engineer. Base courses which are not constructed to the proper section, grade and/or alignment shall be corrected by repair or replacement by the Contractor at no additional cost.

D. The installation of all base courses within Public Rights-of-Way shall be in accordance with the rules and requirements of the Municipality, County, and/or the NYSDOT. Work shall include all items and operations necessary and required to complete the base course installation to the satisfaction of the Authority having jurisdiction, including maintenance of traffic and protection of pedestrians.

3.02 PREPARATION OF SUBGRADE

A. Refer to Section 31 2213 – Grading and Subgrade Preparation.

3.03 PREPARATION FOR INSTALLATION

A. Maintenance - The base courses shall be maintained by the Contractor at all times. Any settlement taking place shall be maintained by the Contractor at his expense by furnishing, spreading and rolling additional material over that previously laid. The Contractor shall continue this maintenance until such time that the area is ready for the placement of the next course of material.

B. Public Rights-of-Way - In Public Rights-of-Way the Contractor shall comply with the requirements of the Authority having jurisdiction.

3.04 FINAL INSPECTION

A. Upon completion of the Work and before final acceptance, the areas shall be subjected to a final inspection in the presence of the Site Engineer and/or Owner's Field Representative. The work shall not be considered complete until all requirements for line, grade, cleanliness, tests and workmanship have been met.

END OF SECTION

SECTION 32 12 16

ASPHALT PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The Work of this Section includes, but is not limited to:
   1. Installation of pavements consisting of asphalt concrete binder and/or intermediate courses, surface course, including all associated items and operations necessary and required to complete the pavement installation.
   2. All necessary and required line cutting of existing pavements.
   3. All finishing, curing, and testing necessary and required for the installation of pavements.
   4. Installation of temporary asphalt concrete pavements over trenches and/or excavations in paved areas and the permanent replacement of pavement over these trenches and/or excavations.
   5. Installation and removal of temporary asphalt concrete pavements required for transitional areas and/or ramps, and the removal of the temporary pavement in these areas.
   6. Refer to Section 31 2213 for grading and subgrade preparation and Section 32 1116 for subbase courses including aggregate base courses.

1.02 REFERENCE STANDARDS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section, as well as all applicable construction, fabrication and safety standards.

B. Comply with requirements of the Stormwater Pollution Prevention Plan (SWPPP) and Soil Erosion and Sediment Control specification, plans, and details, and the Contractor's accepted schedule. Refer to Section 01 5713 of these Specifications.

C. The Contractor shall read the Geotechnical Report for subsurface investigations prepared by Carlin-Simpson & Associates, " Report on Subsurface Soil and Foundation Investigation" dated July 14, 2021, revised April 20, 2022, to be fully aware of available subsurface information and current recommendations. No extra claim for ignorance shall be accepted.

D. Comply with all industry standards and requirements of all Authorities having jurisdiction. If requirements specified conflicts with the requirements of Authorities having jurisdiction, the requirements of the Authority having jurisdiction applies. (NYSDOT: New York State Department of Transportation.)
   1. AASHTO No. 57 – Standard Specification for Materials for Embankments and Subgrades.
   2. AASHTO No. 2 – Standard Practice for Sampling Aggregates.
   3. ASTM D-448 – Standard Classification for Sizes of Aggregate for Road and Bridge Construction.

1.03 SUBMITTALS

A. Shop Drawings: Provide catalog cuts. Include details of fabrications and materials, including accessory items, for all items and appurtenances.

1.04 QUALITY ASSURANCE

A. Provide a detailed installation and termination schedule for all items of work included in this Section. Notify the Site Engineer prior to the work taking place.

B. The installation of certain materials and infrastructure including but not limited to earthwork operations, and hardscape and utility installations, may be subject to special subgrade preparation and construction requirements. Subgrade improvement measures and special construction requirements must be followed as indicated by the Geotechnical Engineer. The most stringent geotechnical requirements stated in the Geotechnical Report or any other place in the Contract Documents shall be adhered to by the Contractor.

PART 2 PRODUCTS

2.01 ASPHALT CONCRETE PAVEMENTS

A. General Requirements - The Contractor shall construct asphalt concrete pavements upon a properly prepared subgrade, in conformity with the lines, grades, compacted thicknesses and typical sections shown on the Drawings and as specified herein.

B. Materials and Construction Details - Materials and construction details on-site shall conform to the applicable requirements of the New York State Department of Transportation (NYSDOT) Specifications, or other Authorities having jurisdiction, as follows and as applicable:
   1. Asphalt Concrete Top Course - Type 6F NYSDOT Item 403.1701.
   2. Asphalt Concrete Binder Course - Type 3 NYSDOT Item 403.13.
   3. Stone Subbase Course (DGA) - Type 1 NYSDOT Item 304.11.
   4. Tack Coat – NYSDOT Item 407.01013.
   5. Sheet/Shim Mix – NYSDOT Item 403.15

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

A. The Contractor shall install all pavements as specified in the locations and to the grades as shown on the Drawings and/or as directed by the Owner's Field Representative. Materials, methods of construction, and type and thickness of pavement courses shall be as shown on the Drawings and as specified herein.

B. Materials and methods for construction of asphalt concrete pavements and bases shall conform to the New York State Department of Transportation and/or the County of Westchester and/or the Municipal Specifications, as applicable.

C. The Contractor shall be responsible for laying out and installing all pavements in the correct locations and to the proper cross sections and in accordance with the lines and grades as specified herein and on the Drawings and/or in accordance with the directions of the Site Engineer. Pavements which are not constructed to the proper section, grade and/or alignment shall be corrected by repair or replacement by the Contractor at no additional cost.

D. The installation of all pavements within Public Rights-of-Way shall be in accordance with the rules and requirements of the County of Westchester, the Municipality, and/or the NYSDOT. Work shall include all items and operations necessary and required to complete the pavement installation to the satisfaction of the Authorities having jurisdiction, including maintenance of traffic and protection of pedestrians.

3.02 PREPARATION OF SUBGRADE

A. Refer to Section 31 2213 of these Specifications.

B. Refer to the Details on the Drawings.

3.03 PREPARATION FOR PAVEMENT INSTALLATION

A. Utility Structures and Appurtenances - After the subgrade and/or existing pavement surfaces have been prepared as specified herein, the Contractor shall check all frames, covers, grates, water valve boxes and all other miscellaneous castings that are located in the proposed new, milled, or overlaid pavement areas to ensure that all such items have been accurately positioned and set to the proper slope and elevation. All covers and grates are to be set flush with the required finished pavement surface. No depressions or mounds will be permitted in the pavement to accommodate inaccuracies in the setting of these appurtenances. All initial and corrective work shall be done by the Contractor at his own expense, regardless of the number of times castings are adjusted to grade.

   Where castings on drain inlets and catch basins cannot be reset because of grade considerations, as determined by the Site Engineer or Owner's Representative, the existing pavement surface adjacent to the casting shall be cut back and removed all around the casting

for a minimum width of two (2) feet and to a depth of one and one half (1-1/2) inches so as to provide a smooth transition of the new pavement surface at the drain inlets and catch basins.

B. Meeting Existing Pavement - Where new pavements are to meet existing pavements, the Contractor shall line cut the existing pavement with an approved saw cutting machine as directed so that there will be a vertical butting surface between the old and new pavements. Line cutting of existing pavements shall be done along neat, straight and even lines and in such a manner so as not to damage the adjacent pavement which is to remain. The Site Engineer shall decide as to the acceptability of the line cutting device and the method of operation, and his decision shall be final.

C. Pavement Replacement in Existing Asphalt Concrete Pavements - The existing pavement shall be line cut and cut back as specified herein above under "Meeting Existing Pavement". Minimum width of cut back shall be twelve (12) inches unless otherwise specified or shown on the Drawings. Line cutting for pavement replacement over trenches shall be parallel to the centerline of the trench. Line cutting for pavement replacement at manholes, drain inlets, catch basins or other underground structures, test holes, etc., shall be in a square or rectangular configuration as directed. For all types of pavement replacement, the line cutting shall encompass the disturbed area and include the required undisturbed pavement shelf area as specified herein or as directed.

D. Asphalt Concrete Overlays Over Milled or Existing Surfaces - The existing pavement surface shall be saw cut along both sides of the cut back area where the new pavement is to meet the existing pavement. Minimum width of cut back area shall be three (3) feet. The existing asphalt concrete surface shall be cut to a depth equal to the thickness of the overlay course with 1½" minimum, to provide neat true lines with straight vertical edges free of irregularities. The pavement shall be cleaned first to remove loose materials. The pavement surface shall then be removed from the cut back area by milling or other approved method to provide a minimum of one and one-half (1-1/2) inch thickness of asphalt concrete overlay in the cut back area where the asphalt concrete overlay is to abut the existing pavement. Immediately prior to placement of the asphalt concrete overlay the trimmed edges of the existing pavement shall be treated with a light coating of asphalt cement or asphalt emulsion to bond the new pavement to the old pavement. The new pavement surface shall be finished flush with the adjacent pavement.

E. Vertical Surfaces in Contact with Asphalt Mixtures - All vertical surfaces of curbs, structures, gutters and existing pavement in contact with new asphalt concrete mixtures shall be painted with a uniform coating of an approved asphalt emulsion or priming material. Extreme care shall be exercised in the application of this material to prevent splattering or staining of surfaces that are to be exposed. Surfaces that are stained as a result of the Contractor's operation shall be repaired and/or replaced at the Contractor's expense.

F. Joints and/or Cracks in Existing Pavement - All joints in existing concrete pavements and all cracks in asphalt concrete pavements (1/4" wide or larger) shall be thoroughly cleaned of all dirt and loose material by means of a jet of compressed air to a depth of 3”. Old joint and crack sealer remaining after such cleaning operation need not be removed.

Joints and cracks in the existing pavement 1/4" wide or greater shall be filled with a sheet/shim asphalt mix, NYSDOT Item No. 403.15, as depicted in the Details of the Drawings or as directed by the Owner's Field Representative. Joints less than 1/4" wide need not be cleaned or sealed.

Cracks greater than 1/4” after filling shall have Mirafi MTK self-adhering waterproofing membrane applied for waterproofing and reflective crack control.

Work on joints and cracks shall not be done until all necessary and required pavement repairs have been completed.

G. Trueing and Leveling Existing Pavement - The existing pavement surface shall be brought to uniform grade and cross section where and as specified. The surface of the existing pavement

shall be brought to the same transverse slope and longitudinal cross sections as the finished pavement section using a proper hot-mix asphalt concrete material. For compacted thicknesses up to 1-1/2 inches, a shim mix shall be used; for compacted thicknesses from 1-1/2 inches to 4 inches, a dense binder mix shall be used; for thicknesses greater than 4 inches, an approved base course mix shall be used.

H. Delay in Surface Course Installation - When there is a delay in the installation of the surface course after the binder and/or intermediate course is placed, as specified or as may be directed by the Site Engineer, which requires that traffic be maintained or parking provided on the binder and/or intermediate course for a period in excess of four (4) weeks, then just prior to placement of the surface course the Contractor will be required to thoroughly clean, repair and tack coat the binder and/or intermediate surface. This requirement shall apply when such delay is caused for any reason. Compensation for this work shall be considered as included in the Contract Sum.

3.04 TEMPORARY PAVEMENT

A. General Requirements - Unless directed otherwise, the Contractor shall install temporary pavement in areas where existing pavement has been disturbed due to his operations, or where necessary to accommodate pedestrians or vehicles. This pavement shall be constructed after the excavation has been backfilled and properly compacted.

Unless otherwise specified, the construction of the temporary pavement shall consist of a minimum of three (3) inches compacted measure of hot-mix asphalt concrete on four (4) inches base course, or approved equal. Approved milled salvaged pavement material may be used as base course for temporary pavement.

B. Spreading and Rolling - Before the material is spread, all surfaces of curbs, edgings, manholes and other structures which will come into contact with the new pavement shall be well painted with an asphalt emulsion or priming material acceptable to the Site Engineer. Care shall be taken to prevent staining, smearing or defacing the exposed faces of the curbs and other structures during the spreading and rolling of the material.

After spreading, the material shall be rolled by means of a roller weighing not less than ten (10) tons. In all places that are not accessible to the roller, the material shall be compacted thoroughly by approved mechanical tampers.

The finished surface of the temporary pavement shall be flush with the adjacent pavement surface.

C. Maintenance - The temporary pavement shall be maintained by the Contractor until such time that the final settlement of the trench shall have taken place in the opinion of the Site Engineer or the temporary pavement is no longer needed. Any settlement taking place shall be maintained by the Contractor at his expense by furnishing, spreading and rolling additional material over that previously laid. The Contractor shall continue this maintenance until such time that the Site Engineer considers that final settlement of the trench has occurred and that the trench is in readiness for the replacement of the permanent surface.

Should the Contractor request to use flowable fill (K-Krete) to avoid maintenance of temporary asphaltic concrete over trenches, the request shall be made in writing, and if permitted, no additional compensation will be paid to the Contractor. Refer to the details on the Plan where flowable fill may be required, which shall be included in the Contract Sum.

D. Public Rights-of-Way - In Public Rights-of-Way the Contractor shall comply with the requirements of all Authorities having jurisdiction, and shall be included in the Contract Sum.

3.05 PERMANENT PAVEMENT REPLACEMENT

A. General Requirements - The Contractor shall replace disturbed pavement to the lines and grades shown on the Drawings or specified herein. The existing pavement shall be saw cut as shown on the Drawings, specified herein, or as directed.

B. Replacement of Temporary Pavements - In areas where a temporary pavement has been placed, the Contractor shall remove the temporary pavement to the subgrade line shown on the Drawings or as specified. He shall then fine grade the subgrade to the proper elevation and compact it as described under Section 31 2213 of these Specifications.

Where shown on the Drawings or as directed, the Contractor shall excavate a shelf to provide a bearing area on all sides for the new pavement; (width as shown or directed).

C. Public Rights-of-Way - In Public Rights-of-Way the Contractor shall comply with the requirements of all Authorities having jurisdiction.

3.06 PAVEMENT MEMBRANE FOR REFLECTIVE CRACKING AND WATERPROOFING (AS APPLICABLE)

A. Cracks greater than 1/4" after filling shall have Mirafi MTK self-adhering waterproofing membrane applied for waterproofing and reflective crack control.

Mirafi MTK is a product of TenCate Geosynthetics North America.

B. The Contractor shall assume for purposes of the Bid that Mirafi MTK will be required for 15% of all areas to be Milled and Overlaid.

C. Refer to Installation Guidelines from the manufacturer.

3.07 GUARANTEE AND MAINTENANCE

A. The Contractor shall guarantee all pavement installations, including materials and workmanship, for a period of one year from the date of completion and initial acceptance of the Work (as specified in writing to the Owner). The Contractor shall make interim repairs as necessary to maintain all paved areas in good, usable condition. The Contractor shall receive no additional compensation for pavement maintenance and restoration during this guarantee period. Payment shall be considered as included in the Contract Sum.

3.08 FINAL INSPECTION

A. Upon completion of the Work and before final acceptance, the paved areas shall be subjected to a final inspection in the presence of the Site Engineer and/or Owner's Field Representative. The work shall not be considered complete until all requirements for line, grade, cleanliness, tests and workmanship have been met.

END OF SECTION

SECTION 32 13 13

CONCRETE PAD / BASE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. The Contractor shall read the "Report on Subsurface Soil and Foundation Investigation" dated July 14, 2021, revised April 20, 2022, prepared by Carlin Simpson & Associates, for subsurface investigations to be fully aware of available subsurface information and current recommendations. No extra claim for ignorance shall be accepted. (Refer to the Geotechnical Engineer for additional information.)

1.02 SUMMARY

A. The work of this Section includes, but is not limited to:
   1. Installation of concrete pad(s) and concrete base where indicated on the Plans, and not specified elsewhere.

1.03 REFERENCE STANDARDS

A. Comply with all industry standards and requirements of all Authorities having jurisdiction. If requirements specified conflicts with the requirements of Authorities having jurisdiction, the requirements of the Authority having jurisdiction applies.

1.04 SUBMITTALS

A. Shop Drawings: Provide catalog cuts. Include details of fabrications and materials as applicable, including accessory items, for all items and appurtenances.

1.05 QUALITY ASSURANCE

A. Provide a detailed installation and termination schedule for work included in this Section. Notify the Site Engineer and all Authorities having jurisdiction prior to work taking place.

B. Coordinate work of this Section with construction and other underground utilities, and with trades responsible for their installation.

C. Work shall be performed in accordance with Town of Mount Pleasant requirements and all Authorities having jurisdiction. The Contractor shall adhere to all requirements and directions of the Geotechnical and/or Site Engineer.

D. The Contractor shall comply with the requirements of the permits and all applicable Federal, State, County, and Local statutes and ordinances relating to the prevention and abatement of soil erosion, sediment and dust, including adherence to the requirements indicated in the Stormwater Pollution Prevention Plan (SWPPP), and the Soil Erosion and Sediment Control specifications, plans and details.

E. The installation of materials and infrastructure may be subject to special construction requirements. Subgrade improvement measures and special construction requirements must be followed as indicated by the Geotechnical Engineer.

   The construction methods and requirements for the preparation of the subgrade and pad installation indicated herein, may be supplemented/amended by more stringent requirements stated in the Geotechnical Report. The most stringent requirements must be followed.

PART 2 - PRODUCTS

2.01 CLASS “A” CONCRETE

A. Class "A" Concrete shall be air-entrained, ready-mixed concrete, 4,000 psi at twenty-eight (28) day compressive strength and shall conform to AASHTO designation M-85.

1. Cement - shall be Portland cement, Type I or II, conforming to AASHTO Designation M-85. Cement shall be by an American manufacturer.
2. Provide white portland cement for integrally colored concrete.
3. Fine Aggregate (sand) - shall conform to AASHTO Designation M-6 having clear, hard, durable, uncoated grains, free from deleterious substances and shall range in size from fine to coarse within the following percentages by weight:

Passing 3/8" Sieve	100%
Passing No. 4 Sieve	95 - 100%
Passing No. 16 Sieve	45 - 85%
Passing No. 50 Sieve	10 - 30%
Passing No. 100 Sieve	2 - 10%

4. Coarse Aggregate - shall conform to AASHTO Designation M-80 and shall be free of deleterious matter or coatings. Gradation must be within the following percentages by weight:

Passing 1-1/2" Sieve	100%
Passing 1" Sieve	95 - 100%
Passing 1/2" Sieve	25 - 60%
Passing No. 4 Sieve	0 - 10%

5. Water - shall be clean and fresh, free from salt, grease, acids, alkalis, organic materials or other deleterious materials. When possible, water shall be from a municipal system.
6. Reinforcement - shall be new deformed billet steel bars free of loose rust, conforming to ASTM Designation A-615, Grade 60, with minimum yield of 60,000 psi. Wire fabric shall conform to the "Standard Specifications for Welded Steel Wire Fabric for Concrete Reinforcement" ASTM Designation A-185.
7. Materials shall conform to the applicable requirements of these specifications titled "Cement and Concrete for Exterior Improvements".

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. General Requirements - There shall be no less than six (6) sacks of cement per cubic yard. The concrete shall contain no more than six (6) gallons of water per sack of cement, and shall produce a slump of not more than four (4) inches. Air content shall be 7% (+1%).

The use of accelerators shall not be used unless prior approval is received from the Owner's Field Representative.

Where concrete surfaces are exposed and visible in the finished work, such as in the construction of pavements, curbs and sidewalks, the cement used shall be of the same brand and from a single source, so that the item of construction will be uniform in color.

If any requirements specified herein for concrete construction conflicts with the requirements of Authorities having jurisdiction, the requirements of Authority having jurisdiction shall apply.

B. Forms - shall be acceptable steel or lumber, straight and free from warp or other irregularities that will adversely affect the installation. Forms shall be carefully set to the proper shape, lines and dimensions as shown on the Drawings and/or as directed by the Owner's Field Representative and shall be sufficiently tight, thoroughly braced and secured in place so that there will be no leakage of mortar or displacement of forms during placing of the concrete.

Prior to placing the concrete, the contact surfaces of the forms shall be given a light coating of form oil that will not discolor the concrete.

Forms shall remain in place until concrete has hardened and acquired sufficient strength to safely support dead and live loads. Form removal shall be carried out in such a manner to ensure complete safety and integrity of the structure.

C. Reinforcement - shall be accurately cut, placed and rigidly held in position by means of bar supports, spacers, ties or other acceptable means in such manner that the reinforcing will not displace when the concrete is poured. When reinforcing bars must be spliced, there shall be sufficient lap to develop the strength of the bar by bond.

D. Concrete Protection for Reinforcement - The steel reinforcement shall be protected by the thickness of concrete as indicated on the details of the Drawings. Where not otherwise specified or directed, the thickness of concrete over the reinforcement (clear dimensions) shall be as follows:
   1. For concrete deposited against ground without the use of forms - not less than three (3) inches.
   2. For concrete exposed to the weather or exposed to the ground but placed in forms - not less than two (2) inches.
   3. For concrete placed in slabs and walls not exposed to the ground or to the weather - not less than one and one half (1-1/2) inches.
   4. In all cases, the thickness of concrete over reinforcement shall be at least equal to the diameter of the reinforcing bars.

E. Construction Joints and Expansion Joints - shall be provided where and as shown in detail on the Drawings. Construction joints and expansion joints not indicated on the Drawings shall be as approved by the Owner's Field Representative and/or Site Engineer.

F. Placement - Unless specified otherwise, concrete three (3) or more inches thick shall be placed and consolidated with mechanical vibrators used in the concrete by skilled workman, properly supervised. Vibrators shall not be moved laterally or used to transport concrete. Vibrators shall be used to merge successive layers and prevent cold joints. Concrete shall be consolidated to maximum density, free of honeycombing and trapped air. Hand spading shall be used in corners and angles of forms while concrete is plastic. During placement operations, concrete shall be thoroughly consolidated and worked well around and into thorough contact with the steel being careful not to disturb the location of the reinforcing. Over-working and over-vibration which may cause segregation shall be avoided.

G. When concrete is to be placed on the ground surface, the subgrade shall be moistened prior to placing the concrete, except during cold weather periods when freezing is likely to occur. Concrete shall be placed in the form as near to its final position as practicable. Concrete shall be placed in layers to prevent honeycombing. Proper chutes, troughs and other approved devices shall be used to minimize free fall of concrete and to convey concrete to the proper locations. In no case shall concrete be deposited from a height that will separate the aggregates.

H. Concrete shall be deposited within thirty (30) minutes after mixing, as nearly as practicable, in its final position to avoid segregation due to rehandling or flowing.

I. Cold Weather Requirements - Adequate equipment shall be provided for heating the concrete materials and protecting the concrete during freezing and near-freezing weather. No frozen materials or materials containing ice shall be used.

J. All concrete materials and all reinforcement, forms, fillers and ground in which the concrete is to come in contact, shall be free from frost. Whenever the temperature of the surrounding air is below 40 degrees F. all concrete placed in the forms shall have a temperature between 70 degrees F. and 80 degrees F., and adequate means shall be provided for maintaining a temperature of not less than 70 degrees F. for three (3) days or 50 degrees F. for five (5) days except when high early strength concrete is authorized for use, in which case, the temperature shall be maintained at not less than 70 degrees F. for two (2) days or 50 degrees F. for three (3) days or for as much more time as is necessary to insure proper curing of the concrete. The

housing, covering or other protection used in connection with curing shall remain in place and intact at least 24 hours after the artificial heating is discontinued. No dependence shall be placed on salt or other chemicals for the prevention of freezing.

K. Finishing - As soon as the face forms are removed, all fins and other projections shall be removed carefully and offsets leveled and rubbed with carborundum where necessary. Pointing and filling voids shall be done only under the direction of the Owner's Field Representative. Finished concrete surfaces shall be clean, smooth, free of honeycombing, spauling, ragged edges and laitance. Finishing of concrete shall be done only by experienced concrete finishers.

L. Curing - Concrete shall be protected from the sun and kept moist for at least seven (7) days. During this period, concrete shall be maintained above 70 degrees F. for at least three (3) days or above 50 degrees F. for at least five (5) days. Exposed concrete shall be kept thoroughly wetted during the first week, and covered with polyethylene or heavy paper. Liquid membrane curing meeting the requirements of AASHTO Designation M-148 may be used upon approval of the Owner's Field Representative.

M. Protection - Every precaution shall be taken by the Contractor to protect finished surfaces from stains, abrasions or damage of any kind. Adequate protection shall be provided against injurious action by sun, wind or freezing temperatures. Fresh concrete shall be thoroughly protected from damage due to heavy rain, flowing water, freezing temperatures and mechanical injury.

N. Construction details shall conform to the applicable requirements of these specifications titled "Miscellaneous Cast-in-Place Concrete".

3.02 DEFECTIVE CONCRETE

A. Concrete work that is not formed as indicated or is not true to alignment, or is not plumb or level, or is not true to grades or levels, is frozen, or has voids or rock pockets, or has saw dust, wood or debris embedded in it, or does not fully conform to the Contract Documents, shall be considered as defective and shall be removed and replaced by the Contractor at no additional cost to the Owner with work that conforms to the Contract Documents.

END OF SECTION

SECTION 32 13 16

COLORED CONCRETE PAVEMENT - ALTERNATE TWO

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Comply with requirements of the Stormwater Pollution Prevention Plan (SWPPP) and Soil Erosion and Sediment Control specification, plans, and details, and the Contractor's accepted schedule. Refer to Section 01 5713 of these Specifications.

C. The Contractor shall read the Geotechnical Report for subsurface investigations prepared by Carlin-Simpson & Associates, " Report on Subsurface Soil and Foundation Investigation" dated July 14, 2021, revised April 20, 2022, to be fully aware of available subsurface information and current recommendations. No extra claim for ignorance shall be accepted.

1.02 SUMMARY

A. Perform all work required to complete, as indicated by the Contract Documents, and furnish all supplementary items necessary for the proper installation of integrally colored site-cast concrete pavement for sidewalk area(s) where indicated on the Plans.

1.03 SUBMITTALS

A. Product Data: Provide characteristics of Product Data:
   1. Color additives.
   2. Curing products.
   3. Proprietary cleaning agents.

B. Submit dimensioned shop drawings depicting pattern layout including locations of expansion joints, for approval by the project's Landscape Architect prior to installation.

C. Indicate extent of each color of integrally colored concrete.

D. Samples: Submit color additive manufacturer's sample.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with: ACI 305.1, ACI 306.1, ACI 318.

B. Obtain each material from same source and maintain high degree of consistency in workmanship throughout Project.

C. Contractor shall coordinate a site meeting prior to the installation of a mock-up which shall include the Landscape Architect and all Authorities having jurisdiction.

D. Integrally Colored Concrete Mock-Up:
   1. Provide full-scale mock-up at least one month before start of concrete work to allow concrete to cure before observation.
   2. Accepted mock-up provides visual standard for work of Section.
   3. Mock-up may remain as part of Work. Remove mock-up when no longer required for comparison with finished work.

E. The installation of certain materials and infrastructure including but not limited to earthwork operations, and hardscape and utility installations, may be subject to special subgrade preparation and construction requirements. Subgrade improvement measures and special construction requirements must be followed as indicated by the Geotechnical Engineer. The most stringent geotechnical requirements stated in the Geotechnical Report or any other place in the Contract Documents shall be adhered to by the Contractor.

PART 2 - PRODUCTS

2.01 CLASS "A" CONCRETE

A. Class "A" Concrete shall be air-entrained, ready-mixed concrete, 4000 psi twenty-eight (28) day compressive strength and shall conform to AASHTO designation M-85.
   1. Cement - shall be Portland cement, Type I or II, conforming to AASHTO Designation M-85. Cement shall be by an American manufacturer.
   2. Provide white portland cement for integrally colored concrete.
   3. Fine Aggregate (sand) - shall conform to AASHTO Designation M-6 having clear, hard, durable, uncoated grains, free from deleterious substances and shall range in size from fine to coarse within the following percentages by weight:

Passing 3/8" Sieve	100%
Passing No. 4 Sieve	95 - 100%
Passing No. 16 Sieve	45 - 85%
Passing No. 50 Sieve	10 - 30%
Passing No. 100 Sieve	2 - 10%

   4. Coarse Aggregate - shall conform to AASHTO Designation M-80 and shall be free of deleterious matter or coatings. Gradation must be within the following percentages by weight:

Passing 1-1/2" Sieve	100%
Passing 1" Sieve	95 - 100%
Passing 1/2" Sieve	25 - 60%
Passing No. 4 Sieve	0 - 10%

   5. Water - shall be clean and fresh, free from salt, grease, acids, alkalis, organic materials or other deleterious materials. When possible, water shall be from a municipal system.
   6. Reinforcement - shall be new deformed billet steel bars free of loose rust, conforming to ASTM Designation A-615, Grade 60, with minimum yield of 60,000 psi. Wire fabric shall conform to the "Standard Specifications for Welded Steel Wire Fabric for Concrete Reinforcement" ASTM Designation A-185.

2.02 MANUFACTURER: COLOR ADDITIVE

A. Manufacturer:

   Color shall have sandscape finish, mix of nickel grey and french grey colors or as selected by the Owner, as manufactured by Bomanite Concrete or approved equal. Finish shall be sandscape finish and planks shall be scored in alternating 1' wide x 3' long planks.

   The Bomanite Company Contact Information:

   Phone: 303-369-1115

   Email: info@bomanite.com

B. Substitutions: Comply with Division 01 Section "Substitution Procedures"

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. General Requirements - Site concrete shall be Class "A" concrete having a twenty-eight (28) day compressive strength of 4000 psi.

   There shall be no less than six (6) sacks of cement per cubic yard. The concrete shall contain no more than six (6) gallons of water per sack of cement, and shall produce a slump of not more than four (4) inches. Air content shall be 7% (+1%).

The use of accelerators shall not be used unless prior approval is received from the Owner's Field Representative.

Where concrete surfaces are exposed and visible in the finished work, such as in the construction of curbs and sidewalks, the cement used shall be of the same brand and from a single source, so that the item of construction will be uniform in color.

If any requirements specified herein for concrete construction conflicts with the requirements of Authorities having jurisdiction, the requirements of Authority having jurisdiction shall apply.

B. Color Mixes

Slump: 4 inches. If greater slump is required, use water-reducing or super-plasticizing admixture; do not add water.

Color Additives: Mix in accordance with manufacturer's instructions. Mix until color additives are uniformly dispersed throughout mixture and disintegrating bags, if used, have disintegrated.

Do not retemper mix or add water in field.

Comply with all color admixture manufacturer’s recommendations unless otherwise specified in this Section.

C. Scoring - lines/joints shall be sawcut and v-grooved or bevel cut on continuous joint spacing as shown on the Plans.

D. Forms - shall be acceptable steel or lumber, straight and free from warp or other irregularities that will adversely affect the installation. Forms shall be carefully set to the proper shape, lines and dimensions as shown on the Drawings and/or as directed by the Owner's Field Representative and shall be sufficiently tight, thoroughly braced and secured in place so that there will be no leakage of mortar or displacement of forms during placing of the concrete.

Prior to placing the concrete, the contact surfaces of the forms shall be given a light coating of form oil that will not discolor the concrete.

Forms shall remain in place until concrete has hardened and acquired sufficient strength to safely support dead and live loads. Form removal shall be carried out in such a manner to ensure complete safety and integrity of the structure.

E. Reinforcement - shall be accurately cut, placed and rigidly held in position by means of bar supports, spacers, ties or other acceptable means in such manner that the reinforcing will not displace when the concrete is poured. When reinforcing bars must be spliced, there shall be sufficient lap to develop the strength of the bar by bond.

F. Concrete Protection for Reinforcement - The steel reinforcement shall be protected by the thickness of concrete as indicated on the details of the Drawings. Where not otherwise specified or directed, the thickness of concrete over the reinforcement (clear dimensions) shall be as follows:

1. For concrete deposited against ground without the use of forms - not less than three (3) inches.
2. For concrete exposed to the weather or exposed to the ground but placed in forms - not less than two (2) inches.
3. For concrete placed in slabs and walls not exposed to the ground or to the weather - not less than one and one half (1-1/2) inches.
4. In all cases, the thickness of concrete over reinforcement shall be at least equal to the diameter of the reinforcing bars.

G. Construction joints and expansion joints - shall be provided where and as shown in detail on the Drawings. Construction joints and expansion joints not indicated on the Drawings shall be as approved by the Owner’s Field Representative and/or Site Engineer.

H. Placement - Unless specified otherwise, concrete three (3) or more inches thick shall be placed and consolidated with mechanical vibrators used in the concrete by skilled workman, properly

supervised. Vibrators shall not be moved laterally or used to transport concrete. Vibrators shall be used to merge successive layers and prevent cold joints. Concrete shall be consolidated to maximum density, free of honeycombing and trapped air. Hand spading shall be used in corners and angles of forms while concrete is plastic. During placement operations, concrete shall be thoroughly consolidated and worked well around and into thorough contact with the steel being careful not to disturb the location of the reinforcing. Over-working and over-vibration which may cause segregation shall be avoided.

I. When concrete is to be placed on the ground surface, the subgrade shall be moistened prior to placing the concrete, except during cold weather periods when freezing is likely to occur. Concrete shall be placed in the form as near to its final position as practicable. Concrete shall be placed in layers to prevent honeycombing. Proper chutes, troughs and other approved devices shall be used to minimize free fall of concrete and to convey concrete to the proper locations. In no case shall concrete be deposited from a height that will separate the aggregates.

J. Concrete shall be deposited within thirty (30) minutes after mixing, as nearly as practicable, in its final position to avoid segregation due to rehandling or flowing.

K. Cold Weather Requirements - Adequate equipment shall be provided for heating the concrete materials and protecting the concrete during freezing and near-freezing weather. No frozen materials or materials containing ice shall be used.

L. All concrete materials and all reinforcement, forms, fillers and ground in which the concrete is to come in contact, shall be free from frost. Whenever the temperature of the surrounding air is below 40 degrees F. all concrete placed in the forms shall have a temperature between 70 degrees F. and 80 degrees F., and adequate means shall be provided for maintaining a temperature of not less than 70 degrees F. for three (3) days or 50 degrees F. for five (5) days except when high early strength concrete is authorized for use, in which case, the temperature shall be maintained at not less than 70 degrees F. for two (2) days or 50 degrees F. for three (3) days or for as much more time as is necessary to insure proper curing of the concrete. The housing, covering or other protection used in connection with curing shall remain in place and intact at least 24 hours after the artificial heating is discontinued. No dependence shall be placed on salt or other chemicals for the prevention of freezing.

M. Finishing - As soon as the face forms are removed, all fins and other projections shall be removed carefully and offsets leveled and rubbed with carborundum where necessary. Pointing and filling voids shall be done only under the direction of the Owner's Field Representative. Finished concrete surfaces shall be clean, smooth, free of honeycombing, spauling, ragged edges and laitance. Finishing of concrete shall be done only by experienced concrete finishers.

N. Curing - Concrete shall be protected from the sun and kept moist for at least seven (7) days. During this period, concrete shall be maintained above 70 degrees F. for at least three (3) days or above 50 degrees F. for at least five (5) days. Exposed concrete shall be kept thoroughly wetted during the first week, and covered with polyethylene or heavy paper. Liquid membrane curing meeting the requirements of AASHTO Designation M-148 may be used upon approval of the Owner's Field Representative.

O. Protection - Every precaution shall be taken by the Contractor to protect finished surfaces from stains, abrasions or damage of any kind. Adequate protection shall be provided against injurious action by sun, wind or freezing temperatures. Fresh concrete shall be thoroughly protected from damage due to heavy rain, flowing water, freezing temperatures and mechanical injury.

P. Cleaning - Do not use muriatic or hydrochloric acid on integrally colored concrete.

3.02 DEFECTIVE CONCRETE

A. Concrete work that is not formed as indicated or is not true to alignment, or is not plumb or level, or is not true to grades or levels, is frozen, or has voids or rock pockets, or has saw dust, wood or debris embedded in it, or does not fully conform to the Contract Documents, shall be considered as defective and shall be removed and replaced by the Contractor at no additional cost to the Owner with work that conforms to the Contract Documents.

END OF SECTION

SECTION 32 14 13

PRECAST CONCRETE UNIT PAVING - ALTERNATE ONE

PART 1 -GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions an Divisions 1 Specifications Sections, apply to this section.

B. The construction methods and requirements for the preparation of the subgrade and paver installation indicated herein, may be supplemented/amended by more stringent or alternate requirements by the Geotechnical Engineer. The most stringent requirements must be followed.

C. Comply with requirements of the Stormwater Pollution Prevention Plan (SWPPP) and Soil Erosion and Sediment Control specification, plans, and details, and the Contractor's accepted schedule. Refer to Section 01 5713 of these Specifications.

D. The Contractor shall read the Geotechnical Report for subsurface investigations prepared by Carlin-Simpson & Associates, " Report on Subsurface Soil and Foundation Investigation" dated July 14, 2021, revised April 20, 2022, to be fully aware of available subsurface information and current recommendations. No extra claim for ignorance shall be accepted.

1.02 SUMMARY

A. Perform all work required to complete, as indicated by the Contract Documents, and furnish all supplementary items necessary for the proper installation of concrete pavers. The paver installation shall be absolutely rigid and shall not be displaced when subjected to vehicular traffic.

B. Submittals:
   1. Product Data: Provide cut sheets and characteristics of paver unit(s). Include dimensions and special shapes, and all materials to be utilized in construction.
   2. Samples: Submit three samples of each paver type, illustrating style, size, color range and surface texture of units being provided.
   3. Manufacturer's Installation Instructions: Indicate substrate requirements and installation methods, and provide maintenance procedures.

C. Mock-Up:
   1. Provide mock-up of the size required by the Landscape Architect for approval.

D. Pre-Installation:
   1. The Contractor shall coordinate a pre-installation meeting prior to beginning work.
   2. Notify the Owner's Field Representative and Landscape Architect with 48 hour minimum notice prior to the onset of work.

PART 2 -PRODUCT

2.01 MANUFACTURER

A. Concrete Pavers:
   1. Unilock, 51 International Blvd., Brewster, NY 10509, www.unilock.com, 1-800-864-5625.

2.02 MATERIALS

A. Precast concrete, as detailed on the Plans.
   1. Unilock Artline Pavers, Laying Pattern "A".
   2. 2.756 inches thick.
   3. Umbriano finish.
   4. Enduracolor, Easyclean and Colorfusion attributes.
   5. Fifty (50) percent mix of Winter Marvel and French Grey, blended on site.

B. Subgrade: Approved compacted subgrade.

C. Base Material:
   1. 3" minimum compacted thickness coarse gravel aggregate base, compacted to achieve full particle lock-up and consolidation, as required by the manufacturer and/or Geotechnical Engineer.

D. Concrete Slab:
   1. 4" thick reinforced concrete slab; 6x6 inch W.W.M., 2" clear.

E. Bituminous Setting Bed:
   1. 3/4" thick bituminous setting bed over primer coat.

F. Provide neoprene adhesive between pavers and asphalt setting bed.

G. Jointing Material:
   1. Polymeric Sand for Joints: Techniseal RG polymeric sand, consisting of graded sand and polymer binders, meeting ASTM C-144, or approved equal.

H. Underdrain:
   1. If detailed on the plan or required by the Geotechnical Engineer, install underdrains through the concrete base consisting of approved granular material.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subbase level is correct gradient and elevations, smooth, capable of supporting pavers and imposed loads, and ready to receive work.

B. Verify the thickness, strengths, surface tolerances and elevations conform to specified requirements.

C. Where appropriate, verify location, type, and elevations of edge restraints, concrete curbing, concrete collars around utility structures, and drainage inlets.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Place material layers compacted in place as detailed on the Plans.

B. Refer to Section 03 3053 and 32 1313 for concrete base and Section 32 1216 for asphalt setting bed.

C. Carefully fill any depressions. The bed depth shall be adjusted to ensure the top surface of the placed pavers will be at the required finished grade.

D. Place paver units in pattern required by the Landscape Architect.

E. Cut paver units at edges with masonry saw.

F. Place half units at edge and interruptions. Maintain hand tight joints.

G. Place polymeric sand over paver surface and sweep into joints between pavers. Moisten joints and recover with additional sand until firm placement is achieved. Remove excess sand.

H. Tamp and level paver units with mechanical vibrator until units are firmly bedded, level, and to correct elevation and gradients. Do not tamp unrestrained edges. Use a protective polymer pad on the bottom of the compactor when performing the compaction of the pavers. Alternatively, use a rubber-roller compactor for the final compaction.

I. Prior to acceptance, the Contractor must demonstrate that the paver installation is absolutely rigid and is not displaced when subjected to vehicular traffic. Should paver installation not meet requirements, it shall be corrected or replaced by the Contractor until satisfactory to the Owner's Field Representative, at the Contractor's expense.

END OF SECTION

SECTION 32 15 40

CRUSHED STONE SURFACING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The work of this Section includes, but is not limited to:
   1. Installation of crushed stone surface over NYSDOT Item 4 within the generator utility area as shown and detailed on the drawings.
   2. Installation of crushed stone wear surface and infill for the Geoweb stabilized maintenance access paths. Refer to Section 32 1116 for crushed stone wearing course and base course beneath Geoweb system, and Section 31 3200 for soil stabilization system (Geoweb).

1.02 REFERENCE STANDARDS

A. Drawings and general provisions, including General and Supplementary Conditions as applicable, and Division 1 Specification Sections, apply to this Section.

B. Comply with requirements of the Stormwater Pollution Prevention Plan (SWPPP) and Soil Erosion and Sediment Control specification, plans, and details, and the Contractor's accepted schedule. Refer to Section 01 5713 of these Specifications.

C. The Contractor shall read the Geotechnical Report for subsurface investigations prepared by Carlin-Simpson & Associates, " Report on Subsurface Soil and Foundation Investigation" dated July 14, 2021, revised April 20, 2022, to be fully aware of available subsurface information and current recommendations. No extra claim for ignorance shall be accepted.

D. Comply with all industry standards and requirements of all Authorities having jurisdiction. If requirements specified conflicts with the requirements of Authorities having jurisdiction, the requirements of the Authority having jurisdiction applies. (NYSDOT: New York State Department of Transportation.)
   1. NYSDOT 304.03 Type 2 Subbase (Item 4).
   2. ASTM D-448 – Standard Classification for Sizes of Aggregate for Road and Bridge Construction.

1.03 SUBMITTALS

A. Shop Drawings: Provide catalog cuts. Include details of fabrications and materials, including accessory items, for all items and appurtenances.

1.04 QUALITY ASSURANCE

A. Provide a detailed installation and termination schedule for all items of work included in this Section. Notify the Site Engineer prior to the work taking place.

PART 2 PRODUCTS

2.01 MATERIALS

A. Six (6) inch depth compacted thickness NYSDOT Item 4 subbase (1/4" - 3/4" blend of stones with fines), over approved compacted subgrade.

B. Two (2) inch depth compacted thickness clean washed #2 crushed stone gravel (size 3/4"), over Item 4 subbase.

C. Clean washed #2 crushed stone gravel (size 3/4") for wearing, infill and subbase courses for Geoweb system.

PART 3 EXECUTION

3.01 PLACEMENT

A. Place the material on the grade in a manner to minimize segregation, using equipment and procedures approved by the SIte Engineer. Do not perform uncontrolled spreading from piles dumped on the grade.

B. The layer thickness shall be as indicated above and/or as shown in the Plan Details. The minimum loose lift thickness is 1.5 times the maximum particle size.

C. Where appropriate, the material shall be placed in maximum six (6) inch lifts.

D. The subgrade shall not be prepared when it is unstable due to excessive moisture. The subgrade shall be shaped and compacted, and when finished, shall confirm to the required subgrade and contour. The subgrade shall be smoothed to correct ridges and other surface irregularities caused by the compaction equipment or otherwise. Remove unsuitable subgrade and replace with gravel material as directed.

E. As applicable, the area shall be sloped away from buildings or structures as directed.

3.02 COMPACTION

A. Gravel shall be spread and rolled/leveled/compacted as directed. The Contractor shall fine grade, roll and shape the stone and base to the required grade.

3.03 TOLERANCE

A. Place stone so that after placement the top surface of the course does not extend more than ¼ in. above no more than ¼ in. below true grade for the course at any location.

END OF SECTION

SECTION 32 16 00

CURBS AND SIDEWALKS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The Work of this Section includes, but is not limited to:
   1. Concrete curb (cast-in-place).
   2. Exposed concrete curb.
   3. Mountable concrete curb, NYSDOT Type M150 Profile.
   4. Concrete sidewalk, drop curb and ramps.
   5. Monolithic concrete flush concrete curb and sidewalk.
   6. Building perimeter monolithic concrete curb and sidewalk.
   7. Work shall also include all associated items and operations necessary and required to complete the installations including but not limited to surface preparation, formwork, finishing and curing.

1.02 REFERENCE STANDARDS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section, as well as all applicable construction, fabrication and safety standards.

B. Comply with requirements of the Stormwater Pollution Prevention Plan (SWPPP) and Soil Erosion and Sediment Control specification, plans, and details, and the Contractor's accepted schedule. Refer to Section 01 5713 of these Specifications.

C. The Contractor shall read the Geotechnical Report for subsurface investigations prepared by Carlin-Simpson & Associates, " Report on Subsurface Soil and Foundation Investigation" dated July 14, 2021, revised April 20, 2022, to be fully aware of available subsurface information and current recommendations. No extra claim for ignorance shall be accepted.

D. Comply with all industry standards and requirements of all Authorities having jurisdiction. If requirements specified conflicts with the requirements of Authorities having jurisdiction, the requirements of the Authority having jurisdiction applies.
   1. ASTM A-1064/1064M - Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
   2. ASTM C-150 – Portland Cement.
   3. ASTM D-1751 – Expansion Joint with Premoulded Bituminous Joint Filler.
   4. ASTM D-1752 - Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
   5. AASHTO M-6 – Fine Aggregate.
   6. AASHTO M-80 – Coarse Aggregate.
   7. AASHTO M-85 – Portland Cement.
   8. AASHTO M-148 – Concrete Curing.
   9. AASHTO T-26 - Quality of Water to be Used in Concrete

1.03 SUBMITTALS

A. Shop Drawings: Provide catalog cuts. Include details of fabrications and materials as applicable, including accessory items, for all items and appurtenances.

1.04 QUALITY ASSURANCE

A. Provide a detailed installation and termination schedule for all items of work included in this Section. Notify the Site Engineer prior to the work taking place.

B. The installation of certain materials and infrastructure including but not limited to earthwork operations, and hardscape and utility installations, may be subject to special subgrade preparation and construction requirements. Subgrade improvement measures and special

construction requirements must be followed as indicated by the Geotechnical Engineer. The most stringent geotechnical requirements stated in the Geotechnical Report or any other place in the Contract Documents shall be adhered to by the Contractor.

PART 2 PRODUCTS

2.01 CURBS

A. General Requirements - The Contractor shall construct poured concrete curbs including curbs for ramps, upon a properly prepared subgrade, in conformity with the lines, grades, typical sections and details shown on the Drawings and as specified herein. Work shall include all excavation and backfill required.

B. Concrete curbs shall be constructed of Class "A" concrete in accordance with Section 03 3053 of these Specifications, and shall be cast-in-place to proper size and shape and to the line and grade shown on the Drawings.

2.02 SIDEWALKS

A. Concrete Sidewalks, Drop Curb and Ramps.
   1. Concrete sidewalks shall be the thickness shown on the Plan Details, constructed in accordance with Section 03 3053 of these Specifications.
   2. Reinforcing shall be 6 x 6 x 6 ga. welded wire or as detailed on the Plans.
   3. Dowels shall be located where shown, and shall be 24" x 1" diameter smooth dowels at 18" on center. Paint and grease one end of dowel.
   4. Forms shall be metal or acceptable planed and matched lumber, straight and free from warp or other irregularities that will adversely affect the installation.
   5. Expansion joints shall be premolded bituminous joint filler, in accordance with ASTM Designation D-1751, one-half (1/2) inch thick and as deep as the full depth of the walk.
   6. Foam backer rod filler shall be ASTM D1752 premolded resilient non-extruding non-staining closed cell foam polyethylene, PVC foam or sponge rubber, 25% wider than joint width, thickness indicated.
   7. Joint sealants shall be two-component polysulfide or polyurethane elastomeric type complying with FS TT-S-00227, self-leveling, designed for foot traffic, such as SikaFlex 1A, or approved equal.
   8. Expansion joints shall not be placed within the ramp area.
   9. Detectable warnings shall be as shown on the Plan Detail(s) or as directed by the Authority having jurisdiction.

B. Crushed Stone Base
   1. Sidewalks shall be installed on 3/4" crushed stone base compacted to a thickness of six (6) inches, or as detailed on the Plans. Subgrade shall be approved by the Geotechnical Engineer prior to placing stone and compacted to 92% maximum modified density.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

A. The Contractor shall install all curbs and sidewalks as specified in the locations and to the lines and grades as shown on the Drawings and/or as directed by the Owner's Representative.

B. The installation of all sidewalks, curbs and gutters within Public Rights-of-Way shall be in accordance with the rules and requirements of the entity having control over the roadway. Work shall include all items and operations necessary and required to complete the installation to the satisfaction of the State, County, and/or Municipality, including maintenance of traffic and protection of pedestrians.

C. Contractor's Responsibility - The Contractor shall be responsible for laying out and installing all curbs, sidewalks, ramps, and related items in accordance with the cross-sections, lines and grades as specified herein and shown on the Drawings and/or in accordance with the directions of the Owner's Representative and/or Site Engineer. All curbs, sidewalks, ramps,

and related items which are not constructed to the proper section, grade or alignment shall be corrected by repair or replacement by the Contractor at no additional cost. Improper finishing or improper expansion or construction of joints shall also be cause for rejecting the curb, sidewalk, or ramp.

D. Concrete - Unless otherwise specified, all cast-in-place concrete items as specified herein shall be constructed in accordance with the requirements of Section 03 3053 of these Specifications.

E. Protection from Damage - The Contractor shall protect all curb, sidewalk, and ramp installation from damage until acceptance of the Work by the Owner. Any damage prior to acceptance of the Work, shall be repaired or replaced by the Contractor at his expense.

F. Defective Concrete - Concrete work that is not formed as indicated or is not true to alignment, or is not plumb or level, or is not true to grades or levels, is frozen, or has voids or rock pockets, or has saw dust, wood or debris embedded in it, or does not fully conform to the Contract Documents, shall be considered defective and shall be removed and replaced by the Contractor at no additional cost to the Owner, with work that conforms to the Contract Documents.

3.02 CURBS

A. Concrete Curb (Cast-in-Place)

1. General Requirements - Concrete curbs shall be cast-in-place to proper size and shape and to the line and grade shown on the Drawings. The curbing shall be constructed using conventional forms and in segments separated by construction joints and expansion joints as specified herein.
2. Forms - Forms shall be metal or acceptable planed and matched lumber, straight and free from warp or other irregularities that will adversely affect the installation. Forms shall conform to the curb cross-section shown on the Drawings and shall be carefully set to line and grade and thoroughly braced and secured in place so that there will be no displacement during placing of the concrete. On curves, all forms must be bent to meet the required curvature; the use of short chords will not be permitted. All forms shall be thoroughly cleaned prior to reuse. Forms which have become worn, bent or broken shall not be used.
3. Placing of Concrete - Concrete shall be placed in the form as near to its final position as practicable, struck off with a template, vibrated or spaded to prevent "rock-pockets" or "honey-combing" adjacent to the forms and finished to a smooth even surface.
4. Expansion Joints - Vertical expansion joints shall be located approximately every twenty (20) feet and shall be so arranged that they shall match expansion joints in adjacent concrete pavements and sidewalks. Unless directed otherwise, expansion joints shall also be installed at the PC and PT of all radius curb. Expansion joints shall be constructed vertical, plumb and at right angles to the face of the curb. They shall be one-half (1/2) inch in width and formed with premolded bituminous joint filler, in accordance with ASTM Designation D-1751, and cut to conform to the cross-section of the curb.
5. Construction Joints - If directed, vertical construction joints shall be located approximately every ten (10) feet being equally spaced between expansion joints. The length of these curb segments may be varied slightly for closures but in no case shall they be less than four (4) feet. Construction joints shall be vertical, plumb and right angles to the face of the curb and shall be formed by approved method that will provide complete separation of the curb segments during placing of the concrete.
6. Finishing - Forms shall be left in place for 24 hours or until the concrete has sufficiently hardened as determined by the Owner's Representative, so that they can be removed without injury to the curb. Upon removal of the forms, the exposed faces of the curb shall be immediately rubbed to a uniform surface. Rubbing shall be done by experienced and competent concrete finishers. No plastering will be permitted.

7. Curing - After finishing, the curb shall be cured in accordance with the requirements as specified under Section 03 3053 of these Specifications.

3.03 SIDEWALKS

A. Concrete Sidewalks, Drop Curb and Ramp.
1. General Requirements - Concrete sidewalks, drop curb and ramp shall be constructed in the locations, and to the dimensions and cross-sections shown on the Drawings. The slope of the sidewalks shall be generally as shown on the Drawings, but in the case of transitions or warp sections, the sidewalk shall be constructed to give an effective combination of proper drainage and good appearance. In the event of doubt regarding the slope of any sidewalk, the Contractor shall set appropriate grade stakes and verify the slope with the Owner's Representative and/or Site Engineer before such sidewalk is placed.
2. Preparation of Subgrade - The subgrade for sidewalks shall be properly prepared by removal of any undesirable material and replaced with suitable granular material, thoroughly compacted. The subgrade surface shall be fine graded and thoroughly compacted prior to placement of the aggregate base course. After the subgrade has been compacted to the satisfaction of the Geotechnical Engineer or Owner's Representative, a layer of approved aggregate (base course) shall be placed upon the subgrade and compacted to the compressed thickness shown in detail on the Drawings.
3. Forms - Forms shall be carefully set to line and grade with the required cross-slopes to provide for proper drainage and shall be thoroughly braced and secured in place so that there will be no displacement during placing of the concrete. On curves, all forms must be bent to the required curvature; the use of short chords will not be permitted. All forms shall be thoroughly cleaned prior to reuse and just prior to placement of the concrete, the portion of the forms in contact with the concrete shall be given a light coat of form oil that will not discolor the concrete. Forms which have become worn, bent or broken shall not be used.
4. Placing of Concrete - Concrete shall be placed in the forms as near to its final position as practicable and shall be vibrated or spaded just enough to compact it firmly. Precautions shall be taken not to overwork the concrete while it is still plastic. Sidewalk shall not be placed on frozen subgrade or frozen base course, and materials containing frost or ice shall be rejected.
5. Drop curb and pedestrian ramps shall be installed in accordance with the Plan Detail and ADA requirements, including tactile detectable warning strips.
6. Scoring - refer to the Drawings for the scoring plan.
7. Expansion Joints - Expansion joints shall be placed approximately every twenty (20) feet as indicated on the drawings or as directed by the Owner's Representative. Expansion joints shall also be placed wherever the walk abuts buildings, existing concrete curb, lighting standards or any other rigid object. The joint filler shall be set as detailed.
8. Control Joints - Provide sawed control joints, sectioning concrete into areas indicated. Saw joints to a depth equal to not less than one-fifth (1/5) of the concrete thickness and of maximum ¼" width. Saw cut joints as soon as surface is firm enough not to be torn or damaged by the cutting blade. Spacing as indicated on the drawings. When not indicated, provide spacing equal to slab width and not greater than 10'-0" on center.
9. Finishing - After the concrete has been struck off, it shall be smoothed with a wood float or darby, leveling any raised spots and filling all depressions. Walks shall be finished with a wood float. Provide a light broom finish as directed.
10. Foam Backer Rod Filler - Install in accordance with manufacturer's recommendations.
11. Joint Sealants - Shall be installed in Accordance with manufacturer's recommendations.
12. Curing - After finishing, the sidewalk shall be cured in accordance with the requirements as specified under Section 03 3053 of these Specifications.

3.04 FINAL INSPECTION

A. Upon completion of the Work and before final acceptance, the areas shall be subjected to a final inspection in the presence of the Site Engineer and/or Owner's Representative. The work shall not be considered complete until all requirements for line, grade, cleanliness, tests and workmanship have been met.

END OF SECTION

SECTION 32 17 23

PAVEMENT MARKINGS AND SIGNS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The Work of this Section includes, but is not limited to:
   1. Installation of pavement striping in roadways, driveways and parking areas including striping of parking stalls.
   2. Installation of pavement markings may include arrows, symbols, numbers, and letters in roadways, driveways and parking areas.
   3. Installation of traffic signs.
   4. Removal of painted markings on paved surfaces.
   5. All items and operations required to complete the work including, but not limited to, cleaning of pavement, layout and protection of striping and markings.

1.02 REFERENCE STANDARDS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section, as well as all applicable construction, fabrication and safety standards.

B. Comply with all industry standards and requirements of all Authorities having jurisdiction. If requirements specified conflicts with the requirements of Authorities having jurisdiction, the requirements of the Authority having jurisdiction applies.
   1. Manual on Uniform Traffic Control Devices (FHWA)
   2. New York State Supplement to the Manual on Uniform Traffic Control Devices (NYSDOT).

1.03 SUBMITTALS

A. Shop Drawings: Provide catalog cuts. Include plans, elevations, sections, and details of fabrications and their connections, including accessory items, for all items and appurtenances, as applicable.

1.04 QUALITY ASSURANCE

A. Provide a detailed installation and termination schedule for all items of work included in this Section. Notify the Site Engineer prior to the work taking place.

PART 2 PRODUCTS

2.01 PAVEMENT STRIPING AND MARKINGS

A. Paint - shall be formulated and manufactured from first-grade materials and shall be free from defects that may adversely affect the serviceability of the finished product. When the paint is stored in its container, the pigmented binder shall not liver or settle out to the extent that re-mixing is difficult by standard methods or the application is detrimentally affected.

B. All paint furnished must be shipped in strong, substantial and properly sealed containers. Five (5) gallon steel pails shall have a full diameter hub cover, wire bail and handle and shall conform to I.C.C. Specification 37A. Steel drums shall be equipped with a ring and lock closure and removable lid which can be readily resealed after partial use of the contents. Steel drums shall conform to I.C.C. Specification 17-H or 37A.

C. Paint shall be Sherwin-Williams Pro-Park Waterborne Traffic Marking Paint or equal as approved by the Owner's Field Representative. Approved equal shall be based on NYSDOT Technical Services approved list of Pavement Marking Materials, TRAFFIC PAINT (727-09) (WATERBORNE).

2.02 TRAFFIC SIGNS

A. All signs shall be product of Acme Sign Co., 12 Research Drive, Stamford, CT, 06906, (203) 324-2263.

B. Reflectorized Signs - shall be "Scotchlite" reflectorized sheeting or approved equal, mounted on aluminum alloy, flat sheet conforming to ASTM Designation B-209, Alloy GS-11A-T6 (6061-T6). Thickness shall be 0.080 inches for signs up to and including eight (8) square feet and 0.100 inches for signs with an area greater than eight (8) square feet.
   1. The manufacturer shall ensure the aluminum is free of all corrosion, white rust and dirt.
   2. The pre-coated adhesive shall form a durable bond to aluminum. The pre-coated adhesive, after 48 hours of aging at 75 degrees F. from the time of application, shall be strong enough to resist scuffing and marring during normal handling, elastic enough at low temperatures to resist shocking off when struck at 20 degrees F., and moisture resistant enough to withstand eight (8) hours of soaking in water at 75 degrees F. without appreciable decrease in adhesion. The pre-coated adhesive shall have no staining effect on the reflective sheeting and must be mildew resistant.
   3. Reflective sheeting shall be free from ragged edges, cracks, scale and blisters. Reflective sheeting shall be moisture resistant and readily cut with scissors, knife, blade or heats without cracking, checking or flaking.

C. Hardware - shall consist of 5/16 inch diameter bolts complete with washers and nuts.
   1. Nuts and bolts shall be hexagonal and made from aluminum alloy 2024 wire or rod (ASTM Specification B-211, alloy CG42A). The thread fit for the bolts shall conform to American Standards Association Class 2A and the thread fit for the nuts shall be Class 2B. Finished bolts and nuts shall be supplied in the T4 temper.
   2. Flat washers shall be 21/64" I.D. x 3/4" O.D. x 0.091" and shall be made from aluminum alloy Alclad 2024-T4 sheet (ASTM Specification B-209, alloy CG42A-T4).

D. Aluminum Sign Posts - shall be 3.25” x 3.25” x 0.125” wall rectangular extruded aluminum post of the height indicated in the detail on the Drawings, with 3/8" holes on one (1) inch centers to receive sign faces or as shown on the Plans. A second post is required for signs 30” or larger, with a 1/8” aluminum retaining strip.
   1. Sign post shall be product of Acme Sign Co., 12 Research Drive, Stamford, CT, 06906, (203) 324-2263. Post color shall match existing sign posts at the site and installed per the manufacturer’s instructions.

E. Steel Channel Posts – where required, shall conform to the standard specifications for cold rolled carbon sheet steel, commercial quality ASTM Designation A-366. Posts shall be minimum 11 gauge steel weighing no less than three (3) lbs./ft. with 3/8" holes on one (1) inch centers to receive sign faces.
   1. Posts shall be galvanized for the full length and total area by the hot dip method and shall have a continuous coating of pure zinc of a uniform thickness, so applied that it will adhere firmly to the surface of the posts, and shall be capable of withstanding four immersions in a standard testing solution of copper sulphate without showing any trace of metallic copper. The first three immersions shall be for a period of one (1) minute each and the fourth immersion for a period of one-half (1/2) minute. All holes in the steel posts shall be pierced before galvanizing.

PART 3 EXECUTION

3.01 PAVEMENT STRIPING AND MARKINGS

A. General
   1. The Contractor shall install all temporary, interim and final pavement striping and markings where and as shown on the Drawings and/or as directed by the Owner's Field Representative.
   2. Before any temporary, interim and final pavement striping and marking work is begun, a schedule of operations shall be submitted to the Owner's Field Representative for his review and approval.
   3. The Contractor shall be responsible for removing, to the satisfaction of the Owner's Field Representative, all tracking marks, spilled paint or paint applied in unauthorized areas.

4. Temporary striping and markings shall be removed as approved by and to the satisfaction of the Owner's Field Representative.
5. The Contractor shall establish marking line points for striping at twenty-five (25) foot intervals throughout the length of the pavement or as directed by the Owner's Field Representative.
6. Where appropriate, the Contractor shall be required to remove all existing lines and markings which are no longer required in the new construction due to revised stall layouts, new driveway locations, etc.
7. Removal of painted lines and markings from the pavement as specified may be done by any method that does not materially damage the surface or texture of the pavement. The Contractor shall advise the Owner's Field Representative of the method he intends to use to remove painted lines and markings.
8. The Contractor shall be responsible for cleaning the pavement, to the satisfaction of the Owner's Field Representative, of dust, dirt, old pavement striping and markings, concrete curing compounds and other foreign material which may be detrimental to the adhesion of the paint film.
9. The paint shall be applied only on thoroughly dry pavement surfaces, when the atmospheric temperature is at or above 40 degrees F. and when the weather conditions are favorable in the opinion of the Owner's Field Representative.
10. After striping and/or markings have been installed, they shall be properly protected to prevent tracking and marring of the striping and markings.

B. Application of Pavement Striping and Markings
1. Painted pavement striping and markings shall, unless otherwise noted herein, be applied with atomizing spray type striping machines. The equipment shall be compatible with and suitable for the application of the type of paint being used and shall be approved by the Owner's Field Representative. Applied markings shall have clean-cut edges, true and smooth alignment and uniform film thickness of 15 +1 mils.
2. The Contractor may apply white and yellow paint, utilizing rollers and/or brushes for marking gore areas, turn arrows, letters, stop bars, short temporary detours or other such areas as approved by the Owner's Field Representative.
3. Normal spreading rates for pavement marking paints shall be from 100 to 115 square feet per gallon so as to obtain a wet film thickness of 15 +1 mils.

C. Striping and Marking Schedule
1. Unless otherwise specified or approved by the Owner's Field Representative, the Contractor shall provide striping and marking colors as applicable, and as follows:

WHITE	**CHROME YELLOW**
1. STOP LINES	**1. SOLID DOUBLE LINES**
2. PEDESTRIAN CROSSWALKS	**2. HATCHED AREAS**
3. PARKING STALLS	
4. ARROWS, LETTERS, NUMBERS	**BLUE**
5. HATCHED AREAS	**1. ACCESSIBLE PARKING STALLS**
	2. ACCESSIBLE SYMBOLS
	3. HATCHED AREAS

3.02 TRAFFIC SIGNS

A. General – The Contractor shall furnish and install traffic signs where and as shown on the Drawings and/or as directed by the Owner's Field Representative.

B. Reflectorized Signs - shall be as indicated in the Traffic Sign Table on the Drawings and shall be fabricated in accordance with the details of the Drawings and the following requirements:

1. Fabrication of all metal parts shall be accomplished in uniform and workmanlike manner. All fabrication, including shearing, cutting and punching of holes shall be completed prior to metal degreasing and application of reflective sheeting. Metal panels shall be cut to size and shape and shall be free of buckles, warp, dents, cockles, burrs and defects resulting from fabrication. The surface of all sign panels shall be flat.
2. All holes shall be 3/8" diameter drilled or punched, and all hole locations shall be centered and shall not crush, chip, burn or otherwise mar the sign face.
3. Degreasing - shall be done by one of the following methods:
   a. Vapor Degreasing - Signs shall be totally immersed in a saturated vapor of trichlorethylene or perchlorethylene. Trademark printing shall be removed with lacquer thinner or controlled alkaline cleaning system. Follow with a thorough rinse.
   b. Alkaline Degreasing - Signs shall be immersed in a tank containing solution, controlled and titrated to the solution manufacturer's specifications. Immersion time shall depend upon the amount of soil present and the gauge of the metal. Rinse thoroughly with running water.
4. Etching - shall be done by one of the following methods:
   a. Acid Etch - Etch well in a 6% - 8% phosphoric acid solution. Rinse thoroughly with running cold water at 100 degrees F. followed by hot water tank rinse.
   b. Alkaline Etch - Etch well the pre-cleaned aluminum surface in an alkaline etching material that is controlled by titration, use time, temperature and concentration specified by the solution manufacturer. Rinse thoroughly. Remove smut with an acidic, chromium compound type solution as specified by the solution manufacturer and then thoroughly rinse.
5. Panels shall be dried by use of a hot air dryer. Metal shall not be handled except by device or clean canvas gloves between all cleaning and etching operations and the application of reflective sheeting. There shall be no opportunity for metal to come in contact with greases, oils or other contaminants prior to the application of reflective sheeting.
6. In the case of Scotchlite sign faces, finishing coats of 700 Finishing Clear shall be applied in accordance with manufacturer's specifications.
7. Reflective sheeting shall be applied to properly treated base panels, mechanically with the equipment and in the manner specified by the manufacturer.
   a. Recommendations of the sheeting manufacturer shall be followed with respect to cutting, matching, positioning, and butting of sheets. The Contractor shall insure that signs shall have a uniform appearance and brilliance both day and night. All sheeting used shall be inspected to insure color matching throughout each sign face.
8. Non-Reflectorized Signs - Those signs that are not required to be reflectorized and so indicated in the Traffic Sign Table, shall be galvanized, bonderized steel with embossed messages and borders and baked enamel finish.
9. Aluminum Sign Posts - shall be set vertical and plumb in the locations shown, specified and/or ordered by the Owner's Field Representative. Posts shall be driven a minimum of three (3) feet into firm ground as detailed on the Drawings. Signs shall be securely fastened to the posts at the correct height by means of non-corrosive hardware as specified herein.
10. Steel Channel Sign Posts – where detailed or required, shall be set vertical and plumb in the locations shown, specified and/or ordered by the Owner's Field Representative. Posts shall be driven a minimum of three (3) feet into firm ground and/or installed in concrete-filled steel pipe protection posts where so specified on the Drawings. Signs shall be securely fastened to the posts at the correct height by means of non-corrosive hardware as specified herein.

3.03 FINAL INSPECTION

A. Upon completion of the Work and before final acceptance, the pavement markings and signage installations shall be subjected to a final inspection in the presence of the Site Engineer and/or

Owner's Field Representative. The work shall not be considered complete until all requirements for line, grade, cleanliness, and workmanship have been met.

END OF SECTION

SECTION 32 31 00

FENCING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The Work of this Section includes, but is not limited to:
   1. Installation of vinyl coated chain link fencing and gates for the proposed stormwater management area (pocket pond) where shown and as detailed on the plans including all necessary hardware and connections.
   2. Concrete footings.

1.02 SUBMITTALS

A. Submit manufacturer's product data (shop drawings) and samples for approval.

B. Submit shop drawings. Include plan layout and details illustrating finish, height, location, and sizes of posts, rails, braces, gates, and anchorage. Provide hardware list and erection procedures.

C. Submit installer's certification that furnished materials meet specification requirements.

1.03 QUALITY ASSURANCE

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section, as well as applicable construction, fabrication and safety standards.

B. Provide fence as complete unit produced by a single manufacturer, including necessary erection accessories, fittings, and fastenings.

C. Installation: Performed only by the manufacturer or an experienced fence installer approved by manufacturer.

D. Materials and installation shall comply with the following standards:
   1. American Society for Testing and Materials, (ASTM).
   2. New York State Building Code.
   3. Local Building Code.

E. Provide manufacturer's warranty for fencing/gates installed. Contractor shall warranty installation for one (1) year from project completion.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver fence materials in the manufacturer's original packaging with tags and labels intact and legible.

B. Handle and store material to prevent damage and deterioration.

1.05 PROJECT CONDITIONS

A. Do not begin fencing installation before completion of final grading.

PART 2 - PRODUCTS

2.01 CHAIN LINK FENCE (VINYL COATED)

A. The Contractor shall furnish and install vinyl coated chain link fence, four (4) feet high, where and as shown on the Drawings and/or as directed by the Owner's Field Representative.

B. Prior to installation of the fence, the Contractor shall check the fence layout with the Owner's Field Representative who must approve the layout before any of the work is done.

C. Posts and Rails - shall be standard full weight vinyl coated galvanized Schedule 40 pipe manufactured and galvanized in accordance with ASTM Designation A-120 except that the zinc coating shall average not less than 2.0 oz. per sq. ft. and no single coating shall show less than 1.8 oz. per sq. ft. All materials shall be new and first class and shall not include

reconditioned or rerolled pipe. Vinyl coating shall be ten (10) to fifteen (15) mils in thickness and coated by the thermal fusion process. All posts shall be furnished with post caps. Pipe sizes shall be as follows:

1. Fence 5 Feet or Less in Height

End, Corner and Gate Posts	2 1/2" O.D. 3.65 #/LF
Line Posts	2" O.D. 2.72 #/LF
Top and Brace Rails	1 5/8" O.D. 2.28 #/LF
Bottom Rails	1 5/8" O.D. 2.28 #/LF

2. Fence Greater Than 5 Feet in Height

End, Corner and Gate Posts	3" O.D. 5.79 #/LF
Line Posts	2 1/2" O.D. 3.65 #/LF
Top and Brace Rails	1 5/8" O.D. 2.28 #/LF
Bottom Rails	1 5/8" O.D. 2.28 #/LF

D. Fittings - shall be vinyl coated malleable iron fittings conforming to the requirements of ASTM Designation A-47 and galvanized in accordance with ASTM Designation A-153.

E. Fabric - shall be 9 gauge galvanized two (2) inch mesh (or as directed), which shall be vinyl clad in conformance with the requirements of AASHTO Designation M-181, Type III, except as may be modified herein. Vinyl coating shall be firmly and continuously extrusion bonded to the galvanized steel wire. Top selvage shall have a knuckled finish.

F. Fabric Ties - shall be minimum 9 gauge vinyl coated galvanized steel or aluminum. Minimum spacing shall be as follows:
   1. 14" o.c. at line posts
   2. 24" o.c. at top and bottom rails

G. Color of Vinyl Coating – Color of Vinyl coating shall be black, or as directed by the Owner's Feild Representative.

2.02 CHAIN LINK HINGED GATES (VINYL COATED)

A. The Contractor shall furnish and install vinyl coated chain link gates where and as shown on the Drawings and/or as directed by the Owner's Field Representative.

Gate shall be a double leaf gate, height to match proposed chain link fence; equal widths to span a clear opening of eight (8) feet.

Gate construction shall be of industrial design and shall be compatible with the chain link fence construction.

B. Fabrication - Fabricate perimeter frames of gates from Schedule 40 galvanized steel pipe with vinyl coated finish to match fence framework. Pedestrian gates shall be constructed of 1 5/8" O.D. galvanized steel pipe (2.28# per LF), and vehicular gates shall be constructed of 2" O.D. galvanized steel pipe (2.72# per LF). Assemble gate frames by welding or with special fittings and rivets for rigid connections, providing security against removal or breakage of connections. Welds for welded frames shall be ground smooth and shall be galvanized. gate frames shall be a minimum of 2" pipe. Provide horizontal and vertical members to ensure proper structural integrity, gate operation and attachment of fabric, hardware and accessories. Space frame members a maximum of 8 feet apart unless otherwise indicated.

Provide same fabric as for fence. Top and bottom selvage shall have knuckled finish. Install fabric with stretcher bars at vertical edges and at top and bottom edges. Attach stretcher bars to gate frame at not more than 15" o.c.

Install diagonal cross-bracing consisting of 3/8" diameter adjustable length truss rods on gates to ensure frame rigidity without sag twist.

All components of the gate (frames, fabric, fastening attachments, etc.) and gate posts shall be galvanized and vinyl coated in accordance with the requirements specified for "Chain Link Fence".

C. Gate Hardware - Provide industrial grade hardware and accessories for each gate, galvanized per ASTM designation A-153, and in accordance with the following:

Hinges: Provide industrial grade hinges. Size and material to suit gate size, non-lift-off type, offset to permit 180 degree gate opening. Provide 1-1/2 pair of hinges for each leaf over 6 feet nominal height. The hinges shall not twist or turn under action of the gate.

Latch: Fulcrum latch to permit operation from either side of gate, with padlock eye as integral part of latch.

Keeper: Provide keeper for vehicle gates, which automatically engage gate leaf and holds it in open positions until manually released.

Drop Rod: 1 3/8" minimum.

D. Gate Posts - Gate posts and concrete foundations for gate posts shall be sized to properly support the weight of the gate and provide for proper operation of the gate, and shall be no smaller than 6 5/8". All gate post shall be furnished with caps.

2.03 CONCRETE

A. Concrete: ASTM C94 ready-mixed concrete, minimum 28-day compressive strength of 4,000 psi, air-entrained 2% to 4%.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine final grades and installation conditions. Do not start fence system work until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Layout complete fence lines. Ensure that the fence lines are located in the exact location required surrounding the leased area.

B. Locate and mark post positions. Space line posts equally and at maximum 8'-0" on center spacing for chain link fence. All posts shall be set vertically and to the required grade and alignment.

C. Provide corner posts at positions where fence changes direction more than 10 degrees. Provide end posts at both sides of all openings.

D. Fence shall generally follow the contour of the ground. Grading shall be performed where necessary to provide a neat appearance.

E. Installation shall not commence until the layout(s) are approved by the Owner's Field Representative.

3.03 INSTALLATION

A. Prior to installation of the fence, the Contractor shall check the fence layout with the Owner's Field Representative who must approve the layout before any of the work is done.

B. Assemble and install fencing in accordance with manufacturer’s recommendations, details**,** final shop drawings, and industry standards.

C. Install gates plumb, level, and secure for full opening without interference to provide heavy duty extended exterior use. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary. The gates shall be capable of being opened or closed easily by one person.

D. All posts shall be set vertical and plumb in each direction, in concrete foundations of the depth and diameter shown in detail on the Drawings or in accordance with manufacturer's

requirements. Set posts in 4,000 psi concrete having a diameter 4 times the diameter of the post, and 6" deeper than the bottom of the post. Forms are not necessary or recommended. Tamp concrete in hole to eliminate pockets. Posts shall be set to the required grade and alignment and shall be equally spaced along each side. Post spacing shall be not greater than eight (8) feet or in accordance with the manufacturer.

E. Perform fitting required for installation. Set the work accurately in location, alignment, and elevation free of rack, measure from established lines and levels. Assembled fencing shall be firm, rigid, free of rattle, and provide maximum protection against tampering and vandalism.

F. Fit exposed connections accurately together to provide flush, tight hairline joints.

G. Fabric shall be securely fastened to posts, rails, braces and tension wire (or bottom rail when specified) by approved method. The fabric shall be secured to all end, corner and gate posts with stretcher bars fastened to the posts and stretcher bands spaced at a maximum of 14 inches in a manner permitting adjustment of fabric tension. Fabric shall be continuous along each stretch of fence. Bottom of fabric shall be installed with a maximum of one and one-half (1-1/2) inch clearance from ground surface.

All top rails shall pass through the base of the post caps and shall form a continuous brace from end to end of each stretch of fence. Top rail lengths shall be joined with sleeve couplings with expansion sleeves provided at 100 foot intervals. Top rails shall be securely fastened to end posts by approved rail end connectors. Horizontal braces shall be provided at end and corner panels between line post and each adjacent end, corner, and gate post midway between the top rail and ground as shown in detail on the Drawings. Diagonal truss rod with turn buckle shall also be provided at these locations.

H. Attach panels to brackets using two (2) 1/4 aluminum air craft rivets.

I. Adjust fence before securing in place to ensure proper matching at butting joints and proper alignment throughout their length.

3.04 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all debris and equipment. Repair all damage resulting from site improvements installation.

END OF SECTION

SECTION 32 32 55

RUBBLE STONE MASONRY TREE WELL AND WALL

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. Comply with requirements of the Stormwater Pollution Prevention Plan (SWPPP) and Soil Erosion and Sediment Control specification, plans, and details, and the Contractor's accepted schedule. Refer to Section 01 5713 of these Specifications.

C. The Contractor shall read the Geotechnical Report for subsurface investigations prepared by Carlin-Simpson & Associates, " Report on Subsurface Soil and Foundation Investigation" dated July 14, 2021, revised April 20, 2022, to be fully aware of available subsurface information and current recommendations. No extra claim for ignorance shall be accepted.

1.02 SUMMARY

A. Build stone tree well and wall with radius as detailed on the Plan, of the size required for the tree caliper. Wall diameter varies.

1.03 QUALITY ASSURANCE

A. Materials and methods of construction shall comply with the Stone Institute of America, (BIA): Technical Notes on Stone Construction and association recommendations:

B. Installation shall be performed only by experienced stone masons with satisfactory record of performance on complete projects of comparable size and quality.

C. Before starting stone wall, provide a sample area using materials indicated for the stone masonry work. Build area at the site of full thickness and approximately 10 l.f. Provide the range of color, texture, and workmanship proposed for the work. Correct and rebuild sample until Landscape Architect's acceptance of the work. Retain area during construction as a standard for completed stone masonry work.

1. The approved sample may be a portion of the work and remain in place. Location as directed by the Landscape Architect.

D. Provide the type of stone to ensure consistent shape, color range, and texture.

E. Unless directed otherwise, do not change stone source during the course of the work.

F. The installation of certain materials and infrastructure including but not limited to earthwork operations, and hardscape and utility installations, may be subject to special subgrade preparation and construction requirements. Subgrade improvement measures and special construction requirements must be followed as indicated by the Geotechnical Engineer. The most stringent geotechnical requirements stated in the Geotechnical Report or any other place in the Contract Documents shall be adhered to by the Contractor.

1.04 SUBMITTALS

A. Where appropriate, submit product data for each type of masonry unit required.

B. Submit a minimum of 5 full size samples of each type of masonry unit. Provide the maximum shape, color, and texture variation range proposed for the work.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Stone masonry materials:

1. Deliver, store, and handle stone materials to prevent soiling and damage. Stack stone material off the ground.

1.06 PROJECT CONDITIONS

A. Protect partially-completed stone work against weather damage and moisture, when work is not in progress. Cover tops of walls with strong, waterproof, non-staining membrane. Extend membrane at least 2'-0" down both sides of walls and hold securely in place.

B. Brace unsupported and newly-laid stone walls. Maintain bracing in place until walls reach design strength.

C. Cold weather construction:
   1. Precondition materials to maintain 50 degrees F. when installed.
   2. Do not install stone work when the temperature of the outside air is below 40 degrees F. and falling unless suitable means acceptable to the Landscape Architect are provided to protect work from cold and frost.
   3. No work will be permitted when outside air temperature is below 25 degree F.
   4. Do not use frozen materials or materials mixed or coated with ice or frost.
   5. Do not build on frozen work. Remove and replace work damaged by frost or freezing.
   6. Protect completed work against freezing for not less than 4 days after laying.

D. Protect adjacent work from damage or soiling during work operations.

PART 2 PRODUCTS

2.01 STONE MATERIAL

A. Stone shall be natural stone, sound, dense, hard, durable, properly quarried (as applicable), free from reeds, rifts, seams, laminations and minerals which, by weathering, would cause discoloration or deterioration, and be of desirable stone of good quality and resistant to weather and disintegration from freezing/thawing.

B. The Contractor will be permitted to incorporate into the work, rubble stones removed from the job site, provided they meet the necessary requirements and have been approved by the Landscape Architect.

C. Stones shall be roughly rectangular field stone, or quarry stone if permitted, and shall be free of acute angles, excessively sharp edges, corners, and gouges from handling. At least four-fifths of the stones shall be greater than one-third cubic foot in volume. Unless directed otherwise, exposed face of each stone shall have a minimum height of two inches and a minimum width of ten inches.

D. Natural variations in color and markings which are characteristics of the stone materials and do not impair strength or appearance are acceptable. Provide only sound stone, free from defects detrimental to appearance and durability.

E. Color range, texture, and finish of rough stone materials shall be within the range of the Landscape Architect's accepted samples.

F. Size of stones shall be as detailed on the Plans or required by the Landscape Architect.

2.02 STONE FOR TOP OF WALL

A. Cap stone is not required for top of wall. Select flat stones, roughly square and of uniform thickness, extending across the entire width of the wall, shall be used for the top course of the wall.

2.03 POROUS BACKFILL

A. Provide broken stone for porous backfill.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates and installation conditions. Do not start stone work until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Establish lines, levels, and coursing.

B. Clean stone before setting. Provide edges and surfaces free of dirt and foreign matter. Dampen stone with clean water prior to setting.

C. Do not use stone units with chips, cracks, voids, stains, or other visible defects.

D. As applicable, protect all exposed or disturbed root structure as directed until the well(s) are constructed.

3.03 INSTALLATION

A. Install and compact subbase in accordance with earthwork specifications.

B. Stone masonry tree well and wall shall be laid dry without mortared joints.

C. Install porous broken stone backfill as detailed on the Plan in the proper location for tree(s) located in a fill area or trees located in a cut area, for the full depth and to a height six inches below final grade or as directed.

D. Install materials to provide an even distribution of various colors and sizes throughout the work. Maintain stone as clean as possible as work progresses. Avoid use of excessive amounts of smaller stones at top of wall.

E. Install stones with larger sides down and generally flat faces forward, Set stones so that face follows angle of indicated batter, as applicable, with tight dry joints.

F. Install top stones on the wall to mimic a cap-stone.

3.04 CLEANING

A. Remove and replace stones which are loose, broken, stained, or otherwise damaged. Replace with new stones and install as specified.

B. Clean stonework after completion of work. Cleaning agents and methods shall be as acceptable to the Landscape Architect.

C. Upon completion of the work, remove from site all excess materials, debris, tools, and equipment. Repair damage resulting from stone work operations.

END OF SECTION

SECTION 32 33 23

SITE TRASH ENCLOSURE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Comply with requirements of the Stormwater Pollution Prevention Plan (SWPPP) and Soil Erosion and Sediment Control specification, plans, and details, and the Contractor's accepted schedule. Refer to Section 01 5713 of these Specifications.

C. The Contractor shall read the Geotechnical Report for subsurface investigations prepared by Carlin-Simpson & Associates, " Report on Subsurface Soil and Foundation Investigation" dated July 14, 2021, revised April 20, 2022, to be fully aware of available subsurface information and current recommendations. No extra claim for ignorance shall be accepted.

1.02 SUMMARY

A. Provide trash enclosure as shown and specified. The work includes:
   1. Furnish all materials, construct and install enclosure as shown and detailed on the drawings.
   2. Securely install enclosure onto concrete pad.

1.03 SUBMITTALS

A. Submit design and manufacturer's product data for the trash enclosure material, and accessory and hardware items.

B. As applicable, submit engineered, stamped shop drawings from a New York State licensed professional engineer for all elements and components of the enclosure. Shop drawings are required.

1.04 QUALITY ASSURANCE

A. Materials and methods of construction shall comply with the following standards:
   1. American Society for Testing and Materials, (ASTM).
   2. State of New York Building Code.
   3. Municipal Building Department requirements.

B. The installation of certain materials and infrastructure including but not limited to earthwork operations, and hardscape and utility installations, may be subject to special subgrade preparation and construction requirements. Subgrade improvement measures and special construction requirements must be followed as indicated by the Geotechnical Engineer. The most stringent geotechnical requirements stated in the Geotechnical Report or any other place in the Contract Documents shall be adhered to by the Contractor.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Keep materials dry during delivery and site storage. Stack materials to ensure proper drainage and ventilation. Protect from weather damage and deterioration.

B. Store and protect hardware from weather damage and deterioration.

1.06 PROJECT CONDITIONS

A. Layout, cut, fit, and erect forms/framing. Brace, plumb, and level in true alignment and rigidly secure in place.

B. Provide all supports required to support construction during formative stages. Set accurately to required lines and levels. Anchor securely in place.

C. Enclosure shall be installed on the proposed reinforced concrete pad where shown and as detailed on the Drawings.

PART 2 - PRODUCTS

2.01 BOLLARDS (AS APPLICABLE)

A. Steel bollards within the enclosure shall be eight (8) inch steel pipe filled concrete with a domed steel plate cap as detailed on the drawings. Bollards shall have 4-#6 x 6" rebars welded to pipe at 90 degrees within the concrete base. Half inch (1/2") joint sealant shall be provided all around; bollard shall be painted traffic safety yellow.

2.02 STRUCTURE

A. Structure including swing gates shall be constructed of Trex commercial grade staggered-board privacy fence, color to be selected by the Owner from manufacturer's standard colors, with 3" x 6" welded steel reinforced Trex clad top, bottom, and side rails. Metal flanges, cleats, bolts, screws, etc. shall be stainless steel or galvanized steel as directed.

B. Post shall be 6" x 6", 4" steel post clad with Trex with colonial style post caps.

C. Hinges shall be heavy-duty, minimum 3/door leaf, black painted galvanized steel.

D. Approved manufacturer: Trex, www.trex.com, 1-800-289-8739, or equal, height as indicated on the plans.

2.03 GATES

A. Gates shall be set in stainless steel sleeves in the concrete pad as detailed. Heavy duty gates shall be of the width indicated on the plans, and must be supplied by the same manufacturer as the fence and exactly match the fence, furnished with heavy duty hinges, carriage bolts, nuts, washers and lock washers, and hasp for padlock. Gate shall be furnished with galvanized steel pin stop with steel pipe in concrete pad.

PART 3 - EXECUTION

3.01 PREPARATION

A. Obtain measurements and verify dimensions and details before proceeding with work. Layout enclosure and obtain approval from the Owner's Representative before beginning any work. Install per the details on the plans.

3.02 TRASH ENCLOSURE

A. Assemble and erect according to the approved Shop Drawings.

B. Locate the structure to the lines and grades shown on the Drawings and according to the specifications and details. All minimum dimensions shall be met. If minimum dimensions are not met by the Contractor, it shall be corrected by the Contractor at no additional cost to the Owner.

C. Gate posts and concrete foundations for posts shall be sized to properly support the weight of the enclosure including gate, and provide for proper operation of the gate. The concrete footings will extend below the thickness of the proposed concrete pad. See the detail on the plans.

3.03 CLEANING

A. Clean up debris on a regular periodic basis.

B. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, tools, and equipment. Repair damage resulting from work.

END OF SECTION

SECTION 32 39 13

BOLLARDS

PART 1 -GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.

1.02 SUMMARY

A. Work includes furnishing and installing concrete filled steel bollards as specified herein and as designated on the Plans.

PART 2 -PRODUCTS

2.01 MATERIALS

A. Structural steel pipe shall be carbon steel (ASTM A-36) having a minimum tensile strength of 400 to 550 Mpa. All structural steel shall be designed in accordance with the American Institute of Steel construction (AISC) - Specification for Design, Fabrication, and Erection of Structural Steel for Buildings.

B. Unless otherwise indicated, the pipe shall be 7 ft in length, with a minimum O.D. of 6 in. and a wall thickness of 0.25 in.

C. The portion of the bollard at grade is susceptible to corrosion from exposure to standing water. To inhibit corrosion of the steel pipes, the contractor shall apply a minimum of 4-mil (.1mm) thickness of Scotchcoat or X-Tru-Coat to the entire length of the pipe. An alternative is a rubber type shrink sleeve that is slipped over the pipe and heated with a low temperature flame to shrink the sleeve tightly around the bollard.

D. Concrete footing and concrete fill shall comply with all requirements under Section 03 3053 “Miscellaneous Cast-in-Place Concrete.”

PART 3 - EXECUTION

3.01 INSTALLATION

A. Excavate to the lines and grades shown on the construction drawings. Contractor shall use caution not to over-excavate beyond the lines shown.

B. Verify locations of existing structures and utilities prior to excavation.

C. Obtain approval for locations prior to installation.

D. Apply a minimum of 4-mil thickness of Scotchcoat or X-Tru-Coat to the entire length of the pipe in color as approved by the owner.

E. Prepare subgrade, set pipe and pour concrete footing in accordance with the plans and specifications.

F. Ensure that pipe is set plumb.

G. Fill pipe with concrete as per the details and specifications.

END OF SECTION

SECTION 32 80 00

IRRIGATION SYSTEM

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

B. Coordinate work of this Section with other underground utilities and with trades responsible for their installation. Refer to respective Drawings pertaining to other work.

1.02 SUMMARY

A. The work of this section includes, but is not limited to, the provision of all materials, labor and equipment and the like necessary and/or required for the complete installation of an on-site irrigation system for the area indicated on the drawings, including, but not limited to the following:

1. Design, provide and install an underground pressure compensating irrigation system for the areas indicated on the Drawings, as specified herein, or both. The system shall be designed for optimal water efficiency, low-flow usage. Indicated shrub and plant bed areas are to be drip systems.
2. Irrigation system shall be designed and installed by an EPA Water Sense Certified Professional.
3. Irrigation system shall be fully compliant with the requirements of LEED® BD+C: New Construction - LEED v4, both the prerequisite and the water efficiency credit for Outdoor Water Use Reduction for one (1) point. The system shall reduce the project's landscape water requirement (LWR) by at least 50% from the calculated baseline for the site's peak watering month. Reductions must be achieved utilizing plant species selection as indicated on the project's Landscaping Plan, and irrigation system efficiency and smart scheduling technologies.
4. Irrigation system will be based on minimum pressure and maximum flow demand. Verify permanent water pressure before the start of construction. Report differences between water pressure indicated on drawings and actual site pressure reading at irrigation point-of-connection to owner's authorized representative for resolution. In the event pressure differences are not reported prior to start of construction, the contractor assumes full responsibility for revisions.
5. Irrigation Sleeves to allow for piping and wiring to be extended to all planting and lawn areas without disturbing paving or other site improvements.
6. The mechanical point of connection for the irrigation system shall be a new 2" water supply line (or size as required by design), located in the water room. A backflow preventer will be required as mandated by Code.
7. The electrical point of connection for the irrigation system shall be to a 120-volt, 20-amp building electrical circuit provided and installed by others, located in the mechanical room.
8. Trench excavation, back filling and bedding materials, together with the testing of the completed installation shall be included in this work.
9. The work shall be constructed and finished in every respect in a good, workmanlike and substantial manner, to the full intent and meaning of the Drawings and Specifications. All parts necessary for the proper and complete execution of the work, whether the same may have been specifically mentioned or not, or indicated on the Drawings, shall be done or furnished in a manner corresponding with the rest of the work as if the same were specifically herein described.
10. Notify the owner's authorized representative of obstructions and conflicts for resolution. In the event this notification is not performed, assume full responsibility for revisions.

11. Record Drawing as well as Operating & Maintenance Manual generation, in accordance to these specifications shall also be included in this work.

B. Related Sections
   1. Section 01 81 13.14 - SUSTAINABLE DESIGN REQUIREMENTS - LEED v4 BD+C
      a. additional LEED requirements and documentation.
   2. Division 22 - PLUMBING
      a. Piping and plumbing within buildings.
   3. Division 26 - ELECTRICAL
      a. Power Supply.
   4. Section 32 91 13 - SOIL PREPARATION FOR LANDSCAPING
      a. Soil preparation for landscaping.
   5. Section 32 92 00 - SEEDING & SODDING
      a. Seeding and sodding.
   6. Section 32 93 00 - EXTERIOR PLANTING
      a. Installation of Trees, Plants, and Groundcovers.
   7. Section 33 10 00 - WATER UTILITIES
      a. Installation of water pipe and appurtenances.
   8. Section 33 40 00 - STORMWATER UTILITIES
      a. Storm water collectors for Irrigation water supply.

1.03 QUALITY ASSURANCE

A. Installer: An EPA water sense certified professional firm which has at least five (5) years' experience in work of the type and size required by this Section and which is acceptable to the Owner's Representative.

B. References: The Contractor must supply three references for work of this type and size with their bid including names and phone numbers of contact person(s).

C. Applicable requirements of accepted Standards and Codes shall apply to the Work of this Section and shall be so labeled or listed:
   1. American Society for Testing & Materials (ASTM)
      a. ASTM: A536 Ductile Iron Castings
      b. ASTM: D1784 Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
      c. ASTM: D1785 Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and Cl200.
      d. ASTM: D2464 Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
      e. ASTM: D2466 Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
      f. ASTM: D2564 Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
      g. ASTM: B43-98 Brass pipe.
      h. ASTM: B88-99 Seamless Copper Water Tube
      i. ASTM: B828-00 Soldered Copper Joints.
      j. ASTM: F477 Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
      k. ASTM: D2737-99 Polyethylene (PE) Pressure rated tube.
   2. National Plumbing Code (NPC)
   3. National Electric Code (NEC)
   4. National Sanitary Foundation (NSF)
   5. American Society of Agricultural Engineers (ASAE)
   6. Underwriters Laboratories, Inc. (UL)
   7. Occupational Safety and Health Regulations (OSHA)
   8. Westchester County Department of Health requirements.

D. All work shall be in accordance with the Authority having jurisdiction.

1.04 DELIVERY, STORAGE AND HANDLING

A. Store and handle all materials in compliance with manufacturer instructions and recommendations. Protect from all possible damage. Minimize on-site storage.

1.05 INTENT

A. The major intent of the work of this section is to provide a new irrigation system for the areas indicated. The contractor shall be solely responsible for judging the full extent of work requirements involved, including but not limited to all components of the required system, such as controllers, valves, piping, conduit, irrigation emitters, wiring, valve boxes, sleeves, and other equipment.

B. Materials and installation requirements are provided to set a standard for items to be included. Depending on the design and site requirements, not all elements may be used. Contractor is responsible for providing a complete installation and indicating all elements to be provided and installed on the design plan and shop submittals.

C. Irrigation system shall have a central shut-off valve.

1.06 ORDINANCES, PERMITS AND FEES

A. The Work under this Section shall comply with all ordinances and regulations of authorities having jurisdiction.

B. The Contractor shall obtain and pay for any and all permits, tests and certifications required for the execution of Work under this Section, including water supply tap fee.

C. Furnish copies of Permits, Certifications and Approval Notices to the Owner's Representative prior to requesting payment.

D. The Contractor shall include in their bid any charges by the Water Department, Utility Company, or other authorities for work done by them and charged to the Contractor.

1.07 EXAMINATION OF CONDITIONS

A. The Contractor shall fully inform himself of existing conditions on the site before submitting his bid, and shall be fully responsible for carrying out all work required to fully and properly execute the work of the Contract, regardless of the conditions encountered in the actual Work. No claim for extra compensation or extension of time will be allowed on account of actual conditions inconsistent with those assumed, except those conditions described in the GENERAL CONDITIONS.

1.08 TESTS

A. Observation: The Owner’s Representative will be on site at various times to insure the system is being installed according to the Specifications and Drawings.

B. Coverage Test: After completion of the system, test the operation of entire system and adjust as directed by the Owner's Representative. Demonstrate to the Owner's Representative that all irrigated areas are being adequately covered.

C. The Owner’s Representative shall be notified 48 hours in advance for inspections.

D. During final inspection, the contractor shall be responsible for having two-way communication and sufficient personnel to provide instantaneous communication between the inspection area and the controller for the system.

E. Recommended Dripline and Emitter Lateral Flushing Procedures.
   1. Flush the system every two weeks for the first six (6) weeks and check the water that is flushed out for cleanliness. Establish a regular system flushing schedule for the future based on results from the initial six-week flushing schedule.
   2. Flush the system completely after any repairs are made and monitor system operation closely under regular system flushing schedule.

3. Check the pressure at the supply and flush headers on a regular basis and compare with the pressure readings taken after installation.

F. Recommended Dripline and Emitter Lateral Leakage Testing Procedures.
1. Subject installed dripline tubing and emitter lateral piping to water pressure equal to specified operating pressure for ten (10) minutes. Test with control zone components and dripline flush valve components installed.
2. Partially backfill buried pipe and tubing to prevent movement under pressure. Expose couplings, fittings, and valve components.
3. Visually inspect valve assemblies and fittings for leakage and replace defective pipe, fitting, joint, valve, or appurtenance. Repeat test until test segment is free from leaks. Cement or caulking to seal leaks is prohibited.

1.09 SHOP DRAWINGS

A. The Contractor is responsible for the design, provision and installation of an irrigation system that is fully compliant with the requirements of LEED® BD+C: New Construction - LEED v4, both the prerequisite and the water efficiency credit for Outdoor Water Use Reduction for one (1) point. The system shall reduce the project's landscape water requirement (LWR) by at least 50% from the calculated baseline for the site's peak watering month. Reductions must be achieved utilizing plant species selection as indicated on the project's Landscaping Plan, and irrigation system efficiency and smart scheduling technologies. Submit calculations utilizing the Environmental Protection Agency (EPA) WaterSense Water Budget Tool demonstrating compliance. Indicate and summarize how the proposed system meets these requirements.

B. Submit complete design plan for irrigation system to cover the area(s) shown. Include location of heads, proposed coverage patterns, piping, drip areas, valves, zoning, location of sleeves, controller location, and connection of system to existing water supply. Note equipment required, location of connection to water supply, and location of required meter pit. Obtain Landscape Architects and Owner's approval before proceeding with any work in this section. Preparation of design shall be scheduled with sufficient time for review and revision so that installation of irrigation may proceed in the most advantageous schedule and will not hold up work. Contractor is responsible for any delay caused by failure to submit design on an appropriate schedule. Connection of irrigation system to water main is to be designed by a registered professional engineer.

C. The Contractor shall provide copies of product specification sheets on all proposed equipment to be installed to the Owner's Representative for approval prior to the start of work, in accordance with the parameters of Division 01. Work on the irrigation system may not commence until product sheets are submitted and approved. Submittals shall be marked up to show proper nozzles, sizes, flows, etc. Irrigation components shall be from the same manufacturer.
1. Drip lines and emitters.
2. Valves: Manual and Automatic
3. Controllers/ Enclosures
4. Valve Boxes
5. Pipe and Fittings
6. Dripline and low-volume irrigation components
7. Wire and Connectors
8. Quick Coupling Valves
9. Rain Sensor
10. Backflow Prevention Device
11. Grounding Equipment
12. Exclusion Water Meter (sub-water meter)
13. Miscellaneous Materials

D. Project Record Documents:

1. The Contractor shall provide and keep up-to-date a complete redlined Record Set of Drawings of the system as the project proceeds. Drawings shall be corrected daily, showing every change from the original Drawings and Specifications. Each valve box location to be referenced by distance from a minimum of two permanent locations. Controller(s), rain sensor(s), air vacuum relief valves, flushing valves, quick coupling valves, water meters, back flow prevention device and all other equipment shall be indicated on the drawings. All wire routing, wire size and splices shall be indicated. Main line pipe and wire route shall have two (2) distinctly different graphic symbols (line types). Prints for this purpose may be obtained from Owner's Representative at cost. This redlined record set of drawings shall be kept at job site and shall be used only as a record set.
2. This redlined set of documents shall also serve as work progress sheets and shall be the basis for measurement and payment for work completed. This record set of drawings shall be available at all times for observation and shall be kept in a location designated by Owner's Representative. Should this record set of drawings not be available for review or not be up-to-date at the time of the observation, it will be assumed no work has been completed. Provide copies of the redlined record set of drawings for Owner's review on a monthly basis.
3. Make neat and legible notations on this record set of drawings daily as the work proceeds, showing the work as actually installed. For example, should a piece of equipment be installed in a location that does not match the plan, indicate that equipment in a graphic manner in the location of installation and so as to match the original symbols as indicated in the irrigation legend. Should the equipment be different from that specified, indicate with a new graphic symbol both on the drawings and the irrigation legend. The relocated equipment dimensions an nothing and easting coordinates should then be transferred to the appropriate drawing in this record set of drawings at the proper time.
4. On or before the date of final field observation, deliver corrected and completed AutoCAD computer plots of "as-built record drawings on vellum and AutoCAD electronic files on disk to Owner as part of contract closeout. Delivery of plots will not relieve Contractor of the responsibility of furnishing required information that may have been omitted from the prints.

1.10 GUARANTEE

A. The Contractor shall obtain in the Owner's name the standard written manufacturer's guarantee of all materials furnished under this Section where such guarantees are offered in the manufacturer's published product data. All these guarantees shall be in addition to, and not in lieu of, other liabilities that the Contractor may have by law.

B. In addition to the manufacturers guarantees the Contractor shall warrant the entire irrigation system, both parts and labor for a period of one (1) year from the date of acceptance by the Owner.

C. As part of the one-year warranty the Contractor shall perform the first year-end winterization and spring start-up for the irrigation system.

D. Should any problems develop within the warranty period because of inferior or faulty materials or workmanship, they shall be corrected to the satisfaction of the Owner's Representative at no additional expense to the Owner.

E. A written warranty showing date of completion and period of warranty shall be supplied upon completion of the project.

1.11 COORDINATION

A. The Contractor shall at all times coordinate his work closely with the Architect to avoid misunderstandings and to efficiently bring the project to completion. The Architect shall be notified as to the start of work, progression and completion, as well as any changes to the

drawings before the change is made. The Contractor shall also coordinate his work with that of his sub-contractors.

B. The Contractor shall be held responsible for and shall pay for all damage to other work caused by his work, workmen or sub-contractors. Repairing of such damage shall be done by the Contractor who installed the work, as directed by the Architect.

1.12 MAINTENANCE AND OPERATING INSTRUCTIONS

A. Contractor shall include in their Bid an allowance for four (4) hours of instruction of Owner and/or Owner's personnel upon completion of check/test/start-up/adjust operations by a competent operator (The Architect's office shall be notified at least one (1) week in advance of check/-test/start-up/adjust operations).

B. Upon completion of work and prior to application for acceptance and final payment, a minimum of three (3) three-ring, hard cover binders titled MAINTENANCE AND OPERATING Instructions FOR THE REGENERON CHILDCARE IRRIGATION SYSTEM, shall be submitted to the Landscape Architect's office. After review and approval, the copies will be forwarded to the Owner. Included in the Maintenance and Operating binders shall be:
   1. Table of Contents
   2. Written description of Irrigation System.
   3. System drawings:
      a. One (1) copy of the original irrigation plan;
      b. One (1) copy of the Record Drawing;
      c. One (1) reproducible of the Record Drawing;
      d. One (1) copy of the controller valve system wiring diagram
      e. Listing of Manufacturers.
      f. Manufacturers' data where multiple model, type and size listings are included; clearly and conspicuously indicating those that are pertinent to this installation.
         1) "APPROVED" submittals of all irrigation equipment;
         2) Operation:
         3) Maintenance: including complete troubleshooting charts.
         4) Parts list.
         5) Names, addresses and telephone numbers of recommended repair and service companies. A copy of the suggested "System Operating Schedule" which shall call out the controller program required (zone run time in minutes per day and days per week) in order to provide the desired amount of water to each area under "no-rain" conditions.
         6) Winterization and spring start-up procedures.
         7) Guarantee data.

1.13 PROCEDURE

A. Notify all city departments and/or public utility owners concerned, of the time and location of any work that may affect them. Cooperate and coordinate with them in the protection and/or repairs of any utilities.

B. Provide and install temporary support, adequate protection and maintenance of all structures, drains, sewers, and other obstructions encountered. Where grade or alignment is obstructed, the obstruction shall be permanently supported, relocated, removed or reconstructed as directed by the Architect.

C. Provide pressure-regulating devices to maintain optimal pressure and prevent misting.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials to be incorporated in this system shall be new and without flaws or defects and of quality and performance as specified and meeting the requirements of the system. All material

overages at the completion of the installation are the property of the Contractor and shall be removed from the site.

B. No material substitutions from the irrigation products described in these specifications and shown on the drawings shall be made without prior approval and acceptance from the Owner's Representative.

2.02 PVC IRRIGATION PIPE

A. All pipe shall bear the following markings: Manufacturer's name, nominal pipe size, schedule or class, pressure rating in psi, and date of extrusion.

B. All pipe in sizes 2-1/2 inches and smaller shall be PVC, Class 200, Type 1120, SDR 21, Solvent-Weld PVC, conforming to ASTM No. D2241 and D3036 as manufactured by Certainteed, Cresline, JM or approved equal.

C. The pipe insertion mark shall be visible to show the proper depth into spigot.

2.03 COPPER PIPE AND FITTINGS

A. Copper pipe, installed between water meter and backflow preventer, shall be 2" Type K, hard tempered ASTM B88.

B. Copper fitting shall be wrought copper, solder joint type in accordance with ASTM B828-00.

C. Joints shall be soldered with silver solder ASTM B32, Grade 95TA up to 250 degree using non-corrosive flux.

D. Supply only pipes and fittings that are marked by the manufacturer with the appropriate ASTM designations and pressure ratings and are free from cracks, wrinkles, blisters, dents or other damage.

2.04 BRASS PIPE AND FITTINGS

A. Brass pipe shall be 125lb., cast bronze, ground joint pattern, threaded, ASTM B43-98.

B. Brass fittings shall be cast bronze, screwed, 125lb. Class.

2.05 PVC PIPE SLEEVES

A. All pipe sleeves beneath non-soil areas under pavements and through walls (as applicable), shall be appropriately sized PVC, Class 160 water pipe as manufactured by Certainteed, Cresline, JM or approved equal. Minimum sleeve size to be 3-inch.

2.06 WIRE CONDUIT

A. Conduit for wiring beneath non-soil areas and under pavements and through walls (as applicable) shall be appropriately sized PVC, SCH-80 conduit with solvent-weld joints, as manufactured by Certainteed, Cresline, JM or approved equal.

B. Conduit for above ground wiring to rain sensors or controllers shall be galvanized, rigid metallic conduit.

2.07 PVC IRRIGATION FITTINGS

A. Fittings for solvent weld PVC pipe, 2-1/2 inch and smaller in size, shall be Schedule 40 solvent weld PVC fittings as manufactured by Dura, Lasco, Spears or approved equal.

B. Fittings shall bear manufacturer's name or trademark, material designation, size, and applicable I.P.S. schedule.

C. All PVC threaded connections in and out of valves shall be made using Schedule 80 toe nipples and Schedule 40 couplers or socket fittings. Schedule 40 male threads will not be approved for installation.

D. PVC solvent shall be NSF approved, for Type I and Type II PVC pipe, and Schedule 40 and 80 fittings. Cement is to meet ASTM D2564 and FF493 for potable water pipes. PVC solvent cement shall be Rectorseal Gold, IPS Weld-ON 711, Oatey Heavy Duty Cement or approved equal, and shall be used in conjunction with the appropriate primer. Primer shall be NSF

approved, and formulated for PVC and CPVC pipe applications. Primer is to meet ASTM F 656. Primer shall be Rectorseal Jim PR-2, IPS Weld-ON P-68 Clear, Oatey Clear Primer for PVC and CPVC, or approved equal.

E. All nipples to be schedule 80 PVC.

2.08 DRIP IRRIGATION COMPONENTS

A. General - The following specification details the drip emitter tubing, air relief valve, and automatic diversion valve. These components shall be considered a minimum for the project, but this specification shall in no way be construed to be complete in every detail. Contractor is responsible for designing and providing a complete drip irrigation system meeting or exceeding applicable industry standards.

B. Dripline (Wasteflow PC 18" / ½ gph) - The dripline shall consist of nominal sized one-half inch linear low density polyethylene tubing, with turbulent flow, drip emitters bonded to the inside wall. The tubing shall have an outside diameter (O.D.) of approximately .63-inches and an inside diameter (I.D.) of approximately .54- inches. The tubing shall consist of three layers; the inside layer shall be a bactericide protection, the middle layer shall be black and the outside layer shall be purple striped for easy identification. The dripline shall have emitters regularly spaced 18" apart. The pressure compensating emitters shall be molded from virgin polyethylene resin with a silicone rubber diaphragm. The pressure compensating emitters shall have nominal discharge rates of ½ gallon per hour. The emitters shall be impregnated with Treflan to inhibit root intrusion for a minimum period of ten years and shall be guaranteed by the manufacturer to inhibit root intrusion for this period.

C. Filter - The Y filter body shall be molded from glass reinforced black plastic with a 1.0-inch male pipe thread (MIPT) inlet and outlet. The two piece body shall be capable of being serviced by unscrewing and shall include an O-ring seal. An additional ¾" MHT outlet shall be capable of periodic flushing. The 150 mesh filter screen is all stainless, providing a 28.4 square inch filtration area. The outer support shall be woven stainless steel wire, and the inner screen shall be made of stainless steel cloth. The inner and outer screens shall be soldered together. The screen collar shall be molded from vinyl.

D. Air Vacuum Relief Valve - The air vacuum relief valve provides instant and continuous vacuum relief and non-continuous air relief. Both the body and the removable dirt cover shall be constructed of molded plastic. The body and the dirt cover shall be connected with a ¾ inch hose thread. The ball shall be constructed of low density plastic and the internal seat shall be constructed of vinyl. The air vacuum relief valve shall seal at 5 psi. Inlet size shall be 1-inch male pipe thread.
   1. Note: Maximum flow of 50 gpm per 1" air vacuum relief. Valve shall be supplied with 12" meter box.

E. Control panel requirements for drip irrigation areas: The project controller shall be capable of: automatically open/close the motorized diversion valve for each zone based upon a 24/7 time clock and duration timer settings. System shall be capable of automatic operation for seven days a week with independent settings for each day of the week as well as lock out time settings for disabling irrigation during early or late day hours. Time settings for each field shall be identical, i.e. in minutes or hours, and shall be adjustable from 0-60 minutes with corresponding off time adjustable from 0-60 minutes. PLC shall open diverter valve and allow each zone to be irrigated for timer duration. PLC shall allow for independent zones to be disabled or manually irrigated. HOA switches shall be accessible without opening enclosure door. Enclosure dimensions shall be 16" x 16". 02800-4

F. Motorized Diverter Valve (Flow Control Valve) - The automatic flow control valve shall be a OSI Jandy Maximum Torque Model 2440/2400 Series Irrigation Valve, operating off a 24 VAC voltage. Valve shall be two position with integral cam adjustments and local HOA switch. Valve shall be supplied with 18" minimum depth meter box and lockable green covered lid marked irrigation and sized to contain the filter and flow control valve as shown on the drawings.

2.09 ELECTRIC CONTROL VALVES

A. Electric control valves shall be one, one and one half and two-inch remote control, diaphragm type, fiberglass or reinforced nylon body plastic valves with manual flow control, manual bleed screw and 200 psi pressure rating.

B. Valves shall be manufactured by Rain Bird, Hunter Industries, Hardie, Toro, or approved equal.

2.10 VALVE BOXES

A. All valve boxes shall be manufactured from unformed resin with a tensile strength of 3,100-5,500 psi conforming to ASTM D638. All boxes shall be green in color. Covers shall be green in color unless otherwise specified.

B. Valve boxes for single electric valves, isolation valves and quick coupling valves shall be 10-inch round valve boxes with metal detection and bolt down covers

C. Valve boxes for dual electric valves shall be 12-inch standard valve boxes with metal detection and bolt down covers.

D. Valve boxes for wire splices shall be 10 inch round valve boxes with metal detection and bolt down covers. All splices shall be in separate valve boxes and not included with isolation valves.

E. Valve box extensions shall be provided and installed as required for proper box depth. Valve box extensions shall be made by the same manufacturer.

2.11 AUTOMATIC CONTROLLER

A. Controller shall be EPA water sense labeled smart evapotranspiration water controller , with radio, pager, or internet signals to direct the irrigation system to replace only the moisture that the landscape has lost because of heat, wind, etc., electronic in construction with capability of up to 10 hour run times per zone in increments of 1 or 10 minutes. Controllers to have minimum two independent programs, with separate zones for each type of bedding area based on watering needs, and auto/off switch, and be capable of manual, semi-automatic and automatic operation. Controller shall have water budgeting feature, sensor input terminal, locking, weather resistant plastic cabinet and internal transformer. Irrigation timer shall activate the valves for each watering zone at the best time of day to minimize evaporative losses and to obey local regulations and water use guidance. Terminal strip connection shall be easily accessible. The controller shall be U.L. listed, 120 volt, 60 Hertz, A.C. type.

B. Controller shall be as manufactured by Rain Bird, Hydrawise, Hunter Industries, Hardie Irrigation, Toro, or approved equal.

C. Station quantity shall be minimum of 24.

2.12 QUICK COUPLING VALVES

A. The valve body shall be of cast brass construction with a working pressure of 125 psi. The valve seat disc plunger body shall be spring loaded so that the valve is normally closed under all conditions when the key is not inserted.

B. The top of the valve body receiving the key shall be equipped with a single slot and smooth face to allow the key to open and close the valve slowly with a one-half turn. The quick coupling valve shall be equipped with a vinyl cover.

C. The valve body construction shall be such that the coupler seal washer may be removed from the top for cleaning or replacement without disassembling any other parts of the valve.

D. Keys shall be single lug with 1-inch male thread and 3/4 inch female thread at the top.

E. Contractor shall provide two (2) keys for quick couplers and two (2) 1 inch x 1 inch swivel hose ells.

2.13 WIRE

A. All valve control wire shall be minimum #14-awg, common #12-awg, single strand, solid copper, UL- approved direct burial AWG-U.F. 600V and shall meet all state and local codes for this service. Individual wires must be used for each zone valve. Common wire shall be white in color, control wire shall be red in color and spare wires, installed where indicated on the drawings shall be blue. White color shall be used for common wire only.

B. In ground wire connections shall be UL listed, manufactured by 3M, model DBY-6 splice kits. All wire splices shall be made in valve boxes, at controller, or at valves.

C. Wire type and method of installation shall be in accordance with local codes for NEC Class II circuits of 30-volt A.C. or less.

2.14 ISOLATION VALVES

A. Isolation valves 2-1/2 inches and smaller in size shall be gate type, of bronze construction, US Manufacture, 600 WOG with steel cross handle and 200 psi rating.

2.15 SWING JOINTS

A. Quick coupling valves to be installed on one-inch brass swing joint, minimum 12-inches in length. Brass swing joints are not prefabricated and shall be assembled with nipples and street elbows.

2.16 AUTOMATIC RAIN SENSOR

A. Rain sensor shall have rain shut-off switch and moisture sensor, and shall be plastic in construction with adjustable interruption point, ½" IPS threads and stainless steel vandal resistant guard.

2.17 BACKFLOW PREVENTION DEVICE

A. Back flow prevention device shall be as per Westchester County Department of Health requirements. Back flow prevention device shall have maximum 6-psi pressure loss at system flow.

2.18 CRUSHED STONE

A. Crushed stone shall be as specified elsewhere in these specifications. Crushed stone shall be used under valve boxes.

2.19 SAND

A. Sand used for backfilling of trenches; under, around and over PVC lines shall be as specified elsewhere in these specifications.

2.20 CONCRETE

A. Standard concrete mix, for enclosure pads, shall be in accordance with ASTM C150, ASTM C-33, and ASTM C-94 with a compressive strength (28 days) of 3,000 psi.

2.21 SPARE PARTS

A. Contractor shall supply the following tools and equipment to the Owner's Representative before final inspection:
   1. Two (2) wrenches for disassembling and adjusting each type of head provided, as applicable.
   2. One (1) quick coupler key assembly for every five quick coupling valves provided.
   3. One (1) of each type of gate valve used in the project.
   4. Two (2) of each type head and pattern (PC & FC) used in the project, as applicable.
   5. Two (2) of each type nozzle used in the project.

B. Before final inspection can occur, written evidence that the Owner's Representative has received the tools and equipment must be shown to the Owner.

PART 3 - EXECUTION

3.01 GENERAL

A. Before work is commenced, hold a conference with the Owner's Representative to discuss general details of the work.

B. Examine all contract documents applying to this Section noting any discrepancies and bringing the same to the attention of the Owner's Representative for timely resolution.

C. All work indicated on Drawings shall be provided whether or not specifically mentioned in the Specifications.

D. If there are ambiguities between Drawings and Specifications, and specific interpretation or clarification is not issued prior to bidding, the interpretation or clarification will be made only by Owner's Representative, and Contractor shall comply with the decisions. In the event the installation contradicts the directions given, the installation shall be corrected by Contractor at no additional cost to Owner.

E. Verify dimensions and grades at job site before work is commenced. Do not proceed with installation of the landscape irrigation system when it is apparent that obstructions or grade differences exist or if conflicts in construction details. Legend or specific notes are discovered. All such obstructions, conflicts, or discrepancies shall be brought to the attention of the Owner's Representative.

F. Make all field measurements necessary for the work noting the relationship of the irrigation work to the other trades. Coordinate with other trades (landscaping and other site work trades). Project shall be laid out essentially as indicated on the approved Irrigation Plans, making minor adjustments for variations in the planting arrangement. Major changes shall be reviewed with the Architect prior to proceeding.

G. Coordinate installation of all irrigation system materials, including pipe, to avoid conflict with the trees, shrubs, or other plantings.

H. During progress of work, a competent superintendent and all assistants necessary shall be on site. All shall be satisfactory to the Owner's Representative. The superintendent shall not be changed, except with the consent of the Owner's Representative, unless that person proves unsatisfactory and ceases to be employed. The superintendent shall represent the Contractor in his absence and all directions given to the superintendent shall be as binding as if given to the Contractor.

I. At all times, protect existing irrigation, landscaping, paving, structures, walls, footings, etc. from damage. Any inadvertent damage to the work of another trade shall be reported at once.

J. Replace, or repair to the satisfaction of the Owner, all existing paving disturbed during course of work. New paving shall be the same type, strength, texture, finish, and be equal in every way to removed paving.

3.02 PIPE AND FITTINGS INSTALLATION

A. Using proper width trencher chain, excavate a straight (vertical) and true trench to a depth of 2-inch of pipe invert elevation.

B. Loam or topsoil encountered within the limits of trench excavation for irrigation mains and branch lines shall be carefully removed to the lines and depths as shown on the Drawings and stockpiled for subsequent replacement in the upper 6 inches of the trench from which it is excavated. Such removal and replacement of the quantities of loam shall be considered incidental to the irrigation system and no additional compensation will be allowed therefore.

C. Pipe shall be laid on undisturbed trench bottom provided suitable base is available - no rock larger than 1 inch or sharp edges; if not, excavate to 2 inch below pipe invert and provide and install sand base or crushed stone upon which to lay pipe.

D. Back filling shall be accomplished as follows: the first 10-inch of backfill material shall contain no foreign matter and no rock larger than 1 inch in diameter. Carefully place material around pipe and wire and tamp in place. Remainder of backfill shall be laid-up in 6-inch (maximum) lifts and tamped to compaction with mechanical equipment. Compact backfill in trenches to dry density equal to the adjacent undisturbed soil, and conform to adjacent grades without dips, sunken area, humps, or other irregularities. Do not, under any circumstances, use truck wheels for compacting soil. Frozen material shall not be used for backfill.

E. Do backfilling when pipe is cool. During hot weather cool pipe by operating the system for a short period, or by backfilling in the early part of the morning before the heat of the day.

F. Do not, under any circumstances, use truck wheels for compacting soil.

G. Restore grades and repair damage where settling occurs.

H. Make all solvent-weld joints in strict accordance with manufacturer's recommendations, making certain not to apply an excess of primer or solvent, and wiping off excess solvent from each connection. Allow welded joints at least 15 minutes set-up/curing time before moving or handling. When the temperature is above 80º F, allow connections to set minimum 24 hours before pulling or pressure is applied to the system. When temperature is below 80º F, follow manufacturer’s recommendations. Provide and install for expansion and contraction as recommended. Wire shall be laid in same trench as mainline and at pipe invert (see Wire Installation).

I. Pressurized mainline pipe shall have minimum 22 inches of COVER (excavate to invert as required by pipe size). Lateral pipe shall have minimum 16 inches of COVER for PVC and 12 inches of cover for Polyethylene (excavate to invert as required by pipe size).

J. Cut plastic pipe with handsaw or pipe-cutting tool, removing all burrs at cut ends. All pipe cuts are to be square and true. Bevel cut end as required to conform to Manufacturer's Specifications.

K. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the trench. At times, when installation of the piping is not in progress, the open end(s) of the pipe shall be closed by a watertight plug or other means. All piping, which cannot temporarily be joined, shall be sealed to make as watertight as possible. This provision shall apply during the lunch hour as well as overnight. Pipe not to be installed that day shall not be laid out. Should water enter the trench during or after installation of the piping, no additional piping may be installed or back filled until all water is removed from the trench. Pipe shall not be installed when water is in the trench, when precipitation is occurring, or when the ambient temperature is at 40º F or below. Pipe installed at temperatures below 40º F shall be removed and replaced at no cost to the Owner. PVC pipe shall be snaked in the trench to accommodate for expansion and contraction due to changes in temperature.

L. In installing irrigation pipe the Contractor shall route the pipe as necessary to prevent damage to tree roots. Where trenching must occur near trees, the Contractor shall provide proper root pruning and sealing methods to all roots 1 inch and larger.

M. Maintain 6-inch minimum clearance between irrigation lines and lines of other trades. Do not install irrigation lines directly above another line of any kind.

N. Maintain 1-inch minimum between lines which cross at angles of 45 to 90 degrees.

O. Exercise care when excavating, trenching and working near existing utilities.

P. Throughout the guarantee period it will be the responsibility of the Contractor to refill any trenches that have settled due to incomplete compaction.

Q. Pulling of pipe will be allowed provided soil is suitable and specified depth of bury can be maintained.

R. Do not install dripline tubing under paved surfaces. Connect dripline tubing to schedule 40 PVC lateral line piping for routing under paved surfaces and schedule of 80 PVC piping routing

through planter walls. Adapt dripline tubing to PVC piping as required with compression adapter fittings.

3.03 ELECTRICAL WIRE CONDUIT INSTALLATION

A. Electrical conduit shall be installed in all non-soil areas, as well as for all above ground wiring where wire passes under or through walls, walks and paving to controllers and rain sensor.

B. Conduit shall extend 18 inches beyond edges of walls and pavement.

3.04 PIPE SLEEVING INSTALLATION

A. Sleeving shall be installed wherever piping is going under a non-soil area, generally where indicated on the Drawings. Minimum cover over all sleeving pipe shall be 24 inches as shown on the detail.

B. Sleeving shall extend 18 inches beyond edges of walls and pavement.

C. Coordinate location of sleeves and installation with other trades so that sleeve installation takes place in advantageous order.

3.05 ISOLATION VALVE INSTALLATION

A. Install isolation valves per detail where indicated on the Drawings. Install all isolation valves on a level crushed stone base so that they can be easily opened or closed with the appropriate valve wrench. Install specified valve box over each isolation valve.

B. Check and tighten valve bonnet packing before valve box and backfill installation.

3.06 VALVE BOX INSTALLATION

A. Furnish and install a valve access box for each electric valve, quick coupling valve, isolation valve and wire splice.

B. All valve access boxes shall be installed on a minimum 4-inch crushed stone base. Finish elevation of all boxes shall be at grade. All crushed stone to be supplied by the Contractor and installed before valve box. Crushed stone shall not be poured into previously installed valve boxes.

3.07 24 VOLT CONTROL VALVE INSTALLATION

A. Control valves shall be installed on a level crushed stone base. Grade of bases shall be consistent throughout the project so that finish grades fall within the limits of work. Valves shall be set plumb with adjusting handle and all bolts, screws and wiring accessible through the valve box opening. Valves shall be set in a plumb position with 24-inch minimum maintenance clearance from other equipment.

B. Install at sufficient depth to provide more than 6 inch, nor less than 4 inch cover from top of valve to finish grade.

C. Adjust zone valve operation after installation using flow control device on valve.

3.08 WIRING INSTALLATION

A. Wiring shall be installed along with the main line. Multiple wire bundles shall be cinched together at maximum 12-foot centers using plastic cable cinches and shall be laid beside, and at the same invert as, the irrigation lines. Sufficient slack for expansion and contraction shall be maintained and wiring shall at no point be installed tightly. Provide and install an additional 8 inches to 12 inches slack at all changes of direction. Wiring in valve boxes shall be a sufficient length to allow the valve solenoid, splice, and all connections to be brought above grade for servicing. This additional slack shall be coiled for neatness in the valve box. Each valve shall have a separate wire back to the controller.

B. All wire shall be laid in trenches and shall be carefully back-filled to avoid any damage to the wire insulation or wire conductors themselves. In areas of unsuitable material, the trench shall have a 2 inches layer of sand or stone dust on the bottom before the wires are laid into the

trench and back-filled. The wires shall have a minimum of 12 inches of cover. Wire not to be installed that day shall not be laid out.

C. An expansion curl shall be provided and installed within 6 inches of each wire connection to a solenoid and at least every 100 feet of wire length on runs more than 100 feet in length. Expansion curls can be formed by wrapping five (5) turns of wire around a 1-inch diameter or larger pipe and then withdrawing the pipe.

D. Provide and install a common ground wire of white color. No white color shall be used for power wire. Control wire shall be red and spare wiring shall be blue in color.

E. Service wiring in connection with Drawings and local codes for 24-volt service. All in-ground wire connections shall be waterproofed with 3M DBY-6 splice kits. All splices shall be made in valve boxes (wire runs requiring splices between valve locations shall be provided and installed in splice box--valve box shall be used). Splice locations shall be shown on the Record Drawings.

F. Contractor shall provide a complete wiring diagram showing wire routing for the connections between the controller and valves. See section one for the inclusion of wiring diagram in operation and maintenance manuals.

3.09 CONTROLLER INSTALLATION

A. Contractor to install controller on interior building wall, location to be determined by owner. Contractor to wire valves and rain sensor into controller and set proper program.

B. Wire controller to 120-volt electrical supply provided and installed to the controller locations by OTHERS.

C. Keys shall be turned over to Owner's Representative.

3.10 RAIN SENSOR INSTALLATION

A. Install rain sensor on exterior building wall, location to be determined by owner. Rain sensor shall be in direct contact with the weather and not in contact with the irrigation spray.

B. Install rain sensor wiring within ½ inch conduit where exposed. All above ground wires shall be installed in conduits.

3.11 DRIP IRRIGATION SYSTEM

A. Coordinate installation of zone piping and placement of dripline tubing with placement of topsoil and installation of trees, shrubs, and ground cover.

B. Install 1 and 1 ½-inch solid PVC zone piping a minimum of 18-inches below finished grade. Grade and slope shall be uniform from low point to high points with air/vacuum relief valves installed at high points within an irrigation zone.

C. Install a flush valve and box at the end of each irrigation zone to facilitate manual flushing.

D. Drip tubing shall be uniformly spaced at a minimum of 18-inches to provide uniform wetting at a depth of 4-6 inches below finish grade.

E. Place air/vacuum relief valve(s) at the highest point(s) of each zone. Connect the air/vacuum relief valve to all dripline laterals within the elevated area with an air/vacuum relief lateral.

F. Place dripline no further than four inches from the edge of the areas to be irrigated. Uniformly space drip tubing such that maximum spacing between drip tubing is 18 inches.

G. Thoroughly flush and pressure test the drip tubing to a minimum of 10 psi prior to covering tubing to identify leaks in fittings, splices, and compression fittings. Repair all leaks.

H. Exercise extreme care when placing plants so as not to damage or cut any drip tubing or zone piping. Repair or replace cut or damaged sections as may be warranted.

3.12 QUICK COUPLING VALVE INSTALLATION

A. Provide and install quick coupling valves where indicated on the Drawings.

B. Quick coupling valves to be mounted on 1-inch brass swing joint with stabilizer as per details.

3.13 WATER METER INSTALLATION

A. Not required.

3.14 BACKFLOW PREVENTION INSTALLATION

A. Install appropriately sized reduced pressure back flow prevention assembly where shown. Back flow installation shall be in accordance with Westchester County Department of Health requirements.

3.15 CHECK / TEST / START-UP / ADJUST

A. Perform a third-party inspection of the irrigation system in operation, including observation of all the following:
   1. All spray heads are operating and delivering water only to intended zones.
   2. Any switches or shut-off valves are working properly.
   3. Any timers or controllers are set properly.
   4. Any irruption systems are located at least two (2) feet from the building.
   5. Irrigation spray does not hit the building.

B. Flushing:
   1. After all piping, valves, pipe lines and risers are in place and connected, open the control valves and flush out the system under a full head of water.
   2. Irrigation system internals, flush caps and riser nozzles as applicable shall be installed only after flushing of the system has been accomplished to the full satisfaction of the Owner's Representative.
   3. Contractor shall be responsible for flushing the entire system after installation is complete and will be responsible for any clogged nozzles for thirty (30) days after substantial completion of this portion of the landscape irrigation system.

C. Testing:
   1. Leakage test: test all pressure main lines for leaks under hydrostatic pressure of 150 psi for a period of three (3) hours. Repair all leaks and re-test.
   2. Coverage test: perform a coverage test in the presence of the Owner's Representative (notify Landscape Architect at least seven (7) days in advance of scheduled coverage test). Representative will determine if the water coverage is complete and adequate. Readjust heads and/or head locations as necessary or directed to achieve proper coverage.
   3. Testing of pressure main line piping shall occur prior to the installation of any electric control valve, basket strainers, quick coupling valves and other pressure-side irrigation facilities. Pressure testing results shall be submitted to owner's authorized representative prior to backfilling.
   4. All testing shall be at the expense of the Contractor.

3.16 CLEANING AND ADJUSTING

A. At the completion of the work, all parts of the installation shall be thoroughly cleaned. All equipment, pipe, valves and fittings shall be cleaned of grease, metal cuttings and sludge which may have accumulated by the operation of the system for testing.

B. Adjust irrigation system valve boxes, and quick coupling valves to grade as required, so that they will not be damaged by mowing operations.

C. Continue irrigation system coverage adjustment as required by settlement, etc., throughout the guarantee period.

D. Each control zone shall be operated for a minimum of 5 minutes and all heads or irrigation system components as applicable checked for consistency of delivering water. Adjustments shall be made to components that are not consistent to the point that they match the manufacturer's standards. All components, valves, timing devices or other mechanical or

electrical components, which fail to meet these standards, shall be rejected, replaced and tested until they meet the manufacturer's standards.

3.17 ACCEPTANCE AND OPERATION BY OWNER

A. Upon completion of the work and acceptance by the Owner, the Contractor shall be responsible for the training of the Owner's Representative(s) in the operation of the system (provide minimum 48 hours written notice in advance of test). The Contractor shall furnish, in addition to the Record Drawings and operational manuals, copies of all available specification sheets and catalog sheets to the Owner's personnel responsible for the operation of the irrigation system. The Contractor shall guarantee all parts and labor for a minimum period of one (1) year from date of acceptance.

B. Conditions for acceptability of work for start of maintenance by Owner issued by Owner or Owner's Representative shall include but not be limited to:
   1. Punch list items complete and approved by Owner or Owner's Representative.
   2. Landscape irrigation system complete and in place.
   3. As-built drawings complete.
   4. Maintain installation and watering schedules until all conditions noted above have been completed.

3.18 CLEAN UP

A. Upon completion of all installation work, Contractor shall remove all leftover materials and equipment from the site in a safe and legal manner.

B. Contractor shall remove all debris resulting from work of this section.

C. Contractor shall regrade, lightly compact, and replant around irrigation system components where necessary to maintain proper vertical positioning in relation to established grade.

D. Contractor shall fill all depressions and eroded channels with sufficient soil mix to adjust grade to ensure proper drainage. Compact lightly, and replant filled areas in accord with Drawings requirements.

3.19 WINTERIZATION AND SPRING START-UP

A. Provide the following services as part of the contract price:
   1. Winterization: Return to the site during the subsequent fall season when requested, and winterize the system. Drain all water from the system or blow out the system with compressed air. Open manual drain valves located at low points on the main line to drain main completely after air blow-out has been completed. Rotate backflow unit at unions and open petcocks and drain. Reverse operation and tighten unions to resume irrigation.
   2. Spring Start-up: Return to the site at the beginning of the subsequent spring season and demonstrate to the Owner the proper procedures for the system start-up, operation, and maintenance, when requested. Repair and/or replace any broken or non-functioning materials or equipment.

END OF SECTION

SECTION 32 91 13

SOIL PREPARATION FOR LANDSCAPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to the Contract and General Conditions and all Sections within Division 1 - General Requirements, which are hereby made a part of this Section of the Specifications.

B. Coordinate work of this Section with other underground utilities and with trades responsible for their installation. Refer to the respective Drawings pertaining to other work.

C. Comply with requirements of the Stormwater Pollution Prevention Plan (SWPPP) and Soil Erosion and Sediment Control specification, plans, and details, and the Contractor's accepted schedule. Refer to Section 01 5713 of these Specifications.

1.02 SUMMARY

A. The work of this section consists of the provision of all materials, labor and equipment necessary and or required for the complete execution of all landscape grading work for this project, including but not limited to the following:
   1. Prepare subgrade in areas to receive topsoil.
   2. Provide and spread topsoil to finish grade for final landscaping, including planters (as applicable), plant beds, lawn areas, and restoration work.
   3. Contractor shall inspect all subgrades prior to commencement of work.

1.03 SUBMITTALS

A. At least thirty (30) days prior to ordering materials, the Contractor shall submit to the Owner's Representative certified test results for materials as specified below. No materials shall be ordered or delivered until the required submittals have been reviewed and approved. Delivered materials shall closely match the approved samples. Approval shall not constitute final acceptance. The Owner's Representative reserves the right to reject, on or after delivery, any material which does not meet these specifications:
   1. Topsoil Borrow: The Contractor shall provide a representative sample of on-site topsoil and from each proposed source for testing, analysis, and approval. Testing and analysis shall be at the Contractor's expense. Samples from on-site stockpiles shall be taken from a minimum of six (6) different locations as directed.
   2. Contractor shall deliver all samples to testing laboratories and shall have the testing report sent directly to the Owner's Representative. An approved Agricultural Experiment Station testing laboratory shall perform tests for gradation, organics, soil chemistry and pH. Testing reports shall include the following tests and recommendations:
      a. Sieve analysis shall be performed and compared to the USDA Soil Classification System. Sieve analysis shall be by combined hydrometer and wet sieving using sodium hexametaphosphate as a dispersant in compliance with ASTM D 422 after destruction of organic matter by ignition.
      b. Percent of organics shall be determined by the loss on ignition of oven-dried samples. Test samples shall be oven dried to a constant weight at a temperature of 230 degrees F, plus or minus 9 degrees.
      c. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, extractable Aluminum, Soluble Salts, and acidity (pH) and buffer (pH). Nutrient levels shall be measured in parts per million (PPM). A Conductance Meter shall be used to measure Soluble Salt levels in soils: water extracts.
      d. Soil analysis tests shall show recommendations for soil additives to correct soils deficiencies as necessary to accomplish particular planting objectives noted. Recommendations for planting shall indicate NPK proportions and rates per caliper inch for trees, per shrub, per vine, and per square foot for ground cover plants.

e. All tests shall be performed in accordance with the current standards of the Association of Official Analytical Chemists.

1.04 COOPERATION AND COORDINATION WITH OTHER TRADES

A. The work shall be so performed that the progress of the entire project construction, including all other trades, shall not be delayed and not interfered with. Materials and apparatus shall be installed as fast as conditions will permit and must be installed promptly when and as directed.

B. All work shall be coordinated with other trades. The work in this section shall at no time interrupt the normal operations of the facility, as applicable.

1.05 REGULATORY REQUIREMENTS

A. Conform to all applicable codes. Including those that may be required by State and Local Building Codes.

B. Comply with NYSDOT Standard Specifications, most recent revision.

1.06 REFERENCE STANDARDS

A. ASTM D2487 - Classification of Soils for Engineering Purposes.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Subsoil
1. Excavated and re-use material and imported borrow.
2. Free of clay, rock, or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation and other organic matter.
3. Satisfactory soil materials are defined as those complying with ASTM D2487, soil classification groups GW, GP, GM, SM, SW, and SP.

B. Topsoil from stockpile: Topsoil may be existing topsoil stripped and stockpiled. Material shall consist of natural topsoil, free from subsoil, obtained from areas on site that have never been stripped. It shall be removed to its full depth. Topsoil shall be of uniform quality screened with a ½" screen and free of hard clods, stiff clay, hardpan, sods, partially disintegrated stone, lime, cement, ashes, slag, concrete, tar residues, tarred paper, boards, chips, glass, sticks, or any other undesirable material, and shall meet all requirements of topsoil borrow as specified below.

C. Topsoil Borrow:
1. The topsoil stripped and stockpiled on the site shall be used provided that, after testing and addition of necessary additives, it meets the following specification. The Contractor shall provide additional topsoil as required to complete the required work.
2. Existing on-site topsoil and new topsoil shall be 'sandy loam' or 'loamy sand' determined by mechanical analysis (ASTM D 422) and based upon the "USDA Classification System". It shall be of uniform composition, without admixture of subsoil. It shall be free of stones greater than one-half (1/2") inch lumps, plants and their roots, debris and other extraneous matter as determined by the Designer. It shall not contain toxic substances harmful to plant growth.
3. Topsoil shall have the following mechanical analysis:

Passing	% Passing by Weight
No. 4 Sieve	100
No. 40 Sieve	60-85
No. 100 Sieve	38-60
No. 200 Sieve	28-40
.002 mm	0-10

4. Maximum size shall be ½-inch largest dimension maximum retained on ¼ inch sieve shall be 20% by weight of the total sample. Testing shall be combined hydrometer and wet sieving as per ASTM D 422 after destruction of organic matter by ignition.

5. Topsoil borrow shall be screened topsoil and shall be free of plants and their roots, debris and other extraneous matter. It shall be uncontaminated by salt, water, foreign matter and substances harmful to plant growth. The electrical conductivity (EC2) of a 1:2 soil-water suspension shall be equal to or less than 1.0 millions/cm. (Test material passing #4 sieve).
6. Material shall consist of natural topsoil, free from subsoil, obtained from an area, which has never been stripped. It shall be removed to a depth of one (1) foot or less if subsoil is encountered. Topsoil shall be of uniform quality screened ½" and free of hard clods, stiff clay, hardpan sods, partially disintegrated stone, lime, cement, ashes, slag, concrete, tar residues, tarred paper, boards, chips, glass, sticks, or any other undesirable material.
7. Topsoil shall have an acidity range of pH 5.5 to pH 6.5 and shall contain not less than 5% nor more than 10% organic matter as determined by the loss on ignition of oven dried samples. Test samples shall be oven dried to constant weight at a temperature of 230 degrees F; plus or minus 9 degrees. To adjust organic matter content, the soil may be amended, prior to site delivery, by the addition of humus or peat moss. Use of organic amendments is acceptable only if random soil sampling indicates thorough incorporation.
8. All topsoil provided from off site sources shall be brought to the site meeting all specification requirements. There must be no mixing or amending of soil on site. No topsoil shall be placed prior to screening. The topsoil borrow must not be handled or moved when in a wet or frozen condition.
9. Topsoil which has been stockpiled on the site may be used provided it can be made to comply with this specification and that it has been screened to meet the above requirements.
10. To assure topsoil borrow purchased and topsoil stockpiled fulfills specified requirements regarding textural analysis, organic matter content, and pH, soil testing results will be obtained by the Contractor and submitted to the Designer for approval before any soil is delivered to the site.

2.02 SOURCE QUALITY CONTROL

A. If testing and analysis indicate topsoil or subsoil materials do not meet specified requirements, amend or change material and retest.

B. Provide materials of each type from same source throughout the work.

PART 3 - EXECUTION

3.01 INSPECTION

A. It shall be the Contractor's responsibility to inspect and verify that all site grading and compaction or de-compaction is complete. If errors in elevation or preparation are encountered, they are to be corrected by the responsible parties prior to the installation of topsoil. Commencement of work will be construed as complete acceptability of surfaces and contiguous elements.

3.02 GRADING

A. Uniformly grade areas to within 1 inch plus or minus of indicated grades. Prevent ponding of water and slope grades away from building structures where applicable. Adjust grades as needed to provide for full specified depth of topsoil and to meet indicated finish grades, and as directed and approved by Designer to insure proper coordination of work.

B. De-compact subsoil in areas of high compaction by ripping, rototilling or other approved method. Compact subsoil in areas of planting or lawn to maximum compaction of 90% or in accordance with Earthwork Section.

3.03 TOPSOIL PLACEMENT

A. Place and spread topsoil from site stockpiles or newly furnished materials over approved areas to a depth sufficiently greater than the depth required for mulch areas so that after natural settlement and light rolling, the completed work will conform to the lines, grades and elevations

indicated, and shall assure proper drainage in an uninterrupted pattern free of hollows and pockets. The resulting depth of the topsoil shall be a 6" topsoil rolled depth. Provide additional topsoil as needed to give the specified depths without additional costs to the Owner.

B. After topsoil has been spread, prepare it by carefully scarifying or harrowing and raking. Remove all stiff clods, lumps, brush, roots, stumps, litter and other foreign material and stones over 1 (one) inch in diameter, and dispose of legally off the site. Topsoiled areas shall also be free of smaller stones in excessive quantities as determined by the Owner's Representative. Roll the entire surface with a hand roller weighing approximately one hundred (100) pounds per foot of width. During the rolling, fill all depressions caused by settlement with additional topsoil and then regrade and roll until the surface presents a smooth, even and uniform finish and is up to the required grade.

C. No subsoil or topsoil shall be handled in any way if it is in a wet or frozen condition.

D. Tree and shrub planting pits shall be excavated as detailed and backfilled with planting soil mix. Remove excess subsoil. Do not spread on adjacent grades.

E. A saucer shall be formed around each plant as detailed on the plans.

F. Leave stockpile area and site graded, clean raked, and ready to receive landscaping.

3.04 TOLERANCES

A. Top of topsoil: Plus or minus ½-inch.

3.05 PROTECTION

A. Contractor shall be responsible for the protection of slopes, landscaping, existing structures, fences, sidewalks, and other site features remaining as final work.

3.06 CLEANING

A. The Contractor shall be responsible for keeping all hardscapes, paving and building surfaces clean during placement of topsoil and mulching operations.

B. All excess stones, debris and soil resulting from work under this section which have not previously been cleaned up shall be cleaned up and removed from the project site. Clean up spill immediately. Acceptance shall not be granted until this condition is met.

END OF SECTION

SECTION 32 92 00

SEEDING & SODDING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to the contract and general conditions and all Sections within Division 1 - General Requirements, which are hereby made a part of this Section of the Specifications.

B. Coordinate work of this Section with other underground utilities and with trades responsible for their installation.

C. Comply with requirements of the Stormwater Pollution Prevention Plan (SWPPP) and Soil Erosion and Sediment Control specification, plans, and details, and the Contractor's accepted schedule. Refer to Section 01 5713 of these Specifications.

1.02 SUMMARY

A. Provide labor, materials, and equipment necessary to complete the work of this Section as shown and specified. The work includes:
   1. Seeding and/or hydro-seeding lawns and other indicated or disturbed areas. The Contractor is ultimately responsible for judging the full extent of work requirements involved.
   2. Sodding, as applicable.
   3. Maintenance.

1.03 SUBMITTALS

A. Submit seed vendor's certification for required grass seed mixture for each application, indicating percentage by weight, and percentages of purity, germination, and weed seed for each grass species.

B. Submit sod growers certification of grass species. Identify source location.

C. Submit the following material samples:
   1. Hydromulch.

D. Submit the following materials certification:
   1. Fertilizer (s) analysis.
   2. Tackifier.
   3. Asphaltic emulsion.

E. Submit materials test report.

F. Upon lawn acceptance, submit written maintenance instructions recommending procedures for maintenance of hydro-seeded, seeded and/or sodded areas.

1.04 QUALITY ASSURANCE

A. Sod: Comply with American Sod Producers Association (ASPA) classes of sod materials.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver seed and fertilizer materials in original unopened containers, showing weight, analysis, and name of manufacturer. Store in a manner to prevent wetting and deterioration.

B. Cut, deliver, and install sod within a 24-hour period.
   1. Do not harvest or transport sod when moisture content may adversely affect sod survival.
   2. Protect sod from sun, wind, and dehydration prior to installation.
   3. Do not tear, stretch, or drop sod during handling and installation.

1.06 PROJECT CONDITIONS

A. Notify Owner's Representative at least 7 working days prior to start of seeding or sodding operations.

B. Protect existing utilities, hardscapes, paving, and other facilities from damage caused by seeding operations.

C. Perform seeding work or sodding installation only after planting and other work affecting ground surface has been completed.

D. Restrict traffic from lawn areas until grass is established. Erect signs and barriers as required.

E. Provide hose and lawn watering equipment as required.

1.07 WARRANTY

A. Provide a uniform stand of grass by watering, mowing, and maintaining seeded and sodded areas until final acceptance. Re-seed or resod areas, with specified materials, which fail to provide a uniform stand of grass until all affected areas are accepted by the Owner's Representative.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Topsoil for lawn areas: See Section 32 9113 "Soil Preparation for Landscaping."

B. Seed: Fresh, clean, and new crop seed mixture. Composed of the following varieties or as approved for the particular application, mixed to the specified proportions by weight and tested to minimum percentages of purity and germination. Poa Annual, bent grass, and noxious weed seed free. Alternate mixes may be accepted provided they provide similar characteristics of performance, growth habit and appearance.
   1. 'SEED': A drought-resistant blend of tall fescues, bluegrass and ryegrass such as 'Black Beauty' by Jonathan Green or 'Pearl's Premium Sun-Shade Mixture' as supplied by Pearl's Premium, Inc. P.O. Box 5166, Wayland, MA 01778. Other suppliers with substantially similar products may be acceptable with Landscape Architect's approval. Seed at 120 lbs/acre.
   2. 'SEED' for Detention Basin:
      a. Prairie moon seed mix with enhancement seed mix for wetter soils.
      b. HM-3 NYSDEC Stormwater Basin Mix #3 (herbaceous).

C. Sod: A nursery grown blend of at least 3 improved Kentucky Bluegrass varieties.
   1. Sod containing Common Bermudagrass, Quackgrass, Johnsongrass, Poison Ivy, Nutsedge, Nimblewill, Canada Thistle, Timothy, Bentgrass, Wild Garlic, Ground Ivy, Perennial Sorrel, or Bromegrass weeds will not be acceptable.
   2. Provide well-rooted, healthy sod, free of diseases, nematodes and soil borne insects. Provide sod uniform in color, leaf texture, density, and free of weeds, undesirable grasses, stones, roots, thatch, and extraneous material; viable and capable of growth and development when planted.
   3. Furnish sod machine stripped in square pads or strips not more than 3'-0" long; uniformly 1" to 1-1/2" thick with clean cut edges. Mow sod before stripping.

D. Fertilizer: Granular, non-burning product composed of not less than 50% organic slow acting, guaranteed analysis professional fertilizer. Provide formulation as recommended by soil tests for the type of lawn or seeding specified.

E. Ground limestone: Containing not less than 85% of total carbonates and ground to such fineness that 50% will pass through a 100 mesh sieve and 90% will pass through a 20 mesh sieve.

F. Straw mulch: Clean oat or wheat straw well seasoned before bailing, free from mature seed-bearing stalks or roots of prohibited or noxious weeds.

G. Wood mulch: Shredded hardwood brown mulch.

H. Wood cellulose fiber mulch: Degradable green dyed wood cellulose fiber or 100% recycled long fiber pulp, free from weeds or other foreign matter toxic to seed germination and suitable for hydromulching.

I. Tackifier: Liquid concentrate diluted with water forming a transparent 3-dimensional film like crust permeable to water and air and containing no agents toxic to seed germination.

J. Asphaltic emulsion binder: Refined petroleum asphalt emulsified in alkaline water without use of clay, starch, or emulsified in alkaline water without use of clay, starch, or like deleterious substances, and not more than 0.75% of saponifiable acids, of a fluid consistency with no petroleum solvents or other diluting agents toxic to seed germination.

K. If an irrigation system is not existing or installed, on-site water from a source designated by the Owner may be available for planting and maintenance operations. The water would be suitable for irrigation and free from ingredients harmful to plant life. The Contractor shall be responsible for bringing water to any and all areas requiring watering under the scope of this contract whether or not on-site water is available. The Contractor shall furnish all hoses and equipment necessary for watering plant materials.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine finish surfaces, grades, topsoil quality, and depth. Do not start seeding or sodding work until unsatisfactory conditions are corrected.

3.02 FINISH GRADING

A. See Section 32 9113 "Soil Preparation for Landscaping."

B. Manually install topsoil at trees to remain. Avoid damage to root system.

3.03 PREPARATION

A. Limit preparation to areas which will be immediately seeded or sodded.

B. Loosen topsoil of lawn areas to minimum depth of 4". Remove stones over 1/2" in any dimension and sticks, roots, rubbish, and extraneous matter.

C. Grade lawn areas to a smooth, free draining even surface with a loose, moderately coarse texture. Roll and rake, remove ridges, and fill depressions as required to drain.

D. Apply limestone and/or fertilizers at rates determined by the soil tests, to adjust pH of topsoil to not less than 6.0 nor more than 6.8. Distribute evenly by machine and incorporate thoroughly into topsoil.

E. If applicable, apply fertilizers to renovated lawn areas by mechanical rotary or drop type distributor, thoroughly and evenly incorporated with soil to a depth of 3" by discing or other approved method. Fertilize areas inaccessible to power equipment with hand tools and incorporate into soil.

F. Restore prepared areas to specified condition if eroded, settled, or otherwise disturbed after fine grading and prior to seeding.

3.04 INSTALLATION OF SEED

A. Seeding:
   1. Seed immediately after preparation of bed. Spring seeding between April 1 and June 1 and fall seeding between August 15 and October 15 or at such other times acceptable to the Landscape Architect.
   2. Seed indicated areas within contract limits and areas adjoining contract limits disturbed as a result of construction operations and/or where indicated on the plans.
   3. Perform seeding operations when the soil is dry and when winds do not exceed 5 miles per hour velocity.

4. Apply seed with a rotary or drop type distributor. Install seed evenly by sowing equal quantities in 2 directions, at right angle to each other.
5. Sow grass seed at a indicated rates.
6. After seeding, rake or drag surface of soil lightly to incorporate seed into top 1/8" of soil. Roll with light lawn roller.
7. Water newly seeded areas. Maintain adequate soil moisture until new grass is established.

B. Hydro-seeding (if selected):
1. Use a hydromulcher (sprayer) and apply mixture(s) at the following rates. Mix in accordance with manufacturer's recommendations.
   a. Seed: as recommended by seed supplier or as noted.
   b. Type A fertilizer: 220 lbs./acre.
   c. Tackifier: 60 gals./acre.
   d. Wood cellulose fiber mulch: 2,000 lbs./acre.
   e. Limestone: Rate determined by soil test.
2. Water newly hydro-seed areas. Maintain adequate soil moisture until new grass is established.

C. Mulching (if mulch is not included with hydro-seed):
1. Place straw mulch on seeded areas within 24 hours after seeding.
2. Place straw mulch uniformly in a continuous blanket at the rate of 2-1/2 tons per acre, or 2- 50 lb. bales per 1,000 sq. ft. of area. A mechanical blower may be used for straw mulch application when acceptable to the Landscape Architect.
3. Crimp straw into soil by mechanical means.
4. Anchor straw with liquid tackifier applied uniformly at a rate of 60 gal. per acre.
5. Protect buildings, paving, plantings, and all nonseeded areas from asphaltic emulsion or liquid tackifier over-spray.

3.05 INSTALLATION OF SOD (AS APPLICABLE)

A. Lay sod to form a solid mass with tightly-fitted joints. Butt ends and sides of sod strips. Do not overlay edges. Stagger strips to offset joints in adjacent courses. Remove excess sod to avoid smothering of adjacent grass. Provide sod pad top flush with adjacent curbs, sidewalks, drains, and seeded areas.

B. Do not lay dormant sod or install sod on saturated or frozen soil.

C. Install initial row of sod in a straight line, beginning at bottom of slopes, perpendicular to direction of the sloped area. Place subsequent rows parallel to and lightly against previously installed row.

D. Water sod thoroughly with a fine spray immediately after laying.

E. Roll with light lawn roller to ensure contact with sub-grade.

F. Water newly sodded areas. Maintain adequate soil moisture until new sod is established.

3.06 MAINTENANCE

A. Maintain seeded and sodded lawns until completion and acceptance.

B. Maintain lawn areas, including watering, spot weeding, mowing, applications of herbicides, fungicides, insecticides, and re-seeding or sodding until a full, uniform stand of grass free of weeds, undesirable grass species, disease, and insects is achieved and accepted by the Landscape Architect.
1. Water daily to maintain adequate surface soil moisture for proper seed germination. Continue daily watering for not less than 30 days or as needed. Thereafter apply 1/2" of water twice weekly until acceptance.
2. Repair, rework, and re-seed or sod all areas that have washed out, are eroded, or do not catch.

3. Mow lawn areas as soon as lawn top growth reaches a 3" height. Cut back to 2" in height. Repeat mowing weekly during the growing season.

3.07 ACCEPTANCE

A. Inspection to determine acceptance of lawns will be made by the Owner's Representative, upon Contractor's request. Provide notification at least 10 working days before requested inspection date.
   1. Lawn areas will be acceptable provided all requirements, including maintenance, have been complied with, and a healthy, uniform, close stand of the specified grass is established free of weeds, undesirable grass species, disease, and insects.
   2. No individual lawn areas shall have bare spots or unacceptable cover totaling more than 2% of the individual areas, in areas requested to be inspected.

3.08 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from seeding and sodding operations. Clean up spills and oversprays immediately. Acceptance shall not be granted until this condition is met.

END OF SECTION

SECTION 32 93 00
EXTERIOR PLANTING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to the Contract and General Conditions and all Sections within Division 1 - General Requirements, which are hereby made a part of this Section of the Specifications.

B. Coordinate work of this Section with other underground utilities and with trades responsible for their installation.

C. Comply with requirements of the Stormwater Pollution Prevention Plan (SWPPP) and Soil Erosion and Sediment Control specification, plans, and details, and the Contractor's accepted schedule. Refer to Section 01 5713 of these Specifications.

D. Comply with the requirements of Appendix A of this Section, titled "Plant Establishment and Maintenance Outline."

1.02 SUMMARY

A. The work of this section includes, but is not limited to, the provision of all plant material, labor and equipment and the like necessary and/or required for the complete execution of all landscaping in accordance with the Contract Documents. The work may include new trees and shrubs, plants, mulch and ground cover including, but not limited to the following:
   1. Perform all soil treatment on topsoil as recommended by the laboratory soil analysis.
   2. Prepare tree pits and planting areas including preparation of planting soil mix for all plants, tree pits and planting beds using topsoil, peat and organic fertilizer.
   3. Provide all new planting including trees, shrubs, plants, ornamental grasses, ground cover and all other miscellaneous planting as indicated; staking and guying.
   4. Provide plugs in pocket pond.
   5. Maintenance of plantings until acceptance and then throughout the warranty period including but not limited to pruning, spraying and weeding; mulching, fertilizing, watering and replacement of unsatisfactory plant material.
   6. Complying with the requirements of Appendix A of this Section titled "Plant Establishment and Maintenance Outline".
   7. One-year warranty on all new plantings, including work during the warranty period to meet the requirements of the drawings and specifications.
   8. The Contractor shall be solely responsible for judging the full extent of work requirements involved, including but not limited to the potential need for storing and maintaining plants, and temporary and/or re-handling plants prior to final installation.

1.03 SUBMITTALS

A. Submit the following in accordance with Division 1 requirements:
   1. At least 90 days prior to the first day of the planting season described in this section, submit to the Owner's Representative proof of certification and experience in accordance with Article 1.04 of this Section.
   2. Materials test reports.
   3. Manufacturer’s and supplier’s cut sheets and brochures indicating sources and composition of materials.
   4. List of sources of plant materials, and proposed plant tagging schedule.
   5. Upon plant material acceptance, submit written maintenance instructions recommending procedures for maintenance of plant materials.

1.04 QUALITY ASSURANCE

A. A firm specializing in such work and possessing adequate years of relevant experience shall perform work required herein.

1. Nursery Qualifications: Local company specializing in growing and cultivating the plants at a location within 500 miles of the site and having eight years documented experience.
2. Installer Qualifications: Local company within 75 miles of the site specializing in landscape installation with a minimum of five years documented experience.
3. Arborist Qualifications: Local company within 75 miles of site specializing in the care of trees and shall be under the full time site supervision of a New York certified arborist.

B. Ship all materials and certificates of inspection required by governing authorities. Comply with regulations applicable to materials being used to complete the work of this Section.

C. Package standard products with manufacturer's certified analysis.

D. Reference Standards
1. ASNS: "American Standard for Nursery Stock," ANSI Z-60.1, latest edition, published by the American Association of Nurserymen, (AAN). All plants shall meet or exceed the size and characteristics specified in the Standard for the spread, height, caliper, or container size indicated.
2. Tree Maintenance and Pruning: TCIA, ANSI A300.

E. Stock furnished shall be at least the minimum size indicated. Larger stock is acceptable, at no additional cost, and providing that the larger plants will not be cut back to size indicated. Provide plants indicated by two measurements so that all plants exceed the minimum size and at least 50% of plants exceed the average of the two sizes.

F. Provide "specimen" plants with a special height, shape, or character of growth. Tag specimen trees or shrubs at the source of supply. When specimen plants cannot be purchased locally, provide sufficient photographs of the proposed specimen plants for approval. Such approval shall not affect the right of inspection and rejection during the progress of the work.

G. Plants will be inspected and approval given by the Owner's Field Representative and/or the Landscape Architect upon delivery for conformity to Specification requirements. Such approval shall not affect the right of inspection and rejection during the progress of the work.

H. The Owner's Field Representative and/or the Landscape Architect reserves the right to inspect and/or select all trees at the place of growth. The Owner's Field Representative and/or the Landscape Architect reserves the right to approve a representative sample of each type of shrub, fern, and ground cover at the place of growth. Such sample will serve as a minimum standard for all plants of the same species used in this work. The Contractor or his representative shall be present for inspection of plants. Plants tagged with the Owner's Field Representative and/or the Landscape Architect's seal shall be delivered to the site unless damaged or unsound between the time of tagging and the time for delivery.

I. Provide and pay for material testing. Testing agency shall be acceptable to the Owner's Field Representative and/or the Landscape Architect. Provide the following data:
1. Topsoil: pH factor, mechanical analysis, percentage of organic content, and recommendations on type and quantity of additives required to establish satisfactory pH factor and supply of nutrients to bring nutrients to satisfactory level for planting.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Existing trees to be reused, if indicated on the plans. Contractor's responsibility for storage, protection and maintenance of existing plant material to be reused shall be continuous from the time of removal to the final acceptance of the installation work.

B. The Contractor shall be responsible for the maintenance of transplanted plant material beginning at the date of acceptance and continuing through the guarantee period.

C. New plant material.
1. Deliver packaged materials in containers showing weight, analysis and name of manufacturer.
2. Protect all plant materials from deterioration during delivery and while stored at the site.

3. Provide freshly dug plantings. Do not prune prior to delivery. Do not bend or bind-tie trees or shrubs in such a manner so as to damage bark, break branches or destroy natural shape. Provide protective coverings during delivery.
4. Deliver plants after preparations for planting have been completed and install immediately. If planting is delayed more than six (6) hours after delivery, set plantings in place, protect from weather and mechanical damage and keep roots moist. Do not remove container-grown stock from containers until planting time.
5. Perform labeling operations with at least one (1) of each variety by securely attaching waterproof tag with a legible designation of both common and botanical name.

D. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.06 REGULATORY REQUIREMENTS:

A. Comply with regulatory agencies for fertilizer and herbicide composition.

B. Plant Materials: Certified by state department of agriculture described by ASTM Z60.1; free of disease or hazardous insects.

1.07 SPECIAL GUARANTEES/WARRANTY TERMS

A. All work of this section shall be guaranteed for a period of one (1) year, OR not less than two (2) full planting seasons from the date of Certificate of Acceptance.

B. Replacement plants are to be of same size and species as specified, planted in the next growing season, with a new warranty commencing on date of replacement.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Soil Additives
1. Commercial fertilizer, peat, humus or other additives shall be used to counteract soil deficiencies as recommended by the soil analysis and as directed by the Owner's Representative.
2. Commercial fertilizer shall be a product complying with State and United States Fertilizer Laws. Deliver to the site in the original unopened containers, which shall bear the manufacturer's Certificate of Compliance covering analysis, which shall be furnished to the Owner's Representative. At least 50% by weight of the nitrogen content shall be derived from organic materials. Fertilizer shall be adjusted to meet all recommendations of the soil analysis.
3. Organic Material (Compost): Compost shall be a well-rotted, natural material, min. 65% organic content by weight, all components passing a 1/2" screen, such as Earthlife compost as supplied by Earthlife, (Billerica, MA), (800) 933-6474, or approved equal.
4. Bone meal shall be fine ground, steam cooked, packinghouse bone with a minimum analysis of 23% phosphoric acid and 4% nitrogen.

B. Planting soil mix
1. Planting soil mix shall be approved loam which has been pH adjusted according to particular planting applications and improved through the addition of organic matter as directed below. Planting mix shall conform to the following pH levels:
   a. Planting soil mix shall consist of pH adjusted loam which has been thoroughly premixed with organic material in the proportions of one (1) organic material (compost) with four (4) parts of approved loam

C. Plant Materials
1. Specimens shall meet requirements of Plant Schedule as shown in Construction Documents.
2. Substitutions shall not be made without written approval of the Owner's Representative .

3. All plants shall be nursery grown within 500 miles of site. Sources of supply shall be verified prior to bidding to insure that all of the plants on specified planting schedule in size, species, variety, and quality noted can be supplied. Failure to take this precaution will not relieve successful bidder from his responsibility for furnishing and installing planting materials as per contract requirements, without additional expense to the Owner.
4. All plants shall be typical of their species or variety and shall have a normal habit of growth and be legibly tagged with the proper name. Only plant stock grown within hardiness Zones 3 through 6a, as established by the USDA Plant Hardiness Zone Map, latest edition, will be accepted. The Contractor's suppliers must certify in writing that the stock has actually been grown under Zone 6 or hardier conditions. Plants not so certified will not be accepted.
5. Plants shall be in accordance with the ANSI Z60 American Standard for Nursery Stock. Botanical plant names shall be in accordance with plant designations included in Hortus III.
6. If at any time during the performance of the Contract, any plant shows signs of graft incompatibility, as determined by the Designer, then the tree or shrub and all other similarly grafted plants of the same Genus/Species/Variety shall be rejected and removed from the site. Visual symptoms of graft incompatibility is cause for rejection.
    a. Development of overgrowths by rootstock or scion resulting in the development of shoulders or inverted shoulders.
    b. Suckering of the rootstock combined with poor growth or dieback of scion.
    c. Any mechanical weakness between scion and rootstock.
    d. Any marked difference in bark pattern and structure between scion and rootstock.
7. All deciduous trees shall meet the following standards:
    a. Trees shall have a single, straight trunk, well formed and sturdy. No part of the trunk shall be conspicuously crooked as compared with normal trees of the same variety.
    b. All pruning wounds shall show vigorous bark on all edges at the time of harvest. Trees shall be free from all signs of pest and disease damage. The trunk shall be free from sunscald; frost cracks, and wounds resulting from abrasions, fire, animal damage, or other causes.
    c. Pruning scars within the crown of any tree shall be clean cut and shall leave no protrusion beyond the branch collar.
    d. All trees shall have healthy, vigorous leaves or needles of normal size, color, shape, and texture for the particular species and variety.
    e. Deciduous shade trees and deciduous flowering trees shall have fall color typical for their species and variety.
    f. Take caliper measurements for deciduous trees six (6) inches above ground level up to and including four (4) inches caliper size and twelve (12) inches above ground for larger sizes.
    g. No deciduous tree shall be pruned after the Owner's Representative has tagged the plant in the nursery except as directed by the Owner's Representative.
    h. Branching of all deciduous trees shall be best quality representatives of the species, cultivars, or variety with lateral branching around the entire trunk to form a symmetrical tree for eighty (80) percent to one hundred (100) percent of the trees outer perimeter.
8. Evergreen trees shall meet the following standards:
    a. All shrubs shall be healthy and vigorous plants which are very well shaped, heavily branched, densely foliated, and true to form for the variety.
    b. Canes or trunks and branches shall be well formed and sturdy.
    c. Branching shall be uniformly distributed close to the ground.
    d. Scars on trunks and branching shall be free of rot and not to exceed ¼ the diameter of the wood beneath in greatest dimension unless completely healed (except pruning scars).

e. Pruning scars on trunks or branches shall be clean cut and shall leave little or no protrusion from the trunk or branch.
f. Graft unions on trunks or branching shall be completely healed.
g. Trunks and branching shall be free of cracks, splits, cadmium peeling, and shall contain no dead wood.
h. No tree or shrub with pest or mechanical damage will be accepted.
i. Trees and shrubs shall show no signs of frost or winter damage to the foliage. Foliage shall not be in a state of drought stress. Leaves or needles shall show no signs of wilt or desiccation due to weather stress at any season of the year.

D. Root Systems for all Plants
1. Each plant shall have an extensive, symmetrically balanced fibrous root system. Any root ball, which shows signs of asymmetry, injury, or damage to the root system, shall be rejected.
2. Curling or spiraling of the roots along the wall of rigid containers will not be accepted.
3. All parts of the fibrous root system of all plants shall be moist and fresh with a white color when washed of soil. When the plant is removed from the container, the visible root mass shall be healthy with white root tips. The root systems of all plants shall be free of disease, insect pests, eggs or larvae.
4. All trees, and all shrubs which are not grown in containers must be moved with the roots systems as solid units with balls of earth firmly wrapped with untreatable eight (8) ounce natural, biodegradable cord or twine. The base of the tree trunks shall be wrapped with a protective burlap layer, surrounded by a cardboard trunk protector, and loosely tied with twine.
5. The diameter and depth of the root balls of earth must encompass the fibrous and root feeding system necessary for the healthy development of the plant. Minimum root ball diameters and depths shall be in accordance with ASNS standards.
6. No plant shall be loose in the container.
7. Plants marked “pots” or other container on plant list shall have been grown in those containers for a minimum of one (1) year and a maximum of two (2) years. Roots shall fill containers but show no evidence of being or having been root-bound. Plants shall not be picked up or moved by stems or branches; but lifted and handled from sides of containers.

E. Antidesiccants
1. Antidesiccants shall be emulsions or other materials, which will provide a protective film over plant surfaces permeable enough to permit transpiration, and specifically manufactured for that purpose. Manufacturer of antidesiccant shall be subject to the Owner's Representative's approval. Antidesiccant shall be delivered in containers of the manufacturer and shall be mixed according to the manufacturers instructions.

F. Mulch
1. Mulching material shall be shredded or ground pine bark mulch aged a minimum of six (6) months and not longer than two years. The mulch shall be dark brown in color, free of dirt, growth or germination inhibiting ingredients, deleterious or extraneous materials, and pieces of wood thicker than ¼ inch. Mulch must be suitable for top dressing of trees and plant beds and free of stringy material or chunks over three inches in size and shall not contain, in the judgment of the Owner's Representative, an excess of fine particles. Wood chips are not acceptable. Submit sample for approval.

G. Mycorrhizal fungal inoculant shall be 3 ounce packets of live spores. Each packet of inoculant shall contain the following:
1. Live spores of VA Endomycorrhizal fungi: minimum 1,000 spores of Vesicular-Arbuscular fungi including: Entrephosora columbiana, Glomus etunicatum, Glomus clarum, and Glomus sp.
2. Live spores of Ectomycorrhizal fungi: minimum 60 million spores of Pisolithus tinctorius.
3. Acrylamide copolymer gel as a water absorbent gel.

4. Yucca schidegera, a dry soluble yucca plant extract.
5. Soluble sea kelp extract, Ascophylum nodosum.
6. Humic acids, leonardite humates.

H. Accessories
1. Wrapping Materials: Tree wrap tape of jute or waterproof paper not less than 4" wide, designed to prevent bore damage and winter freezing.
2. Stakes: For exposed stakes: cedar free of knotholes and other defects, three inch square by 8' long; for below-grade short stakes: 2"x4" nominal by 2'6" length sound hardwood free of defects.
3. Cable, Wire: Non-corrosive #12 gauge galvanized annealed wire minimum and of sufficient strength to withstand wind pressure and resulting movement of plant life.
4. Eye Bolts and Turnbuckles: Non-corrosive, of sufficient strength to withstand wind pressure and resulting movement of plant life.
5. Plant Protectors: 1/2" diameter rubber hose friction guards or sleeves over cable to protect plant stems, trunks, and branches. Cut to required lengths and of uniform color.
6. 'Gator' Bags: Slow release water bags such as Treegator Original, as manufactured by Spectrum Products Inc., (http://www.treegator.com/index.html), or approved equal. Provide size as recommended by manufacturer for caliper of tree.

PART 3 -EXECUTION

3.01 INSPECTION

A. At least one month prior to the expected planting date, the Contractor shall request that the Owner's Representative provide a representative to select and tag stock to be planted under this section. If requested by the Owner's Representative, the contractor shall supply photographs of proposed plant material for approval.

B. The Contractor shall be responsible to certify the availability of required plantings in specified sizes from his sources of supply prior to requesting the Owner's Representative to make plant source inspections. In the event that plantings at the inspection location are found to be unavailable or of insufficient size, the Contractor shall be liable to reimburse the Owner for all costs of the Owner's Representative's hourly services, which are incurred during unproductive inspection trips.

C. Unless specifically designated otherwise, a representative of the Contractor shall accompany the Owner's Representative on all plant material selection field trips.

D. For all plantings for the project, a representative sample shall be individually tagged for approval as "An Approved Typical Sample". The Owner's Representative will reject any individual plant, which arrives at the construction site and does not meet or exceed the Approved Typical Sample.

E. Inspection and approval of plantings at the source shall not impair the right of subsequent inspection and rejection upon delivery to the site, or during the progress of the work; if the Owner's Representative finds that plants have declined noticeably due to handling abuse, lack of maintenance, or other causes. Cost of replacements, as required, shall be borne by the Contractor.

3.02 PREPARATION

A. Furnishing and planting of the plant material includes digging of the holes, provision of soil additives and loam, furnishing the plants of specified size with roots in the specified manner, the labor of planting, fertilizing, mulching, guying, and staking where called for, and maintenance.

B. The Contractor shall locate plant material sources and ensure that plants are shipped in timely fashion for installation.

C. Planting season: Unless otherwise shown on the plans or directed by the Owner's Field Representative and/or the Landscape Architect the planting season shall be those indicated below. No planting shall be done in frozen ground or when snow covers the ground, or the soil is otherwise in an unsatisfactory condition for planting.
   1. Deciduous Material: Spring: March 15th to May 31st (inclusive) Fall: From October 1st until the ground freezes. Certain plant items, designated elsewhere in the contract documents, shall be planted in the Spring planting season only.
   2. Evergreen Material: Spring: March 1st to June 1st (inclusive). Fall: August 15th to October 15th (inclusive).
   3. The Contractor may elect to plant outside these planting periods, but shall advise the Owner's Field Representative and/or the Landscape Architect before so doing. All plants installed under such conditions shall meet all conditions of the guarantee.

3.03 PLANTING OF RELOCATED TREES (AS APPLICABLE)

A. Immediately prior to transplanting trees shown on the Contract Documents, prune each tree in accordance with the recommendations of the TCIA as set forth in A300.

B. Temporary storage of transplanted trees:
   1. Contractor is responsible for temporary storage and protection of trees to be transplanted. Temporary storage area to be either on site or other suitable location.
   2. Machine dig trees using a tree spade with a spread diameter as appropriate to the root ball perimeter.
   3. Tag the north side of each tree trunk and transplant in new locations with the same orientation to reduce the possibility of sunscald damage to bark.
   4. Prune, with a clean cut all projecting roots or root tips shredded by digging operations.
   5. Transport tree to new location.
   6. Take all necessary precautions so as not to damage the tree trunk, break branches or loosen the root ball mass during transport of the tree.

C. Planting Trees in New Location
   1. Plant relocated trees as shown on the drawings for new trees.

3.04 NEW PLANTING MATERIAL

A. Notify the Owner's Representative three (3) working days prior to the proposed arrival of plant material on the site. All plantings shall be planted within five (5) days of arrival on site or will be rejected. Container grown shrubs stored on site shall be shaded from direct sunlight at all times and shall not be stored on paved surfaces. All plants delivered to the site and not planted within 24 hours of delivery shall have their root balls covered with mulch and shall be watered on a daily basis.

B. Locations for all plants and outlines for planting areas shall be staked on the ground by the Contractor for approval by the Owner's Representative before plant pits or plant beds are dug.

C. Plant pits shall be excavated in accordance with details. Where pavements restrict the size of planting pits, the hole shall be the maximum diameter along the edges abutting pavement.

D. Planting soil mix as specified shall be prepared and backfilled at individual tree and shrub planting pits as directed.

E. All plant roots and earth balls must be damp and thoroughly protected from sun and wind from the beginning of the digging operation, during transportation and on the ground until the final planting.

F. Loosen burlap at top of root ball and gently remove soil to expose root flair. Cut any adventitious roots above the root flair. Plant at specified depth, in the center of the plant pits.

G. After completion of planting installations, remove rope and wires from the upper third of the root balls. Do not pull burlap or wires out from sides or under root balls.

H. Topsoil and or planting mix shall be backfilled in layers of not more than six (6) inches and each layer watered sufficiently to settle before the next layer is put in place. Enough topsoil and or planting soil mix shall be used to bring the surface to two (2) inches above at plant stem finished grade when settled. A saucer shall be formed around each plant at a depth of six (6) inches for trees and four (4) inches for shrubs. All topsoil excavated from the planting pit shall be used to backfill the pit; supplement with planting soil mix as necessary.

I. At the time of planting, install fertilizer packets with formulation as recommended by soil test at a depth of 6 to 8 inches equally spaced around the plant, as it is being backfilled. Packets shall be placed approximately three (3) inches away from the plant roots or plant ball. Packets shall not be cut, ripped or damaged. If it becomes necessary to remove and replace dead or unhealthy plants, damaged or broken packets shall be replaced with new packets. The application rates for fertilizer packets shall be as follows:

Type of Plant	Rate of Application
Deciduous Shade Trees	One packet for each inch of caliper
Evergreen and Small Flowering Trees	One packet for each 18 inches of height.
Shrubs	One packet for each 12 inches of height or spread
Ground Covers	Per manufacturer's instructions

J. All plants that are not being automatically irrigated shall be inoculated with mycorrhizal fungi. Inoculants shall be added after the plants have been placed in their holes. Open the specified number of 3-ounce packets for each plant and thoroughly mix the inoculant powder into the upper 10 inches of backfill soil. Mycorrhizal fungal inoculant shall be added to the plant pits according to plant size. The application rates for 3 ounce mycorrhizal fungal packets shall be as follows:

Type of Plant	Size of Plant	Packet Rate
Deciduous Trees:	2"-2-1/2" caliper	three
	2-1/2"-3" caliper	three
	3"-3-1/2" caliper	four
	3-1/2" caliper	four
Evergreen Trees:	5'-6' height	two
	6'-7' height	three
	7'-8' height	three
	8'-9' height	three
	9'-10' height	four
	10' height plus	four
Shrubs other than Rhododendron or Kalmia species:		
	Up to 4'H x 4'W	one
	Over 4'H x 4'W	two

Submit the purchasing receipt showing the total quantity purchased for the project prior to installation. Submit empty packets of fungal spore inoculant to the Owner's Representative for verification of use. The Owner's Representative may excavate pits to determine the presence of mycorrhizal fungi inoculant.

K. All plants shall be watered immediately following planting as necessary to thoroughly moisten root ball and plant pit loam and thereafter shall be inspected frequently for watering needs and watered, as required, to provide adequate moisture in the planting pit. The Contractor shall inspect tree pits 24 hours after the initial watering to confirm that they are draining properly. If surface water or excessively saturated plant pit soils exist, the Contractor shall immediately

notify the Owner's Representative who will recommend remedial measures based upon site conditions.

L. As shown on the drawing details, all trees shall be firmly guyed or anchored at the time of planting. Cables used for tying the trunk to stakes for guying shall be secured to the tree by passing through an approved hose to prevent chafing and injury to the trees. Cable ends shall be formed with a looped connection, which is secured with compressed malleable fittings as specified.

M. Mulch material shall be placed over the entire saucer areas of individual trees and shrubs and over the entire area of planting beds to a depth of 2 inches after settlement, not later than one (1) week after planting. No mulch shall be applied prior to the first watering of plant materials.

N. Pruning: Prune only to remove dead, broken or rubbing limbs, or as directed by the Owner's Field Representative and/or the Landscape Architect. All pruning shall be done in accordance with the provisions of the A300 standards.

O. Antidesiccant:
1. The Contractor shall spray all evergreen and broadleaf evergreen plants with antidesiccant the first winter after the plants are planted.
2. Spraying shall be performed at the correct time for that particular year's climatic conditions to insure the maximum protection for plants during the first winter.
3. If the fall has been particularly dry, the Contractor shall thoroughly water all evergreens and broadleaf evergreens for two weeks prior to spraying

P. If planting is done after lawn preparation or installation, proper protection of lawn areas shall be provided and damage of lawn resulting from planting operations shall be repaired immediately at no cost to the Owner.

Q. In the event that rock (ledge) obstructions are encountered in a plant pit or bed excavation work, the rock (ledge) shall be removed to a minimum depth of five (5) feet for trees and three (3) feet for shrubs. Other underground obstructions that are encountered shall be reported to the Owner's Representative who may select alternate plant locations.

R. All plant beds shown on the drawings shall have a spade-cut edge unless otherwise specified to receive edging.

3.05 PLANT MAINTENANCE

A. Plant Maintenance - Refer to Appendix A of this Section.
1. Maintenance Period shall begin immediately after each plant is planted and shall continue until the final acceptance of the planting or the issuance of a Certificate of Occupancy.
2. Maintenance shall consist of keeping the plants in a healthy growing condition and shall include watering, cultivating, re-mulching, tightening and repair of guys, removal of dead material, resetting plants to proper grades or upright position and maintaining the planting saucer.
3. Plants shall be inspected for watering needs at least twice a week and watered to promote plant growth and vitality even though species selected are not to be irrigated once established. The following watering rates assume that the soil is free draining. If the on site conditions do not ensure a free draining soil, then notify the Owner's Representative in writing of this condition. Watering rates for trees and shrubs in free draining soils shall be established during the submittal phase and in accordance with the following:
a. For trees in lawn or mulched beds, apply water to the ground surface directly under the canopy. Water shall be applied at a sufficiently slow rate to prevent runoff from the soil surface but great enough to equal 2 inches of water per square foot of canopy area per hour for five hours a week.
4. Provide 'Gator' bags of the appropriate size for the caliper of tree for all trees not in irrigated areas. Bags will become the property of the Owner. Maintain Gator bags from planting until acceptance of planting by Owner.

5. Planting beds and individual plant pits shall be kept free of weeds, and mulch shall be replaced as required to maintain the specified layer of mulch. Beds and individual pits shall be neat in appearance and maintained to the designed layout.
6. Plants that die during the maintenance period shall be removed and replaced by the Contractor within one week of notification and replaced during that growing season, unless designated otherwise by the Owner's Representative .
7. Work of pruning, fertilizing, spraying, and similar activities shall be undertaken only by Certified Arborists and licenses chemical applicators, as pertinent to the work being performed.

B. Seasonal spraying as required shall also be included. The Owner's Representative shall approve pesticides prior to use and shall be used in accordance with the specifications of the prevailing Public Health Authority.

C. Planting areas and plants shall be protected at all times against trespassing and damage of all kinds for the duration of the maintenance period. If any plants become damaged or injured, they shall be treated or replaced as directed by the Owner's Representative at no additional cost to the Owner.

Defective work shall be corrected as soon as possible after it becomes apparent and weather and season permit.

D. During the maintenance period, a decline in the condition of plantings shall require the Contractor to take immediate action to identify potential problems and undertake corrective measures. If required, the Contractor shall engage professional arborists and or horticulturalists to inspect plant materials and soil conditions, to identify problems and recommend corrective procedures.

E. Full and complete written instructions for the maintenance requirements for proper care and development of the plantings shall be furnished by the Contractor to the Owner at least thirty (30) days prior to the end of the maintenance period. Plan should caution Owner that even though species are selected so as not to need irrigation once established, Owner will need to water balance of first year after installation to assure plants are established. Provide a copy of the instructions to the Designer for approval.

3.06 FINAL INSPECTION AND FINAL ACCEPTANCE

A. After completion of the planting installation, the Owner's Field Representative and/or the Landscape Architect will inspect all work for final acceptance upon the written request of the Contractor to the Owner's Field Representative and/or the Landscape Architect, received at least five days before the anticipated date of inspection.

B. After the inspection, the Owner's Field Representative and/or the Landscape Architect will prepare a punch list of items to be corrected or replaced in order for final acceptance to be granted. All replacements shall be as specified herein. After necessary corrective work has been completed, the Owner's Field Representative and/or the Landscape Architect will again inspect all work and the Owner's Field Representative and/or the Landscape Architect will certify in writing to the contractor the final acceptance of the planting.

C. All replacements planted as conditions of final acceptance shall be guaranteed for one year from the date of provisional acceptance of those replacements, in accordance with the requirements herein.

D. Contractor shall furnish full and complete written instructions (six copies) for maintenance of the planting to the Owner at the time final acceptance.

E. Upon final acceptance, the Owner will assume plant maintenance.

3.07 GUARANTEE PERIOD AND REPLACEMENTS

A. All plants shall be guaranteed by the contractor for not less than one full year from time of final acceptance. During this time the Contractor shall visit the site periodically to observe the

plantings and evaluate the ongoing maintenance procedures. Should the contractor observe that proper maintenance is not being performed, they shall notify the Owner immediately in writing of the condition observed and the remedies recommended. Failure to so notify the Owner shall place the responsibility on the Contractor to replace any plants that fail during the warranty period due to improper maintenance.

B. After the inspection, the Owner's Field Representative and/or the Landscape Architect will prepare a punch list of items to be corrected or replaced in order for final acceptance to be granted. All replacements shall be as specified herein. After necessary corrective work has been completed, the Owner's Field Representative and/or the Landscape Architect will again inspect all work and the Owner's Field Representative and/or the Landscape Architect will certify in writing to the contractor the final acceptance of the planting.

C. All replacements planted as conditions of final acceptance shall be guaranteed for one year from the date of provisional acceptance of those replacements, in accordance with these specifications.

3.08 CLEANING

A. Following the acceptance of planting work, the Contractor shall immediately remove from the site all materials and equipment not required for any other planting or maintenance work. Store materials and equipment remaining on site in locations, which do not interfere with the Owner's maintenance of accepted work.

B. The Contractor shall be responsible for keeping all hardscapes, paving and building surfaces clean during placement operations. All excess stones, debris and soil resulting from work under this section, which has not been previously cleaned up, shall be cleaned up and removed from the project site. Clean up spills immediately. Acceptance shall not be granted until this condition is met.

Appendix A
PLANT ESTABLISHMENT AND MAINTENANCE OUTLINE

Scope of Work

The Contractor shall furnish all labor, equipment and materials needed to maintain and ensure the establishment of all new plantings annually. The Contractor shall be required to water, weed, prune, replace plant material and clear the site of all trash and debris periodically throughout the plant establishment period.

This work is providing maintenance care of plant material planted under this contract for a period of 12 months (365 days) from the documented date of acceptance of the entire project. This work includes operations including watering, fertilizing, insect and disease control, pruning, plant replacement, mulch replacement, stake and guy maintenance, litter removal, protection from wildlife and winter protection if required.

The work shall include weekly maintenance site visits every week April 15th through November 15th.

All work shall be in accordance with *ANSI A300 Best Management Practices for Tree and Shrub Planting, Transplanting, Maintenance and Care* produced by the International Society of Arboriculture (ISA).

Hand watering will be also be necessary and shall be done on an as-needed basis per weather conditions in accordance with standard ANSI Best Management Practices for Trees and Shrubs. The contractor shall be responsible for monitoring weather and rainfall and respond accordingly and shall be paid per occurrence.

Contractor to provide written monthly reports detailing the services performed to the Owner. Record all sedum planter maintenance events. Including the name of person, date and activity.

Contractor shall meet with the Owner and/or Owner's representative a minimum of three times a year to review the progress and discuss any changes that are needed in the maintenance program.

All chemical and fertilizer applications shall be made by licensed applicators. All work and chemical use shall comply with applicable local, provincial and federal requirements.

Disease and insect control: Provide an Integrated Plant Management (IPM) program to maintain disease and insects at acceptable and manageable levels. Manageable levels shall be defined as minimum damage to plants. Use least invasive methods to control plant disease and insect outbreaks. The Owner must approve in advance the use of all chemical pesticide applications.

General:

The period of establishment and replacement will begin from the documented date of acceptance of the entire project. Monitoring shall begin immediately after acceptance of the final work.

Monitor the condition of the plants and initiate all horticultural practices necessary to maintain the plants in a healthy condition during the period of establishment. Protect plants from wildlife depredation.

Spring Maintenance (April to June)

1. Spring clean-up and debris removal.
2. Monthly inspections.
3. Pruning.
4. Weeding.

5. Watering.
6. Soil Testing.
7. Soil amendments (fertilizing, herbicides and/or pesticides)
8. Mulching
9. Plant replacement

Summer Maintenance (June to September)

1. Debris and litter removal.
2. Monthly inspections.
3. Weeding.
4. Watering.
5. Pest management.

Fall/Winter (October to November 15th)

1. Fall clean-up and debris removal.
2. Monthly inspections.
3. Pruning.
4. Weeding.
5. Watering.
6. Soil amendments (fertilizing, herbicides and/or pesticides)
7. Mulching
8. Plant replacement
9. Anti-desiccant application.

Soil Testing (every spring and fall):

Soil test (Twice yearly—see October): send soil samples to soil testing laboratory to determine supplemental fertilizer or other amendments needed. Provide amendments at rates prescribed by the soil testing laboratory for each plant type. Submit receipts to authorized Owner's Representative as proof of fertilizer/amendment purchase.

Soil Testing and Fertilization. Approximately 2-3 weeks before spring "growth flush," administer an annual soil test for PH and fertility levels.

Maintain pH in the range of 6.5 to 7.0. Consult the testing lab for appropriate recommendations for soil amendments to increase and/or decrease PH levels.

Maintain fertility in the normal range using a typical field soil fertility test as provided by A&L labs or equivalent testing lab. Evaluate the various nutrient levels such as Nitrogen (N or NO_3N), Potassium (K), Phosphorus (P). If the soil contains a low (L) amount of these nutrients, conduct a single application of a high-quality controlled slow-release fertilizer at the lab recommended rate. Ensure that the chosen fertilizer contains NO Herbicides or Pesticides and meets Westchester County's laws and regulations. It is the responsibility of the Contractor to ensure the compliance with all laws and regulations. The Contractor is encouraged to review all laws and regulations, especially the recent adoption of Article XXVI to Chapter 863 of the Laws of Westchester County which pertains to fertilizers.

Fertilizer application (as required):

Fertilize trees and shrubs during late following the initial planting season. Apply fertilizer on soil surface by evenly scattering material beneath and slightly beyond the plant's foliage mass and incorporate into the

top 1-inch of soil. Apply approximately one cup of fertilizer (8 fl. oz.) per plant or per manufacturer's recommendations.

Follow the fertilizer labeled directions for application rate and use a rotary spreader to ensure even fertilizer application. Runoff potential does exist and should be evaluated by the applicator in accord with the site specifics; the greater the runoff sensitivity, the lower the application rate. **All applications of fertilizer are the sole responsibility of the applicator.** The contractor shall keep a logbook of all amendments and herbicides and pesticides applied at the site. All applicators shall be licensed applicators.

Watering (as required):

Monitor weather conditions to see if addition irrigation is necessary. Manual irrigation is the only form of irrigation. Prolonged hot dry weather is generally defined as periods of 75° F weather with less than 1" of rainfall persisting for 2 weeks. Check the plants for wilting in the afternoon. Water thoroughly to runoff to remoisten entire soil profile if the plants show signs of wilting.

Check soil moisture and root ball moisture with a soil moisture meter on a regular basis and record moisture readings. Do not over water. Apply water by open-end hose supplied by gravity or low-pressure pump (pressure not to exceed 10 psi). Apply water at a rate so that the water does not completely run-off and will thoroughly soak and percolate into the soil in the planting pit. Perform watering within 1 calendar day if site conditions require water to save the health of the plants. Commercial tree watering bags and/or soaker hoses or other containers that will allow a slow dispensing of water over a period equal to the desired amount of water to be provided at each plant can be submitted for use and approval for this operation.

Water each shrub (plant size 3-1/2 ft. or less in height) with approximately 10-gallons of water per application. Shrubs larger than 3-1/2 ft. in height will be treated as a tree. Water each tree with approximately 30-gallons of water per application. A 10-gallon amount can be estimated for application purposes at approximately 3-minutes of water run out of a 5/8-inch diameter hose at the desired water pressure. Some plant pit mulch conditions may require a small portion of the mulch to be loosened or cleared from the pit to allow the water to percolate through the mulch and into the plant pit soil. Water smaller type perennial or herbaceous plants such as bulbs, tubers, rhizomes, plugs, starter plants, seedlings and small transplants with 2-gallons of water per plant per watering cycle.

Water the plants on a 7 to 10-day cycle based on a natural rainfall condition of less than 1-inch of rainfall per week, or when temperatures and humidity remain greater than 90 degrees for a period of one week. Do not water if soil conditions are determined to be saturated. Do not water at or onto the trunk or stems of the plant.

Provide a watering schedule, and list of watering equipment to be used for approval prior to commencing this operation. Watering shall be paid on an occurrence basis.

Pruning (as required):

Prune periodically to remove dead, damaged, or diseased branches. Cut back damaged branches to live growth. Properly dispose of pruned material. Prune in accordance with ANSI A300 Pruning Standard.

Pruning should be done on an as-needed basis. The intent of this style of pruning is to maintain the natural plant appearance. Shrubs are intended to fill planting spaces as much as possible. Shrubs on slopes are not to be pruned or shaped but allowed to spread naturally. Broken or badly bruised branches shall be removed with a clean cut. Do not cut leaders or use wound paint or dressing to treat cut areas. Crossed branches shall be pruned with a sharp tool in

such a manner as to preserve and encourage the plant's natural growth form. The crowns of young trees should not be cut back to compensate for root loss.

Shearing back of shrub stems and branches is not encouraged unless the plant possesses a safety hazard, or unless directed by the Owner. Pruning should be completed from November 15 – 15 and should not occur during the active growing season.

Pruning should only be undertaken after the plant has flowered. Care should be taken to avoid pruning early flowering plants, which should be pruned in the fall if they cannot be pruned after flowering but before 15.

Insect/Fungus Disease Control (as required):

Monitor health of plants. Provide insect and disease control as necessary with appropriate approved pesticide or fungicide applications. Submit application schedules and materials to be used for approval by owner prior to application. Organic methods of pest and disease control are preferred, and all applicators shall be NYSDEC Licensed.

Plant Replacement (as required):

Replace in accordance with the drawings and specifications, plants that are dead, missing or, in the opinion of the Landscape Architect, are in an unhealthy condition and/or have lost their natural shape due to dead branches. Replace with plants of the same species, size and root system as original contract unless a substitute species has been approved by the Landscape Architect. Remove all unsatisfactory plants upon notification and replace within 10 calendar days if within the designated planting dates of April 15th to November 15th. Replace any other plants at least 30 days prior to the end of the 12-month plant establishment period.

Mulch Replacement (as required):

Reapply mulch of the type indicated when necessary to maintain the desired 3-inch depth.

Weeding (weekly and/or as required):

Perform weed removal at all plant bed areas as necessary to prevent competition for existing nutrients, water and sunlight, and remove any volunteer vegetation not originally designed in the plans. Dispose of all weeds and volunteer vegetation at an approved disposal area.

The Contractor shall be responsible for keeping all planted areas free of weeds. Contractor is required to keep weeds controlled primarily by the use of organic mulches on the soil surface and secondarily the use of manual labor.

Contractor shall inhibit growth and/or remove all weeds (plants not planted and not desired) that germinate and grow in the planting areas within the contract limit line. Each weeding event shall be defined as one complete session of weeding that results in the complete weeding of all planting beds on the project site.

Weeds shall be removed entirely (roots included) and individually by hand. The use of mechanized equipment or herbicide shall be prohibited (except where specified below). All plants, plant parts and debris generated by the weeding shall be removed from site in their entirety. Plants targeted for weeding and removal include but are not limited to the following species: *Ambrosia* spec. (all Ragweeds), *Artemisia vulgaris* (Mugwort), *Celastrus orbiculatus* (Oriental Bittersweet), *Lonicera* spec. (all Honeysuckles), *Lythrum salicaria/virgatum* (Purple loosestrife)

Appendix A
PLANT ESTABLISHMENT AND MAINTENANCE OUTLINE

Phragmites australis (Common Reed), *Polygonum* spec. (all Knotweeds), *Rosa multiflora* (Mulitflora Rose), *Rumex* spec. (all Sorrels), *Smilax* spec. (all Greenbriers), *Toxicodendron radicans* (Poison Ivy).

Stake and Guy Removal (as required):

Remove all tree bracing material at the end of the establishment period and prior to final inspection. The Owner and/or the Owner's representative may conduct independent inspections of all landscape items at any time during the establishment period. Any landscape items failing to meet the minimum standards of the department as specified in the contract or the American Standard for Nursery Stock, must be replaced or the defective items repaired at no additional cost to the Owner.

The contractor must correct all deficiencies within 10 calendar days after notification by the Owner and/or Owner's representative.

Anti-desiccant (as required):

Anti-desiccant

Anti-Desiccant shall be emulsion type, film-forming agent similar to Dowax by Dow Chemical Company, or Wilt-Pruf by Nursery Specialty Products, Inc., Croton Falls, New York, designed to permit transpiration but retard excessive loss of moisture from plants. Deliver in manufacturer's fully identified containers and use in accordance with manufacturer's instructions. Submit manufacturers product data for approval.

Annual Decorative Plantings @ (2) Main Planters in the Front

The Contractor shall supply annual plantings for the (2) square main planters at the front entrance. The Plantings shall be seasonal for:

- Spring
- Summer
- Fall
- Winter

All plantings shall be coordinated with the Space Planning Group/Client and or the Client's Landscape Architect.

MEASUREMENT AND PAYMENT

Contractor shall supply quotes for work as noted herein the maintenance outline and shall bill on a monthly basis for (8 months of work).

END OF SECTION

SECTION 32 94 19

RIVER STONE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This section includes work to the limits as indicated on the plan for the installation of a decorative river jack stone course ("mow strips")with steel landscape edging (as applicable), as shown and detailed on the drawings.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Thicknesses of rock shall be indicated on the Plans. River rock stones shall be round washed native stones 2” to 5" size placed over woven fabric weed barrier.

B. Geotextile Filter Fabric – Class “C”, Carthage Mills, FX-40HS, nonwoven polypropylene geotextile, or approved equal.

C. Landscape Edging (as applicable) – shall be hot rolled standard flexible carbon steel landscape edging complying with ASTM A569 with stake pockets approximately 30” apart, equal to Duraedge manufactured by The JD Russell Company, Shelby Township, Mi, 1-800-888- 9708; with electrostatically applied oven baked powder coated finish; color to be selected by the Owner. Thickness, 12 gauge, 4” height, 8’ or 10’ length, four (4) 12” or 14” deep tapered steel stakes per piece, with start/end pieces and spacers as required.

PART 3 – EXECUTION

3.01 PLACEMENT

A. Place the stones on the grade in a manner to minimize segregation, using equipment and procedures approved by the Engineer. Do not perform uncontrolled spreading from piles dumped on the grade.

B. The layer thickness shall be as indicated in the contract documents. The minimum loose lift thickness is 1.5 times the maximum particle size.

3.02 COMPACTION

A. The stones shall not be compacted. Stones shall be spread over compacted subgrade and geotextile barrier, and rolled/leveled as directed. Remove unsuitable subgrade and replace with geotextile barrier, and rolled/leveled as directed.

3.03 TOLERANCE

A. Place stone so that after placement the top surface of the course does not extend more than ¼ in. above no more than ¼ in. below true grade for the course at any location.

3.04 LANDSCAPE EDGING (AS APPLICABLE)

A. Install straight and curved sections horizontally true to the alignments as indicated, free of waves or bends, following marked alignments approved by the Owner’s Field Representative.

B. Install vertically parallel with the finished grade.

C. Replace damaged edging sections as directed.

END OF SECTION

SECTION 33 00 00

MISCELLANEOUS UTILITIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. The Work of this Section may include, but may not be limited to:
   1. Excavation, bedding, base, and backfill, including excavation support and dewatering as required, for the installation of:
      a. Electric service(s) to facilities and building.
      b. Electric conduit to vehicle charging stations.
      c. Telecommunication service(s).
      d. Fuel service line(s) as applicable.
      e. Utility structures as applicable.
   2. Refer to the Contract Documents by the MEP Engineer for information regarding routes, materials, and their installation requirements, as well as any Authority having jurisdiction.

1.03 REFERENCE STANDARDS

A. Comply with all industry standards and requirements of all Authorities having jurisdiction. If requirements specified conflicts with the requirements of Authorities having jurisdiction, the requirements of the Authority having jurisdiction applies.

B. Comply with requirements of the Stormwater Pollution Prevention Plan (SWPPP) and Soil Erosion and Sediment Control specification, plans, and details, and the Contractor's accepted schedule. Refer to Section 01 5713 of these Specifications.

C. The Contractor shall read the Geotechnical Report for subsurface investigations prepared by Carlin-Simpson & Associates, " Report on Subsurface Soil and Foundation Investigation" dated July 14, 2021, revised April 20, 2022, to be fully aware of available subsurface information and current recommendations. No extra claim for ignorance shall be accepted.

1.04 SUBMITTALS

A. Shop Drawings: Provide catalog cuts/shop drawings. Include details of fabrications and materials as applicable to the appropriate Authority for approval, for all items and appurtenances.

1.05 QUALITY ASSURANCE

A. Provide a detailed installation and termination schedule for work included in this Section. Notify the Site Engineer and all Authorities having jurisdiction prior to work taking place.

B. The installation of certain materials and infrastructure including but not limited to earthwork operations, and hardscape and utility installations, may be subject to special subgrade preparation and construction requirements. Subgrade improvement measures and special construction requirements must be followed as indicated by the Utility Company or the Geotechnical Engineer. The most stringent geotechnical requirements shall be adhered to by the Contractor.

C. Coordinate work of this Section with construction and other underground utilities, and with trades responsible for their installation.

D. Work shall be performed in accordance with all Authorities having jurisdiction. The Contractor shall adhere to all requirements and directions of the Utility Company, Geotechnical Engineer, and/or Site Engineer, as applicable.

E. The Contractor shall comply with the requirements of the permits and all applicable Federal, State, County, and Local statutes and ordinances relating to the prevention and abatement of soil erosion, sediment and dust, including adherence to the requirements indicated in the Stormwater Pollution Prevention Plan (SWPPP), and the Soil Erosion and Sediment Control specifications, plans and details.

F. The installation of certain materials and infrastructure including but not limited to earthwork operations, and hardscape and utility installations, may be subject to special subgrade preparation and construction requirements. Subgrade improvement measures and special construction requirements must be followed as may be indicated by the Geotechnical Engineer. The most stringent requirements shall be adhered to by the Contractor.

PART 2 - PRODUCTS

2.01 GENERAL

A. The Contractor is required to coordinate with the applicable Authority for the materials and location of the utility to be installed, bedding, backfill, and depth of cover.

B. Minimum depth of cover over underground conduit shall be two (2) feet.

C. Refer to the Drawings and Specifications by the MEP Engineer for additional information.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Unless indicated otherwise, or required by the Authority having jurisdiction, trenching, bedding and backfilling shall be performed in accordance with the manufacturer, the Utility Company having jurisdiction, Section 31 2316 of these Specifications, the Details of the Drawings, and/or the MEP requirements.

B. The Contractor shall be responsible for all damage occurring as a direct or indirect result of his work. Where an item of work is to be “furnished” or “furnished and installed” by others, the Site Work Contractor shall be responsible for all damage caused by his neglect or due to his failure to properly protect the item of work.

C. Trenching shall be straight as is practical, and shall be pitched wherever possible to eliminate traps and pockets in the runs which might collect dirt or moisture.

3.02 COORDINATION

A. The Contractor is referred to the Building Construction Drawings for the continuation of the electric, telecommunication and other service line work within the building.

3.03 AS-BUILTS

A. Provide as-builts as required and in accordance with Division 1 requirements.

END OF SECTION

SECTION 33 10 00

WATER UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The Work of this Section includes, but is not limited to:
   1. Installation of building water service line(s), consisting of all pipe, fittings, valves and valve boxes, anchor and/or thrust blocks, encasements, and all necessary and required accessory items and operations, including connection(s).
   2. Installation of underground fire protection piping consisting of all pipe, fittings, valves, valve boxes, hydrants (as applicable), anchor and/or thrust blocks, and all necessary and required appurtenances, accessory items and operations including connection(s).
   3. Resetting castings to grade as required.
   4. Testing and disinfection.
   5. Where appropriate, the installation of all water facilities within Public Rights-of-Way or utility easements shall be in accordance with all rules and requirements. Work shall include all items and operations necessary and required to complete the water facilities, including maintenance of traffic and protection of pedestrians, as applicable.

1.02 GENERAL

A. A bonded and insured, licensed, and pre-qualified water main contractor may be required for all water work to be owned by the Town, or located within the public right-of-way, as applicable.

B. Coordinate with the Water Authority for demarcation of work to be performed for a fee (as applicable), by the Water Authority, and work to be performed by the Contractor.

C. The Contractor is required to obtain all permits and pay all fees for all work contained herein, and shall be included in the Contract sum.

1.03 REFERENCE STANDARDS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section, as well as all applicable construction, fabrication and safety standards.

B. Comply with requirements of the Stormwater Pollution Prevention Plan (SWPPP) and Soil Erosion and Sediment Control specification, plans, and details, and the Contractor's accepted schedule. Refer to Section 01 5713 of these Specifications.

C. The Contractor shall read the Geotechnical Report for subsurface investigations prepared by Carlin-Simpson & Associates, " Report on Subsurface Soil and Foundation Investigation" dated July 14, 2021, revised April 20, 2022, to be fully aware of available subsurface information and current recommendations. No extra claim for ignorance shall be accepted.

D. Comply with all industry standards and requirements of all Authorities having jurisdiction. If requirements specified conflicts with the requirements of Authorities having jurisdiction, the requirements of the Authority having jurisdiction applies.
   1. ASTM A193 - Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
   2. ASTM A194 - Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
   3. AWWA C-104 - Cement-Mortar Lining for Ductile Iron Pipe and Fittings.
   4. AWWA C-110 - Ductile Iron and Gray Iron Fittings.
   5. AWWA C-111 - Rubber-Gasketed Joints for Ductile Iron Pressure Pipe and Fittings.
   6. AWWA C-150 - Thickness Design of Ductile Iron Pipe.
   7. AWWA C-151 - Ductile Iron Pipe Centrifugally Cast.
   8. AWWA C-153 - Ductile Iron Compact Fittings.
   9. AWWA C-500 - Metal-Seated Gate Valves for Water Supply Service.

10. AWWA C-509 - Resilient-Seated Gate Valves for Water Supply Service.
11. AWWA C-550 - Protective Interior Coatings for Valves and Hydrants.
12. AWWA C-600 - Installation of Ductile Iron Water Mains and their Appurtenances.
13. AWWA C-651 - Disinfecting Water Mains.
14. AWWA C-800 – Underground Service Line Valves and Fittings.
15. AASHTO M-85 - Portland Cement.
16. AASHTO M-105 - Gray Cast Iron Castings, Grade 30.

1.04 SUBMITTALS

A. Shop Drawings: Provide catalog cuts. Include plans, elevations, sections, and details of fabrications and their connections as applicable, including accessory items, for all water items and appurtenances such as pipe, fittings, castings, hydrants (as applicable), valves, valve boxes, etc.

B. Contractor shall obtain and pay for all required permits.

1.05 QUALITY ASSURANCE

A. Provide a detailed installation and termination schedule for all items of work included in this Section.

B. Contractor to coordinate a pre-construction meeting prior to all work.

C. Notify the Site Engineer prior to work taking place.

D. The installation of certain materials and infrastructure including but not limited to earthwork operations, and hardscape and utility installations, may be subject to special subgrade preparation and construction requirements. Subgrade improvement measures and special construction requirements must be followed as indicated by the Geotechnical Engineer. The most stringent geotechnical requirements stated in the Geotechnical Report or any other place in the Contract Documents shall be adhered to by the Contractor.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. All materials for water lines and appurtenances shall be in accordance with the requirements of the Water Authority.

B. Where material requirements specified herein conflicts with the requirements of Authorities having jurisdiction, the requirements of the Authority having jurisdiction shall govern.

2.02 WATER SYSTEM AND APPURTENANCES

A. General - All materials for water lines shall be in accordance with the requirements of the Water Authority, including but not limited to domestic made pipe, couplings, fittings, valves, valve boxes, joint restraint, etc.

B. Ductile Iron Pipe (DIP) - All water lines greater than three (3) inches in diameter shall be ductile iron pipe, Class 54, or Class required by the Water Authority, and shall conform to the requirements of AWWA Specifications C-150 and C-151. Pipe shall be furnished in eighteen (18) or twenty (20) foot nominal lengths. (See "Service Lines" for water piping less than three (3) inches in diameter).

Lining and Coating - All pipe shall be double cement lined and bituminous coated in conformance with AWWA Specification C-104.

Joints - shall be push-on joints in accordance with AWWA Specification C-111 and shall be furnished complete with brass wedges to permit electrical conductivity across the joints (2 wedges per joint). All push-on pipe connections shall be restrained utilizing Field Lok 350 Gaskets as manufactured by U.S. Pipe, or approved equal.

C. Fittings - All iron fittings shall be ductile iron in accordance with AWWA Specification C-110, or AWWA Specification C-153, pressure rated 350 psi, and shall be furnished with mechanical

joints in accordance with AWWA Specification C-111. Fittings shall be cement lined and bituminous coated in conformance with AWWA Specification C-104. All joints shall be furnished complete with accessories consisting of cast iron glands, steel alloy high-strength bolts and nuts, and plain tipped rubber gaskets.

D. T-Head Bolts and Nuts - shall be Cor-Blue manufactured by NSS Industries or Birmingham T-bolts and nuts manufactured by Birmingham Fastener Manufacturer.

E. Transition Couplings - shall be Power Seal Model 3501, Dresser Model 253 or Omni Model 441 with stainless steel nuts and bolts per AWWA C-219.

F. Bronze Wedges - The manufacturer of the pipe shall furnish two silicon bronze wedges for each length of pipe to be used in the pipe installation to provide a positive means of electrical conductivity across the pipe joint.

G. Hydrants (as applicable) - All hydrants shall be Water Authority standard. Hydrant must be approved by the Water Authority and Fire Department having jurisdiction.

H. Tapping Sleeve and Gate Valve (if required by the Water Authority) - may be installed by the Water Authority. If not, it shall be installed by the Contractor in accordance with AWWA C-500 and meet the specifications for resilient seated gate valves. Gate valves shall have mechanical joints x flanged ends, and equal to Mueller Co., style T-2360 with stainless steel nuts and bolts. Interior surfaces shall be epoxy coated to meet all applicable requirements of ANSI/AWWA C550. Valve shall meet or exceed ANSI/AWWA A509 standards for resilient seated valves and be non-rising stem, opening counter-clockwise. Tapping sleeve shall be full circle construction, Power Seal model 3490 fabricated stainless steel with type 304 (18-8) stainless steel flange. Shall gasket shall be 1/4" thick Nitrile (Buna-N, NBR) Check-O-Seal with multi o-ring sealing ribs from 100% new rubber. Stainless steel type 304 (18-8) nuts and bolts per ASTM A193 and A194.

I. Resilient Seated Gate Valves - shall be made in accordance with AWWA Specification C-509. Gate valves shall be iron body, bronze mounted, non-rising stem assembly, with O-Ring seals and mechanical joint ends complete with fittings. The body and bonnet shall be coated with 8 mils minimum fusion bonded epoxy complying with AWWA Specification C-550. Valves are to be rated at 250 psi for AWWA service and 200 psi for ULFM service. All valves are to be hydrostatically tested at 400 psi. Gate valves shall conform to the requirements of the Water Authority.

J. Gate Valve Boxes - shall be sliding "Buffalo" type and shall be made of cast iron (heavy pattern), having a minimum interior diameter of 5 1/4 inches, length as required. It shall have a base of the proper size to fit the valve upon which it is installed and shall have a drop cover marked "WATER". Gate valve boxes shall meet the requirements of the Water Authority.

K. Service Lines – all service lines less than four (4) inches in diameter shall be Type K copper tubing conforming to the "Specifications for Seamless Copper Water Tube" ASTM Designation B-88 and AWWA Specification C-800. Joints between the water main and curb stop shall be connected by Mueller Cat. #H-15403 straight coupling three part union, 110 conductive compression for CTS O.D. tubing, both ends, or approved equal.

Service lines four (4) inches or greater in diameter shall be Class 54 ductile iron pipe, or Class required by the Water Authority, conforming to the requirements specified elsewhere in this Section for Ductile Iron Pipe.

L. Corporation Stops - shall be approved equal to Mueller Oriseal H-15000 series with Mueller 110 conductive compression connection and shall conform to AWWA Specification C-800.

M. Curb Stops - shall be approved equal to Mueller Oriseal H-15000 series with Mueller 110 conductive compression connection, copper to copper, with tee head, and shall conform to AWWA Specification C-800.

N. Curb Box for Curb Stop - shall be cast iron, approved equal to Mueller H-10350 "Buffalo" type, arch pattern, adjustable curb box complete with necessary extension section, lid and brass locking screw.

2.03 CONCRETE

A. Concrete for thrust, anchor blocks and encasements shall be in accordance with Section 03 3053 of these Specifications.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

A. Pipe and fittings shall be of the type and sizes specified and shall be laid accurately to line and grade. Hydrants, valves and all other water line appurtenances shall be accurately located and properly oriented.

B. The on-site installation of materials and infrastructure may be subject to special construction requirements. Subgrade improvement measures and special construction requirements must be followed as indicated by the Geotechnical Engineer and/or Site Engineer. The most stringent requirements stated in the Geotechnical Report, or any other place in the Contract Documents shall be adhered to by the Contractor.

C. The installation of all water pipe and appurtenances shall conform to the requirements of the Water Authority and all Authorities having jurisdiction.

D. The requirements of the Health Department and any other Authority having jurisdiction shall govern the horizontal and vertical separation of water lines from sanitary sewers and storm drains and the hydrostatic testing and disinfection of the water line.

E. Concrete encasements shall be installed by the Contractor when the required horizontal or vertical separation of sewer or drain crossings cannot be met, whether or not shown on the plans or profiles. All encasements required shall be considered to be included in the amount bid. No extra payment will be made.

3.02 TRENCH EXCAVATION, DEWATERING, BEDDING AND BACKFILL

A. The provisions of Section 31 2316 of these Specifications shall govern all work under this Section including but not limited to dewatering and excavation support (sheeting and shoring).

B. The requirements for excavation, bearing capacity, subsurface preparation, dewatering, and backfill must be in accordance with the Geotechnical Engineer's requirements.

C. Work shall include all excavation, bedding and backfill required to complete the installations in accordance with the requirements of the manufacturers and/or all Authorities having jurisdiction.

3.03 STORAGE AND HANDLING

A. Storage - Storage of water pipe and appurtenances on the job shall be in accordance with the manufacturers' recommendations. Storage locations of pipe and appurtenances on the site shall be subject to approval.

B. Handling - All water pipe and appurtenances shall be protected against impact, shock and free fall, and only equipment of sufficient capacity and proper design shall be used in handling the pipe and appurtenances. Special care shall be taken to prevent damage to pipe coatings. The interior of the pipe shall be cleaned before being laid and shall be kept clean until accepted.

All material shall be carefully inspected for defects in workmanship and materials; all debris and foreign material cleaned out of valve openings, etc.; all operating mechanisms operated to check their proper functioning; and all nuts and bolts checked for tightness. Valves, hydrants and other equipment which do not operate easily or are otherwise defective shall be repaired or replaced at the Contractor's expense.

3.04 DAMAGE

A. General - Water pipe and appurtenances which are defective from any cause, including damage caused by handling, and is unrepairable, shall be unacceptable for installation and shall be replaced by the Contractor at no cost.

B. Damage Due to Cutting - All cutting of ductile iron pipe shall be done with an approved power-driven or mechanical cutter. All cut ends shall be thoroughly examined for possible cracks caused by cutting, and any cut pipe found to have such cracks shall be rejected. The cut ends of all pipe shall be beveled and ground smooth.

C. Inspection for Damage - All pipe and fittings shall be subjected to a careful inspection and proper testing just before being laid. Any pipe, fitting or appurtenance which shows a crack or which has received a severe blow that may have caused an incipient fracture even though no such fracture can be seen, shall be marked as rejected and removed at once from the Work.

D. Damage Prior to Acceptance - Pipe and all water line appurtenances that are damaged or disturbed through any cause prior to acceptance of the Work shall be repaired, realigned or replaced at the Contractor's expense.

3.05 PIPE INSTALLATION

A. Laying Pipe - Each length of pipe shall be laid with firm, full and even bearing throughout its entire length, in a trench prepared and maintained in accordance with the details as shown on the Drawings and the Section 31 2316 of these Specifications. Pipe shall be laid upgrade with bells uphill unless otherwise directed, with the top of pipe at a minimum depth as specified hereinafter, except where otherwise noted.

Every length of pipe shall be inspected and cleaned of all dirt and debris before being laid. The interior of the pipe and the jointing seal shall be free from sand, dirt and debris before installing the line. Extreme care shall be taken to keep the bells of the pipe free from dirt and debris so that joints may be properly assembled without overstressing the bells. No pipe is to be trimmed or chipped to fit.

No length of pipe shall be laid until the preceding lengths of pipe have been thoroughly embedded in place, so as to prevent movement or disturbance of the pipe.

No pipe, valve, blow-off or fitting shall be laid on wood blocks. Similarly, no pieces of rock, brick, or other material other than earth or gravel shall be left under or adjacent to the pipe. Pipe laying, in general, shall conform to the latest Standard Specifications of the AWWA for laying ductile iron pipe.

Generally, trenches shall not be opened for more than 200 feet in advance of pipe laying nor left unfilled for more than 100 feet in the rear of pipe laying. New trenches will not be permitted when earlier trenches require backfilling.

B. Full Lengths of Pipe - Only full lengths of pipe are to be used in the installation except that partial lengths of pipe may be used at the entrance to structures or where necessary to obtain a proper connection to the structure or fitting.

C. Bedding and Backfilling - The type of materials to be used in bedding and backfilling and the method of placement shall conform to the requirements of Section 31 2316 of these Specifications and as shown on the details of the Drawings.

D. Protection During Construction - The Contractor shall protect the installation at all times during construction. Movement of construction equipment, vehicles and loads over and adjacent to any pipe shall be done at the Contractor's risk.

At all times when pipe laying is not in progress, all open ends of pipes shall be closed by approved temporary watertight plugs. If water is in the trench when work is resumed, the plug shall not be removed until the trench has been pumped dry and all danger of water entering the pipe has been eliminated.

The Contractor shall furnish a sufficient pumping plant and shall provide and maintain at his own expense satisfactory drainage wherever needed in the trench and other excavations during the progress of the Work and at its completion for final inspection. No pipe or other structure shall be laid in water and water shall not be allowed to flow or rise under any concrete or other masonry. All water pumped or bailed from the trench or other excavation shall be conveyed in proper manner to a suitable point of discharge. The flow in all sewers, drains and watercourses encountered on the Work and in gutters along the sides of or across the Work shall be entirely provided for, both temporarily and permanently, as required, by the Contractor at his expense. All offensive water shall be removed from the Work at once.

E. Pipe Deflection - Maximum allowable deflection for pipe laid without fittings shall not exceed the pipe manufacturer's requirements and the requirements of the Water Authority. Deflection which exceeds the maximum allowable as established by the pipe manufacturer and the Water Authority or any other Authority having jurisdiction shall be grounds for rejection of the line of pipe.

F. Cover on Pipe - The water pipe shall be laid so as to provide a minimum cover of four (4) feet below existing grade if existing grade is to remain, or four (4) feet below proposed finished grade or future grade, whichever is lower, or meet the requirements of the Water Authority, whichever is greater. The Contractor is advised that at pipe crossings, minimum cover must be maintained and also proper clearance between pipes must be maintained.
   1. No additional payment will be made for costs incurred with increased the depth of trench to comply with crossing requirements.

3.06 PIPE JOINTS

A. All joints are to be made watertight and pressure-tight in accordance with the requirements specified herein and on the Drawings.

B. Unless otherwise permitted, jointing of all pipe and fittings shall be done entirely in the trench.

C. Except as may be otherwise specified herein, all sections of the pipe to be joined shall have a bell end and a plain end. Installation of cut sections of pipe without a bell end will not be allowed, except as specifically authorized in instances where repairs are to be made or pipe closures are required. In such instances, the design of the joint shall be as approved.

D. Install Field Lok gaskets in accordance with the manufacturer's instructions.

3.07 WATER LINE APPURTENANCES

A. Fittings - fittings shall be used at all breaks in grade or alignment where deflection of the pipe exceeds the maximum allowable pipe deflection as specified hereinabove. Only proper fittings shall be used to obtain the required deflection.

B. Valves/curb stops and valve/curb stop boxes:
   1. Gate valves and/or curb stops shall be installed on water lines where and as shown on the Drawings and as specified herein. Unless otherwise stated, valves shall be of the same size as the line.
   2. Gate valves shall be installed on all hydrant laterals where and as shown on the Drawings.
   3. Valves and/or curb stops shall be installed on all service lines in the locations shown or where directed.
   4. Boxes shall be placed over all buried valves. Valve boxes shall be placed so as not to transmit vehicle loads or shock to the valves and shall be centered and set plumb over the operating nut of the valve. The cover of the box shall be set even with finished grade.

C. Hydrants (as applicable):
   1. Hydrants shall be installed where and as shown on the Drawings or as directed.

2. Hydrants shall be installed vertical and plumb, with the proper cover over the hydrant lateral and proper vehicular clearance from curb line and/or edge of pavement. The installation shall provide proper access for Fire Department connections.
3. Hydrants and their installation shall conform to the requirements of the Water Authority and Fire Department.

D. Restraining Devices:
1. At hydrants, the installation shall be rodded in accordance with the detail shown on the Drawings or as directed.
2. All plugs, caps, dead-ends and other fittings as may be directed shall be harnessed to the adjacent pipe with steel clamps and tie rods. If directed, harnessing shall be extended beyond the adjacent pipe to provide proper length of restrained pipe.
3. The installation of the restrained joints and rodding shall be as approved by the Water Authority.
4. Install FIELD LOK gaskets and Megalug joint restraints in accordance with the manufacturer's requirements.

E. Concrete Blocking - Where pipes change horizontal and vertical direction, at hydrants, tees and other fittings, and whenever abnormal thrust forces are developed, the Contractor shall construct thrust and/or anchor blocks as detailed on the Drawings. They shall be constructed of Class "A" concrete, as defined in Section 03 3053 of these Specifications, of minimum dimensions as detailed on the Drawings or of adequate size to suit actual conditions to withstand the pressures anticipated, and shall be founded in virgin soil.

3.08 CONNECTIONS

A. General Requirements - The Contractor shall make all required connections of the proposed water facilities to existing or proposed water facilities where and as shown on the Drawings or as directed.

B. As applicable, and at the Contractor's expense, pressurized line stops may be required by the Water Authority so that the existing water line remains active while connections are made. Should a temporary bypass be required, the bypass shall be designed by a licensed New York State Professional Engineer at the sole expense of the Contractor, and shall be approved by the Town and County as needed.

C. Compliance with Requirements of Owner of Facility - Connections made into existing water facilities owned by others shall be done in accordance with the requirements of the owner of the facility. The Contractor shall be required to comply with all such requirements, including securing of all required permits, and paying the costs thereof. The cost of making the connections in accordance with the requirements of the owner of the existing facility shall be included in the Contract Sum.

3.09 RELAYING AND/OR ALTERATION OF EXISTING WATER LINE (AS APPLICABLE)

A. General Requirements - The Contractor shall relay portions of the existing water line which interfere with the proposed construction where and as shown on the Drawings and/or as directed by the Owner's Field Representative.

B. Compliance with Requirements of Owner of Facility - Relaying and/or alteration of existing water line facilities shall be done in accordance with the requirements of the owner of the facility. The Contractor shall be required to comply with all such requirements, including securing of all required permits, and paying the costs thereof. The cost of relaying and/or alterations in accordance with the requirements of the owner of the existing facility shall be included in the Contract Sum.

C. Damage to Existing Water Line - The Contractor shall exercise extreme care during such relaying and/or alteration so as not to damage any portions of the water line which are to remain. Any such damage shall be repaired by the Contractor at his own expense and to the satisfaction of the owner of the facility.

3.10 RELOCATION AND/OR ABANDONMENT OF EXISTING FACILITIES

A. The Contractor shall not abandon, disconnect, obstruct or in any other way interfere with the operation of an existing water facility until such time as adequate permanent or temporary substitute facilities have been constructed and placed in operation.

No connections of active services shall be made until water facility is accepted by the Department of Health or Water Authority, as applicable. The Contractor must bypass the flow for active services.

3.11 SERVICE LINES

A. General Requirements - The Contractor shall make all required connection(s) of the building water service line(s) into the water system where and as shown on the Drawings and as directed. Work shall include making the service line connection(s) into the water system, furnishing and installing all service line pipe from the water facility to point(s) located five (5) feet outside of the building lines and properly sealing the end(s) with watertight plugs, except that, if the building plumbing contractor has installed his portion of the water service line(s), work under this Contract shall also include final connection(s) of the water service line(s) five (5) feet outside of the building lines to the building service line installed by the building plumbing contractor. The connection(s) shall be made utilizing proper fittings compatible with the building service line(s) providing watertight connection(s) and shall be done at no additional cost.

B. Service Lines Smaller than Four (4) Inches - Each service line shall be valved with curb stop where and as directed, and a curb box shall be installed over the curb stop. A corporation stop shall be used to connect the service line to the main. Taps shall be made using proper tools and proper procedures as recommended by the manufacturer of the water pipe. Unless otherwise specified, there shall be no joints in the service line between the water main and the curb stop.

C. Service Lines Four (4) Inches or Greater - All service lines equal to or greater than four (4) inches in diameter shall be valved with a gate valve where and as directed. Unless specified otherwise, connections of service lines at the main shall be made with appropriate size tees or tapping sleeves and gate valves, as required by the Water Authority.

D. Coordination with Building Plumbing Contractor - The Contractor will be required to coordinate his work with the work of the building plumbing contractor to determine the exact location(s) and elevation(s) of the point(s) of entry into the building(s).

3.12 ADJUSTING WATER VALVE BOXES AND CURB BOXES

A. After the subgrade and/or existing pavement surfaces have been prepared, the Contractor shall check all water valve and curb boxes and water manhole castings that are located in proposed new, milled, or overlaid pavement areas to ensure that all such items have been accurately positioned and set to the proper slope and elevation. All covers are to be set flush with the required finished pavement surface. No depressions or mounds will be permitted in the pavement to accommodate inaccuracies in the setting of these appurtenances. All initial and corrective work shall be done by the Contractor at his own expense, regardless of the number of times boxes and castings are adjusted to grade.

3.13 TESTS

A. All testing shall be in accordance with the Health Department regulations, Sanitary Code, and any requirements required by the Owner's insurer. The Contractor must satisfy all requirements at his own expense for acceptance.

B. Forty-eight (48) hour advance notice must be given to the Water Authority and Health Department prior to pressure testing of the water line.

C. General

1. The Contractor shall provide all necessary equipment and shall perform all work required in connection with all tests as specified herein. All pipe shall be tested by hydrostatic pressure, fifty (50) percent in excess of the normal psi working pressure but not less than 200 psi or more than the design rating of the pipe or appurtenances, in accordance with AWWA Specification C-600-05. The test pressure shall be determined by the Water Authority and/or Owner's Representative. Each section tested shall be slowly filled with water, care being taken to expel all air from the pipes. If necessary, the pipes shall be tapped at high points to vent the air. Required pressure, as measured at the point of lowest elevation, shall be applied for not less than two (2) hours, and all pipe, fittings, valves, hydrants and joints shall be carefully examined for defects. Leaky joints shall be made watertight.
2. A leakage test shall also be conducted in accordance with AWWA Specification C-600-05. Permissible leakage shall be in accordance with AWWA Specification C-600-05.

Testing allowance shall be defined as the maximum quantity of makeup water that is added into a pipeline undergoing hydrostatic pressure testing, or any valved section thereof, in order to maintain pressure within ±5 psi of the specific test pressure (after the pipeline has been filled with water and the air has been expelled). No pipe installation will be accepted if the quantity of makeup water is greater than that determined by the following formula:

In inch-pound units,

$$L = \frac{SD\sqrt{P}}{148{,}000}$$

Where:

L = testing allowance (makeup water), in gallons per hour

S = length of pipe tested, in feet

D = nominal diameter of the pipe, in inches

P = average test pressure during the hydrostatic test, in pounds per square inch (gauge)

D. Fire Services
1. The Contractor shall provide all necessary equipment and shall perform all work required in connection with all tests as specified herein. All pipe shall be tested by hydrostatic pressure at not less than 200 psi, or at fifty (50) psi over the maximum static pressure when the maximum static pressure is above 150 psi, in accordance with FM Global Standards FMDS0310 (see attached). The test pressure shall be determined by the Water Authority and/or Owner's Representative. Each section tested shall be slowly filled with water, care being taken to expel all air from pipes. Expel all air by opening hydrants at the high points of the system and at both ends, or by bleeding air through the sprinkler drains. Increase the water pressure in 50 psi increments until the specified test pressure is attained. After each increase in pressure, make observations of the stability of the joints. In these observations, include such items as protrusion or extrusion of the gasket, leakage or other factors likely to affect the continued use of a pipe in service. During the test, increase the pressure to the next increment only after the joint has become stable.
2. A leakage test shall also be conducted in accordance with FM Global Standards FMDS0310. Permissible leakage shall be in accordance with FM Global Standards FMD S0310. measure the amount of leakage at the specified test pressure by pumping from a calibrated container. For new pipe, the amount of leakage at the joints is limited to a maximum of 2 qts/hr per 100 gaskets or joints irrespective of pipe diameter.

E. If the section being tested shall fail to pass the pressure test or the leakage test, or both, the Contractor shall do everything necessary to locate, uncover, and repair or replace the defective pipe, fittings or joints, and all such work shall be done at his expense and at no additional cost to the Owner.

F. In the event of conflict between the tests specified herein and the test requirements of the Water Authority, Health Department or any other Authority having jurisdiction over all or any portion of the water lines installed under this Contract, the more restrictive requirements shall govern.

3.14 DISINFECTION OF COMPLETED LINE

A. All disinfection shall be in accordance with the Health Department regulations, Sanitary Code, and any requirements required by the Owner's insurer. The Contractor must satisfy all requirements at his own expense for acceptance.

B. Domestic Services
1. After the water line has passed the required pressure and leakage tests and before being placed in service, the entire line shall be disinfected. All disinfecting methods and materials shall be in accordance with AWWA Specification C-651, except that the "Tablet Method" as specified in Section 4.4.2 of AWWA Specifications C-651 shall not be used.

C. Fire Services
1. After the water line has passed the required pressure and leakage tests and before being placed in service, the entire eline shall be disinfected. All disinfecting methods and materials shall be in accordance with FM Global Standards FMDS0310.

D. Two acceptable results of bacteriological analyses of samples of water collection from every 1,200 feet and at least 24 hours apart from the new distribution water line after disinfection and before use of the water lines shall be submitted to the Westchester County Department of Health as part of certification of construction compliance. All disinfection operations and procedures shall meet with the approval of the Water Authority and Health Department.

3.15 RECORD DRAWINGS

A. In addition to the requirements stated in Division 1 Specification Sections, an "as-built" set of record drawings shall be kept on the site concurrently with the progress of the work. These "as-built" record drawings shall consist of a marked set of the drawings with additional sketches as required, denoting and dimensioning accurately and neatly all changes and conditions that are variations from the drawings.

B. All changes in alignment and grade of the newly installed underground piping which are not marked by a visible surface structure such as manholes, shall be recorded. These locations shall be located in reference to three (3) separate permanent surface reference points and recorded on the "as-built" record drawings. An accurate record shall also be kept of all existing site items which are reworked or relocated.

C. The as-built may be required for submission to Westchester County Department of Health (DOH), prior to submitting the final record drawings. The newly installed works may not be placed into service, until the completed works approval is received from the DOH, as applicable.

D. Upon completion of the work, the Contractor shall deliver the final "as-built" record drawings in Autocad format and on a thumb drive, and bear the original signature and seal of a licensed land surveyor in the State of New York or the design engineer, prepared pursuant to the New York State Education Law. All modifications must be included on the "as-built" with all changes bubbled in red, including details, and be of the same scale as the approved plans. All information pertaining to the utilities must be included on the plan and profiles, with clear delineation between pre-existing utilities and newly installed utilities. All drawings must include the date and an "as-built" stamp or notation on each sheet, and the full set of plans including detail sheets. A list must be provided of all deviations from the original approved plans shown on the record drawings, together with the Contractor's explanation thereof.

E. If utilities are constructed within easements, the easements must be included, showing dimensions of the utilities located within the easements, demonstrating that they are located wholly within the easement boundaries.

3.16 FINAL INSPECTION

A. Upon completion of the Work and before final acceptance, the entire water system shall be subjected to a final inspection in the presence of the Site Engineer and/or Owner's Representative. The work shall not be considered complete until all requirements for line, grade, cleanliness, tests and workmanship have been met.

INSTALLATION AND MAINTENANCE OF PRIVATE FIRE SERVICE MAINS AND THEIR APPURTENANCES

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1.0 SCOPE

This data sheet covers the installation, arrangement, location and preventive and corrective maintenance of private fire service mains and their appurtenances. This equipment includes manually operated valves, hydrants, meters and outside hose equipment including hose houses and cabinets. The hydraulics of underground mains, including hydrant and other orifice discharge coefficients and Hazen-Williams pipe coefficients are covered in Data Sheet 3-0, *Hydraulics of Fire Protection Systems.* Cross connections and the use of backflow preventers are covered in Data Sheet 3-3, *Cross Connections.* Guidelines for the installation, maintenance and testing of pressure reducing valves are covered in Data Sheet 3-11, *Flow and Pressure Regulating Devices for Fire Protection Service .*

For the purpose of this data sheet, a *private fire service main* is that pipe between a source of water and the water supply side of the first above ground connection to a sprinkler or standpipe system. When connected to a public water system, the private fire service main begins at a point designated by the public utility, usually at a manually operated valve near the property line. When connected to a fire pump, the main begins at the system side of the pump discharge water control valve. A main connected to a gravity or pressure tank begins at the system side of the tank's discharge water control valve.

Some mains are used to carry water for both fire service and industrial use. This data sheet also applies to these ''combined service'' mains.

1.1 Hazards

Underground mains are a critical component of a fire protection system linking the water source and above ground components such as sprinklers, hydrants and hoses. The one purpose of underground mains is to get water to the attached fire protection systems and equipment where it can be used. A lack of water to the fire protections systems can lead to a large and devastating loss. Proper design, installation and maintenance of underground mains reduces the potential of any disruption to this water supply, allowing water to reach sprinklers and other equipment in the areas where it is needed.

1.2 Changes

January 2022. Interim revision. The following significant changes were made:

A. Added Section 2.1 on using FM Approved equipment and services. Removed all subsequent redundant iterations of this language in the document.

B. Added guidance for the new FM Approved pipe rehabilitation system in Section 2.0.

C. Updated explanatory text on pipe rehabilitation systems in Section 3.0 to support the new Section 2.0 guidance on FM Approved pipe rehabilitation systems.

D. Updated guidance on thrust block areas in Table 2.

E. Relocated information on leak detection methods and equipment to Section 3.0. This material contains no recommendations.

F. Replaced unreadable figures in the document.

G. Updated references and terminology to current FM Global and FM Approval brand assurance standards.

2.0 LOSS PREVENTION RECOMMENDATIONS

2.1 Introduction

2.1.1 Use FM Approved equipment, materials, and services whenever they are applicable and available. For a list of products and services that are FM Approved, see the *Approval Guide*, an online resource of FM Approvals.

2.2 Construction and Location

2.2.1 System Components

2.2.1.1 Local governing authorities may require the installation of various system components. If FM Approved components are not available, then components made in accordance with American Water Works Association (AWWA) or to similarly recognized standards are acceptable.

2.2.2 Maintenance of System Components

2.2.2.1 Supervise and maintain system components in accordance with Data Sheet 2-81, *Fire Protection System Inspection, Testing and Maintenance,* and Section 2.3.8, of this data sheet.

2.2.3 Single Check Valves

2.2.3.1 If a single check valve is required to prevent water from the private fire protection main system from being lost through the tanks and pump supply, install the valve at the discharge from fire pumps and at gravity tank and pressure tank connections.

2.2.3.2 When check valves are installed in a vertical pipe, flow must be in the upward direction.

2.2.3.3 Install check valves so that they are accessible and, when located underground, in watertight, frost-proof concrete or masonry pits. Provide clearance around the main where it passes through the wall, and pack the annulus with a sealant.

2.2.3.4 Provide manually operated valves, preferably the indicating type, on both sides of the check valve to allow isolation for maintenance or repair.

2.2.3.5 Frequently there is a curb box valve at the connection to the public main that can serve as the upstream valve. Roadway box valves (curb box installation) use inside screw gate valves.

Provide ample clearance for valves with side mounted covers to permit clapper removal. Wafer check valves have a shorter body length and many do not have covers. Check valves without covers must be removed from the system for clapper replacement or repair.

2.2.4 Anti-Water Hammer Check Valves and Surge Arresters

2.2.4.1 Install check valves at the discharge of the fire pump. Install surge arresters on the system side of the fire pump discharge check valve and as close to the valve as possible.

2.2.4.2 Special anti-water hammer check valves are Approved for use in the discharge of a fire pump, where conditions may cause severe water hammer with the usual single swing type check valve.

Because of the relatively high friction loss through anti-water hammer check valves, consult the friction loss data tabulated in the FM *Approval Guide* and consider the loss when designing the private fire service system. Some Approved anti-water hammer check valves are not suited for direct bolting to the body of butterfly valves because of clearance problems between the butterfly vane and the check valve clapper. Limit the use of anti-water hammer check valves to installations on the discharge side of fire pumps or other water hammer problem areas.

For other situations use Approved single swing check valves.

2.2.4.3 Use a surge arrester or damper if an anti-water hammer check valve alone proves inadequate to control the problem.

2.2.5 Backflow Preventers

2.2.5.1 When backflow prevention is required, refer to Data Sheet 3-3, *Cross Connections,* for cross connection control guidelines.

2.2.6 Fire Department Pumper Connections

2.2.6.1 To prevent loss of system pressure through the pumper connection, install the Approved single check valve at each fire department connection, located as near as practicable to the point where it joins the system.

2.2.6.2 Do not provide a shutoff valve in the piping between the pumper connection and the fire service mains. Provide an Approved automatic drip valve (ball drip) at a low point in the pipe between the check valve and the outside hose coupling of the pumper connection. Arrange the automatic drip system so that it discharges to a proper frost-free location.

2.2.7 Manually Operated Valves

2.2.7.1 In both new fire service main system installations and valve replacement situations, install valves that open in a counterclockwise direction. In existing installations where all valves open clockwise or a mixture of opening directions are present, clearly identify the direction of opening.

2.2.7.2 For underground fire service main use, install either a post indicator valve assembly or a gate valve with an indicator post to readily show the open or closed position of the valve. If a valve must be placed where an indicator post cannot be used, such as in a road, use an indicating valve (such as an indicating butterfly valve or an outside screw and yoke gate valve), installed in a watertight, frost-proof concrete or masonry pit (see Data Sheet 3-2, *Water Tanks for Fire Protection.* The section titled *Valve Enclosures and Frost Protection* describes the Valve Pit Enclosure).

2.2.7.3 Limit the use of non-indicating type underground gate valves on branch mains to hydrants and building lead-ins. Indicating valves are preferred. Such valves are normally nonrising stem type, and require a key wrench for operation. A curb box with cover plate at grade level provides access for the wrench to the valve stem nut.

2.2.8 Hydrants

2.2.8.1 Do not install pumper connections (also known as pumper-suction connections and steamer connections) with hydrants for private fire protection systems. The draft created by the pumpers connected to the pumper connections could deplete the water supply to the automatic sprinkler system.

2.2.8.2 Consult the relevant occupancy data sheets if hose streams from hydrants as supplementary protection are required.

The number of hydrants may be modified according to varying conditions:

1. Hose connections at standpipes may reduce the total number of hydrants required. Include the water demand requirements for hose connections at standpipes when determining the total system water demand.
2. Extra hydrants may be necessary to fight fires in yard storage and exposed buildings.
3. For buildings having long, blank masonry walls with few windows, hydrants are often unnecessary for considerable distances unless required for protection of yard storage or other purposes.
4. Where the roofs of windowless buildings are of combustible construction, provide intermediate hydrants roughly 300 ft (90 m) apart for use in the event of a roof fire.
5. Provide hydrants approximately 300 ft (90 m) apart along walls of buildings with windows for hose stream use on indoor fires.
6. For buildings over 300 ft (90 m) wide, provide hydrants on opposite sides of the building, unless long, blank masonry or metal walls are present (see 3 above).
7. Roof hydrants may be necessary to protect conveyors passing over buildings, for fighting fires in ducts and applying hose streams through roof monitors and skylights.
8. Sometimes a hose header at the pump house may be substituted for a hydrant.
9. A wall hydrant supplied from oversized (4 in. [100 mm] minimum) sprinkler system piping may substitute for a yard hydrant.

2.2.9 Fire Service Mains

2.2.9.1 Acceptance of pipe, joints and fittings that are not Approved is based on satisfactory experience and conformity to specifications of recognized engineering bodies. Cast and ductile iron, steel, and asbestos cement pipe are acceptable on that basis. Plastic and other nonmetallic pipe and fittings are acceptable when they are Approved.

2.2.9.2 Do not use polyvinyl chloride (PVC) pipe in areas subject to potential spillage of aromatic hydrocarbons. Aromatic hydrocarbons such as benzene and toluene will dissolve polyvinyl chloride.

Table 2.2.9.2 summarizes the various types of pipe, joints, anchorage, applicable standards and working pressures.

Table 2.2.9.2. Description of Pipe and Joints

	Material[1]					
	Cast[2] *and Ductile Iron*	*Steel*	*Asbestos Cement*	*Plastic*		
				Polyethylene	*Polyvinyl Chloride (PVC)*	*Fiber-reinforced Composite*
Standard[3] (ANSI/AWWA)	C110/A21.10 C150/A21.50	C200	C400	C901	C900	C950
Working pressure	See FM Approvals *Approval Guide* Reference: C110/A21.10 C150/A21.50	See C200 Also Data Sheet 2-8N, *Installation of Sprinkler Systems (NFPA)*	Class 150 150 psi (1035 kPa, 10.3 bar) Class 200 200 psi (1380 kPa, 13.8 bar)	See FM Approvals *Approval Guide* Reference: AWWA Standard		
Joint type	Approved push-on, standardized mechanical, ball and socket, poured lead bell and spigot	Welded, threaded, Flagged, Approved Grooved couplings	Approved push-on cast iron	Butt fusion or Approved adapters	Push-on, bell and spigot, cast iron or Approved materials	Approved using solvent cement, push-on cast iron
Restraint[4]	Approved, rods and clamps, thrust blocks	Not necessary	Thrust blocks	Thrust blocks		

Note 1. Acceptance of pipe, joints and fittings that are not Approved is based on satisfactory experience and conformity to specifications of recognized engineering bodies. Cast and ductile iron, steel, and asbestos cement pipe are acceptable on that basis.

Note 2. Cast Iron Standards, C106/A21.6 and C108/A21.8 withdrawn in 1982 and 1979 respectively. Ductile iron pipe has replaced cast iron.

Note 3 AWWA: American Water Works Association. ANSI: American National Standards Institute, Inc.

Note 4. Thrust blocks are the preferred method of restraint.

2.2.10 Connections From Water Supplies

2.2.10.1 Size connections from water supplies to restrict velocities to less than 20 ft/sec (6.1 m/sec) and minimize friction loss at anticipated rates of flow. A minimum pipe size of 6 in. (150 mm) is recommended.

2.2.10.2 If the main does not supply hydrants a pipe size of less than 6 in. (150 mm) may be used if:

A. hydraulic calculations have determined that the main will supply the total demand at the appropriate pressure and

B. the main size shall be at least as large as the riser.

Take into consideration future needs and hose stream flows.

2.2.10.3 Provide minimum 6 in. (150 mm nominal) diameter connections between hydrants and mains.

See also Data Sheet 3-3, *Cross Connections,* which details cross-connection control, achieved by backflow prevention devices or by air gap separation.

2.2.11 Arrangement and Location of Fire Service Mains

2.2.11.1 Arrange private fire service mains to minimize, insofar as practical, impairments (loss of protection) in the event the mains or their appurtenances are damaged or in cases of system shutdown for other reasons.

2.2.11.2 Where looped mains are present, provide divisional valves so that sections of the loop may be isolated.

2.2.11.3 Limit the number of risers served by one divisional valve to approximately six (6).

2.2.11.4 Locate underground mains, except lead-ins, to maintain minimum 5 ft (1.5 m) clearance between building foundation footings and near side of trench. Run mains outside buildings.

2.2.11.5 If placement of a fire service main inside a building is unavoidable, place the main in a covered masonry or concrete trench. The trench may be sand-packed with a removable cover, or simply grate-covered.

2.2.11.5.1 Provide clearance around the main where it passes under or through a foundation wall so that building settlement will not damage the main.

2.2.11.5.2 Provide outdoor valves on each side of a building beneath which a main passes so that an indoor break can be isolated.

2.2.11.6 Avoid overhead runs of fire service mains. Overhead mains are subject to mechanical damage.

2.2.11.7 In cold climates, provide sufficient building heat to prevent freezing of the main, or protect the main against freezing.

2.2.12 Pipe Installation: Trenching and Laying

2.2.12.1 Install ductile iron piping in accordance with American Water Works Association (AWWA) C600, asbestos-cement pipe in accordance with AWWA C603 and polyvinyl chloride pipe in accordance with AWWA C900. These AWWA standards were written for water utility piping, but the same principles and procedures apply to fire service mains.

A. Provide bell holes in the trench bottom to allow joint assembly and to ensure that the pipe barrel will lie flat on the trench bottom. For asbestos cement pipe excavate a coupling hole with sufficient length, width and depth to permit assembly, and provide a minimum clearance of 2 in. (51 mm) below the coupling.

B. Except for bell holes and coupling holes, maintain a level trench bottom so that the pipe is supported along its full length.

C. When excavation of rock is encountered, remove all rock necessary to provide a clearance of at least 6 in. (152 mm) below and on each side of all pipe, valves and fittings. When excavation is completed, place a bed of sand, crushed stone or earth that is free of stones or large clods of frozen earth, on the bottom of the trench to a minimum depth of 6 in. (152 mm). Level and tamp the bedding material.

D. When the subgrade is found to be unstable or to include ashes, cinders, refuse, organic material or other unsuitable material, remove such material to a minimum of at least 6 in. (152 mm) below the bottom of the pipe. Replace the material with clean, stable backfill material. When such unsuitable materials are encountered, consider providing polyethylene encasement (see Section 2.1.5.3, *Protection Against External Corrosion).*

E. When the bottom of the trench or the subgrade is found to consist of material that is unstable to such a degree that it cannot be removed, construct a foundation for the pipe and/or appurtenances using piling, timber, concrete or other materials.

F. Lower all pipe, fittings, valves and hydrants into the trench in such a manner as to prevent damage to materials and protective coatings and linings.

G. Complete the specified laying conditions:

1. for ductile iron pipe according to AWWA C150 and as illustrated in Section 3.0, Figure 35
2. for asbestos cement pipe according to AWWA C603 and as illustrated in Section 3.0, Figure 36
3. for polyethylene, PVC, glass fiber-reinforced and other Approved pipe according to the manufacturer's installation instructions

H. Do not allow foreign material and water to enter the pipe during installation. At times when pipe laying is not in progress, close the open ends of pipe by installing a watertight plug or by other means. Prevent pipe flotation, which is possible if the trench fills with water, by backfilling as necessary.

I. Limit maximum deflection at joints to that given in the appropriate standard.

J. Consult the railroad authority for special conditions and procedures that may apply to mains laid below their tracks. Where iron pipe is laid under a single track, install the pipe so that the center point of its full length is positioned midway between the rails. Where ductile-iron pipe is laid under multiple tracks, position the joints midway between the tracks. Asbestos cement and glass fiber-reinforced pipe laid under railroad tracks or highways may need to be enclosed within a larger protective pipe, following the manufacturer's recommendations. See also AWWA C600.

2.2.13 Setting Valves, Fittings, Indicator Posts and Hydrants

2.2.13.1 Join valves and pipe fittings to the pipe in the manner required for the type of pipe being used. Set valves so that the attached indicator posts are vertical, and inspect to ensure that they operate properly.

2.2.13.2 Set hydrants plumb after dirt or other foreign material has been cleaned out. Locate the center line of the butts at least 12 in. (305 mm) above the ground to allow ready access for attaching hoses. Provide valves on pipe that supplies hydrants so that one hydrant can be repaired without impairing the rest of the system. Provide dry-barrel hydrants with drainage. In permeable soil, provide coarse gravel or crushed stone for at least 1 ft (0.3 m) around the base of the hydrant and at least 6 in. (152 mm) above the drain port. In clay or other impervious soil, dig a drainage pit about 2×2×2 ft (0.6×0.6×0.6 m) below the hydrant and fill with compacted, crushed stone and coarse sand around the hydrant elbow and 6 in. (152 mm) above the drain port. Do not connect hydrant drainage systems to sewers. Some local authorities require the dry-barrel hydrant drain ports to be plugged. The hydrant barrels must then be pumped following use in cold weather to avoid freezing.

2.2.13.3 Provide individual support for valves, hydrants, check valves and meters used with plastic pipe. Further details on installation of valves, fittings, and hydrants are given in AWWA C600.

2.2.14 Protection Against External Corrosion

2.2.14.1 Avoid installing iron or steel pipe under coal piles, in cinder fill, or wherever acids, alkalis, pickling liquors, etc., can penetrate the soil.

2.2.14.2 When using polyethylene encasement as a method of protection against external corrosion, apply the following guidelines:

1. Install polyethylene encasement in accordance with ANSI/AWWA C105/A21.5.
2. Use polyethylene film of minimum 0.008 in. (0.20 mm) thickness.
3. Use polyethylene tubes or polyethylene sheets.
4. Install polyethylene encasement to prevent contact between the pipe and the surrounding backfill and bedding material. Complete air tightness and water tightness are not necessary.
5. Encase fittings, valves and other appurtenances to iron fire service mains.
6. Avoid prolonged exposure of the polyethylene film to sunlight. Such exposure will eventually deteriorate the polyethylene film.
7. Use the same backfill material as that specified for pipe without polyethylene wrapping. Use care to prevent damage to the polyethylene wrapping when placing backfill.

2.2.14.3 When stray electric currents are suspected, determine their extent and origin by professional ground surveys. If the stray currents cannot be eliminated or diverted, and the main is not yet seriously corroded, it can be protected by bonding all the joints and providing direct low resistance metallic ground connections. Cathodic protection is sometimes used. This technique imposes direct electric current from a galvanic anode to the buried main. Cathodic protection is also effective against corrosive soils, but is rarely used in fire protection installations due to the costs of installation and maintenance.

2.2.15 Protection Against Freezing

2.2.15.1 Determine the required depth of cover over water mains by considering the maximum depth of frost penetration. Local soil conditions and elevation will affect the depth of frost cover. Consult local officials for recommended frost depth levels. For areas where frost is a factor, bury fire service mains at least 6 in. (152 mm) deeper than municipal water works piping. The additional depth of cover is necessary because of the lack of water circulation in fire service mains.

2.2.15.2 Avoid locations where mains pass over raceways or near embankment walls. Special protection is needed to prevent freezing in these areas. Insulation cannot protect exposed mains from freezing unless heat is added or there is sufficient flow of water to replace the heat loss.

2.2.15.2.1 Wrap, box and heat exposed mains containing static water on bridges.

2.2.16 Restraining

2.2.16.1 Unbalanced thrust forces occur in the water main where the piping stops or changes cross-sectional area or direction. At bends, hydrants, reducers, tees, valves, wyes, dead-ends and offsets on pipe systems, these unbalanced forces must be overcome to prevent the joints from separating.

2.2.16.2 Several methods of restraint are available to keep the piping system intact when subjected to these unbalanced thrust forces. Thrust blocks, tie rods and clamps, and devices specifically Approved to counteract thrust forces without the use of thrust blocks, or a combination of these methods with the friction forces between the pipe and the soil may be used as methods of restraint.

2.2.16.3 Thrust blocks may be used with steel, cast iron, plastic or asbestos cement pipe. Make them of concrete mix not leaner than one part cement, two and one-half parts sand and five parts stone or washed gravel. Cast thrust blocks in place to bear against an area of undisturbed soil in the trench wall. Leave the pipe joint accessible for inspection and repair. Tie rods and clamps may be used with ductile-iron pipe.

2.2.16.4 A thrust block under a hydrant or valve to prevent upward movement requires rods bent over the bells to hold the hydrant or valve to the thrust block. Locate thrust blocks under hydrants so as not to prevent the hydrant from draining properly. Place small stones alongside the thrust block to provide a place where water from the hydrant barrel may drain without washing away bearing surfaces.

2.2.16.5 If thrust blocks are to be used alone, Table 2.2.16.5 shows the required bearing area.

Table 2.2.16.5. Area of Bearing Surface of Concrete Thrust Blocks

Pipe Size in. (mm)	*90° Bend or ¼ Bend ft² (m²)*	*45° Bend or ⅛ bend ft² (m²)*	*Tees, Hydrants, Caps, Plugs ft² (m²)*
4 (100)	*3 (0.3)*	*2 (0.2)*	*3 (0.3)*
6 (150)	6 (0.6)	4 (0.4)	5 (0.5)
8 (200)	11 (1.0)	6 (0.6)	8 (0.7)
10 (250)	16 (1.5)	9 (0.8)	11 (1.0)
12 (300)	22 (2.0)	12 (1.1)	16 (1.5)
14 (350)	30 (2.8)	16 (1.5)	21 (2.0)
16 (400)	38 (3.5)	21 (2.0)	27 (2.5)

Areas in this table were derived using 225 psi (1551 kPa, 15.5 bar) water pressure and 2000 lb/ft² (96 kPa, 1 bar) soil resistance. This is typical of sand and gravel with clay. For other soils, multiply the table values by the following factors:
- Soft clay 4
- Sand 2
- Sand and gravel 1.3
- Sand and gravel cemented with clay 0.5
- Shale, hardpan 0.4

Note: Wide variations of bearing load capacity may be encountered within each soil type.

2.2.16.6 Tie rods and clamps may be used with ductile-iron pipe. Table 2.2.16.6 shows, for various pipe sizes, the clamp size, bolt size, washer size (washers may be cast iron or steel, round or square) and the number of rods needed when rod and clamp restraint is used. For pipes over 12 in. (300 mm) in diameter, the use of rods alone is not adequate.

Table 2.2.16.6. Rod and Clamp Anchorage

Pipe Size in. (mm)	Clamp Size in. (mm)	Bolt Size in. (mm)	Washers in. (mm)		Number of Rods and Rod Size (in. [mm]) for Rod and Clamp Anchorage					
					Mechanical Joint			Push-on Joint		
			Cast Iron	Steel	90° ¼ bend	45° ⅛ bend	Tee, hydrant cap, plug	90° ¼ bend	45° ⅛ bend	Tee, hydrant cap, plug
4 (100)	½×2 (13×50)	⅝ (16)	⅝×3 (16×80)	½×3 (13×80)	2 ¾ (20)	2 ¾ (20)	2 ¾ (20)	2 ¾ (20)	2 ¾ (20)	2 ¾ (20)
6 (150)					2 ¾ (20)	2 ¾ (20)	2 ¾ (20)	2 ¾ (20)	2 ¾ (20)	2 ¾ (20)
8 (200)	⅝×2-½ (16×65)				4 ¾ (20)	2 ¾ (20)	4 ¾ (20)	4 ¾ (20)	2 ¾ (20)	4 ¾ (20)
10 (250)		7/8 (22)			6 ¾ (20)	4 ¾ (20)	4 ¾ (20)	4 7/8 (22)	4 7/8 (20)	4 7/8 (22)
12 (300)	⅝×3 (16×80)	1 (25)	¾×3-½ (18×90)	½×3-½ (13×90)	8 ¾ (20)	6 ¾ (20)	6 ¾ (20)	4 1 (25)	4 1 (25)	4 1 (25)

Note 1. After installation, protect tie rods, bolts, nuts, washers and clamps against corrosion with a heavy coat of asphalt material.

Note 2. The length of the rod required will vary with the pipe fitting, and must be determined by field measurement. If the distance between the joints is less than 12 ft (3.7m), extend the anchorage to the second bell.

Note 3. When ordering fittings, specify lugs if tie rods and clamps are to be used.

Note 4. Bolt holes 1/16 in. (1.6 mm) larger than bolts. Rod holes ⅛ in. (3.2 mm) larger than rods.

Note 5. Washers may be round or square.

2.2.16.7 Mechanical joints should not be used unless full consideration of frictional and lateral soil resistance has been engineered into the system design. The resistance to thrust forces is a function of the joint mechanics and also depends on conduit frictional resistance, which is a function of soil properties (i.e., soil pressure, cohesion friction and density) and lateral resistance. (Reference: Carlson, R.J., "Thrust Restraint for Underground Piping Systems." Cast Iron Pipe News, Fall 1975 or "Thrust Restraint Design for Ductile Iron Pipe," Second Edition 1989 Ductile Iron Pipe Research Institute).

2.2.16.8 These references outline the minimum length of pipe to be restrained on either side of the fitting. Care must be taken to ensure that the joints are installed according to the manufacturers' specifications. When mechanical joints are used, conduct a visual verification of proper installation (e.g., for bolt heads that shear and break off when a predetermined torque is achieved).

2.2.16.8.1 Apply protective coatings to exposed nuts, bolts, etc., prior to filling the trench to protect against failure due to corrosion.

2.2.16.9 The determination and selection of the proper methods of restraining underground pipe and its appurtenances requires on-site planning prior to installation. Conduct soil tests to determine the soil properties. The proper selection of the method of restraint depends on the soil characteristics as well as other utilities (gas or electric) and structures (foundations) in the proposed excavation area.

2.2.17 Backfilling

2.2.17.1 Accomplish backfilling according to the specified laying condition. The type and degree of compaction of the backfill determines the type of "laying condition" which, in turn, determines in part the wall thickness of pipe to be used. Additional backfilling details are given in AWWA C600 for cast- and ductile-iron pipe and in AWWA C603 for asbestos cement pipe.

2.2.17.2 Use only backfill that is free of cinders, ashes, refuse, vegetable or organic material, boulders, rocks or stones, frozen soil, and other unsuitable material.

2.2.17.3 With plastic pipe it is particularly important that adjacent backfill be clean, well-compacted sand. Special precautions are needed where ambient or ground temperatures before backfilling are considerably

higher than normal water temperature, because plastic pipe expands at a rate greater than that of steel. Make provisions for the contraction of plastic pipe that will occur upon filling the system. With polyethylene pipe, such a provision can be made by ‘‘snaking’’ the pipe in the trench.

2.2.17.4 As a further precaution, fill the pipes with water prior to backfilling. Ideally, conduct backfilling early in the morning when pipe and soil are nearly at the same temperature. Deposit selected backfill material on both sides of the pipe for the full width of the trench. Tamp the backfill in thin layers not exceeding 3 in. (76 mm) in depth to 12 in. (305 mm) above the top of the pipe. Compact thoroughly to provide solid backing against the external surface of the pipe. For complete backfilling procedures for plastic pipe, follow the manufacturer’s instructions.

2.3 Operations and Maintenance

2.3.1 Hydrostatic Leakage Testing

2.3.1.1 Conduct Hydrostatic testing on new mains and mains that have been relined to determine if the joints are tight and to ensure that there are no defective pipes or fittings. Before tests are made, tamp clean backfill to a depth of 1 ft (0.3 m), (2 ft [0.6 m] for 10 in. [254 mm] pipe or larger), over asbestos cement or plastic pipe, or at least to the center line of cast- or ductile-iron pipe. Leave the joints uncovered until the tests have been completed satisfactorily. Large installations may be tested in their entirety, or sections between valves may be tested individually. In some cases, it may be necessary to include older pipe within the test section.

2.3.1.2 Hydrostatically test all new yard piping at not less than 200 psi (1380 kPa, 13.8 bar) pressure for two hours, or at 50 psi (345 kPa, 3.4 bar) over the maximum static pressure when the maximum static pressure is above 150 psi (1034 kPa, 10.3 bar). If a booster pump is present, consider the pump shut-off (churn) pressure in determining the maximum static pressure.

2.3.1.3 Slowly fill with water each section of the main to be tested. Expel all air by opening hydrants at the high points of the system and at both ends, or by bleeding air through the sprinkler drains. Open wide the valve controlling the admission of water before shutting the hydrants or drains. After the system has been filled with water and the entrapped air expelled, close the valve that controls the section being tested and begin applying pressure.

2.3.1.4 Increase the water pressure in 50 psi (345 kPa, 3.5 bar) increments until the specified test pressure is attained. After each increase in pressure, make observations of the stability of the joints. In these observations, include such items as protrusion or extrusion of the gasket, leakage or other factors likely to affect the continued use of a pipe in service. During the test increase the pressure to the next increment only after the joint has become stable. This applies particularly to movement of the gasket.

2.3.1.5 After the pressure has been increased to the required maximum value and held for one hour, decrease the pressure to 0 psi (0 kPa, 0 bar) while observing for leakage. Then slowly increase the pressure to the specified maximum and hold the pressure for one more hour while leakage measurements are made. Do not use fire pumps to supply pressure because a pipeline break during testing could result in damage from the large flow of escaping water. Instead, use a small hydrostatic test pump.

2.3.1.6 Measure the amount of leakage at the specified test pressure by pumping from a calibrated container. For new pipe, the amount of leakage at the joints is limited to a maximum of 2 qts/hr (1.9 l/h) per 100 gaskets or joints irrespective of pipe diameter. The amount of allowable leakage may be increased by 1 fluid ounce per inch valve diameter per hour (12 ml/hour for each cm of valve diameter) for each metal seated valve isolating the test section. If dry-barrel hydrants are tested with the main hydrant valve open, so the hydrants are under pressure, an additional 5 oz/min (150 ml/min) leakage is permitted for each hydrant.

2.3.1.7 On completion of all work except backfilling, ensure that representatives of the contractor and management make a joint inspection and witness the hydrostatic tests. The purpose of the inspection is to ensure that there are no defects serious enough to prevent the system from being put into commission immediately. Ensure that a ‘‘Contractor’s Material and Test Certificate’’ as shown in Data Sheet 2-0, *Installation Guidelines for Automatic Sprinklers* is signed, in triplicate, by the contractor’s and management’s representatives. One copy is to be kept by management, one by the contractor and one sent to the FM Global district office serving the area in which the installation is located.

2.3.1.8 After the pressure test, open the control valves wide and then fully open and close every hydrant at the normal operating rate.

2.3.2 Flushing Underground Mains

2.3.2.1 Flush underground mains and lead-in connections to system risers through hydrants at dead ends of the system or through accessible aboveground flushing outlets, allowing the water to run until clear. If water is supplied from more than one source or from a looped system, have divisional valves closed to produce a high velocity flow through each single line. The flows specified in Table 2.3.2.1 will produce a velocity of at least 10 ft/sec (3.0 m/sec), which is necessary for cleaning the pipe and for lifting foreign material to an aboveground flushing outlet.

Table 2.3.2.1. Flushing Flows

Pipe Size		*Flow Rate*	
in.	*mm*	*gpm*	*l/min*
4	100	390	1500
6	150	880	3300
8	200	1560	5900
10	250	2440	9200
12	300	3500	13,300

Note: Flow rates based on nominal values of pipe diameters.

2.3.2.2 When the water supply will not produce the stipulated flow rate, connections to a hydraulically-designed system may be flushed at the demand rate of the system, including hose streams if hose or hydrants or both are supplied from that connection. For pipe-schedule systems, when the water supply will not produce the stipulated flow rate, use the maximum flow rate available.

2.3.2.3 Provide for the safe disposal of water issuing from the test outlets to avoid property damage or danger to personnel.

2.3.3 Tapping Machines

2.3.3.1 Make certain that the contractor or local water department has suitable tapping equipment.

2.3.3.2 It is vital that the disk be removed after the cutting operation is complete. In operating a tapping machine, care must be taken not to withdraw the shaft until the cut is completed. Otherwise, the retaining thread may be stripped and the disk not withdrawn with the cutter. If this does occur, a brief shutdown will be necessary, and the disk can readily be recovered by reaching through the open valve.

2.3.4 Fire Hose and Equipment for Private Hydrants

Recommendations in this section apply only to those locations having personnel trained to use the recommended equipment.

2.3.4.1 Provide sufficient underwriter playpipes for 2-½ in. (60 mm) hose to permit adequate flow testing of the fire protection water supplies if meters are not used for flow testing.

2.3.4.2 For plant yards where rough surfaces cause heavy wear, or where working pressures are above 150 psi (1034 kPa, 10.4 bar), use double-jacket lined hose or other Approved hose for use in such areas.

2.3.4.2.1 Use woven-jacket lined hose with a protective cover where the hose is exposed to acids, acidic gases or other corrosive materials.

2.3.5 Size of Hose and Type of Nozzle

2.3.5.1 Provide hose threads for couplings, hydrants and nozzles that conform to those used by the local fire department.

2.3.6 Storing and Transporting Hose

2.3.6.1 At facilities that have no mobile equipment, provide Approved hose houses at most yard hydrants.

2.3.6.2 Construct hose houses to provide good inside air circulation. Provide roofs that are substantial and watertight. Provide screening for protection against vermin

2.3.6.3 Install foundations that are above the yard level to ensure good drainage. Provide at least 6 in. (152 mm) between swinging door bottom and the ground. Arrange doors and shelves to permit easy operation of the hydrant and attachment of the hose.

2.3.6.4 The type and amount of equipment needed for individual hose houses or cabinets depends on the needs of the immediate area and the specific hardware used. Individual requirements may call for all 1-½ in. (40 mm) hose, all 2-½ in. (60 mm) hose, or some of each. Table 2.3.6.4 is to serve as a guide. The amount specified may vary depending on the user and on local occupancy and combustibility conditions.

2.3.6.5 Keep special firefighting equipment as needed at the facility's fire department headquarters, e.g., breathing apparatus, protective clothing, forcible entry tools, power tools, hand lights, etc.

Table 2.3.6.4. Recommended List of Hose House Equipment

Quantity	*Description*
200 ft (61 m)	Approved 2-½ in. (60 mm) lined hose
100 ft (30 m)	Approved 1-½ in. (40 mm) lined hose
Two	Approved combination spray, solid stream, shutoff nozzles for 1-½ in. (40 mm) hose
Two	Approved combination spray, solid stream, shutoff nozzles for 2-½ in. (60 mm) hose
One	Hydrant wrench
Four	Spanners for 1-½ in. (40 mm) hose
Four	Spanners for 2-½ in. (60 mm) hose
Four	Spare hose washers (1-½ in. and 2-½ in. [40 and 60 mm])
One	Gated wye (2-½ by 1-½ in. [60 by 40 mm])
Two	Adapter fittings (2-½ to 1-½ in. [60 to 40 mm])

2.3.7 Cleaning and Lining Fire Service Mains

At the time of publication of this data sheet (January 2022), at least one FM Approved pipe rehabilitation and lining product is available for use in underground mains. Additional details on FM Approved products can be found in the *Approval Guide*.

2.3.7.1 Confirm the scope of work to be conducted as part of any pipe relining/rehabilitation operation before commencing any work. Include, at a minimum, the following:

A. Soil conditions. Polyethylene pipe or pipes externally coated with polyethylene can degrade under certain soil conditions. See additional guidance in Section 2.1.5.3.

B. The suitability of the pipe rehabilitation system for correcting the type and size of the defect in the existing pipe.

C. The suitability of the material used in the pipe rehabilitation for use in the existing pipe.

D. The method of cleaning to be used. Certain cleaning methods can negatively impact existing pipe joins. See Section 3.1.8.2 for further information. Cleaning underground piping is essential before relining.

2.3.7.2 Analyze the impact of changes made as part of pipe relining to ensure the relined pipe is still adequate. This can be done via a flow test. Certain pipe properties (internal diameter, C-factor, etc.) will change during the relining process.

2.3.7.3 Conduct hydrostatic testing on relined mains in accordance with Section 2.3.1.1.

2.3.8 Maintenance of Single Check Valves

2.3.8.1 Single check valves on public water connections to private fire systems need internal inspection and cleaning at least once every five years.

2.3.8.2 If there are several check-valved fire service connections from public mains, overhaul and clean one check valve at a time, leaving the others in service. When there is only one connection, observe the following precautions:

A. If there is a secondary supply from a fire pump or from a tank, ensure that the secondary source will maintain pressure on the sprinklers while the public water connection is shut off.

B. If other supplies cannot be maintained in service or if there is no other supply, overhaul the check valve while the plant is not in operation.

2.3.8.3 Clean rust and tubercles from the inside of the valve body —particularly around the seat ring, between the clapper and its arm, around the hub of the clapper arm and in the space between the bottom of the seat ring and the body. This will probably require removing the clapper. When cleaning around the seat ring, take care the face of the seat ring is not injured. Remove any roughness or corrosion on the clapper face or seat ring that would prevent the clapper from seating tightly, using a piece of fine emery cloth wet with water. Do not use a file or coarse scraper on the clapper face or seat ring. Scrape any incrustation formed by hard water from interior bronze parts.

2.3.8.4 Clean the underside of the cover if necessary.

2.3.8.5 Make sure that the side plugs that hold the hinge pin in place are tightly screwed without binding the clapper arm. Ensure the clapper is free to open wide and seat positively.

2.3.9 Maintenance of Double Check Valves and Reduced-Pressure Backflow Preventers

2.3.9.1 Details of testing and maintenance of double check valves and testing of reduced pressure backflow preventers are given in Data Sheet 3-3, *Cross Connections.* Maintain reduced pressure backflow preventers according to the manufacturer's instructions.

2.3.10 Maintenance of Manually Operated Valves

2.3.10.1 At least once a year, operate all valves to the full travel of their mechanism to make sure they can be operated easily when necessary. Maintain a record of the number of turns required to operate each valve from the fully open to the fully shut position. This record is valuable in determining whether a valve has jammed partially open.

2.3.10.2 Clean and lubricate the stems and threads of outside screw and yoke valves regularly.

2.3.10.3 Lubricate indicator post mechanisms regularly, using the oil hole on the cap.

2.3.10.4 Do not tighten stuffing box glands excessively, as this can score the valve stem and cause hard operation. Repack the valve instead.

2.3.11 Maintenance of Hydrants

2.3.11.1 Introduction

2.3.11.1.1 Ensure that hydrants are accessible at all times.

2.3.11.1.2 Ensure that the hydrant wrench is readily available.

2.3.11.1.3 Examine nozzle and cap threads and gasket.

2.3.11.1.4 Ensure that nozzles are tight; they may need caulking.

2.3.11.1.5 Examine the barrel for cracks.

2.3.11.1.6 Ensure that nozzles are accessible for attaching hose.

2.3.11.1.7 Lubricate threads on nozzles and caps.

2.3.11.2 Dry-Barrel Hydrants

2.3.11.2.1 Remove the cap from one of the discharge outlets and determine, by sounding or by dropping a weight on a string into the barrel, if water or ice is present. If either is found, take the necessary steps to eliminate the cause and drain the hydrant. The trouble may be due to groundwater, a plugged drain, or leakage through the hydrant valve.

2.3.11.2.2 When hydrants do not drain properly, attempt to clear the drain hole by opening the hydrant one or two turns with the hose outlets closed. If this is not successful, most hydrants must be dug up to expose and clear the drain hole with a rod. Other types can be disassembled, and a rod driven through the drain hole.

2.3.11.2.3 At locations where groundwater stands at levels above that of the drain, plug the hydrant at the time of installation. If the drain hole is plugged, hydrants in service in cold climates shall be pumped out after usage. Such hydrants shall be marked to indicate the need for pumping after usage.

2.3.11.2.4 If a hydrant leaks at the valve, the cause may be an obstruction, or a defective valve facing or seat ring. Attempt to remove any obstruction by opening the valve wide and allowing water to flow from the hydrant outlet. If this is not successful, disassemble the hydrant and remove the obstruction. The hydrant must also be disassembled to install a new valve facing or replace a damaged seat ring. The latter sometimes requires that the hydrant be dug up.

2.3.11.2.5 For certain compression type hydrants, use the special socket-key wrench supplied by the manufacturer to remove a retainer ring or the seat ring before the hydrant's valve mechanism can be removed.

2.3.11.2.6 Lubricate the threads of the stem nut through grease fittings, or by removing a bolt in the top of the weather cap or stem nut, and pouring oil in the bolt hole.

When hydrants leak at the packing, replace the packing or tighten the packing gland.

2.3.11.3 Wet-Barrel Hydrants

2.3.11.3.1 If wet-barrel hydrants leak at the valve, the cause may be an obstruction or a defective valve facing. Attempt to remove the obstruction by opening the valve and flowing water from the outlet. If not successful, disassemble the hydrant and remove the obstruction.

2.3.11.4 Maintenance of Fire Hose for Use Outdoors

2.3.11.4.1 Dry hoses with jackets made from a combination of cotton and synthetic yarns.

2.3.11.4.2 Hydrostatically test fire hose for outdoor use at least once a year. Use a hydrostatic pump and test double jacket hose to 250 psi (1723 kPa, 17.3 bar) and single jacket hose to 150 psi (1034 kPa, 10.4 bar) in separate tests.

2.3.11.4.3 Several lengths may be connected and tested together. Lay the hose without kinks or twists on a flat, horizontal surface or on one sloping gently upward from the inlet end. At the outlet end, attach a shutoff nozzle or a threaded cap with a petcock, or small valve, as an air vent. Mark the hose at the couplings to show any movement of the coupling on the hose during the test.

2.3.11.4.4 With the air vent open, gradually fill the hose with water, taking care to replace all air. Close the air vent after the hose has been filled. Move personnel out of range of the whiplash of any hose that may burst during the test. Apply full test pressure for five minutes, then release.

2.3.11.4.5 Take burst or leaking hose out of service. Replace any coupling that has moved on the hose, is found defective or has damaged threads. Replace gaskets that are worn or cracked, or if a coupling leaks after tightening.

3.0 SUPPORT FOR RECOMMENDATIONS

3.1 General Information

3.1.1 System Components

3.1.1.1 Flow Meters

Some water utilities require the installation of flow meters in connections from public water mains to private fire service systems. Approved meters include both full registration meters and waterflow detector check valves. Each experiences friction loss, which must be accounted for in the design of a private fire service system.

One Approved full registration fire service meter uses a weighted check valve and a compound meter on a main line, combined with a single disk meter on a bypass line for the purpose of measuring small rates of flow. The weighted lever valve diverts small flows through the bypass meter for accurate measurement, and opens automatically to full capacity when there is a large demand for water. A compound type meter is available as an option on the bypass line. With this type, small flows are measured accurately by a disk meter and the larger flows by a torrent (current type) meter (see Figs. 3.1.1.1-1 and 3.1.1.1-2).

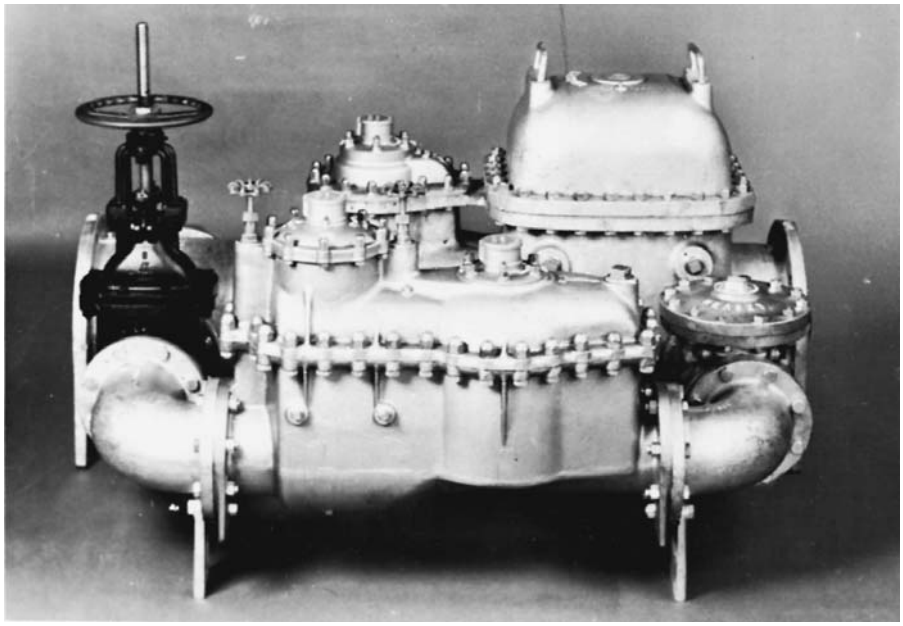


Fig. 3.1.1.1-1. Full registration fire service meter, exterior view showing bypass meter

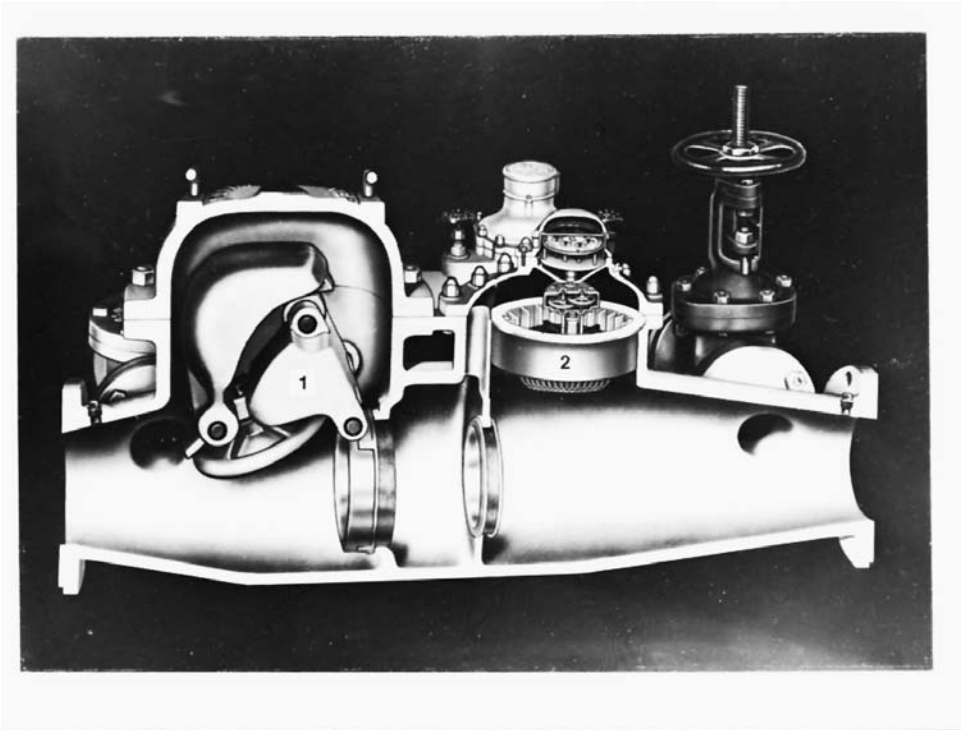


Fig. 3.1.1.1-2. Full registration fire service meter, section view showing weighted lever valve (1) and mainline torrent meter (2)

Waterflow detector check valves are used where the water utility accepts a simple indication of high water flow, rather than a record of the actual amount of water used.

Approved waterflow detector check valves generally operate as follows: the clapper starts to open when the differential pressure across the clapper assembly exceeds the established differential pressure of the check valve.

Small flows that produce a differential pressure less than the established differential pressure do not move the clapper. These are directed through the bypass piping and are metered. Large flows, caused by water demand in the fire protection system, produce a greater differential pressure and move the clapper out of the waterway, allowing the full flow to pass into the system unmetered (see Figs. 3.1.1.1-3 and 3.1.1.1-4).

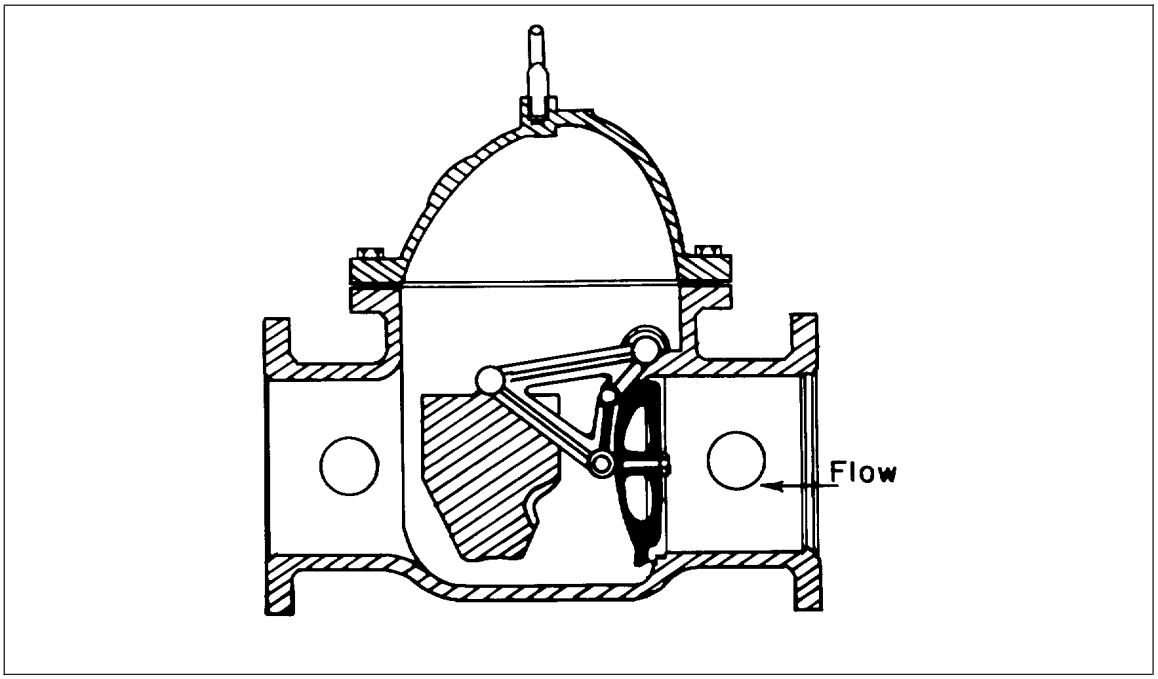


Fig. 3.1.1.1-3. Waterflow detector check valve, section view showing weighted clapper arrangement

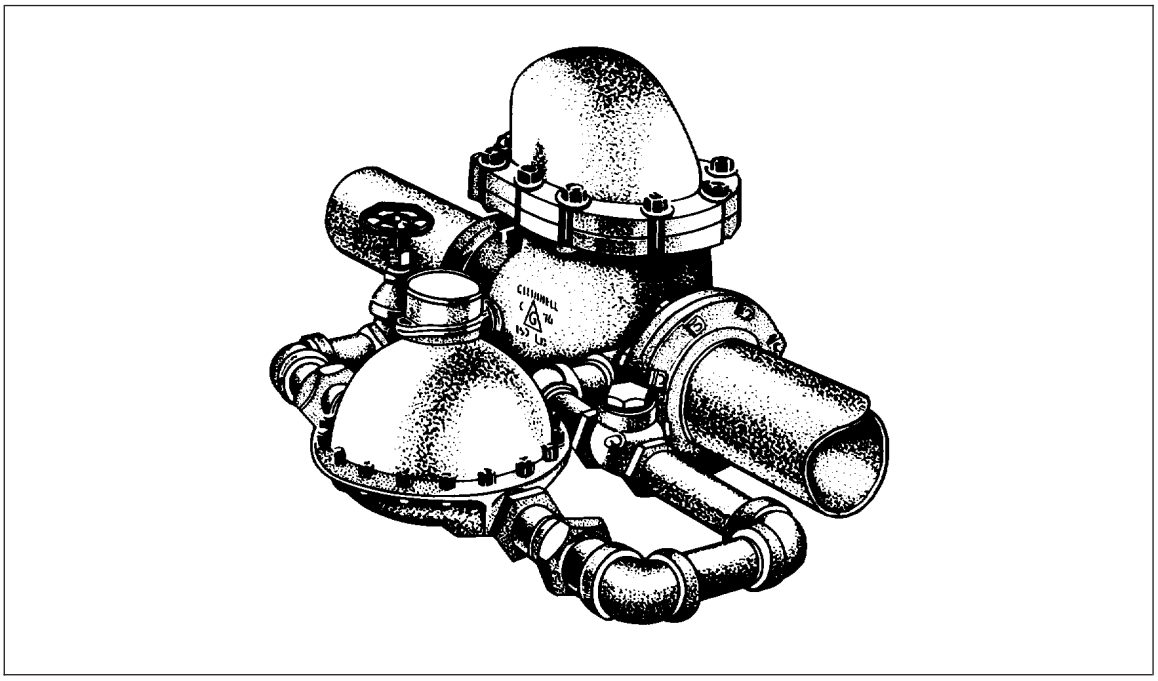


Fig. 3.1.1.1-4. Waterflow detector check valve, exterior view showing bypass meter

Typical meter installations are illustrated in Section 2.2.10, *Connections From Water Supplies.*

3.1.1.2 Single Check Valves

Single check valves are used in fire protection piping systems to allow water to flow in one direction only. Gravity-operated swing check valves (see Fig. 3.1.1.2-1) are kept open by water flow. Closure is effected by back pressure in the line or by the weight of the check mechanism when there is no flow.

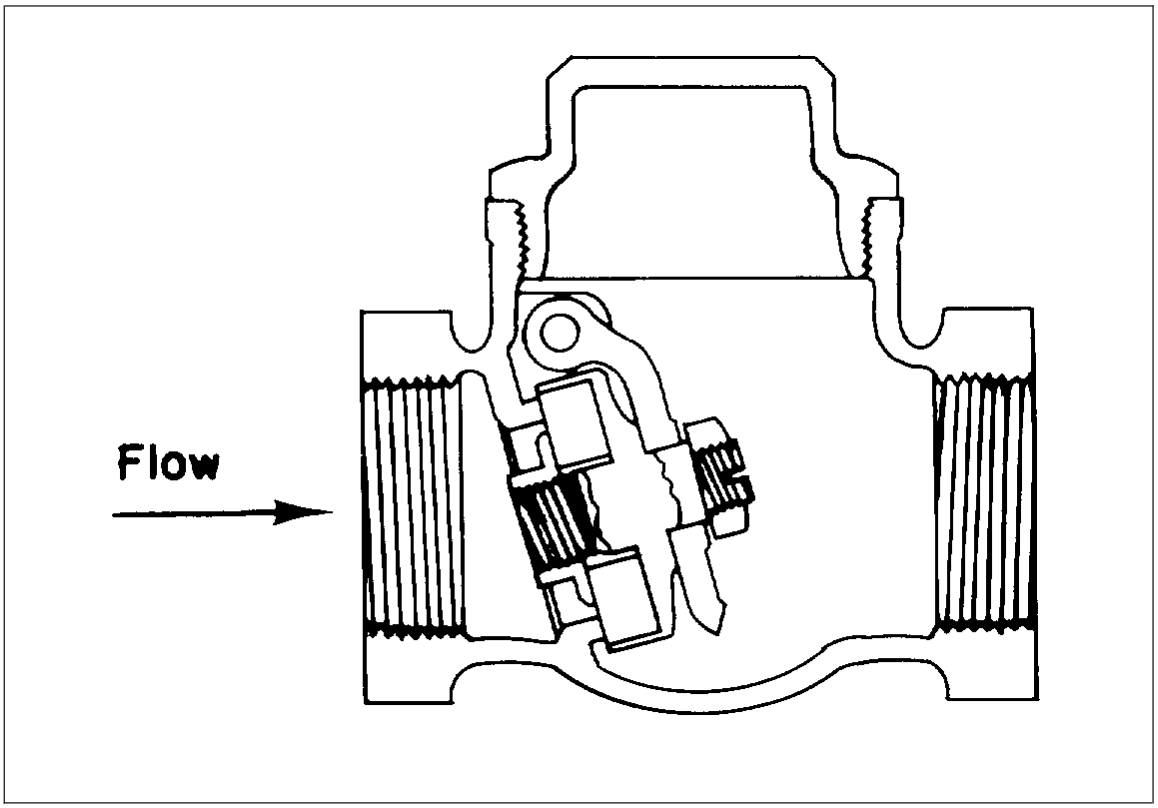


Fig. 3.1.1.2-1. Single check valve

Water authorities often require a single check valve or other backflow preventer at connections to public water sources (see Data Sheet 3-3, *Cross Connections).* This is to prevent the backflow of fire protection system water from mixing with the public water supply, possibly contaminating the public supply.

Providing a single check valve in each connection to a public water source permits the fire pump or fire department pumper to raise the private fire protection system pressure to a higher level than that of the public mains.

Providing a single check valve at the discharge from fire pumps and at gravity tank and pressure tank connections will help to prevent water from the private fire protection main system from being lost through the tanks and pump supply.

Single check valves may be installed in either horizontal or vertical pipe unless restricted to a specific positioning as noted in the *Approval Guide* listing. For installation in vertical pipe the flow must be upward.

Figure 3.1.1.2-2 indicates a location where the check valve is installed in a water-tight, frost-proof concrete or masonry pit.

3.1.1.3 Anti-Water Hammer Check Valves and Surge Arresters

Water hammer is the term associated with the destructive forces, exemplified by pounding noises and vibration, which develop in a piping system where a column of noncompressible liquid flowing through a pipe line at a given pressure and velocity is stopped abruptly. When water hammer occurs, a high intensity

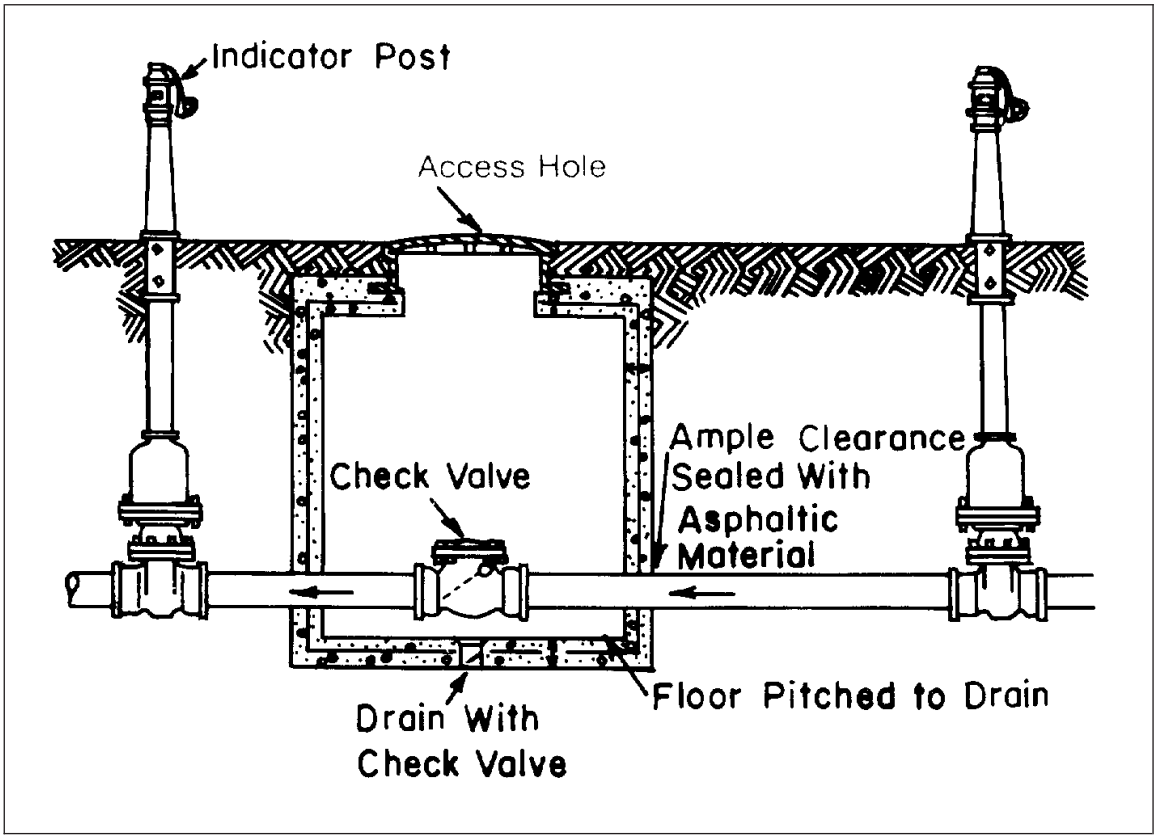


Fig. 3.1.1.2-2. Single check valve in concrete pit

pressure wave travels back through the piping system until it reaches a point of some relief, such as a larger diameter riser or piping main. The shock wave then surges back and forth between the point of relief and the point of impact until the destructive energy is dissipated in the piping system, sometimes in the form of broken piping. This violent action accounts for the piping noise and vibration. Water hammer also can occur without any noticeable sound.

Generally the anti-water hammer check valve (see Fig. 3.1.1.3-1) has a spring mechanism that automatically closes the valve disk at zero flow, before flow reversal occurs, thereby preventing surge and water hammer.

Approved single swing check valves may be utilized in other situations. The swing check valves have a lower friction loss, greater clearance between parts, and lower susceptibility to being obstructed.

Surge arresters or dampers are used to moderate the potentially destructive effects of pressure surges, or water hammer, due to a pump starting and stopping and a valve opening and closing. They are employed and used when an anti-water hammer check valve alone proves inadequate to control the problem.

These hydropneumatic devices absorb pressure surges into a precalculated volume of captive gas and return the absorbed water volume to the system in a controlled fashion. Surge arresters are installed on the system side of the fire pump discharge check valve, and as close to the check valve as possible. Water hammer arresters are covered in ANSI/ASME Standard, *Water Hammer Arresters,* ANSI/ASME A112.26.1.

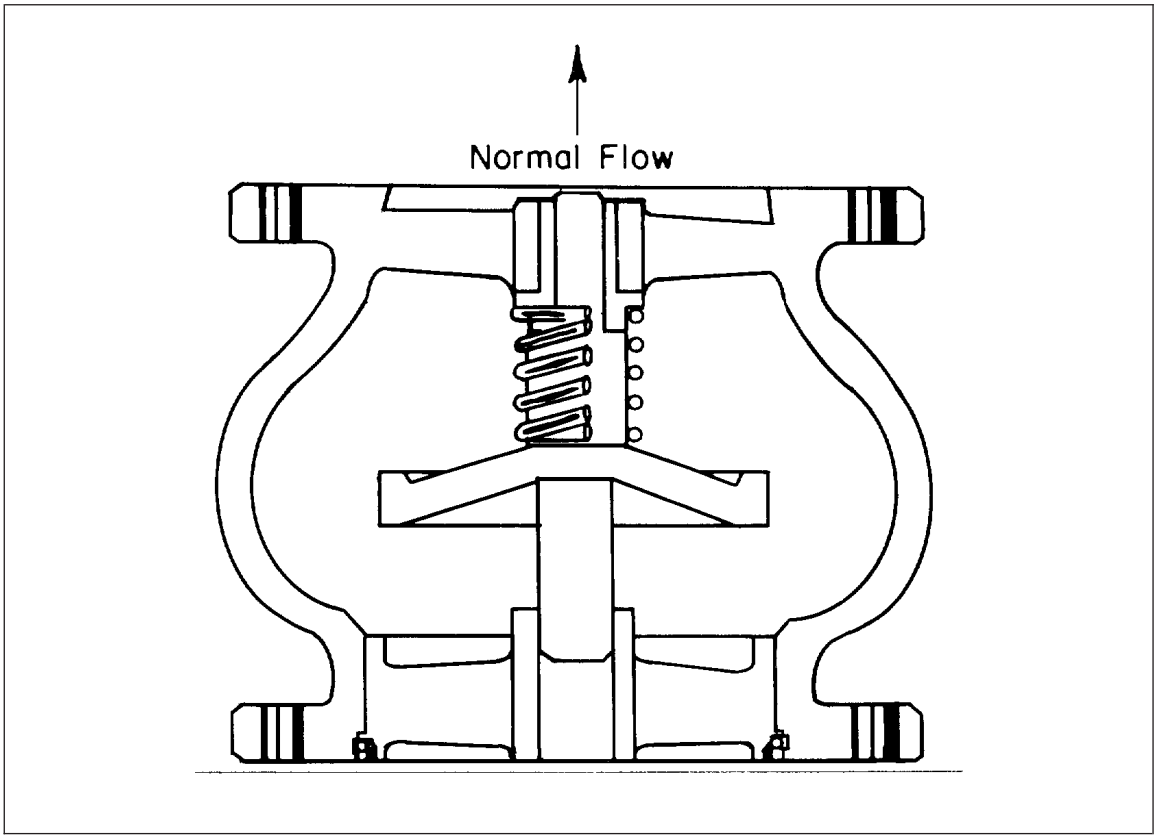


Fig. 3.1.1.3-1. Anti-water hammer check valve

3.1.1.4 Double Check Valves and Backflow Preventers

Cross connections can result in the contamination of the public water sources by the intermixing at the public source of private water supplies and the public water sources. Cross connection control as indicated by water regulatory authorities can be achieved with double check valves (see Fig. 3.1.1.4-1) or reduced pressure principle backflow preventers commonly referred to as RN devices or a double check-detector check valve. Cross connection control is covered in Data Sheet 3-3, *Cross Connections.*

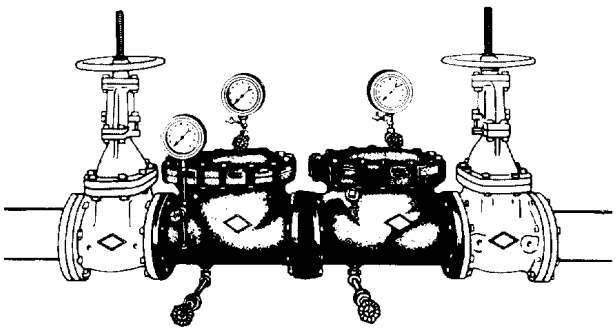


Fig. 3.1.1.4-1. Double check valve

3.1.1.5 Fire Department Pumper Connections

A fire department pumper connection, sometimes referred to as simply “pumper connection,” is a connection through which a fire department can pump water into fire service mains or into a sprinkler system, thus raising the water pressure above that normally available. The Approved connections are made of bronze, and consist of two inlet couplings threaded for standard fire hose and joined into the outlet pipe connection. A check valve is provided in each inlet so that either connection may be used separately. The connections are available in straight, 45° or 90° patterns.

Providing one or more pump connections on private fire service systems is particularly important where the public water system is the only source of supply. To prevent loss of system pressure through the pumper connection, install an Approved single check valve in each fire department connection, located as near as practicable to the point where it joins the system.

An Approved automatic drip valve in the pipe is installed between the check valve and the outside hose coupling of the pumper connection so that it discharges to a proper frost-free location.

Other information on the installation of fire department pumper connections and associated hose coupling threads is covered in Data Sheet 2-0, *Installation Guidelines for Automatic Sprinklers.*

3.1.1.6 Manually Operated Valves

3.1.1.6.1 General

Manually operated valves are used to control individual sources of water supply, isolate equipment such as check valves for maintenance, and allow sectionalizing of water main systems in the event of a break or for the purpose of making repairs or extensions.

3.1.1.6.2 Gate Valves and Butterfly Valves

Gate valves (Fig. 3.1.1.6.2-1) and butterfly valves (Fig. 3.1.1.6.2-2) with associated indicating mechanisms are commonly used in fire service mains. With the gate valve in its fully open position, the disk is lifted completely out of the waterway. Butterfly valves utilize a quarter turn disk to control flow. With the butterfly valve in its open position, the disk sits in the waterway, parallel to the direction of flow.

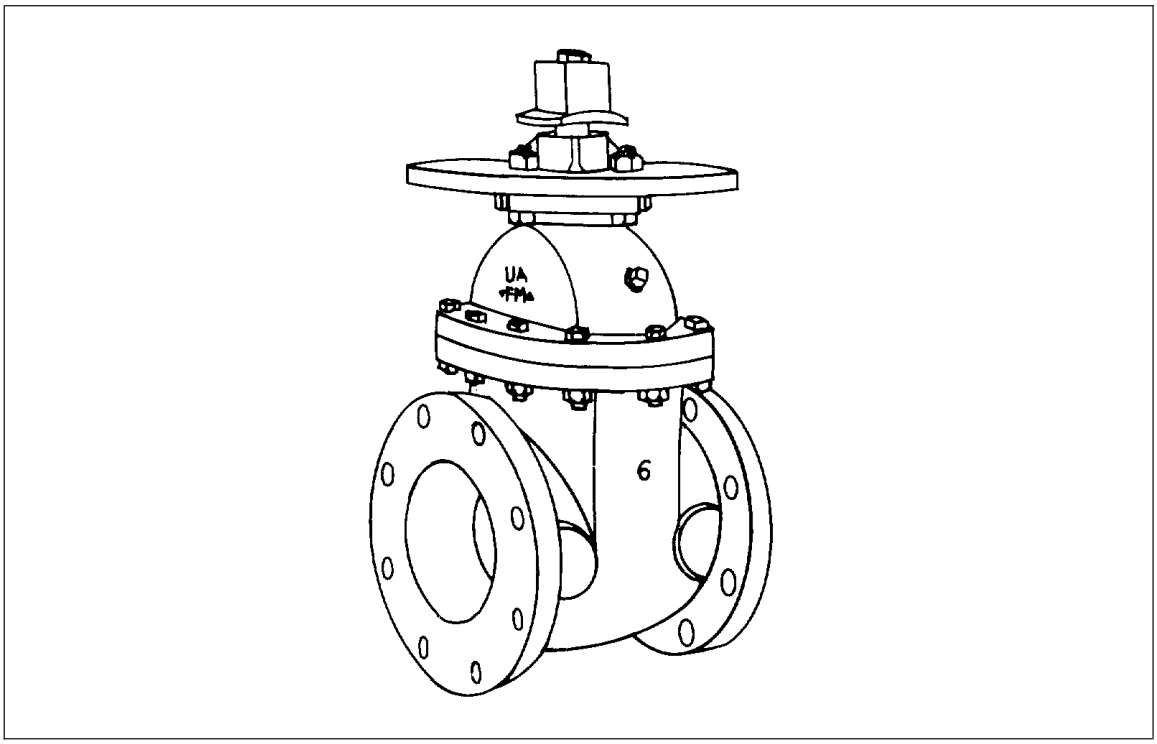


Fig. 3.1.1.6.2-1. Gate valve

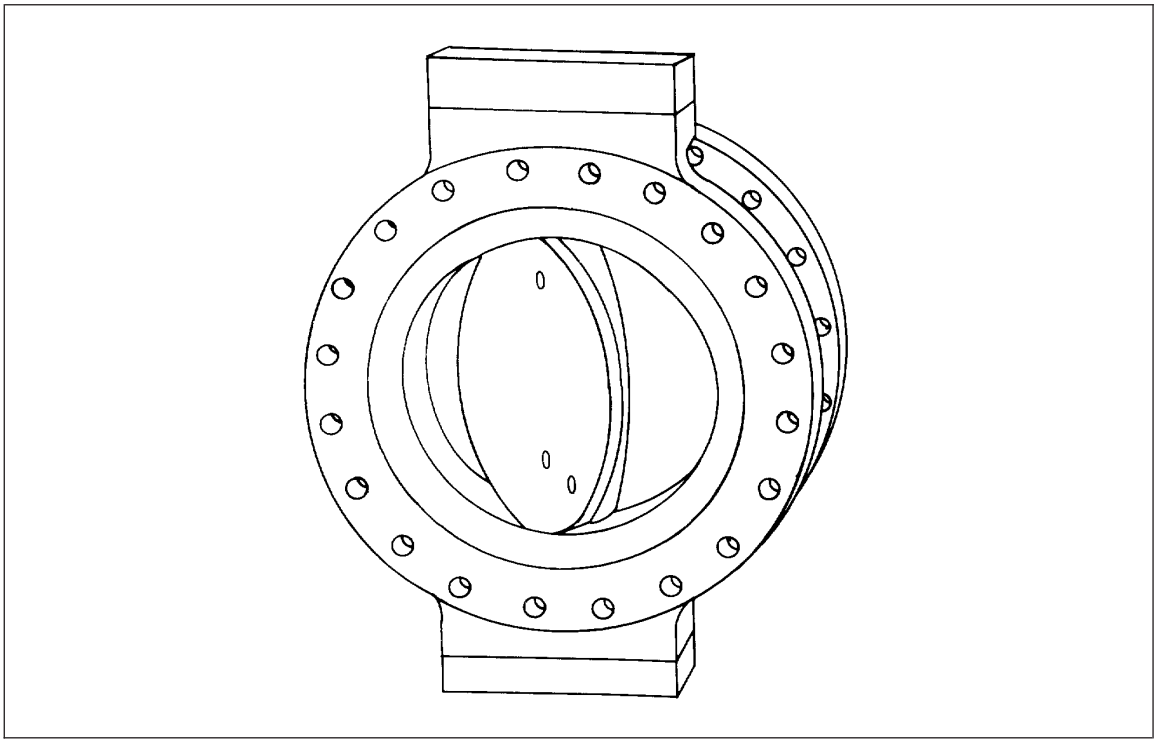


Fig. 3.1.1.6.2-2. Butterfly valve

3.1.1.6.3 Post Indicator Valve Assembly

An Approved post indicator valve (PIV) assembly (Fig. 3.1.1.6.3-1) is available only as a factory assembled unit with true open-shut orientation. The assembly consists of a buried, quarter turn valve and an above-grade indicator operator. If excessive force is applied to the handle, one of the series of successively weaker shear joints incorporated into the drive train will break so as to preserve the correct orientation between indicator and valve position. Parts are so designed that they can be assembled only one way, always to give correct indication. If the post is broken off above grade, failsafe features will keep the valve intact and a spring will hold an open valve open.

3.1.1.6.4 Indicator Posts

Indicator posts are controls that extend above ground for operating underground fire service main valves. As an important feature of their design, a target or indicator, visible through an opening in the post, indicates whether the valve is open or shut.

The indicator post consists of a cast-iron barrel, an extension flange that allows the height of the barrel to be regulated, and a wrought-iron or mild-steel stem that operates the underground valve and simultaneously moves the target (see Fig. 3.1.1.6.4-1). Indicator posts are available for installation on existing gate valves.

3.1.1.6.5 Manually Operated Valves

If a valve must be placed where an indicator post cannot be used, such as in the road, an Approved indicating butterfly valve (IBV, see Fig. 3.1.1.6.5-1) or an outside screw and yoke (OS&Y, see Fig. 3.1.1.6.5-2) may be installed in a watertight, frost-proof concrete or masonry pit.

Nonindicating type underground gate valves are generally limited to branch mains, hydrants and building lead-ins. Such valves are normally non-rising stem type and require a key wrench for operation. A curb box with cover plate at grade level provides access for the wrench to the valve stem nut (see Fig. 3.1.1.6.5-3).

All Approved PIV assemblies, IBV and OS&Y valves open counterclockwise. Currently Approved non-rising stem (NRS) gate valves for operation with key wrenches through curb boxes or with indicator posts are manufactured to open counterclockwise. A sign securely attached to the indicator post that shows the direction

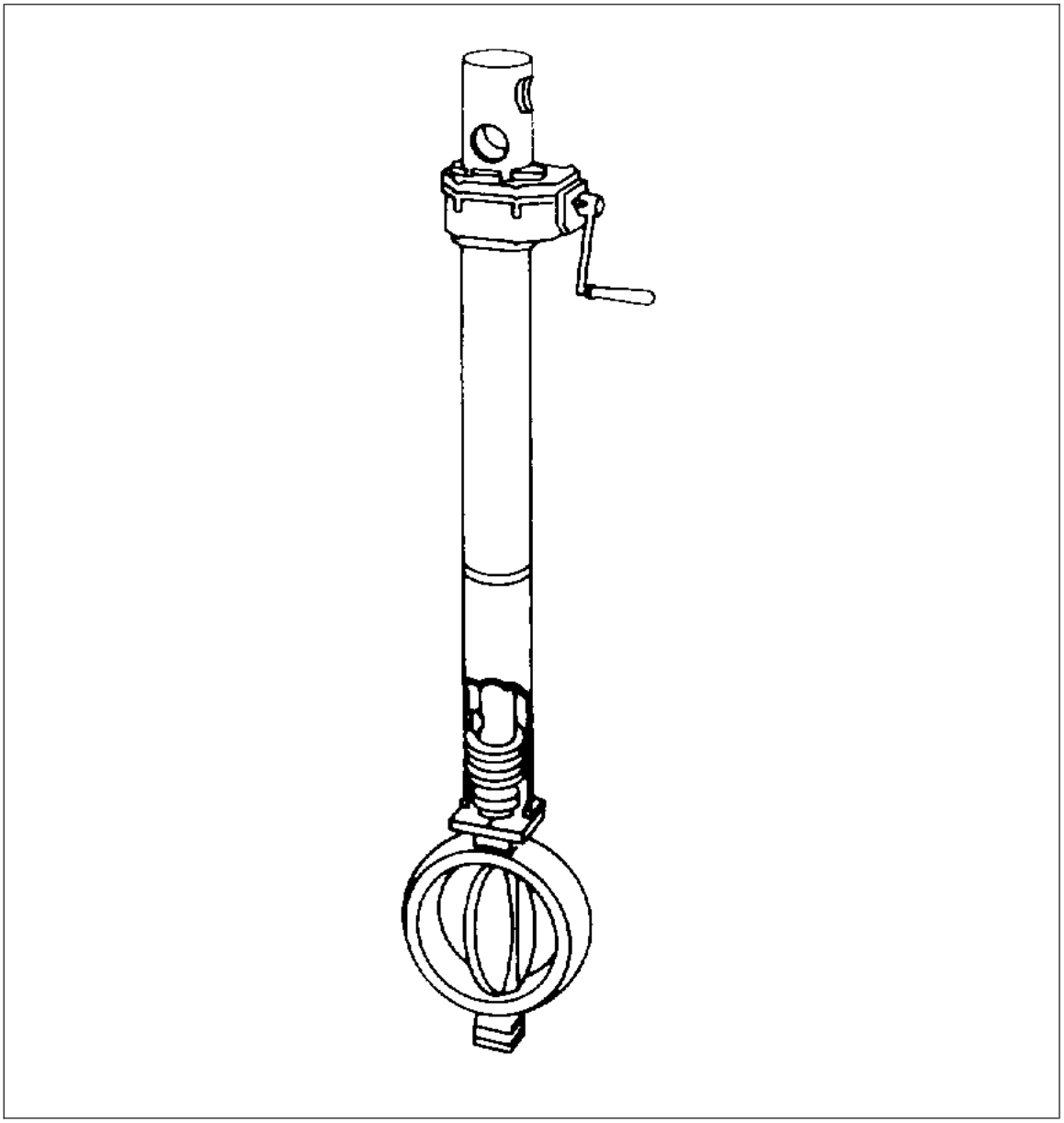


Fig. 3.1.1.6.3-1. Post indicator valve assembly

of opening is an acceptable form of identification. For curb box installations, the cover plate can be appropriately marked or a sign installed on a nearby post or building wall.

3.1.1.6.6 Tapping Valves

The use of a tapping valve allows a new connection to be made to an existing water main without shutting off the water. Tapping valves are covered in this data sheet in Section 2.3.3, *Tapping Machines.*

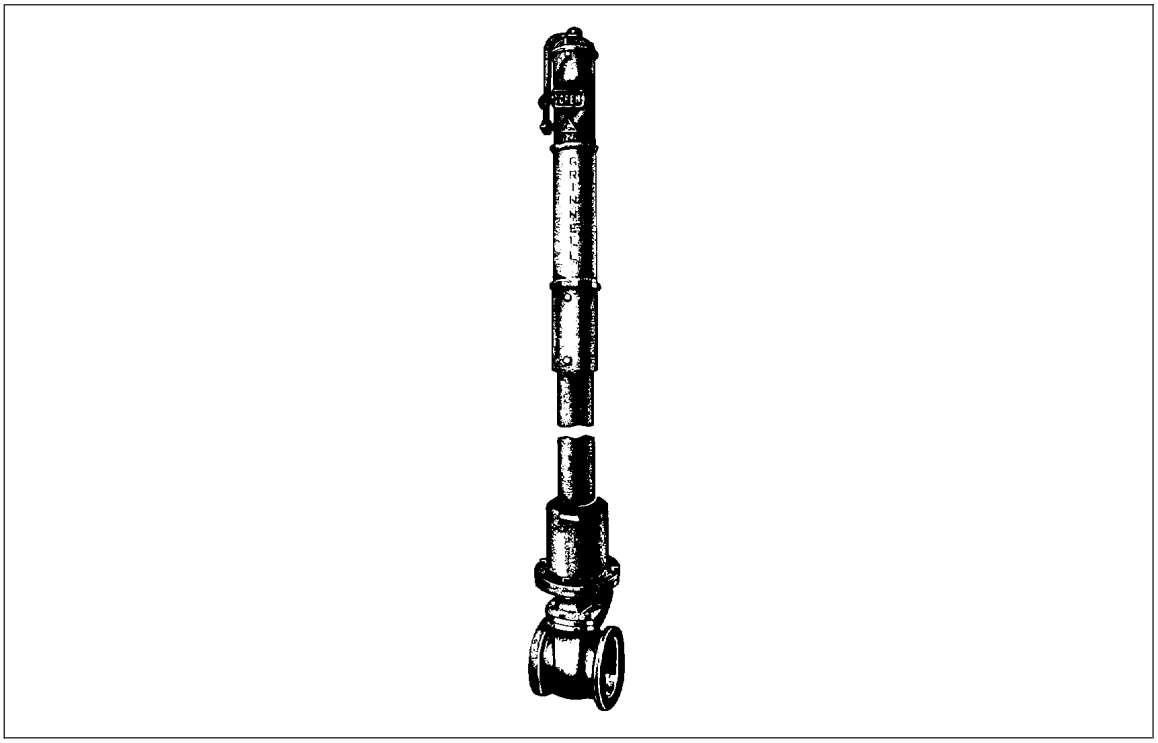


Fig. 3.1.1.6.4-1. Gate valve with indicator post

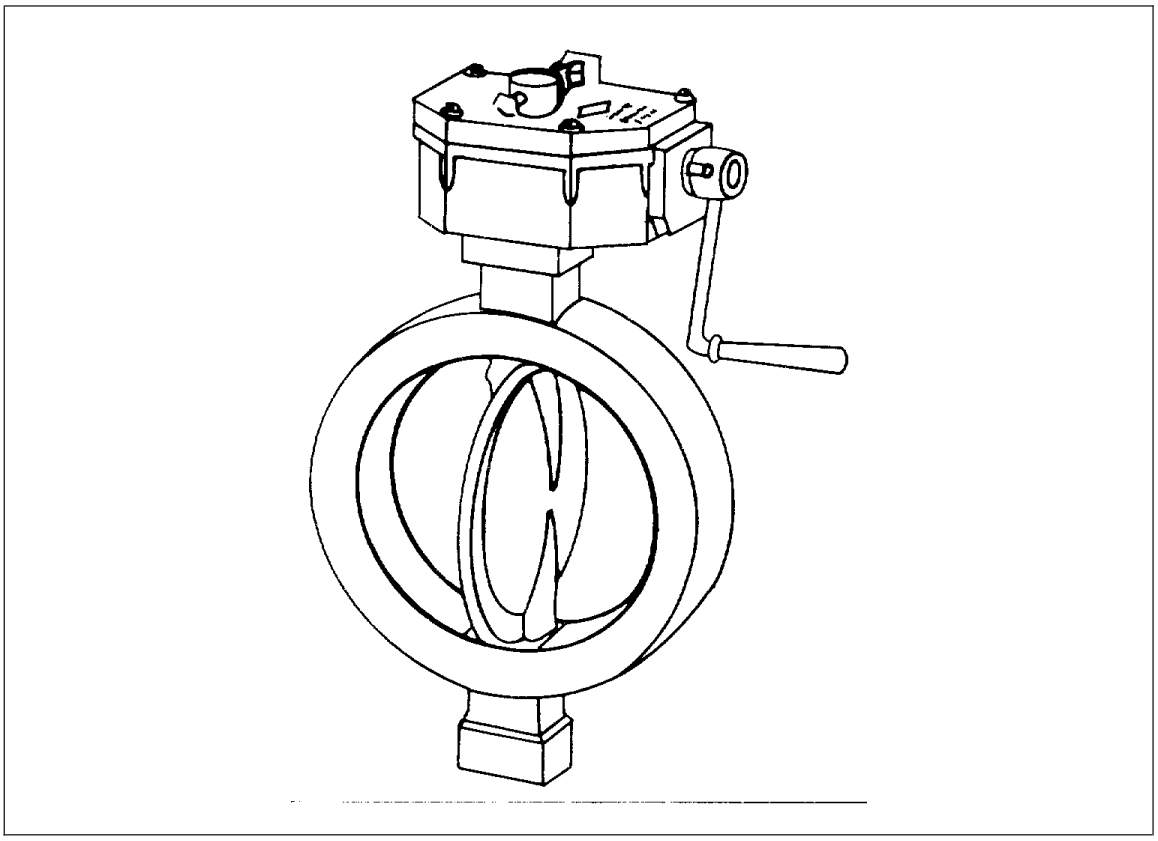


Fig. 3.1.1.6.5-1. Indicating butterfly valve

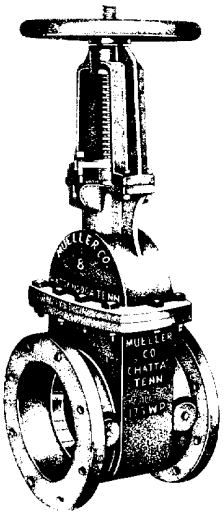


Fig. 3.1.1.6.5-2. Outside screw and yoke gate valve

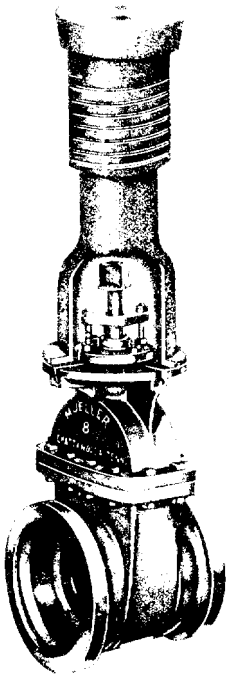


Fig. 3.1.1.6.5-3. Curb box with cover plate at grade level

3.1.1.6.7 Hydrants

Types

Dry-barrel hydrants (see Fig. 3.1.1.6.7-1) are used in areas where freezing temperatures are experienced. Water is admitted into the barrel only when the hydrant valve is opened. To prevent the water that remains in the barrel from freezing after the hydrant is closed, a small drain hole opens as the hydrant valve is closed. ‘‘Traffic’’ model hydrants are available incorporating sections of intentional weakness at ground level so that if struck by a vehicle, the hydrant will break off above ground level without the hydrant valve opening. The most common kind of dry-barrel hydrant is the compression type (see Fig. 3.1.1.6.7-1).

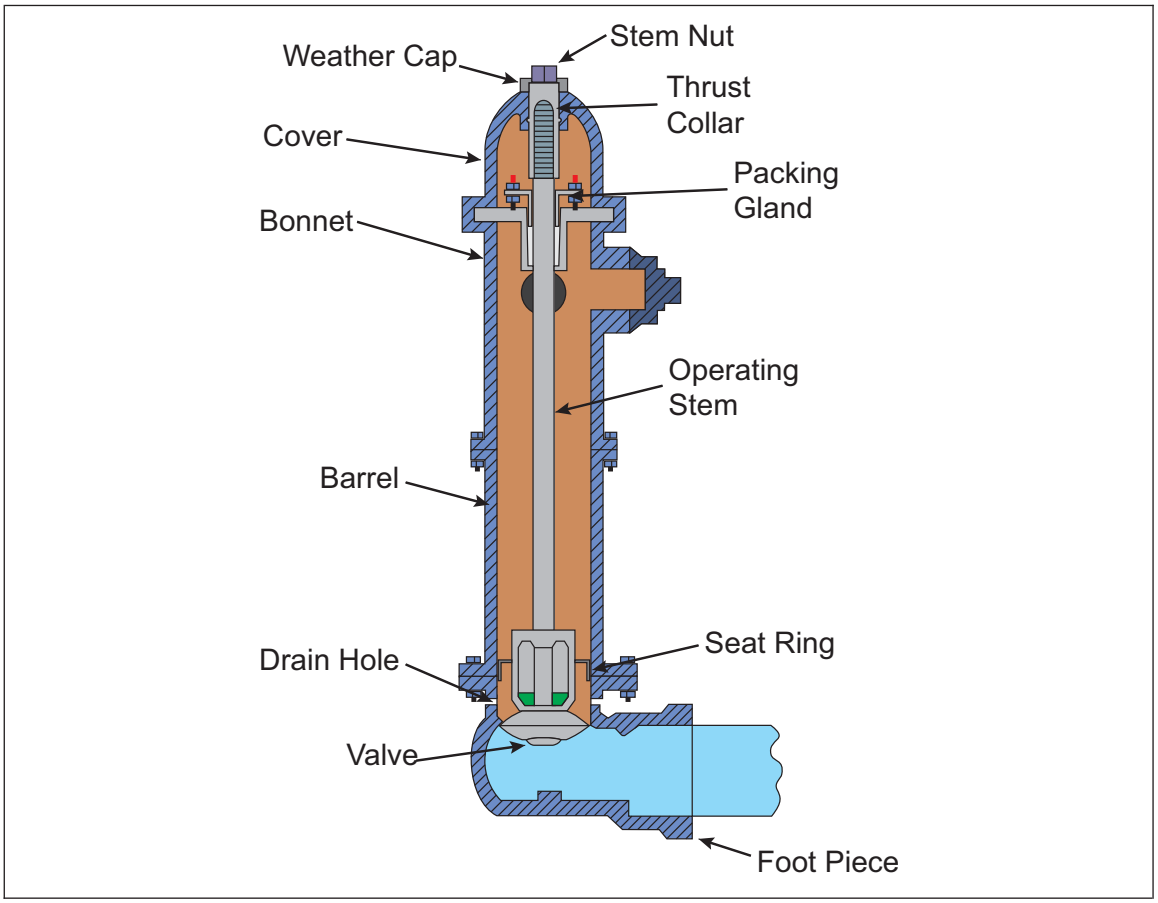


Fig. 3.1.1.6.7-1. Dry barrel hydrant

Wet-barrel hydrants (see Fig. 3.1.1.6.7-2) are used in areas where the temperature remains above freezing. They usually have a compression valve at each outlet, but may have one such valve in the bonnet that controls the flow of water to all outlets.

Approved hydrants have either two or three hose outlets. Installations of hydrants having pumper-suction outlets in private fire protection systems may cause water supply deficiencies. The draft created by pumpers connected to pumper-suction outlets of a hydrant could deplete the water supply to sprinklers.

Uses

Hydrants are used to supply water for manual fire fighting. Outdoor hazards for which hose stream protection is especially needed include storage of combustible materials and equipment, freight cars and loading platforms and aboveground ignitable liquid tanks. Hose streams from hydrants or hose connections on the roof are needed to protect combustible roof structures and equipment such as cooling towers, oil-filled transformer installations, and large areas of smooth-surfaced roof coverings. For unsprinklered buildings, hose streams are usually the main defense against fire.

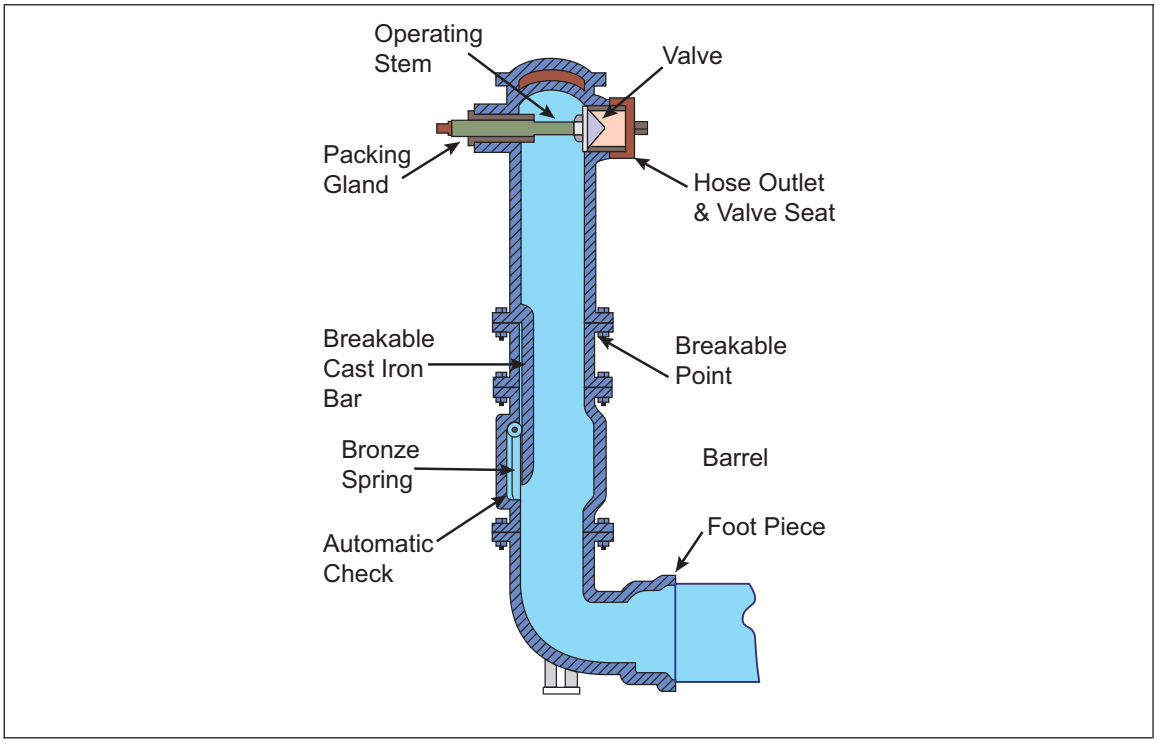


Fig. 3.1.1.6.7-2. Wet barrel hydrant

In sprinklered buildings, occupancies such as those described below need hose streams from hydrants as supplementary protection.

1. *Warehouses and storage areas in manufacturing buildings.* Storages of high piled combustible material and those where smoldering or burrowing fires are persistent, particularly need supplementary protection since reignition is possible after sprinklers are shut off.

2. *Ignitable liquid occupancies.* Hose stream protection is needed to cool exposed, ignitable liquid tanks and their supports, and for use with portable foam generators.

3. *Loading docks.* Hose stream protection is needed to control a fire in a railroad car or trailer that is shielded from sprinkler discharge.

Location

Sufficient public or private hydrants are installed to provide an adequate number of readily available hose streams, as recommended by other FM Global Data Sheets, at any point in the property where fire may occur outdoors. For the protection of buildings and contents, hydrants are located near access openings and at points between, if necessary. This type of installation may result in uneven, though adequate, spacing of hydrants.

3.1.2 Fire Service Mains

3.1.2.1 General

Underground pipe and fittings for fire service mains must be suitable for the working pressures and the conditions under which they are to be installed. The pipe and fittings must be able to withstand the severe conditions that may be imposed by fire pump operation, pressure surges, the use of hose streams or operation of automatic deluge or water spray sprinkler systems.

Low residual pressures, including the vacuum conditions that could realistically exist, will not cause acceptable pipe to collapse or crack. Cast-iron, ductile-iron and asbestos-cement pipe have been tested where the

external pressure was raised to 25 psi absolute (172 kPa absolute, 1.7 bar absolute) while the internal pressure was lowered to between 0.2 and 1.0 psi absolute (1.4 and 6.9 kPa absolute). There were no adverse effects on the pipe.

Acceptance of pipe, joints and fittings that are not Approved is based on satisfactory experience and conformity to specifications of recognized engineering bodies.

3.1.2.2 Types of Material

Note: The majority of iron pipe manufactured today is ductile iron. For purposes of this data sheet the term cast-iron refers to cast-gray iron; ductile-iron refers to cast-ductile iron.

3.1.2.2.1 Cast Iron

Cast iron made in accordance with ANSI/AWWA C106/A21.6 or C108/A21.8 (withdrawn in 1982 and 1979 respectively) or equivalent is acceptable. These specification standards give data on pipe sizes, weights, working pressures and thickness classes for various laying conditions. In these specifications the pipe class (150, 200, 250, etc.) represents the maximum working pressure expressed in psi. Select pipe thickness class (wall thickness) on the basis of maximum working pressure and laying condition as described in ANSI/AWWA C101/A21.1 (withdrawn in 1982). The thickness classes are numbered 22 through 28 for pipes up to 12 in. (300 mm nominal) diameter.

Use lined pipe for all new or replacement installations to offset the corrosive action of water. Portland cement is extensively used for lining pipe today. Cement-mortar linings are covered in ANSI A21.4 (AWWA C104). Coal-tar enamel linings are also available but less common.

Select fittings for use with cast-iron pipe that conform to ANSI A21.10 (AWWA C110). Also select fittings appropriate for the same range of working pressures as the pipe with which they are to be used.

Joints may be of several types, including push-on, standardized mechanical and poured-lead bell and spigot. The last type is now rarely used. Special forms of push-on and standardized mechanical joints are Approved. These joints are essentially bell and spigot, and depend on friction between parts and the surrounding earth fill to prevent separation.

The push-on-joint (see Fig. 3.1.2.2.1-1) is made up by seating a circular rubber gasket of special cross section in the bell and then forcing the spigot end of the pipe past the gasket to the bottom of the bell socket. No packing or caulking is required.

The standardized mechanical joint (see Fig. 3.1.2.2.1-2) consists of a single rubber gasket held firmly in place by a follower ring or gland bolted to the bell. The advantages are tightness, flexibility, speed and ease of installation. Care must be taken to assemble the joint correctly. The spigot must be lubricated and the nuts tightened uniformly according to the manufacturer's instructions. The bolts and nuts must be coated with an asphaltic material to avoid corrosion.

The bells of mechanical joint pipe usually will accommodate straight spigot ends from other cast-iron pipe having the same outside diameter; if not, sleeves and adapters may be needed to connect old and new pipe.

The poured-lead bell and spigot joint (see Fig. 3.1.2.2.1-3) is made by placing a ring of packing material in the bell, filling the joint with molten lead, and caulking the lead for tightness. It is now rarely used.

3.1.2.2.2 Ductile Iron

Ductile iron is a cast-iron material in which a major part of the carbon content (graphite) occurs as free carbon in nodular or spheroidal form instead of the flake form found in cast iron. This carbon form makes ductile-iron pipe less brittle than, and preferable to, gray-cast-iron pipe. Ductile iron has the corrosive resistance of cast iron and approaches the strength and ductility of steel.

Ductile-iron pipe made in accordance with ANSI/AWWA C151/A21.51 is acceptable for fire service use. The ANSI/AWWA specification gives data on pipe sizes, wall thicknesses, weights and working pressures for various laying conditions. Select pipe thickness class (wall thickness) on the basis of working pressure, laying condition, and depth of cover as described in ANSI/AWWA C150/A21.50. The thickness classes are numbered 51 through 56 for 3 and 4 in. (80 and 100 mm) pipe, and 50 through 56 for pipe 6 in. (150 mm) and larger. Class 50 (the thinnest available wall) is satisfactory for working pressures up to 350 psi (2412 kPa, 24 bar) for all laying conditions and depths of cover in pipe sizes 6 through 12 in. (150 through 300 mm).

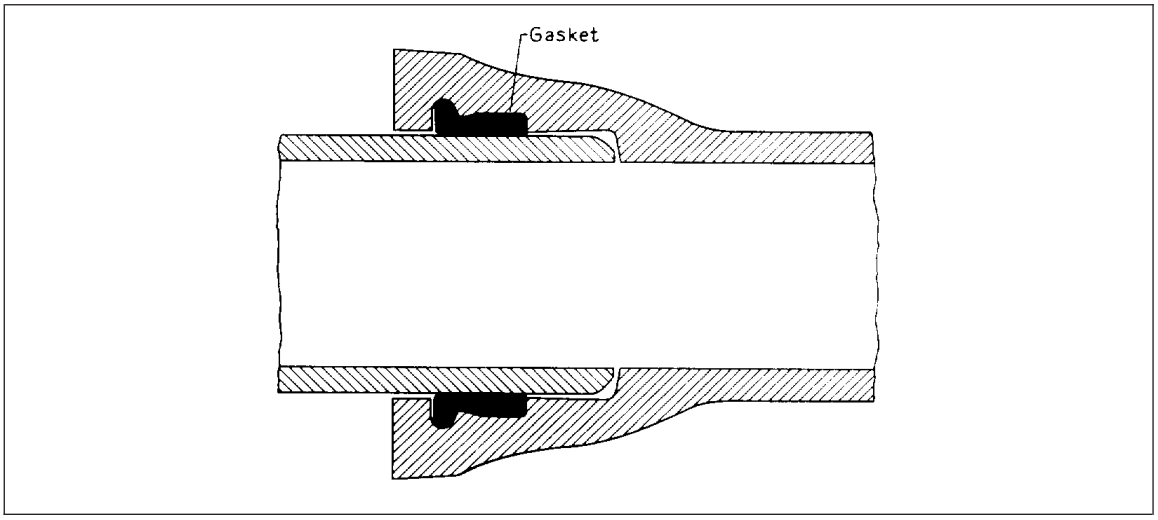


Fig. 3.1.2.2.1-1. Push-on joint

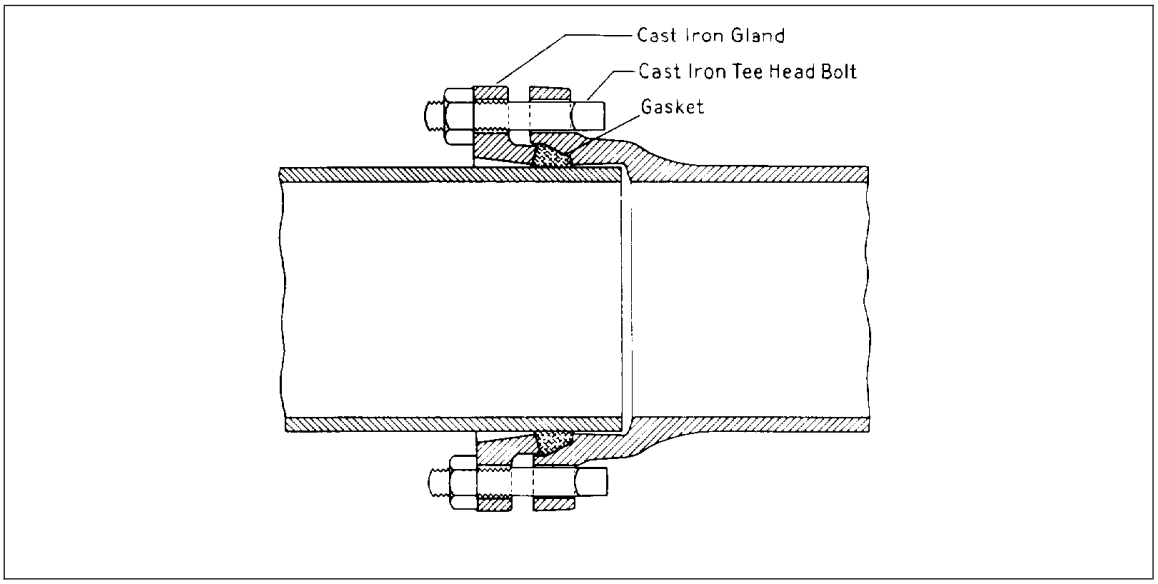


Fig. 3.1.2.2.1-2. Standardized mechanical joint

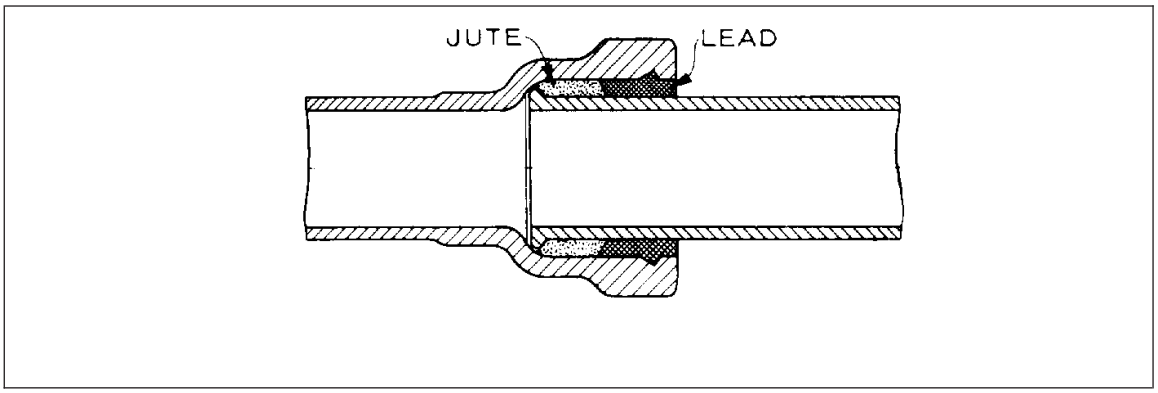


Fig. 3.1.2.2.1-3. Bell and spigot lead joint

Cast-iron or ductile-iron fittings conforming to ANSI/AWWA C110/A21.10 are used with ductile-iron pipe, which is made for use with push-on and standardized mechanical joints.

As with iron pipe, select lined pipe for all new or replacement installations to offset the corrosive action of water. Portland cement is extensively used for lining pipe today. Cement-mortar linings are covered in ANSI/AWWA C104/A21.4. Coal-tar enamel linings are also available but less common.

3.1.2.2.3 Steel

Steel pipe manufactured in accordance with ANSI/AWWA C200 is acceptable for fire service use.

Because of its high strength, steel pipe is particularly suitable for use where it may be exposed to earthquake shock, or to the impact from vehicle loads on railroad tracks, highways and similar locations. Its greater strength is also advantageous in unstable soil or on steep slopes.

Steel pipe for use as buried pipe is lined and coated for corrosion protection. Protective coal-tar enamel and cement-mortar coatings and linings should conform to ANSI/AWWA C203 or C205 respectively. Pipe so protected is available directly from the mill; except for repair, coatings that may be applied in the field are practical only on large jobs. Paint or otherwise protect exposed steel piping, as in pits, against atmospheric conditions.

Steel pipe may be joined by welding, threaded joints or Approved flexible couplings for use with grooved or plain pipe ends. Repair damaged linings and coatings. Do not field weld steel pipe having coal-tar enamel lining, because resulting damage to the lining cannot be effectively repaired. Welding should conform to ANSI/AWWA C206. Suitable precautions against fire are essential when welding in tunnels. Expansion joints may be needed in long tunnels. Hangers and supports should conform to the recommendations of Data Sheet 2-0, *Installation Guidelines for Automatic Sprinklers*.

3.1.2.2.4 Asbestos Cement

Asbestos-cement pipe made in accordance with AWWA C400 is acceptable for fire service use. Classes 150 and 200 pipe are used when the maximum working pressures do not exceed 150 and 200 psi (1034 kPa, 10.4 bar and 1378 kPa, 13.8 bar), respectively. AWWA C400 does not cover pipe in classes higher than 200.

Asbestos-cement pipe is composed of a mixture of asbestos fibers and cement. It is particularly well adapted for locations where ferrous pipes, without special protective linings or coverings, would be obstructed or weakened by actively corrosive waters, soil conditions or electrolysis. Where asbestos-cement pipe must be buried in highly acid or alkaline soils, the pipe manufacturer should be consulted as to its suitability. Occasionally coatings can be provided that will protect the pipe from soil conditions.

Joints for asbestos-cement pipe are of the push-on type, and are Approved. The usual joint is a cement asbestos sleeve into which a specially shaped rubber gasket is inserted in a circumferential groove near each end of the sleeve. When making the joint, the tapered ends of the pipe are forced into the sleeve, compressing the rubber gaskets to make a tight joint. Another method of joining is to use an asbestos-cement sleeve, which is forced over roll-on rubber gaskets so arranged that the gaskets, in their final position, are properly located on each side of the joint to form a watertight connection (see Fig. 3.1.2.2.4-1.).

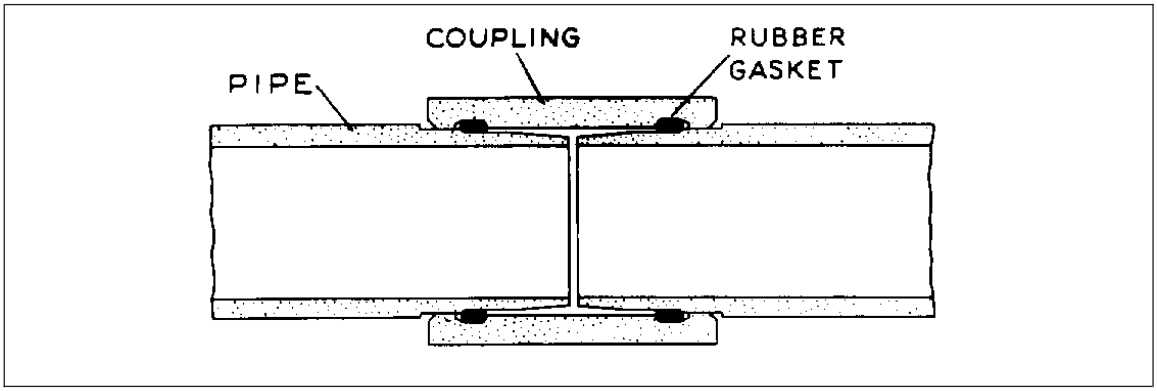


Fig. 3.1.2.2.4-1. Coupling for asbestos cement pipe

Fittings other than couplings are cast iron. Anchorage is by thrust blocks.

3.1.2.2.5 Plastic

When using plastic pipe and fittings for fire service, select Approved products. Use the Approved pipe within the limits of its Approval, and according to the manufacturer's installation instruction. Where plastic pipe may be exposed to a damaging chemical environment, consult the manufacturer. For example, pipe may be exposed to chemical attack as a result of an oil spill on the ground surface above.

Approved plastic pipe is available in various types of material, including polyethylene, polyvinyl chloride and glass fiber-reinforced plastic. All are lightweight and corrosion resistant. Thrust blocks are used for anchorage.

3.1.2.2.6 Polyethylene

Polyethylene pipe exhibits a typical elastic behavior to short-term stress, and its resistance to these stresses is extremely high. It has been successfully used in installations such as river, lake and salt water crossings as well as for underground service mains. Polyethylene pipe is generally chemically inert and is only attacked by certain very strong chemicals. Water does not corrode polyethylene pipe so that the Hazen-Williams flow coefficient, "C", remains practically constant throughout the life of the pipe.

Joints are made by the butt fusion process. The process is based on temperature-induced changes in the crystalline structure of polyethylene. At normal ambient temperatures and elevated temperatures to 200°F (93°C) the crystalline structure of polyethylene is readily recognizable on microscopic examination. As the temperature increases above 200°F (93°C), the structure becomes less distinct, and at 260°F (127°C), it disappears entirely. This point is usually referred to as the crystalline melting point. In the butt fusion process the pipe ends are trimmed and heated to a temperature above the crystalline melting point. The butt ends are brought together under pressure and the material flows and mixes. As the material cools below the crystalline melting point, crystals form across the joining plane, essentially reforming the original material structure (see Figs. 3.1.2.2.6-1 and 3.1.2.2.6-2).

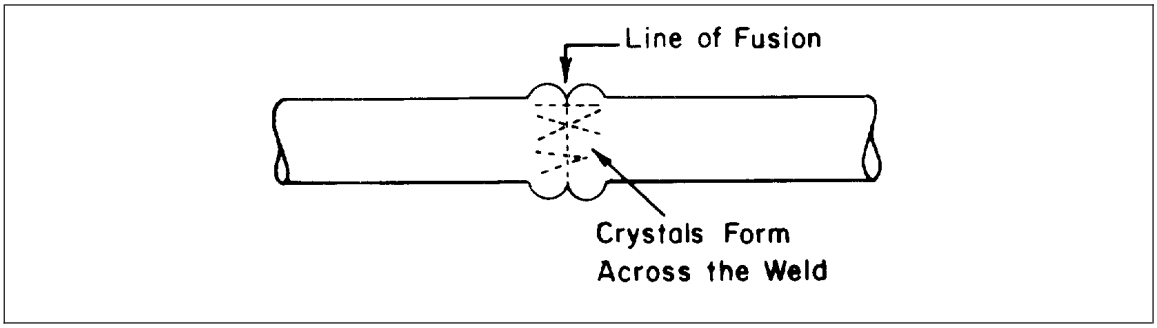


Fig. 3.1.2.2.6-1. Butt fusion joint

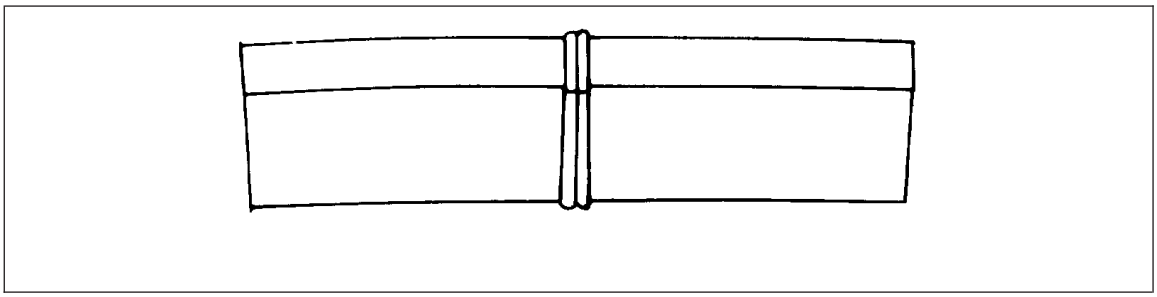


Fig. 3.1.2.2.6-2. Section of polyethylene pipe wall joined by butt fusion

To ensure mixing at the line of fusion, the viscosity of the two pieces must be the same, otherwise, the materials tend to flow at different rates under pressure, with the risk that the plane will not fuse. For this reason, join by fusion only polyethylene materials of the same kind.

Polyethylene pipe may be connected to flanged, cast iron fittings or components with metal flanges. Polyethylene stub ends that are compatible with the metal flanged components are joined to the pipe by the butt fusion process (see Fig. 3.1.2.2.6-3).

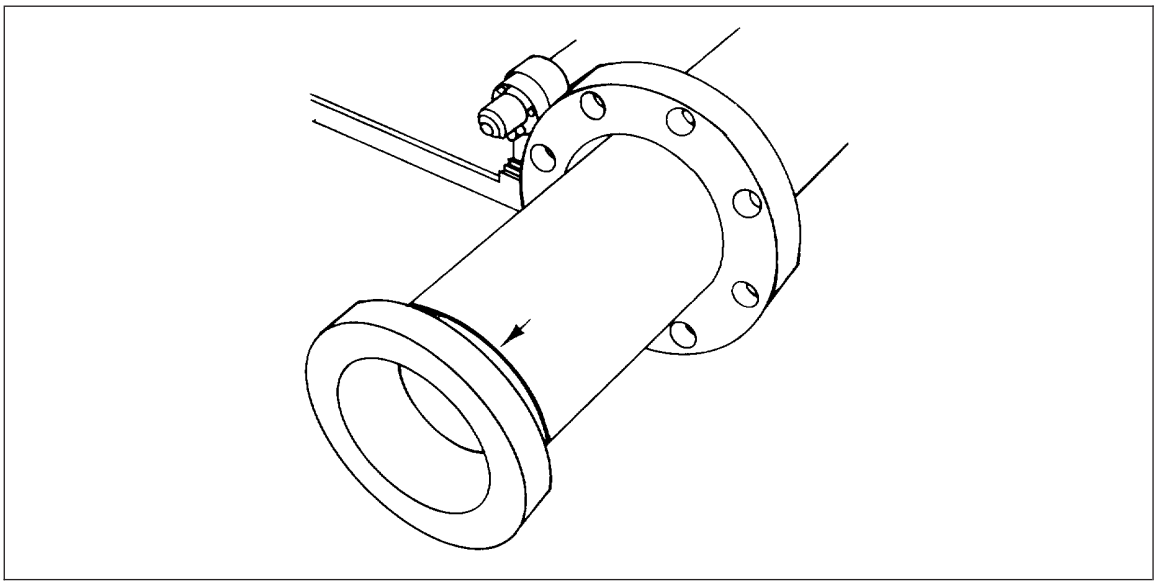


Fig. 3.1.2.2.6-3. Stub end butt fused to polyethylene pipe. Note joining point

3.1.2.2.7 Polyvinyl Chloride (PVC)

Polyvinyl chloride pipe is immune to nearly all types of chemical and electrochemical corrosion that may be experienced in underground piping systems. Since PVC is a nonconductor, galvanic and electrochemical effects may not affect PVC piping systems. Do not use PVC pipe in areas subject to constant spillage of aromatic hydrocarbons.

Some Approved PVC pipe has an integral bell on one end and a spigot on the other end. Thus the typical coupling is by a push-on, bell and spigot joint with a steel band-reinforced elastomeric gasket (see Fig. 3.1.2.2.7-1). Other Approved PVC pipe has plain ends, and is joined by a twin-gasketed coupling.

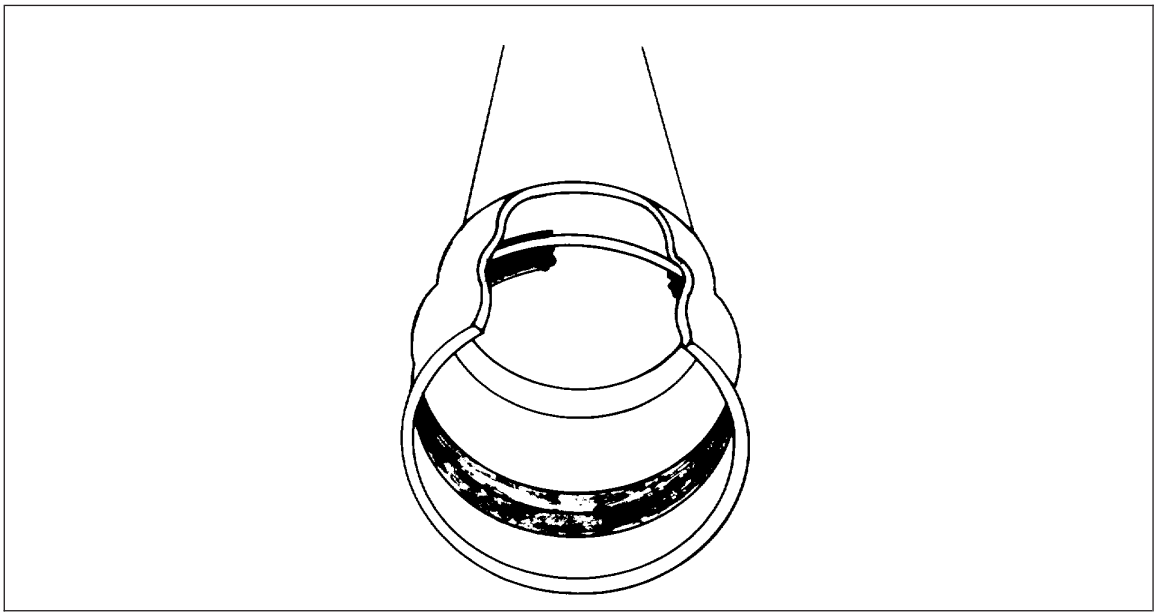


Fig. 3.1.2.2.7-1. PVC pipe end with integral bell and steel-band-reinforced elastomeric gasket

Approved PVC pipe is manufactured with cast iron outside diameter dimensions, and may be joined to standard cast iron belled fittings or other fittings by Approved devices or standardized mechanical joints.

3.1.2.2.8 Glass Fiber-Reinforced Composite

Glass fiber-reinforced composite pipe is immune to most corrosive soils and ground water. Approved pipe is manufactured in various configurations of glass fiber-reinforced composites. Joints are formed by couplings and adhesive, integral flanges, or mechanical couplings (see Fig. 3.1.2.2.8-1). Pipe is joined to cast iron fittings using transition gaskets and Approved devices or standardized mechanical joints (see Fig. 3.1.2.2.8-2). Approved glass fiber-reinforced plastic fittings are available.

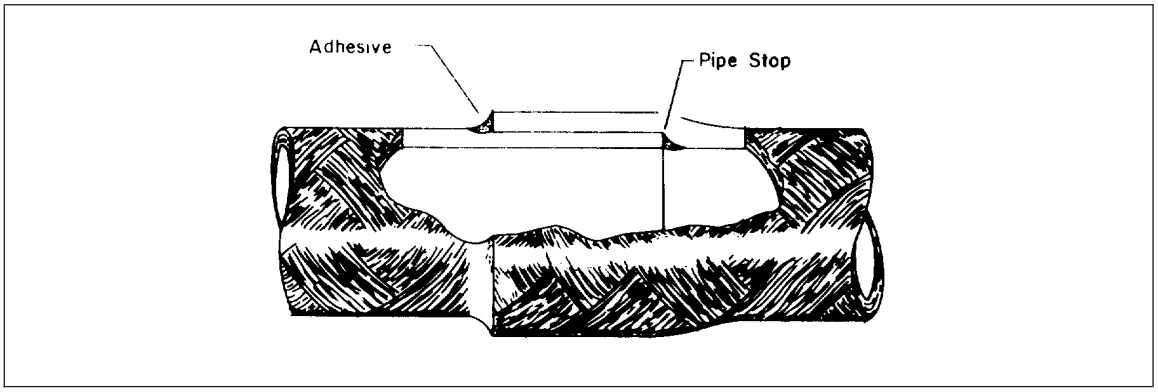


Fig. 3.1.2.2.8-1. Glass fiber-reinforced composite pipe joint formed by integral flanges and adhesive

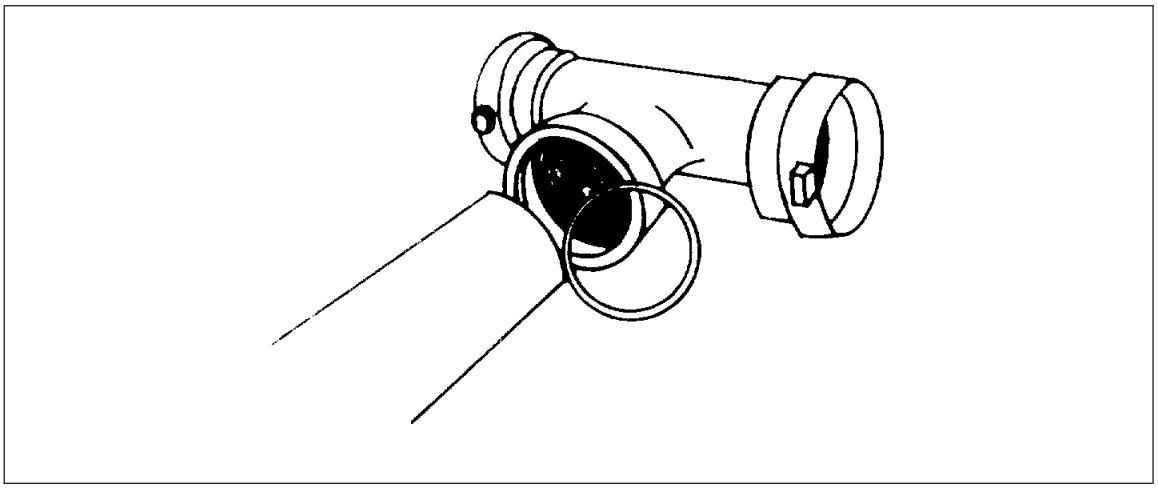


Fig. 3.1.2.2.8-2. Glass fiber-reinforced composite pipe, cast iron fitting and transition gasket

3.1.3 Connections From Water Supplies

3.1.3.1 Size

Connections from water supplies are sized to restrict velocities to less than 20 ft/sec (6.1 m/sec) to prevent damage to fittings and valves. Friction loss at anticipated rates of flow can be minimized by properly sizing the pipe.

3.1.3.2 Arrangement

Figure 3.1.3.2-1 shows some acceptable arrangements of manually operated control and check valves in connections from various water supplies to fire service mains.

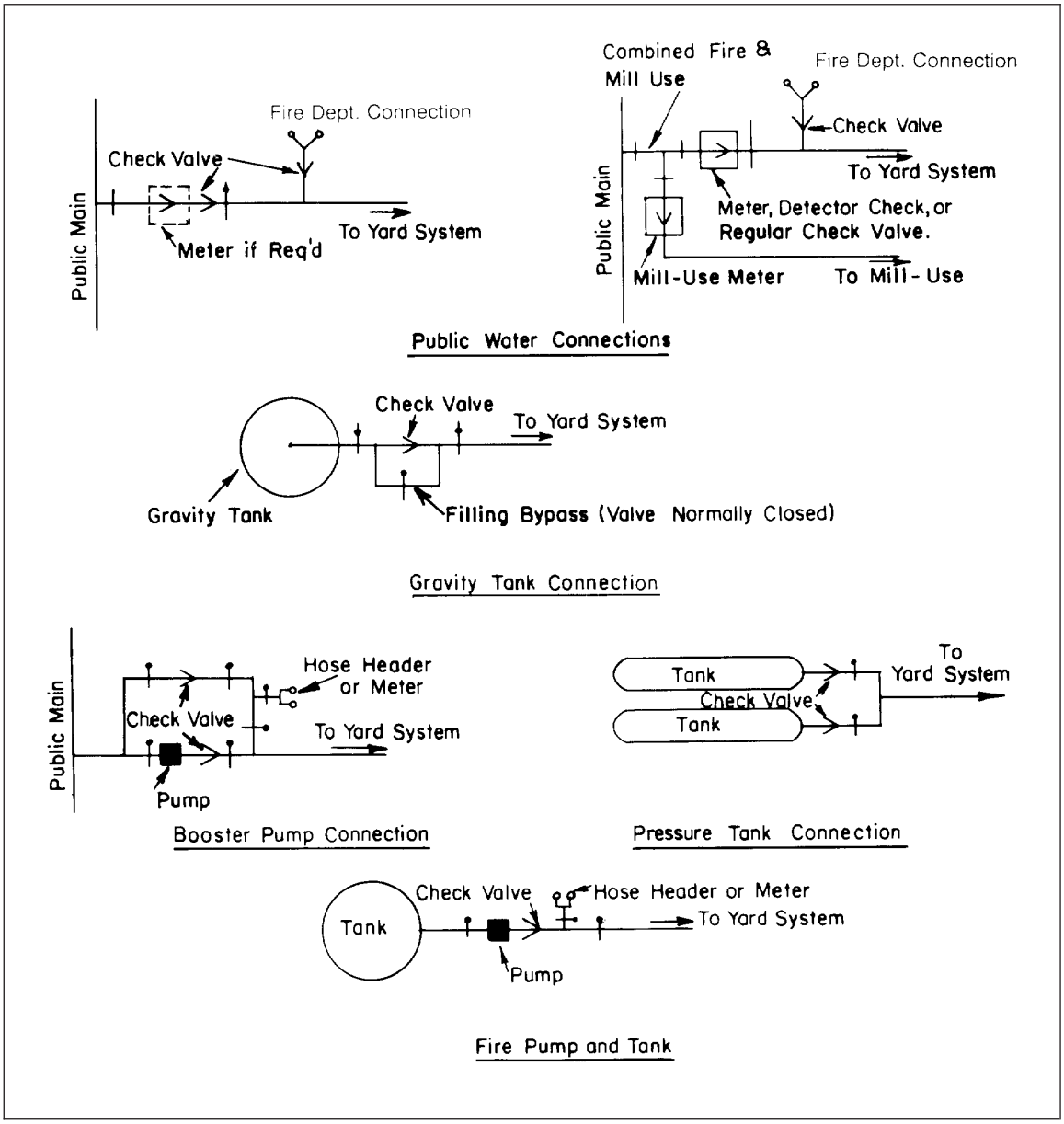


Fig. 3.1.3.2-1. Connections from water supplies

3.1.3.3 Cross Connections

The public health authority determines the acceptability of cross connections. Data Sheet 3-3, *Cross Connections,* details cross-connection control, achieved by backflow prevention devices or by air gaps. The devices required by health authorities can have high head loss.

3.1.4 Arrangement and Location of Fire Service Mains

3.1.4.1 Arrangement

Private fire service mains are arranged so as to minimize, insofar as practical, impairments (loss of protection) in the event the mains or their appurtenances are damaged, or in cases of system shutdown for other reasons. Such damage can include main breaks and leaks, dropped valve gates and damaged valves and hydrants.

The layout of plants varies widely, making it impossible to establish firm rules concerning the arrangement of fire service mains and divisional valves. Judgment is applied to achieve economic but effective arrangements. Underground mains are costly to install, thus making every effort to avoid unnecessary installations is advised. Consider the following items when planning new installations.

1. Rarely is it practical to arrange the mains and division valves so that impairments have little or no effect on the fire protection system. For example, a virtually impairment-free (but impractical) system is shown in Figure 3.1.4.1-1.

The two-riser installation shown in Figure 3.1.4.1-1 is impractical because it requires seven valves in addition to the city gate valve, and an extent of underground main, the cost of which is out of proportion to maximum foreseeable fire loss, with all protection out of service. A more practical arrangement is shown in Figure 3.1.4.1-2.

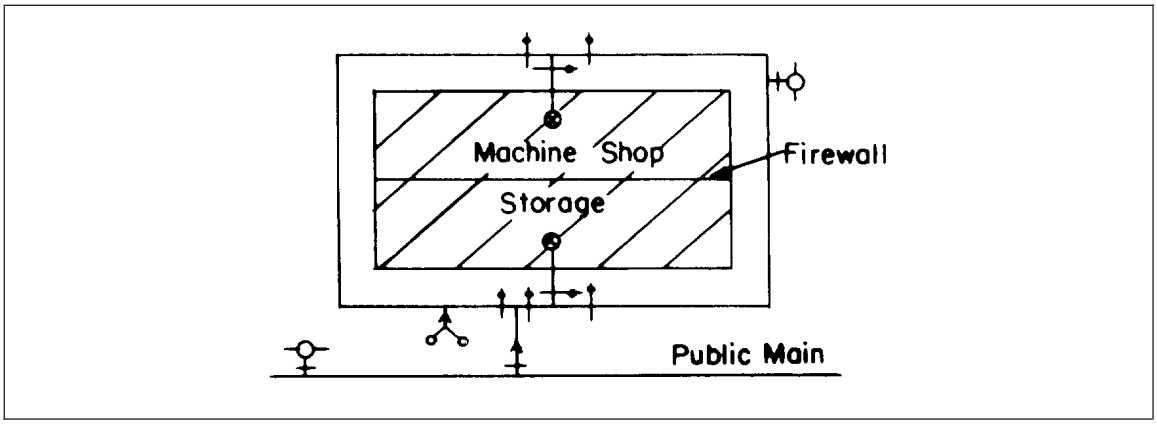


Fig. 3.1.4.1-1. Impairment-free (but impractical) underground system

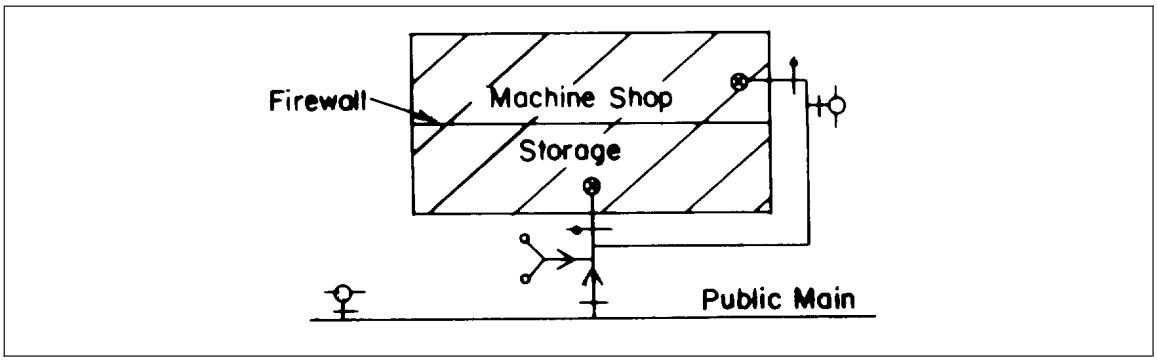


Fig. 3.1.4.1-2. Practical underground system

One-quarter as much underground piping and only two valves are needed. Clearly this system is not as responsive to impairments but with only one-quarter as much underground piping, the exposure to impairments is greatly diminished.

2. Rarely is an underground main necessary solely to supply hydrants. In a case without underground mains in the vicinity of needed hydrants, wall hydrants fed from indoor sprinkler system piping can provide acceptable alternative sources of hose stream supply.

One exception to this is the single-building plant where the hydrants are used to supply water for fighting fires indoors. A wall hydrant cannot be relied upon to be in service for use with hose streams on a fire inside the building, since there is too great a chance that the sprinkler system and therefore the water supply to the wall hydrant will be shut off at a critical moment. Hydrants fed from underground mains may therefore be necessary.

A second exception is where hydrant protection is necessary for yard storage remote from buildings. In this case an underground main system used solely to supply the yard hydrants may be necessary.

3. Where multiple water sources are provided, it is not necessary that they all remain in service in the event of an impairment. Only those (or that one) necessary to meet the total water demand need be available.

4. Where loops are provided so that multiple paths are available for water flow to a single point, the mains forming the legs of the loop need to be sized only to carry that portion of the flow occurring under no-impairment conditions. Where the hazard is such that a deluge system is provided, it may be advisable to size the legs of the loop to carry the total water flow.

5. Arrange systems involving multiple water sources so that an underground main impairment is unlikely to impair all sources (see Fig. 3.1.4.1-3).

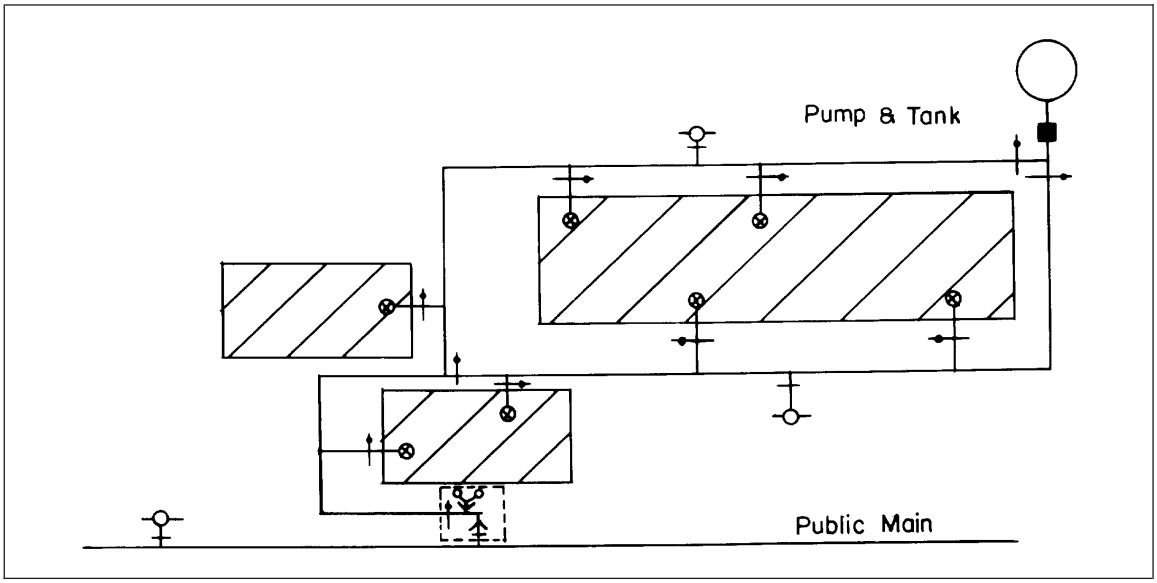


Fig. 3.1.4.1-3. Acceptable arrangement of multiple water sources

6. Manifolded riser arrangements, though generally undesirable (see Data Sheet 2-8N), decrease the need for looped mains (see Figs. 3.1.4.1-4. and 3.1.4.1-5).

In Figure 3.1.4.1-4 a manifolded riser arrangement has been used, and a loop around Building ‘‘A’’ would serve little purpose. In Figure 3.1.4.1-5 the risers are more widely distributed, and the loop around building ‘‘A,’’ in addition to judiciously placed divisional valves, allows for some flexibility.

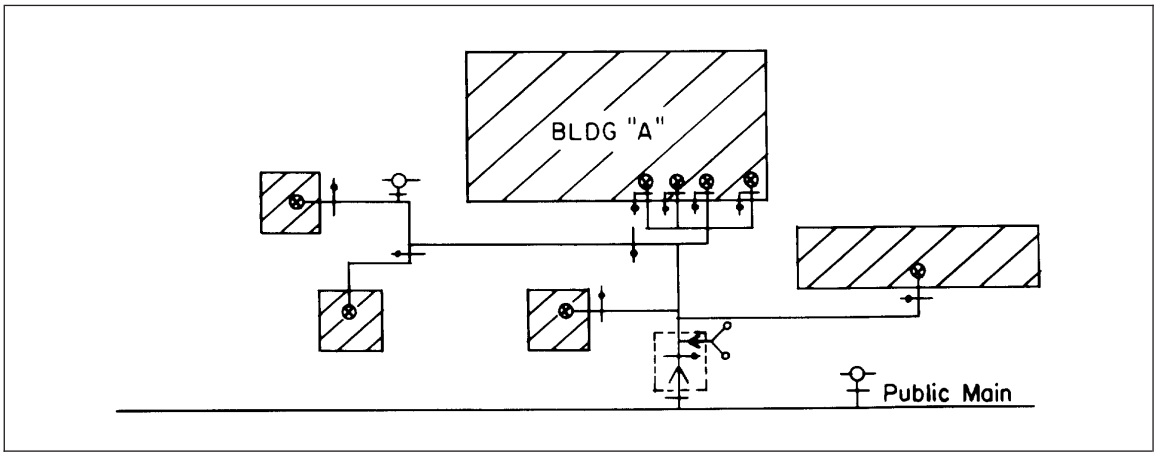


Fig. 3.1.4.1-4. System with manifolded riser arrangement

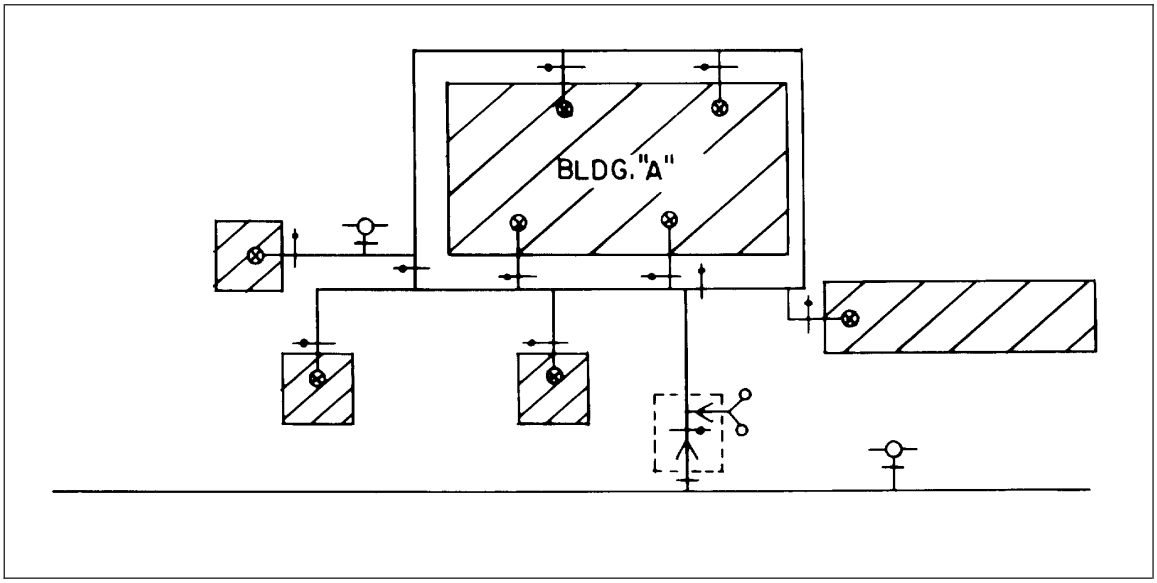


Fig. 3.1.4.1-5. System with looped main substituted for manifolded riser arrangement of Figure 3.1.4.1-4

7. Where looped mains are present, divisional valves are provided so that sections of the loop may be isolated. The maximum number of risers to be impaired simultaneously depends on the values exposed to loss by the impairment, the possibility of temporary water supply connections to the impaired risers from in-service hydrants or other sources, the expected frequency of fires (this may be deduced from the occupancy), and the ease with which the area may be patrolled. As an example of the latter, a large, open building with a mezzanine at one end from which the entire building may be surveyed is easier to patrol than several widely separated smaller buildings.

As a general guideline, limit to about six the number of risers served by one divisional valve. Base the identification of needed valves on the combination of the above guideline and good judgment. If 13 risers are served by two divisional valves, an additional valve is not needed unless judged necessary after careful consideration.

8. Large, multi-riser, multi-source, multi-building plants usually benefit from looped main arrangements. In such plants, extensive main installations are usually necessary, so that completing loops does not add significantly to the cost.

9. Looped main arrangements can be economically advantageous, especially in the case of large buildings. The cost of several long runs of feed main indoors may exceed the cost of providing a looped main to directly feed the risers on the far side of the building (see Fig. 3.1.4.1-6).

10. A major factor in the installation of underground mains is the cost of excavation. This is influenced largely by the ground conditions. Rock formations that require blasting escalate cost, while clay soils, which do not even require shoring, may be more economically excavated.

3.1.4.2 Location

Underground breaks have occurred where the main ran beneath the floor. Floor settlement is a major factor in the breaks. Repair of main breaks below the floor can be a lengthy and costly procedure. In addition, the break can cause much damage, both to the structure (by washouts) and to the building contents.

3.1.5 Pipe Installation

3.1.5.1 Trenching and Laying

Installation of ductile-iron piping is in accordance with ANSI/AWWA C600 and asbestos cement pipe is in accordance with ANSI/AWWA C603. These AWWA standards were written for water utility piping, but the same principles and procedures apply to fire service mains.

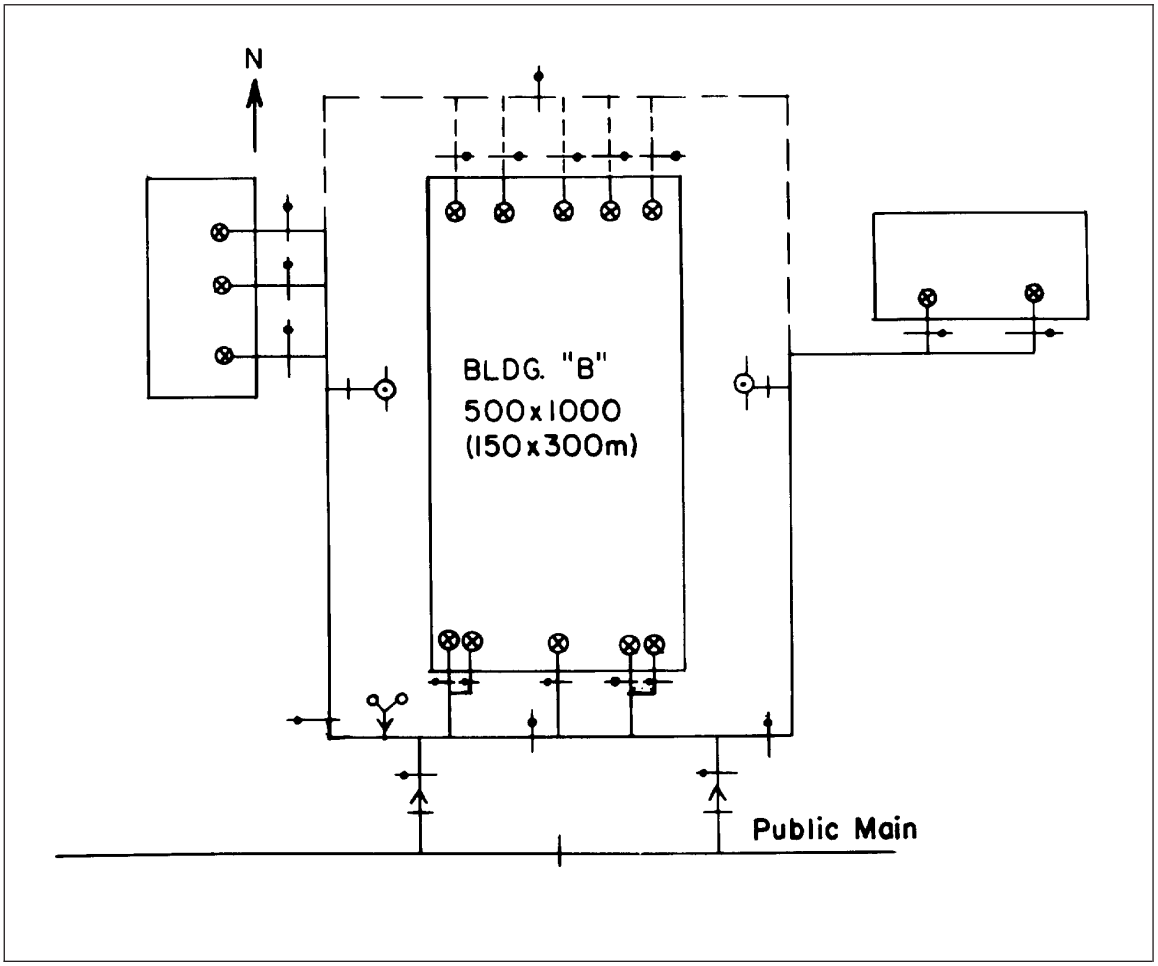


Fig. 3.1.4.1-6. System where completion of underground main loop avoids long runs of indoor feed mains

Figures 3.1.5.1-1 and 3.1.5.1-2 show the pipe laying conditions for ductile-iron and asbestos-cement pipe, respectively.

Bell holes are provided in the trench bottom to allow joint assembly, and to ensure that the pipe barrel will lie flat on the trench bottom.

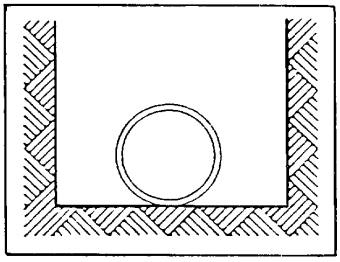
Except for bell holes and coupling holes, a level trench bottom is maintained so that the pipe is supported along its full length.

3.1.5.2 Protection Against External Corrosion

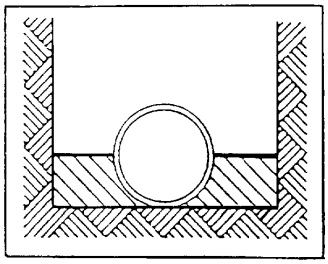
Metallic salts, acids or other substances in the soil combine with moisture, resulting in an electrochemical reaction, which causes iron ions to separate from the pipe. The mass of the metal at the pipe's surface is diminished, and it becomes pitted or corroded.

External corrosion occurs if iron or steel pipe is installed under coal piles, in cinder fill or wherever acids, alkalis, pickling liquors, etc., can penetrate the soil.

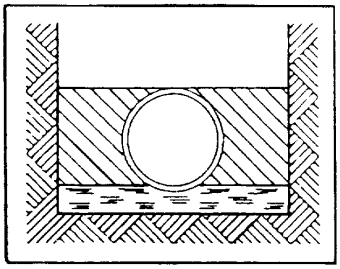
Loose polyethylene encasement used according to ANSI/AWWA C105/A21.5 affords good protection to iron pipe exposed to corrosive soil conditions. The polyethylene encasement provides a high degree of protection, and results in minimal and generally insignificant exterior surface corrosion of iron thus protected. Also, the dielectric capability of polyethylene provides shielding against stray direct current at most levels encountered in the field. Tests on polyethylene used in the protection of cast- and ductile-iron pipes have shown that after 20 years of exposure to corrosive soils, the polyethylene strength loss and elongation reduction are insignificant. The polyethylene is also highly resistant to bacteriological deterioration.



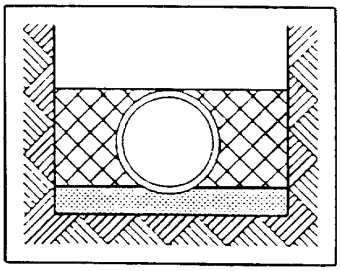
Type 1*
Flat-bottom trench.† Loose backfill.



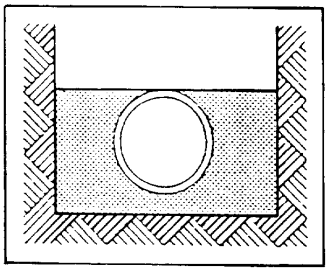
Type 2
Flat-bottom trench.† Backfill lightly consolidated to centerline of pipe.



Type 3
Pipe bedded in 4 in. (100 mm) minimum of loose soil.‡
Backfill lightly consolidated to top of pipe



Type 4
Pipe bedded in sand, gravel, or crushed stone to depth of ⅛ pipe diameter, 4 in. (100 mm) minimum. Backfill compacted to top of pipe.



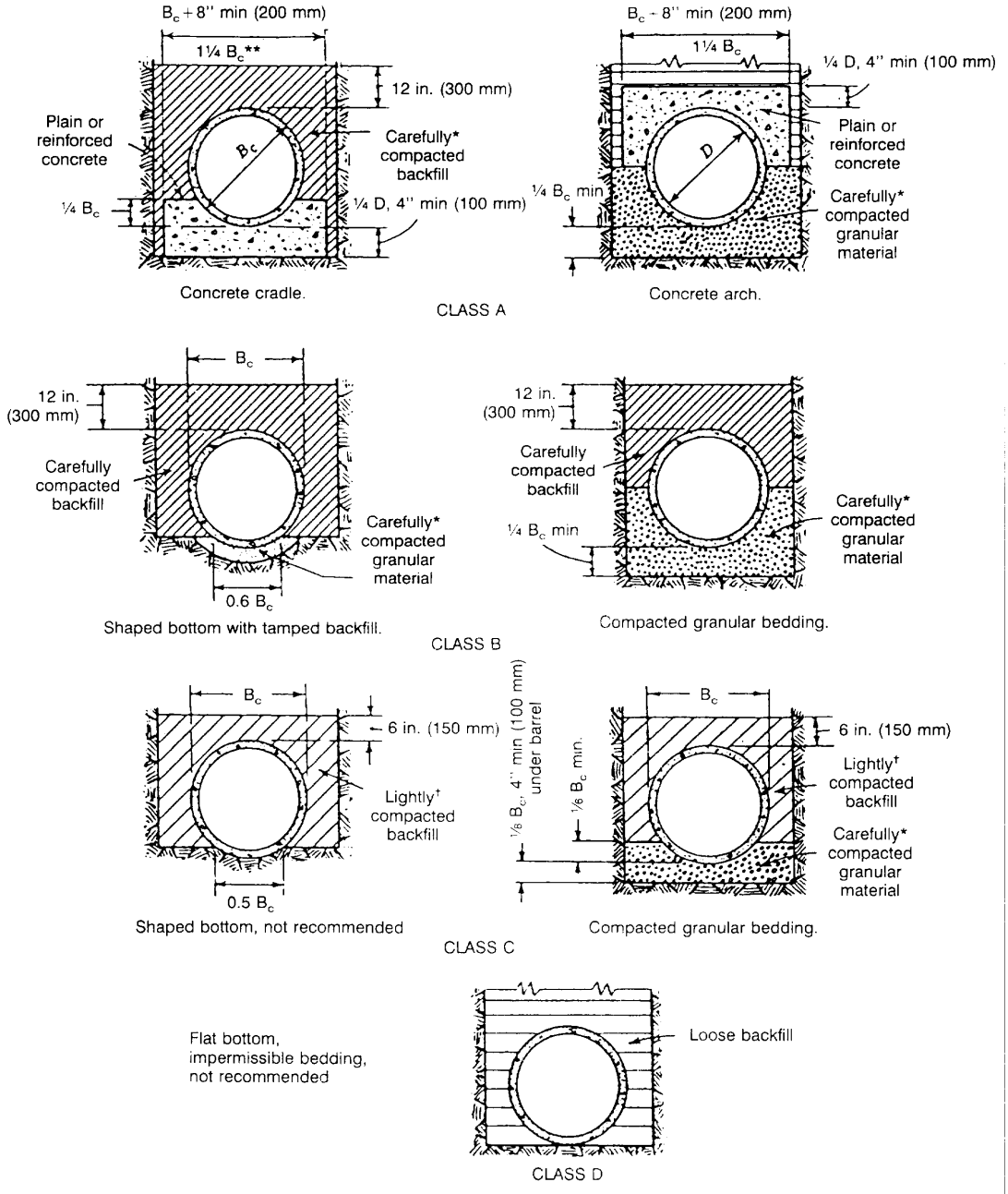
Type 5
Pipe bedded in compacted granular material to centerline of pipe. Compacted granular or select‡ material to top of pipe.

NOTE: Reprinted from AWWA Standard C600 by permission. Copyright 1987, American Water Works Association.
*For 14 in. and larger pipe, consideration should be given to the use of laying conditions other than type 1.
†"Flat-bottom" is defined as undisturbed earth.
‡"Loose soil" or "select material" is defined as native soil excavated from the trench, free of rocks, foreign materials, and frozen earth.

Fig. 3.1.5.1-1. Laying conditions for ductile-iron pipe

Asbestos-cement pipe is particularly suitable for locations where ferrous pipe would be subjected to attack by actively corrosive water, soil conditions or electrolysis. Where asbestos-cement pipe must be buried in highly acid or alkaline soils, the manufacturer should be consulted. Protective coatings are sometimes available.

Stray electric current from an external source may follow a buried main until it reaches a location where the resistance to ground is lower. Ionization occurs at these points where the current leaves the main, producing an effect similar to that of soil corrosion.



NOTE: 1. Reprinted from AWWA Standard C403 by permission. Copyright 1989, American Water Works Association.
2. In rock trench, excavate at least 6 in. (150 mm) below the coupling of the pipe except where concrete cradle is used.
*Carefully compacted backfill or granular material
†Lightly compacted backfill
**B_c = Outside Diameter of Pipe

Fig. 3.1.5.1-2. Laying conditions for asbestos-cement pipe

When stray electric currents are suspected, the extent and origin can be determined by professional ground surveys. If the stray currents cannot be eliminated or diverted, and the main is not yet seriously corroded, it can be protected by bonding all the joints and providing direct low resistance metallic ground connections. Cathodic protection is sometimes used. This technique imposes direct electric current from a galvanic anode to the buried main. Cathodic protection is also effective against soil corrosion, but is rarely used in fire protection installations due to the costs of installation and maintenance.

3.1.5.3 Protection Against Freezing

Local soil conditions and elevation will affect the depth of frost cover. Frost penetrates deeper in soils on hillsides with northern exposure than those with southern exposure. Frost penetration has been found to be 1.5 times as deep in sand as in clay. Frost penetration is significantly greater in disturbed soil than in undisturbed soil. Based on these examples, local officials should be consulted for recommended frost depth levels. Relying on generalized maps for a specific location is not recommended. For areas where frost is a factor, bury fire service mains at least 6 in. (150 mm) deeper than municipal water works piping. The additional depth of cover is necessary because of the lack of water circulation in fire service mains. Figure 3.1.5.3-1 shows a generalized recommended depth of cover in the United States.

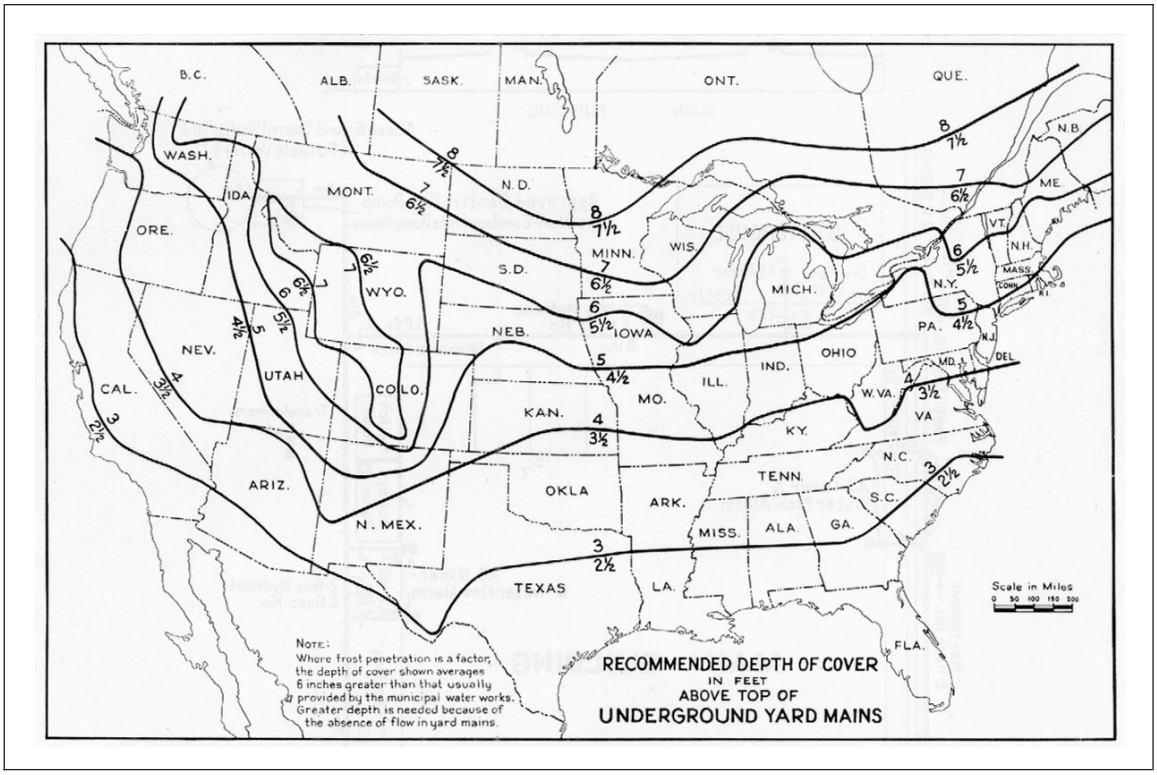


Fig. 3.1.5.3-1. Recommended depth of cover (ft) above underground mains (1 ft=0.3 m)

3.1.5.4 Restraining

Unbalanced thrust forces occur in the water main where the piping stops or changes cross-sectional area or direction. At bends, hydrants, reducers, tees, valves, wyes, dead-ends and offsets on pipe systems, these unbalanced forces must be overcome to prevent the joints from separating. For example, a resultant force of 43,500 lbs (193,500 N) can act on a 90° bend on a 12 in. (305 mm) pipe at a water pressure of 225 psi (1550 kPa). Technical information on thrust restraint can be found in AWWA Manual M11, *Steel Pipe*—A Guide for Design and Installation and AWWA Manual M23, *PVC Pipe-Design and Installation.* Figure 3.1.5.4-1 shows examples of joint restraint.

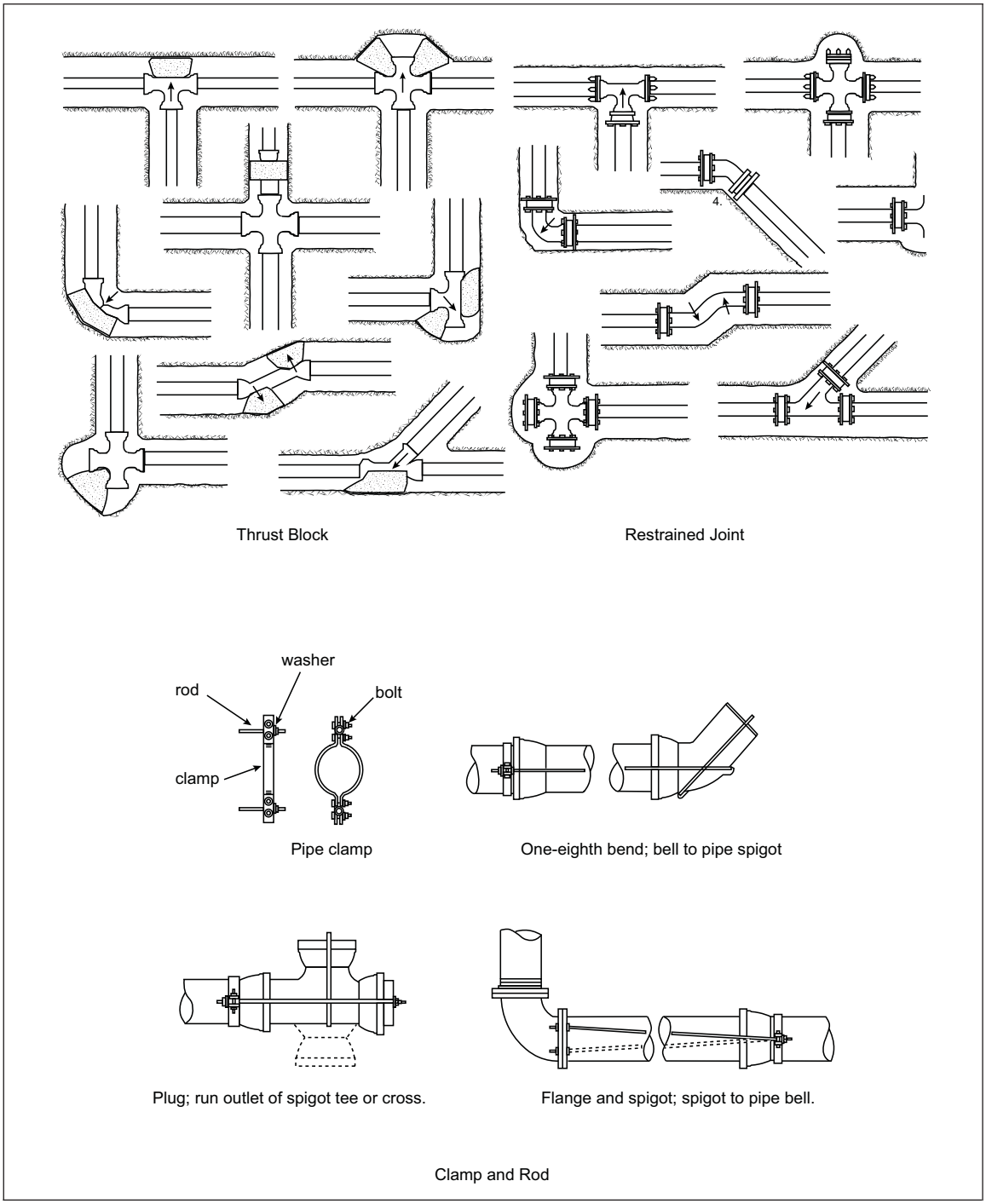


Fig. 3.1.5.4-1. Various methods of joint restraint

3.1.5.5 Hydrostatic Leakage Testing

New mains are hydrostatically tested to determine if the joints are tight and to ensure that there are no defective pipes or fittings. Large installations may be tested in their entirety, or sections between valves may be tested individually. In some cases, it may be necessary to include older pipe within the test section.

A "Contractor's Material and Test Certificate" as shown in Data Sheet 2-0, *Installation Guidelines for Automatic Sprinklers*, is signed by the contractor's and management's representatives upon inspection.

3.1.6 Tapping Machines

3.1.6.1 Purpose

Major impairments of fire protection, and therefore the potential for very serious fires, can occur when water is shut off to make new connections to existing water mains. Tapping machines are valuable tools that permit such connections to be made without shutting off the water. Use of this equipment, in addition to maintaining normal protection, avoids postponing the work until periods of facility shutdown. Connections can be made in any size not larger than the nominal diameter of the main to be tapped, and preferably one size smaller.

Tapping tools are available for use with cast- and ductile-iron, asbestos-cement and some types of plastic pipe. The components for tapping are a split sleeve with a side outlet and a special tapping valve. The tapping valve is similar to a gate valve, but the seat opening is larger, to allow clearance for the cutter. The outlet has a bell end with a special flange for bolting onto the tapping machine.

Knowledge of the size and class, or the outside diameter, of the pipe and the diameter of the tap is required when ordering tapping sleeves and valves. Make certain that the contractor or local water department has suitable tapping equipment.

3.1.6.2 Operation

To make a tap, the split sleeve is assembled on the main with the face of the side outlet in the proper direction, and end joints are made watertight. The tapping valve is then attached (see Fig. 3.1.6.2-1) and the tapping machine bolted to the discharge side of the valve. A tapping drill and shell cutter are attached to a shaft that is inserted through the wide open gate until contact is made with the main. The drilling operation bores and threads a center hole, and the cutter takes a disk from the pipe wall. When the cut is complete, the shaft holding the cutter, the threaded drill and the disk are withdrawn far enough to allow the tapping valve to be closed. The machine is then unbolted and removed so that the branch main can be connected to the valve outlet.

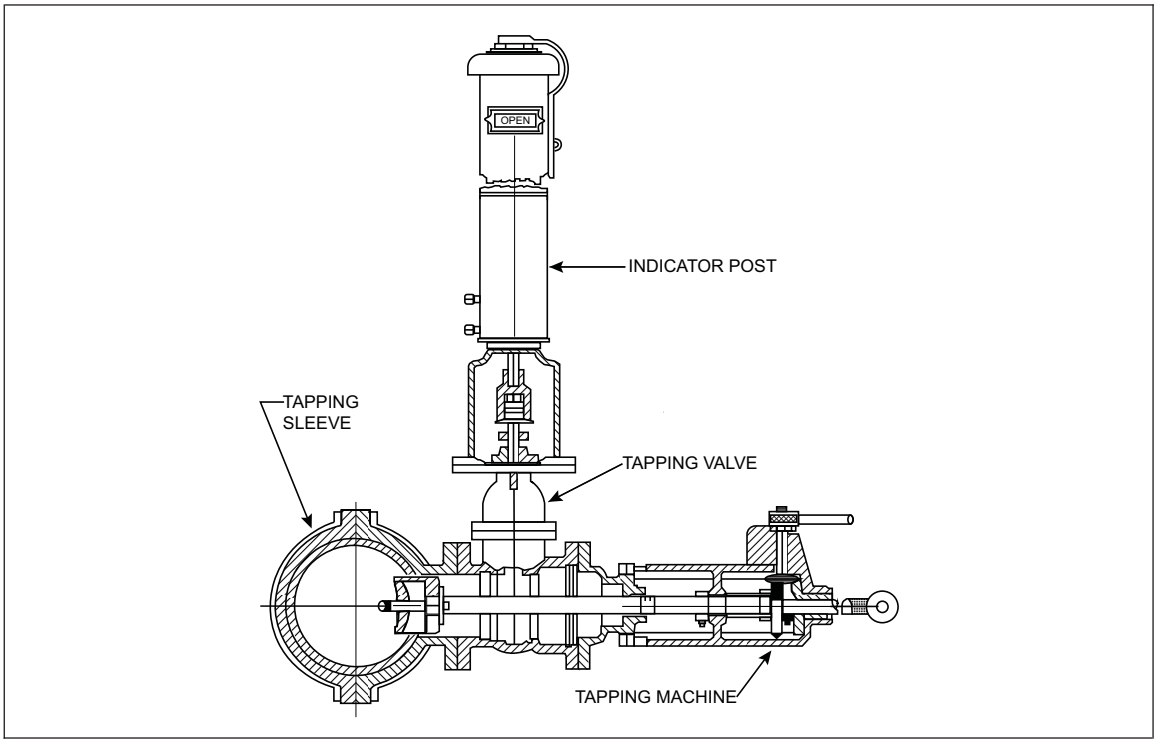


Fig. 3.1.6.2-1. Application of tapping machines to pipe under pressure

It is vital that the disk be removed. Care must be taken in operating a tapping machine not to withdraw the shaft until the cut is completed. Otherwise, the retaining thread may be stripped and the disk not withdrawn with the cutter. If this does occur, a brief shutdown will be necessary and the disk can readily be recovered by reaching through the open valve.

Approved tapping valves have flanges to accommodate indicator posts.

3.1.7 Fire Hose and Equipment for Private Hydrants

3.1.7.1 General

Fire hose is important in all types of occupancies when sprinkler systems are impaired, particularly while sprinklers are shut off immediately following a fire. Charged lines with shutoff nozzles are needed for prompt application of water in the affected areas. The fire hose also can be used to temporarily provide water to sprinkler system risers from nearby hydrants or other risers in the event of an impairment.

Hose streams from hydrants should be available as standby protection in case the sprinkler system is unable, for any reason, to cope with the fire.

For hydrants to be used effectively, sufficient hose and accessory equipment must be quickly available. The equipment needed and its use depend on local facility conditions. Both should reflect the facility's location and size, and the probable needs of the Emergency Organization or public fire department.

Most public fire departments will not use hose provided by the facility, so it is not usually necessary to store hose for their use. Underwriter playpipes for hoses are generally supplied to permit adequate flow testing of the fire protection water supplies if meters are not used for flow testing.

Hose connections above roofs or at the tops of stairs to the roofs of large buildings may need the same hose and accessory equipment as yard hydrants.

3.1.7.2 Size of Hose and Type of Nozzle

Approved 1-½ in. (40 mm) hose with combination spray and solid-stream shutoff nozzles keeps water damage at a minimum and is easy to handle. A gated wye-and-adapter fitting will permit an extension of small hose lines directly from the hydrant or from a lead line of 2-½ in. (60 mm) hose.

The necessary amount and arrangement of small hose, in hose houses or cabinets at hydrants, will depend on the layout of small hose stations within the building.

The type of nozzle will depend on the specific occupancy and protection requirements.

3.1.7.3 Storing and Transporting Hose

At the large facility with a well trained, centralized fire department and motorized equipment, fire hose and accessory equipment are usually carried on a fire truck or other motorized vehicles.

Hand-drawn hose carts or hose reels, each provided with 400 or 500 ft (120 or 150 m) of hose and accessory equipment, are commonly used, acceptable methods of storing hose at both large and small plants. One such cart or reel kept in a strategically located hose reel house or other suitable place can serve three or four hydrants.

Some hose houses or outdoor hose cabinets may be needed at locations that are inaccessible to vehicles, and at concentrated local hazards in the yard or on roofs.

Facilities that have no mobile equipment may have hose houses at most yard hydrants. It is desirable to connect two or three lengths of hose to the hydrant outlet, ready for quick use.

Approved types of hose houses have been in use for many years and are available in knockdown form. Approved hose cabinets are suitable where plant yard space is limited or where the usual hose house would not be desirable for other reasons. They are often useful for storage of hose at a roof hydrant location. They can be attached to a building wall, or placed on angle-iron legs or a concrete foundation near a hydrant.

Hose houses may be designed of masonry or other materials to match the architecture of plant buildings. Hose houses should be constructed to provide good inside air circulation. Provide roofs that are substantial and watertight. Provide screening for protection against vermin

Install foundations that are above the yard level to ensure good drainage. Provide at least 6 in. (152 mm) between swinging door bottom and the ground. Arrange doors and shelves to permit easy operation of the hydrant and attachment of the hose.

The type and amount of equipment needed for individual hose houses or cabinets depends on the needs of the immediate area. Individual requirements may call for all 1-½ in. (40 mm) hose, all 2-½ in. (60 mm) hose, or some of each.

3.1.8 Cleaning and Lining of Fire Service Mains

3.1.8.1 Reason for Cleaning and Lining

The carrying capacity of unlined, cast iron, ductile iron and steel water mains decreases with age because of corrosion. The inside surface is roughened by the formation of tubercles or rusting and the effective diameter also may be reduced by chemical deposits, silt or organic growths.

Practical methods are available for cleaning and lining buried water mains and the cost is usually less than that for replacement with new pipe of the same size.

Cleaning should restore old iron and steel mains to 80% or more of new pipe capacity, but improvement is temporary unless the main is also lined. Lined mains retain their capacity for many years. Negotiate contracts for cleaning that guarantee a Hazen-Williams "C" of not less than 90.

3.1.8.2 Methods of Cleaning

3.1.8.2.1 General

There are two basic cleaning methods: mechanical and chemical. Mechanical methods are used most frequently. Lining materials include cement mortar, plastic (epoxy resin), and bituminous compounds. For cleaning or lining, the run of pipe must be isolated. This may require the installation of temporary valves.

Impairment of sprinklers or other protective equipment during these operations must be handled according to recommended procedures. Piping connected to a public water system must usually be disinfected after the work is completed, and before service is restored. Verify the result of the cleaning and lining by conducting waterflow tests.

3.1.8.2.2 Mechanical Cleaning

Mechanical cleaning consists of cutting, scraping and brushing off deposits with special tools, which are forced through the pipe. Loosened material is then flushed out with water. The choice of tools and method depends on the type and hardness of the scale, piping layout and water pressure.

Mechanical cleaning methods vary considerably, but usually involve the following steps:

1. A length of main is excavated at each end.
2. Valves controlling sprinkler systems and branch mains are closed.
3. Control valves at each end of the main are closed and water is removed from the main.
4. Butterfly valves within the length of main are removed.
5. A section of pipe is removed from each end.
6. A 45° elbow and a piece of pipe are attached to the downstream end for discharging water and debris above ground level.
7. A tool is put in the upstream opening and run through the pipe.
8. After the tool is removed, the pipe is reconnected at the upstream end and water is run until clear. The pipe must then be drained and dried, and the lining done immediately.
9. The discharge pipe and elbow are removed, and the pipe reconnected. All divisional valves are opened. The sprinkler control valves are slowly opened (with the sprinkler drains open) and left open until water runs clear so that debris from the lead-ins is flushed from the sprinkler drains rather than entering overhead piping.

The hydraulic method uses water pressure to force the cleaning tool through the pipe. The tool consists of a series of overlapping steel blades and wire brushes mounted at the front end. A series of loosely fitting, flexible cups is mounted behind the cutters, and water pressure against them forces the assembly through the pipe.

Pipes 4 in. (100 mm) nominal diameter and larger can be cleaned by this method. Runs up to several thousand feet can be cleaned in one pass, and bends of 90° can be negotiated.

The procedure is to insert the cleaning tool at the upstream opening and reconnect the pipe using mechanical joints. The upstream valve is opened and pressure applied to push the tool through the main. The course and progress of the tool can usually be followed by sound. An appropriate method of cleaning the pipes should be chosen to minimize the impact on pipe components, such as pipe joints.

Another hydraulic method using a plastic sponge can be used to advantage in runs of pipe with many turns and fittings. This method removes softer deposits by propelling a bullet-shaped cylinder of polyurethane sponge through the pipe by water pressure. The sponges are available with various abrasive surfaces.

The rotating cutting tool method uses powered, rotating cutters or reamers, driven through a rotating, flexible spring-steel cable. This method is used where pipe deposits are too dense or hard for successful removal by the hydraulic method. Single runs are limited to about 300 ft (90 m) but complex piping layouts and 90° bends can be negotiated.

The cable-and-winch method is often used for relatively short runs of pipe where water pressure is too low or deposits too hard for the hydraulic method. The cleaning tool is pulled through the pipe by cable attached to a power winch.

3.1.8.2.3 Chemical Cleaning

Chemical methods of cleaning pipe use weak solutions of hydrochloric acid or other chemicals. These methods are most advantageous for complex piping layouts with many elbows.

The choice of chemicals depends on the nature of the scale. For example, inhibitors may be added to reduce reaction with the metal pipe. The solution may be circulated continuously through the pipe during cleaning or allowed to stand until cleaning is completed. Supplemental mechanical methods may be used.

3.1.8.3 Methods of Lining

Pipe lining is a method used to rehabilitate existing pipes and underground mains. The most common methods of pipe rehabilitation are:

- Centrifugally cast concrete pipe (CCCP)
- Cured-in-place pipe (CIPP)
- High-density polyethylene sliplining (HDPE)

For all methods, prior to starting any pipe rehabilitation or relining, the existing pipe is measured using a small camera to map the interior of the piping and the locations of any branch or tap lines.

The piping is then cleaned to remove any deposits or material before the relining operation commences.

Centrifugally cast concrete pipe (CCCP) is a type of spin-in-place pipe lining that uses a spinning head to apply thin coats of a cementitious material (e.g. Portland cement or Permacast mortar) to the inside of the pipe. These thin coasts may also contain other material such as fiber reinforcement and rust inhibitors to increase erosion resistance and prevent corrosion. The number of applied coats determines the thickness of the lining and is determined during the initial examination phase. This type of lining is typically seen in large concrete pipes and culverts.

Cure-In-Place Pipe (CIPP) uses an epoxy resin to line existing pipe and is the most common type of pipe rehabilitation seen today. After inspection, cleaning and measurement of the existing pipe, a special liner is prepared and soaked with epoxy resin. The resin-impregnated liner is then inserted or pulled into the existing pipe, in an inverted condition, positioning the resin between the liner and the existing internal pipe wall. A special bladder is then inserted into the liner and inflated, using air or water, pressing the epoxy resin against the internal surface of the existing pipe. The resin is then dried and cured using UV light, heat or steam Branch lines and taps can also be coated using this method. The lining is thin and smooth, therefore the flow in the newly relined pipe is not noticeably reduced and this method can be applied to pipes with a wide range of pipe diameters.

High-density polyethylene sliplining does not involve adding a new liner, but instead involves pulling a new polyethylene pipe inside the old existing pipe. Sections of piping are grouted together prior to being pulled into the existing piping. One disadvantage of this method is that the flow capacity of the pipe is noticeably reduced due to the addition of the HDPE pipe.

Because any relining operation will impact the internal properties of the pipe, a calculation of these impacts should be conducted. An example of this is seen when a pipe is relined using the CIPP epoxy resin. While the resin lining does reduce the internal diameter of the pipe, and thereby reducing the flow slightly, the new epoxy lining is smoother and therefore reduces the C-factor. This reduction on C-factor reduces frictional losses, with the overall effect being no real reduction in flows through the relined pipe.

Cure-in-place pipe (CIPP) and high-density polyethylene (HDPE) sliplining pipe rehabilitation systems are covered under FM Approval Standard 1616 Underground Pipe Rehabilitation Systems.

The products that have passed the requirements for Approval Standard 1616 are listed in the *Approval Guide* under the section: Automatic Sprinkler Systems / Pipe, Fittings and Pipe Joints for Underground Fire Service Mains / Underground Pipe Rehabilitation Systems.

As part of the Approval process, the rehabilitation system undergoes a series of tests to ensure its suitability for use in existing mains.

The tests conducted include:

- Determining the lining material is suitable for use within the existing main. This includes ensuring the liner is suitable for the defects seen and can withstand the water conditions (e.g., pH).
- Hydrostatic strength testing to ensure the rehabilitation system does not leak under the normal rated working pressures seen in the underground mains.
- A vacuum test to show the rehabilitation system can withstand the conditions that can occur when mains are drained for maintenance.
- A flow test to ensure the pipe liner does not detach from the existing pipe once it is in place.

3.1.9 Breakage of Underground Fire Service Mains

3.1.9.1 Reason for Breaks

Underground water mains may fail because of corrosion, external loading or water pressure surges (water hammer). Joints may separate as a result of inadequate anchorage at bends and tees. Manufacturing defects are rarely responsible, and defective pipes are usually detected by inspection prior to installation.

Excessive stresses in piping are caused by uneven movement or settlement in unstable soil, or by external loading from above. Such loading can be due to building walls and foundations, heavy floor loads, and vehicle or rail traffic.

Hydrostatic tests are frequently used to determine the condition of underground piping. The tests are made at 150 psi (1034 kPa, 10.3 bar) minimum pressure, but at least 50 psi (345 kPa, 3.5 bar) above the normal static pressure. Such tests merely indicate whether or not the yard system will withstand that pressure at that time, and do not necessarily indicate the system's true condition.

3.1.9.2 Investigating Breaks

Note: Figures 3.1.9.2.1-1 through 3.1.9.2.4-1 picture asbestos-cement pipe. Similar pipe failures are common with cast-iron and ductile-iron pipe.

3.1.9.2.1 Hydrostatic Failures

''Hydro breaks'' occur when a complete section of pipe wall is blown off by internal pressure. Hydro breaks are of two types, low pressure and high pressure.

In a low pressure hydro break (Fig. 3.1.9.2.1-1) a section of pipe, starting at or near a coupling, is lifted out of the pipe wall. Invariably there is a crack running out to the end of the pipe.

Fig. 3.1.9.2.1-1. Examples of low pressure hydro breaks

Cause of failure is probably a crack in the pipe end caused by rough handling after hydrostatic testing at the pipe manufacturing plant. The crack is usually not severe enough to show up as a leak. When pressure is increased, or water hammer is encountered in the system, the weakened section blows out.

In a high pressure hydro break (Fig. 3.1.9.2.1-2) the break occurs in the center of the pipe, and has the appearance of resulting from an explosion. A section of the pipe will be lifted out of the barrel of the pipe. A crack out to the end of the pipe is possible.

Cause of failure is probably water hammer from air present in the pipe, in combination with high water pressure.

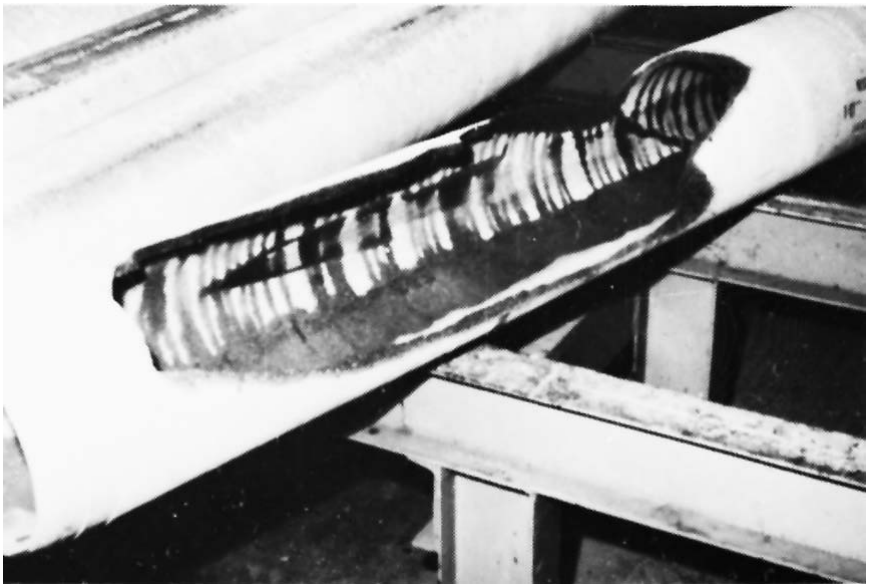


Fig. 3.1.9.2.1-2. High pressure hydro break

3.1.9.2.2 Crush Failure

Crush failure is characterized by a crack of the horizontal axis of the pipe usually down both sides. It is due to loads applied above the crush limits of the pipe. The excess loads can result from excessive depth of bury and/or live loads.

3.1.9.2.3 Shear Failure

Shear failure has the appearance of having been cut straight across the pipe diameter. It is common for pipe ends to be substantially offset in profile. Pipe ends, although straight, have rough and irregular surfaces and can be accompanied by a small lip and companion cavity.

The failure is caused by shear conditions that exceed the pipe strength. Often caused by pipe being laid on a trench bottom that goes from one type soil to another, e.g., hard stable trench bottom to soft yielding type of soil conditions. It also can be caused by hillside movement or slipping, as when a pipe section enters a structure without adequate flexibility provisions.

3.1.9.2.4 Flex Failure

Flex failure (Fig. 3.1.9.2.4-1) has the general appearance of having been cut straight across the pipe diameter similar to a shear failure, except that the pipe ends are not offset. Pipe ends are open on the top or bottom, thus indicting how the pipe was bent. For example, a rock under the crack would result in the top being open more than the bottom. The pipe ends have the same general appearance of those resulting from shear failure.

The failure is caused by the pipe having been forced to bend to the breaking point.

Fig. 3.1.9.2.4-1. Flex failure. Break offset to show crack

3.1.9.2.5 Corrosion

Corrosion of pipes is the deterioration of pipe material due to a reaction with the environment. Three general types of corrosion are recognized: galvanic, electrolytic and biological. Soil corrosion or metallurgical investigations may be required to determine the cause and type of corrosion.

3.1.9.3 Repairing Breaks

Breaks in underground mains may be repaired quickly by bolting split sleeves. Long breaks, however, may require replacement of the pipe. For short or cirumferential breaks, special saddles and clamps are available.

3.1.10 Investigating Breakage of Underground Fire Service Mains

3.1.10.1 The following steps are recommended in investigating breaks:

1. Determine the type and class of the pipe.

2. Determine the faulty condition or combination of conditions that caused the break.

3. When corrosion is a factor, arrange to have parts of the yard system uncovered to determine the extent of the corrosion. If it has not advanced to a dangerous degree, the pipe may be protected by coating and wrapping. It is recommended that cinder fill, one of the most common causes of pipe corrosion, should be removed and replaced with clean soil, or the main should be relocated. Take whatever other steps are necessary to discover and correct the cause if the corrosion is excessive.

4. If hydrostatic tests are to be made, section the mains by shutting division valves and apply the pressure through small connections around the shut valves. With this procedure, failure of a main under test will cause only minor discharge and prevent the excessive damage that might occur if fire pump pressure were applied to an entire system through larger sized valves. As an alternative, a small pump may be used. Take particular care when testing mains located under plant buildings.

5. Where pipes under buildings are in poor condition and require replacement, locate the new pipes in the yard away from foundations and other structures, or indoors in a trench.

6. If excessive pressure surging (water hammer) is suspected as the cause of the breaks, try to discover the source and take steps to eliminate or minimize the effects, as achieved through the installation of anti-water hammer check valves or suitable pressure relief valves. Ridding the system of air, by flowing water, may reduce the occurrence of water hammer.

3.1.11 Leakage From Underground Fire Service Mains

3.1.11.1 General

Unusually large water bills, loss of water from a gravity tank or frequent automatic fire pump start-ups usually indicate leaks in underground fire service mains.

3.1.11.1.1 Determine that there is no obvious leakage through sprinkler drain valves or hydrants, no tank overflows, nor any backup through pump suction lines. Make sure that the unaccounted water from the fire service system is not being used for industrial purposes.

3.1.11.2 Locating Leaks

3.1.11.2.1 In attempting to locate leaks, study the location and arrangement of the underground mains shown on the original plans. Look for surface depressions in driveways or railroad sidings where mains cross. Unusual surface loadings or heavy vehicle traffic occasionally causes yard mains to settle with resultant joint leakage or cracks. Clumps of grass that are taller than surrounding growth are sometimes a sign of water leakage. Inadequate anchorage at dead ends and blow-off connections are often the source of leaks. Look for signs of moisture where mains pass under or through building foundations.

3.1.11.2.2 Isolate the leak systematically by closing divisional and sprinkler-riser control valves, and by noting whether the pressure at sprinkler-riser gauges or hydrants remains constant. Any unusual drops in pressure on gauges will indicate that the leak is within the closed off section of the yard main. If the rate of leakage is abnormal, the leak can usually be located by one of the following methods:

1. Listening device. After the leak has been isolated in one pipe or section, it can often be found by using a listening device. Listening involves the use of sound-intensifying equipment in a systematic fashion to locate leaks. When escaping through a pipe wall, all leaks lose energy to the wall and the surrounding area, and the energy is then converted to audible sound waves. These sound waves can be picked up by sensitive instruments and amplified so the user can hear them. In the hands of an experienced operator these instruments can help locate a leak with remarkable accuracy.

Sound-intensifying equipment in common use today is either mechanical or electronic. The two most widely used mechanical devices are the aquaphone and the geophone. The aquaphone resembles an old-fashioned telephone receiver with a metal spike protruding where the telephone wire would go. The listening end of the geophone looks like a doctor’s stethoscope but the listening tubes are connected to two diaphragms, which give the operator the desired “stereo” effect to indicate the direction of the leak.

The listening device should preferably be used when the plant is shut down and all is quiet. Leaks are common in hydrants and stuffing boxes of indicator post gate valves, so listen at these points first. Leaks in underground pipes in swampy or porous fill, or where sewers or other pipes run nearby, are difficult to locate with listening devices.

2. Rods. Leakage from yard mains can sometimes be located by driving rods through the soil along the run of main where the leak is suspected, and listening at the exposed end of the rods. The sound of escaping water will increase as the point of leakage is approached. Note whether the rod is wet when withdrawn and whether it drives easily when nearing pipe depth.

3. Electronic instruments. Electronic instruments are more delicate, yet are capable of filtering out unwanted background noise. They need a power source and require more care in handling and storing than the mechanical instruments. All the newer devices can be easily carried by the operator. One system is hooked up to an electronic console and housed in a truck or “mobile” laboratory.

3.1.11.2.3 Rate of leakage can be determined by one of the following recommended methods:

1. Meter readings. Measure all water delivered to the section under test by reading the meter (if any) on the public water connection or by using a small domestic water meter attached to a hydrant. Any draft of mill-use water through connections to the yard system will usually be detected by an irregular meter reading. If a booster pump maintains pressure on the fire system, operate it and use the small meter to obtain the rate of leakage.

Figure 3.1.11.2.3-1 shows a water meter attached to a hydrant. The meter is used to measure all water delivered to the test section.

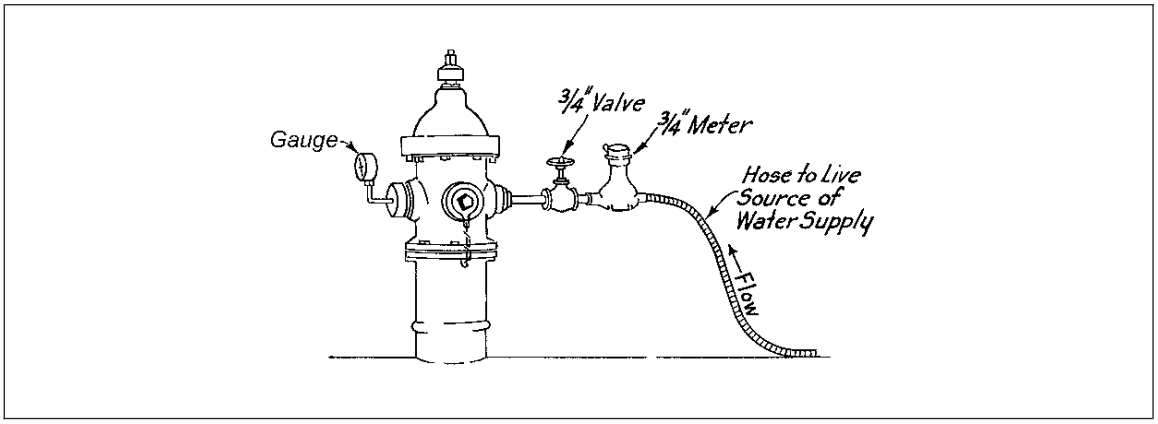


Fig. 3.1.11.2.3-1. Metering method of leak detection

2. Drop in water level. Measure the drop in level in a gravity tank. If the fire service system is also supplied by one or more connections to public water, close the control valves in these connections during measurements so that all water flowing to leakage will come from the gravity tank.

3.1.12 Maintenance

3.1.12.1 Maintenance of Single Check Valves

Single check valves on public water connections to private fire systems need internal inspection and cleaning at least once every five years.

Check valves in poor condition may remain partly open and leak. Any fluctuations in pressure in the public main would then cause similar variations of pressure within the plant system, resulting in false waterflow alarms.

Occasionally, it is necessary to shut off public mains for repairs or changes, and sometimes public water pressure is reduced by heavy drafts or breaks in mains. In systems where public water and gravity tank pressures are about the same, or where the public water pressure is less, good check valve maintenance is especially needed to safeguard the tank supply.

When fire department pumper connections provide the only supplementary water supply, regular internal examination and cleaning of the check valves is essential so that pressure added by the fire department pump is not lost by leaking check valves.

The modern, Approved check valve is well designed but needs periodic attention. The body is of iron, and enough tubercles may build up on the interior of the valve to interfere with the free movement of the clapper and clapper arm or prevent tightness of the clapper seat.

3.1.12.2 Maintenance of Double Check Valves and Reduced Pressure Backflow Preventers

Details of testing and maintenance of double check valves, and of testing of reduced pressure backflow preventers are given in Data Sheet 3-3, Cross Connections. Maintain reduced pressure backflow preventers according to the manufacturer's instructions.

3.1.12.3 Maintenance of Manually Operated Valves

Yearly, all valves should be operated to full travel of their mechanism to make sure they can be operated easily when necessary. Records should be maintained of the number of turns required to operate each valve from the fully open to the fully shut position. This is valuable later in determining whether a valve has jammed partially open.

3.1.12.4 Maintenance of Hydrants

To ensure that a hydrant will work correctly when it is needed, a periodic testing and maintenance program should be followed. AWWA Manual M17, Installation, Field Testing, and Maintenance of Fire Hydrants,

outlines various points to check, lubrication repairs and record keeping procedures to carry out a meaningful inspection. Hydrants should be inspected yearly, and in locations of freezing climates, two inspections per year may be appropriate.

3.1.12.5 Maintenance of Fire Hose for Use Outdoors

Mildew may attack untreated hose fabric containing cotton or linen if the hose is stored in a damp location or not thoroughly dried after wetting. Fire hose is available with chemically treated fabric for protection against mildew and rot. Treated jackets also absorb less water and, therefore, dry more quickly. The resistance to dampness and mildew is not 100% effective even when the treatment is new, and it deteriorates with age.

It is just as important to carefully dry hose with jackets made from a combination of cotton and synthetic yarns.

4.0 REFERENCES

4.1 FM Global

Data Sheet 2-0, *Installation Guidelines for Automatic Sprinklers*
Data Sheet 2-81, *Fire Safety Inspections and Sprinkler System Maintenance*
Data Sheet 3-0, *Hydraulics of Fire Protection Systems*
Data Sheet 3-2, *Water Tanks for Fire Protection*
Data Sheet 3-3, *Cross Connections*
Data Sheet 3-11, *Flow and Pressure Regulating Devices for Fire Protection Service*
Data Sheet 3-26, *Fire Protection for Nonstorage Occupancies*

FM Approvals *Approval Guide*

4.2 NFPA Standards

NFPA 24, *Installation of Private Fire Service Mains and Their Appurtenances.*

NFPA 1962, *Care, Use and Service Testing of Fire Hose Including Connections and Nozzles.*

4.3 Others

ANSI/AWWA C101/A21.1, *American Standard Practice—Manual for the Computation of Strength and Thickness of Cast Iron Pipe* (Standard withdrawn in 1982).

ANSI/AWWA C104/A21.4, *American National Standard for Cement Mortar Lining for Cast Iron Pipe and Fittings for Water.*

ANSI/AWWA C105/A21.5, *American National Standard for Polyethylene Encasement for Gray and Ductile Cast Iron Piping for Water and Other Liquids.*

ANSI/AWWA C106/A21.6, *American National Standard for Cast Iron Pipe Centrifugally Cast in Metal Models, for Water or Other Liquids* (Standard withdrawn in 1982).

ANSI/AWWA C108/A21.8, *American National Standard for Cast Iron Pipe Centrifugally Cast in Sand-Lined Molds, for Water or Other Liquids* (Standard withdrawn in 1979).

ANSI/AWWA C110/A21.10, *American National Standard for Gray Iron and Ductile Iron Fittings, 2 in. through 48 in., for Water and Other Liquids.*

ANSI/AWWA C150/A21.50, *American National Standard for the Thickness Design of Ductile Iron Pipe.*

ANSI/AWWA C151/A21.51, *American National Standard for Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.*

ANSI/ASTM A-333, *Standard Specification for Seamless and Welded Steel Pipe for Low-Temperature Service.*

ANSI/AWWA C200, *AWWA Standard for Steel Water Pipe 6 in. and Larger.*

ANSI/AWWA C203, *AWWA Standard for Coal-Tar Protective Coatings and Linings for Steel Water Pipelines—Enamel and Tape—Hot-Applied.*

ANSI/AWWA C205, *AWWA Standard for Cement-Mortar Protective Lining and Coating for Steel Water Pipe—4 in. and Larger—Shop Applied.*

ANSI/AWWA C206, *AWWA Standard for Field Welding of Steel Water Pipe.*

ANSI/AWWA C400, *AWWA Standard for Asbestos-Cement Distribution Pipe, 4 in. through 16 in. (100 mm through 400 mm), for Water and Other Liquids.*

ANSI/AWWA C600, *AWWA Standard for the Installation of Ductile-Iron Water Mains and Their Appurtenances.*

ANSI/AWWA C603, *AWWA Standard for the Installation of Asbestos Cement Pressure Pipe.*

AWWA C900, *Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. Through 12 in., for Water and Other Liquids.*

AWWA Manual M6, *Water Meters-Selection, Installation, Testing and Maintenance.*

AWWA Manual M17, *Installation, Field Testing and Maintenance of Fire Hydrants.*

AWWA Manual M11, *Steel Pipe—A guide for Design and Installation.*

AWWA Manual M23, *PVC Pipe—Design and Installation.*

ANSI/ASME A112.26.1, *Water Hammer Arresters.*

Cast Iron Pipe News, Fall 1975, *Thrust Restraint for Underground Piping Systems*, Carlson, R.J.

Ductile Iron Pipe Research Institute, Second Edition 1989, *Thrust Restraint Design for Ductile Iron Pipe.*

APPENDIX A GLOSSARY OF TERMS

FM Approved: Product and services that have satisfied the criteria for FM Approval. Refer to the *Approval Guide*, an online resource of FM Approvals, for a complete listing of products and services that are FM Approved.

Refer to Section 3.0, *Support for Recommendations* for descriptions of system components.

APPENDIX B DOCUMENT REVISION HISTORY

January 2022. Interim revision. The following significant changes were made:

A. Added Section 2.1 on using FM Approved equipment and services. Removed all subsequent redundant iterations of this language in the document.

B. Added guidance for the new FM Approved pipe rehabilitation system in Section 2.0.

C. Updated explanatory text on pipe rehabilitation systems in Section 3.0 to support the new Section 2.0 guidance on FM Approved pipe rehabilitation systems.

D. Updated guidance on thrust block areas in Table 2.

E. Relocated information on leak detection methods and equipment to Section 3.0. This material contains no recommendations.

F. Replaced unreadable figures in the document.

G. Updated references and terminology to current FM Global and FM Approval brand assurance standards.

September 2000. Reorganized to provide a consistent format.

June 1992. First issued.

APPENDIX C UNDERGROUND MAIN INSTALLATION CHECKLIST

The following checklist is designed to allow on-site checks during actual underground installations. The items that are included in the checklist are those that are often performed poorly, leading to underground breaks, leaks and impairments to the fire protection system. It is assumed that before underground main installation begins, plans have been reviewed and accepted to ensure that all aspects of design and material selection are in accordance with requirements.

The purpose of the checklist is to allow a person to ensure that the actual physical installation of the underground mains is done in a proper manner. Any problems that are identified during the actual installation

should be corrected immediately, or work should be suspended until corrections are made. Since problems are far less likely to be recognized or resolved after the trench has been back filled, the importance of a corrective resolution to problems cannot be overemphasized.

Checklist

This checklist is designed to allow an on-site person to witness an underground main installation, and easily determine whether important installation practices are being followed. The checklist is divided into three parts: 1) Trench Preparation, 2) Pipe Installation, and 3) Acceptance Testing. It is assumed that all details of design and materials selection have previously been reviewed and accepted. References to sections or figures pertain to this data sheet.

C.1 Trench Preparation

C.1.1 Compare, by measurement, the actual versus specified depth of trench when trench is dug.

Actual depth of trench is _____ ft (_____ m).

Specified depth of trench is _____ ft (_____ m).

(Check one)

_____ Actual depth is greater than or equal to specified depth— *work may continue,* go to item C.1.2.

_____ Actual depth is less than specified depth— *stop,* and make sure correct depth is provided.

Comment: If bury depth is inadequate, water in the pipe may freeze during the winter, impairing protection and causing pipe breakage.

C.1.2 Confirm, by inspection, that the trench contains clean fill only.

Important: Laying pipe on any material other than clean fill may cause pipe breakage or pipe decay after the trench is back filled!

(Check one)

_____ Trench contains *only* clean fill— *work may continue.*

_____ Trench contains materials other than clean fill— *correct as follows:*

If the Trench Bed Contains	*And:*	*Then:*
Rocks, boulders *or* any exposed rock surface	They cannot be removed	Construct a foundation for the pipe using suitable material.
	They can be removed	Remove all rocks, etc. to provide a clearance at least 6 in. (152 mm) below and on each side of all pipe, valves and fittings. Replace removed material with a bed of sand, crushed stone or earth that is free from stones, large clods or frozen earth, on the bottom of the trench to a minimum depth of 6 in. (152 mm) level and tamp the bedding material.
Unstable material	Which cannot be removed	Construct a foundation for the pipe using suitable material
	It can be removed	Remove unstable material and replace it with clean stable backfill material.
Ash, cinders, refuse or other organic material	It cannot be removed and it is unstable:	Construct a foundation for the pipe using suitable material and protect the pipe against corrosion
	It can be removed	Remove material to a minimum of at least 3 in. (76 mm) below intended pipe elevation and replace with clean, stable backfill material.

C.2 Pipe Installation and Testing

C.2.1 Pipe Material

Check that the type of pipe being used is the same as that specified on plans.

(Check one)

_____ Pipe material is the same; *go to C.2.2.*

_____ Pipe material is not the same; *stop and determine why.*

C.2.2 Pipe Joints

Make sure all joints between pipe, valves and fittings are properly installed in the manner required for the type of pipe being used.

(Check one)

_____ All joints are proper for the type of pipe being used; go to C.2.3.

_____ All joints are not proper for the type of pipe being used— *stop and resolve.*

C.2.3 Pipe Restraint

Generally, restraining is required at all bends, tees, plugs and hydrant lines, unless Approved devices specifically designed for this purpose are used

(Check one)

_____ Pipe restraint *is provided at all bends, tees, plugs and hydrants;* go to C.2.4.

_____ Pipe restraint *is not provided at all bends, tees, plugs and hydrants— stop and determine* if other means are used to eliminate the need for pipe restraint. *If so, continue. If not, stop and resolve.*

C.2.4 Corrosion Protection

Corrosion protection is needed for pipe restraining devices (such as rods, nuts, bolts, washers, clamps and for iron or steel pipe. Corrosion may occur when corrosive soil conditions exist or when galvanic action occurs due to stray electrical currents.

(Answer ‘‘Yes’’ or ‘‘No’’)

_____ All rods, nuts, bolts, washers, clamps and other restraining devices (except thrust blocks) have been cleaned and thoroughly coated with a bituminous or other acceptable corrosion-retarding material.

If Yes, continue.

If No, stop, and ensure that proper corrosion protection is provided.

(Answer ‘‘Yes’’ or ‘‘No’’)

_____ Suitable pipe materials are used, or proper corrosion protection is provided for iron or steel pipe based on the corrosiveness of the soil.

If Yes, continue.

If No, stop and ensure that proper corrosion protection is provided.

(Answer ‘‘Yes’’ or ‘‘Does Not Apply’’)

_____ Suitable protection is provided against galvanic corrosion to ferrous pipe materials due to stray electrical currents.

If Yes or Does Not Apply, continue to C.2.5.

If No, stop and ensure that proper corrosion protection is provided.

C.2.5 Hydrostatic Leakage Testing

Hydrostatic leakage testing ensures that all joints are tight, and that pipe and fittings are not defective. Partially backfill over pipe before testing in accordance with test guidelines.

(Answer ‘‘Yes’’ or ‘‘No’’)

_____ Hydrostatic testing indicates that the amount of leakage does not exceed that allowable.

If Yes, continue to C.2.6.

If No, stop, correct deficiencies, and re-test.

C.2.6 Backfilling

Backfilling using suitable fill material to the correct depth to prevent freezing will help ensure suitable long term underground main performance.

(Answer "Yes" or "No")

_____ Suitable fill material is used for backfilling.

If Yes, continue to C.2.6.1.

If No, stop and make sure suitable fill material is used.

(Answer "Yes" or "No")

C.2.6.1 Depth of Backfill

_____ Depth of backfill is sufficient for freeze protection for the geographic location involved.

If Yes, continue to C.2.7.

If No, stop and make sure that pipe is buried to the proper depth.

C.2.7 Flushing

Make sure that proper flushing of all underground piping is conducted to ensure that foreign materials are removed.

(Answer "Yes" or "No")

_____ Flushing completed per accepted practices.

If Yes, continue to C.3.

If No, make sure flushing is completed and foreign materials are removed.

C.3 Acceptance Testing and Documentation

C.3.1 Contractor's material and test certificate for underground piping. Make sure that the certificate is completely filled out, that the results indicated on the certificate agree with the actual results obtained, and that the certificate is signed and dated by a suitable person.

(Answer "Yes" or "No")

_____ Certificate properly prepared and signed.

If Yes, stop.

If No, make sure certificate is completed and signed.

END OF SECTION

SECTION 33 30 00

SANITARY SEWERAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The Work of this Section includes, but is not limited to:
   1. Installation of building sanitary sewer service line consisting of all manholes, pipe, fittings, and required accessory items and operations including connections.
   2. Resetting castings to grade, providing drop connection(s), relocating or providing new steps in existing manhole if required, and reconstructing inverts as required.
   3. Testing.
   4. Where appropriate, the installation of all sewer facilities within Public Rights-of-Way shall be in accordance with all rules and requirements. Work shall include all items and operations necessary and required to complete the sewer facilities, including maintenance of traffic and protection of pedestrians.

1.02 GENERAL

A. The Contractor is required to obtain all permits and pay all fees for all work contained herein, and shall be included in the Contract sum.

1.03 REFERENCE STANDARDS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section, as well as all applicable construction, fabrication and safety standards.

B. Comply with requirements of the Stormwater Pollution Prevention Plan (SWPPP) and Soil Erosion and Sediment Control specification, plans, and details, and the Contractor's accepted schedule. Refer to Section 01 5713 of these Specifications.

C. The Contractor shall read the Geotechnical Report for subsurface investigations prepared by Carlin-Simpson & Associates, " Report on Subsurface Soil and Foundation Investigation" dated July 14, 2021, revised April 20, 2022, to be fully aware of available subsurface information and current recommendations. No extra claim for ignorance shall be accepted.

D. Comply with all industry standards and requirements of all Authorities having jurisdiction. If requirements specified conflicts with the requirements of Authorities having jurisdiction, the requirements of the Authority having jurisdiction applies. Refer to the applicable standards:
   1. ASTM A-47 - Malleable Iron Steps, Grade 35018.
   2. ASTM A-48 – Ductile Iron Steps, Class 25A
   3. ASTM A-615 - Plastic Coated Steel No. 4 Deformed Reinforcement Bar, Grade 60.
   4. ASTM C-139 - Concrete Masonry Units for Construction of Catch Basins and Manholes.
   5. ASTM C-443 - Joints for Precast Concrete Manhole Sections.
   6. ASTM C-478 - Precast Concrete Manhole Sections.
   7. ASTM C-913 - Precast Concrete Square or Rectangular Box Structures.
   8. ASTM C-990 - Joints for Precast Concrete Box Sections.
   9. ASTM C-1244 - Standard Test Method for Concrete Sewer Manholes by Negative Air Pressure (Vacuum) Test Prior to Backfill.
   10. ASTM D-2146 - Polypropylene Plastic Coating Type II, Grade 49108.
   11. ASTM D-2241 - Polyvinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series).
   12. ASTM D-3034 - Polyvinyl Chloride Pipe for Gravity Lines (PVCP), SDR-35 Extra Strength Pipe and Fittings.
   13. ASTM D-3139 - Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
   14. ASTM D-3212 - Push-on Joints with Flexible Elastomeric Seals for PVCP Pipe.
   15. ASTM F-477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

16. ASTM F-1417 - Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air.
17. AASHTO M-45 - Mortar Sand.
18. AASHTO M-85 - Portland Cement.
19. AASHTO M-91 Grade MS - Sewer and Manhole Brick (Clay or Shale).
20. AASHTO M-105 - Gray Cast Iron Castings, Grade 30.

1.04 SUBMITTALS

A. Shop Drawings: Provide catalog cuts. Include plans, elevations, sections, and details of fabrications and their connections as applicable, including accessory items, for all sanitary sewer items and appurtenances such as pipe, fittings, castings, steps, precast concrete structures, etc.

B. Contractor shall obtain and pay for all required permits.

1.05 QUALITY ASSURANCE

A. Provide a detailed installation and termination schedule for all items of work included in this Section.

B. Contractor to coordinate a pre-construction meeting prior to all work.

C. Notify the Site Engineer prior to work taking place.

D. The installation of certain materials and infrastructure including but not limited to earthwork operations, and hardscape and utility installations, may be subject to special subgrade preparation and construction requirements. Subgrade improvement measures and special construction requirements must be followed as indicated by the Geotechnical Engineer. The most stringent geotechnical requirements stated in the Geotechnical Report or any other place in the Contract Documents shall be adhered to by the Contractor.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. The materials to be used in the construction shall be those indicated on the Drawings and specified herein, and the Contractor shall supply to the Owner's Representative, prior to installation, certificates of compliance for the materials used.

B. Where material requirements specified herein conflicts with the requirements of Authorities having jurisdiction, the requirements of the Authority having jurisdiction shall govern.

2.02 SANITARY SEWER PIPE, FITTINGS AND JOINTS

A. Polyvinyl Chloride Pipe and Fittings for Gravity Lines (PVCP) - shall conform to the requirements of ASTM Designation D-3034 for SDR-35 extra strength pipe and fittings. Pipe shall have integral wall bell and spigot joints. Assembly shall be by means of push-on joints using flexible elastomeric seals conforming to ASTM Designation D-3212.

All fittings and accessories shall be furnished by the pipe manufacturer. Joint lubricant shall be as recommended by the pipe manufacturer.

2.03 STRUCTURES

A. General - Where material requirements specified hereinafter conflicts with the requirements of those Authorities having jurisdiction, the requirements of the Authority having jurisdiction shall govern.

B. Brick - shall conform to the "Specifications for Sewer and Manhole Brick (made from Clay or Shale)", AASHTO Designation M-91, Grade MS.

C. Concrete Block - shall be solid block and shall conform to the "Specifications for Concrete Masonry Units for Construction of Catch Basins and Manholes," ASTM Designation C-139.

D. Precast Concrete Structures - Prior to fabrication, the Contractor shall submit four (4) sets of plans of the proposed precast concrete structures to the Site Engineer for review along with

design criteria and certification from the manufacturer by a licensed Professional Engineer registered in the State in which the Work is performed that the structure will support the design load. All precast concrete structures shall be designed and fabricated for an H-20 loading. The minimum compressive strength of the concrete used for all precast concrete structures shall be 4,000 psi.

Precast concrete manhole sections shall conform to ASTM Designation C-478. Precast concrete square or rectangular box structures shall conform to ASTM Designation C-913.

Joints in the structures shall be tongue and groove joints, formed in such a manner so that a watertight rubber seal can be applied. Joints for precast concrete manhole sections shall conform to ASTM Designation C-443 or ASTM designation C-990. Joints for precast concrete box sections shall conform to ASTM Designation C-990. Provisions shall be made for installation of approved watertight connections to precast concrete structures.

Where steps are required in structures, steps shall be installed during the casting of the structures, aligned as specified herein. Steps shall be spaced 12 inches vertically on-centers, and shall be arranged so that the lowest rung is no more than 15 inches above the bench in structures with an invert and above the bottom of the structures with no invert. The top rung is to be installed no more than 24 inches below the top of the casting. Steps shall be arranged out of the alignment of the pipes and/or floor channel and shall be centered in the opening of the cover.

No precast concrete structure shall be fabricated or delivered to the job site until it has received final review status by the Site Engineer. All structures shall have an identifying number and manufacturer's name on each section.

When precast concrete structures are to be used, the Contractor shall bear all responsibility for the proper locations and sizes of all openings to receive the pipe. Final review of shop drawings by the Site Engineer shall not relieve the Contractor of his responsibility in this matter.

E. Manhole Frames and Covers - shall be as specified on the Drawings. Castings shall be gray cast iron, American made by a nationally recognized casting manufacturer conforming to the requirements of AASHTO Designation M-105, Class 30, and shall be true to pattern in form and dimensions as specified, and shall be free from pouring faults, sponginess, cracks, blowholes and other defects that affect their strength and other characteristics for the intended use. All surfaces shall have a workmanlike finish.

   All component parts shall fit together in a satisfactory manner and frames and covers shall be of a design that will prevent rocking or rattling under traffic. Frames and covers that are warped or rocking shall be rejected and shall be removed and replaced.

   Unless otherwise specified, the word "SEWER" shall be integrally cast on the cover in raised letters and centered. Letter size shall be two (2) inches. Covers shall not have vent holes.

   If directed, and at no additional cost, castings shall be coated with an asphalt paint which shall result in a smooth coating and not be tacky or brittle.

F. Concrete and Reinforcing - shall conform to the requirements as specified herein under Section 03 3053.

G. Mortar - shall be composed of one (1) part Portland cement and two (2) parts sand by volume. Material requirements shall be as follows:
   1. Portland Cement - shall conform to the requirements of AASHTO Designation M-85.
   2. Mortar Sand - shall conform to the requirements of AASHTO Designation M-45, except that aggregate shall be no coarser than #8 sieve size.
   3. Water - shall be clean and shall not contain any oil, acid, alkali, salts, vegetable matter, organic matter or other deleterious substances. When possible, water shall be from a municipal system.

   Hand mixing of mortar will be permitted only when the amount of mortar to be used makes machine mixing undesirable. When hand mixing is used, the ingredients must first be

thoroughly mixed dry in a tight box. The proper quantity of clean water shall then be gradually added, and the materials shall be hoed or worked until a uniform mixture is secured. Admixtures may be added only with prior written consent.

No greater quantity of mortar is to be prepared than is required for immediate use, and it shall be worked over constantly with hoe or shovel until used. No mortar shall be retempered, and none shall be used more than one and one-half (1-1/2) hours after mixing. All mortar which remains upon stopping work shall be discarded.

H. Steps - Steps in sanitary sewer structures shall be as specified herein and on the details of the Drawings and shall meet the requirements for steps and ladders as specified under ASTM Designation C-478.
   1. Malleable or Ductile Cast Iron - shall be designed for a minimum design live load of a single concentration of 300 pounds. Material shall be of Iron, Class 25A, in accordance with ASTM Designation A-48 or Malleable Iron, Grade 35018 in accordance with ASTM Designation A-47.
   2. Plastic Coated Steel - shall be No. 4 deformed reinforcement bar meeting the requirements of ASTM Designation A-615, Grade 60 which shall be coated with polypropylene plastic meeting the requirements of ASTM Designation D-2146 for Type II, Grade 49108.
      All steps shall be true to pattern, form dimensions, and free from defects which would affect their strength. Steps having defects filled with putty or cement of any kind shall be rejected.
   3. Relocated Steps - should the location of the proposed connection to an existing manhole interfere with the existing steps, the steps shall be removed and either relocated or new steps provided, as determined by the Site Engineer. Any existing holes or other marring of the manhole due to the step removal shall be repaired to the satisfaction of the Site Engineer. Patching of manhole shall be accomplished with non-shrinking cement mortar grout, approved equal to Sika-Set as manufactured by the Sika Chemical Corp.

2.04 PIPE-TO-MANHOLE CONNECTOR

A. Pipe-to-manhole connector - shall be equal to "Kor-n-Seal" connector as manufactured by NPC Inc. Rubber boot shall be constructed of resilient EPDM rubber and meet ASTM C923. The internal and external expander-type clamp shall be manufactured of 304-Series stainless steel and meet ASTM C923 and A167.

2.05 DROP CONNECTION

A. Internal drop connection to existing manhole - shall be in accordance with the Plan detail, and shall consist of polyvinyl chloride pipe (PVC) and fittings, Schedule as indicated on the Plans, and attached to the manhole with Unistrut pipe clamps.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

A. Pipe shall be of the type and sizes specified and shall be laid accurately to line and grade. Structures shall be accurately located and properly oriented.

B. The installation of all sanitary sewer structures and pipe shall conform to the requirements of all Authorities having jurisdiction.

C. The requirements of the Health Department and any other Authority having jurisdiction shall govern the horizontal and vertical separation of sanitary sewers from water lines, including testing requirements.

3.02 TRENCH EXCAVATION, DEWATERING, BEDDING AND BACKFILL

A. The provisions of Section 31 2316 of these Specifications shall govern all work under this Section including but not limited to dewatering and excavation support (sheeting and shoring).

B. The requirements for excavation, bearing capacity, subsurface preparation, dewatering, and backfill must be in accordance with the Geotechnical Engineer's requirements.

C. Work shall include all excavation, bedding and backfill required to complete the installations in accordance with the requirements of the manufacturers and/or all Authorities having jurisdiction.

3.03 STORAGE AND HANDLING

A. Storage - Storage of sanitary sewer pipe and appurtenances on the job shall be in accordance with the manufacturers' recommendations. Storage locations of pipe and appurtenances on the site shall be subject to approval.

B. Handling - All sanitary sewer pipe and appurtenances shall be protected against impact, shock and free fall, and only equipment of sufficient capacity and proper design shall be used in handling the pipe and appurtenances.

3.04 DAMAGE

A. General - Sanitary sewer pipe and appurtenances which are defective from any cause, including damage caused by handling, and is unrepairable, shall be unacceptable for installation and shall be replaced by the Contractor at no cost.

Sanitary sewer pipe and appurtenances that are damaged or disturbed through any cause prior to acceptance of the Work shall be repaired, realigned or replaced by the Contractor at the Contractor's expense.

3.05 PIPE INSTALLATION

A. Laying Pipe - Each length of pipe shall be laid with firm, full and even bearing throughout its entire length, in a trench prepared and maintained in accordance with the details as shown on the Drawings and Section 31 2316 of these Specifications. Pipe shall be laid upgrade with bells uphill unless otherwise directed.

Every length of pipe shall be inspected and cleaned of all dirt and debris before being laid. The interior of the pipe and the jointing seal shall be free from sand, dirt and debris before installing the line. Extreme care shall be taken to keep the bells of the pipe free from dirt and debris so that joints may be properly assembled without overstressing the bells. No pipe is to be trimmed or chipped to fit.

No length of pipe shall be laid until the preceding lengths of pipe have been thoroughly embedded in place, so as to prevent movement or disturbance of the pipe.

B. Full Lengths of Pipe - Only full lengths of pipe are to be used in the installation except that partial lengths of pipe may be used at the entrance to structures where necessary to obtain a proper connection to the structure.

C. Pipe Entrances to Structures - All pipe entering structures shall be cut flush with the inside face of the structure, and the cut ends of the pipe and surface of the structure shall be properly rounded and finished so that there will be no protrusion, ragged edges, or imperfections that will impede the flow or affect the hydraulic characteristics of the installation. The method of cutting and finishing shall be subject to the approval. Connections shall be made watertight by the use of approved rubber seals.

D. Bedding and Backfilling - The type of materials to be used in bedding and backfilling and the method of placement shall conform to the requirements of Section 31 2316 of these Specifications and as shown on the details of the Drawings.

E. Protection During Construction - The Contractor shall protect the installation at all times during construction. Movement of construction equipment, vehicles and loads over and adjacent to any pipe shall be done at the Contractor's risk.

At all times when pipe laying is not in progress, all open ends of pipes shall be closed by approved temporary watertight plugs. If water is in the trench when work is resumed, the plug

shall not be removed until the trench has been pumped dry and all danger of water entering the pipe has been eliminated.

The Contractor shall furnish a sufficient pumping plant and shall provide and maintain at his own expense satisfactory drainage wherever needed in the trench and other excavations during the progress of the Work and at its completion for final inspection. No pipe or other structure shall be laid in water and water shall not be allowed to flow or rise under any concrete or other masonry. All water pumped or bailed from the trench or other excavation shall be conveyed in proper manner to a suitable point of discharge. The flow in all sewers, drains and watercourses encountered on the Work and in gutters along the sides of or across the Work shall be entirely provided for, both temporarily and permanently, as required, by the Contractor at his expense. All offensive water shall be removed from the Work at once.

F. Grade and Alignment
   1. Gravity Sewers – Pipe for sanitary sewer gravity lines shall be laid accurately to the line and grade shown on the Drawings. Each section of pipe shall be checked for line and grade after being laid. A survey instrument shall be used at all times during pipe laying operations, and all adjustments which must be made shall be made by removing material or filling with select bedding material under the barrel of the pipe as necessary and not by wedging or blocking any portion of the pipe. Deviations from line and grade shall be a basis for rejection of the line of pipe. Any line which has been rejected shall be rebuilt to the correct line and grade by the Contractor at his own expense.

3.06 PIPE JOINTS

A. All joints are to be made watertight in accordance with the requirements specified herein and on the Drawings.

B. Unless otherwise permitted, jointing of all pipe and fittings shall be done entirely in the trench.

3.07 STRUCTURES

A. General Requirements - All sanitary sewer structures shall be built in accordance with the details and at the locations shown on the Drawings and as specified herein. Where a specific material of construction is indicated, no substitution will be allowed unless authorized in writing. Where more than one type of material of construction is indicated, the Contractor shall have the option of constructing the structure of any one of the materials specified. Precast concrete structures shall require shop drawing submission for review.

Cast-in-place concrete and/or masonry shall not be laid when the temperature is below 40 degrees F, or when indications are for lower temperatures within 24 hours, unless protection of concrete and masonry is approved. In this event, the Contractor shall take measures to prevent concrete and masonry from being exposed to freezing temperatures for a period of not less than five (5) days after installation. Approval of the method of protection shall not relieve the Contractor of his responsibility to protect the concrete and masonry from freezing, and any damage to the structure because of freezing shall be corrected by the Contractor at his own expense.

All cast-in-place concrete and masonry shall be installed by personnel experienced and skilled in this work, and any person not deemed to be such shall be removed and replaced by a person so qualified.

Sanitary sewer structures are to be constructed as soon as the pipe laying reaches the location of the structures. Should the Contractor continue his pipe laying without making provision for completion of the structures, the pipe laying operations will be stopped until the structure is completed.

In constructing manholes and other sanitary sewer structures, the Contractor shall accurately locate each structure and set accurate templates to conform to the required line and grade. Any structure which is mislocated or oriented improperly shall be removed and rebuilt in its proper location, alignment and orientation at the Contractor's expense.

The Contractor shall use extreme care in the handling of precast concrete structures. Any damage occurring to the precast concrete structures due to carelessness in handling or due to any of the Contractor's operations shall be repaired or replaced by the Contractor at his own expense.

Unless otherwise specified, all structures shall be constructed on concrete foundations. All foundations shall rest on firm soil of uniform bearing. If the soil beneath the foundation is unsuitable, the Contractor shall remove this unsuitable material as directed, and replace it with an approved properly compacted granular backfill material conforming to the requirements of Section 31 2316 of these Specifications to the bottom elevation of the structure.

B. Cast-in-Place Concrete Structures - Cast-in-place concrete structures shall be constructed of a Class “A” concrete, conforming to the requirements of Section 03 3053 of these Specifications, with reinforcing as shown in detail on the Drawings and as specified herein.

C. Precast Concrete Structures - Precast concrete structures shall be installed only after shop drawings have received final review by the Site Engineer. All precast concrete structures shall be designed and fabricated for an H-20 design load.

The base of the precast concrete structures shall be set on a foundation pad of crushed stone eight (8) inches in compacted thickness. Foundations of all precast concrete structures shall rest on firm soil of uniform bearing. If soil beneath the foundation is unsuitable, the Contractor shall remove the unsuitable material as directed, and replace it with and approved properly compacted granular material conforming to the requirements of Section 31 2316 of these Specifications to the bottom elevation of the crushed stone pad.

Provisions shall be made for installation of approved watertight connections at pipe entrances to precast concrete structures by the use of approved rubber seals.

The precast concrete top section shall be set sufficiently below finished grade to permit adjustment of the casting using brick or precast concrete adjustment rings as risers to adjust the grade of the casting (minimum 4" – maximum 12" adjustment). Manhole frames shall be set on a grout pad as specified hereinabove.

D. Shallow Circular Structures - For shallow circular structures, the top conical section shall be replaced by a flat reinforced concrete slab with the proper size opening to accommodate the specified casting. The reinforced concrete slab shall have a minimum thickness of six (6) inches and shall be designed for a H-20 design load. In general, and unless otherwise specified or directed, the flat slab top shall be used for circular structures whose depth from pipe invert to finished grade is five (5) feet or less.

E. Inverts - Smooth invert channels shall be constructed in all manholes. Unless otherwise specified, inverts channels shall be constructed of concrete.

If brick inverts are specified or permitted, special care shall be taken in laying brick inverts. Joints shall not exceed three-sixteenth (3/16) inch in thickness and each brick shall be carefully laid in full cement mortar joints on bottom, sides and ends in one operation. No grouting or working in of mortar after laying of the brick shall be permitted.

Extreme care shall be taken by the Contractor to construct invert channels to the shape, elevations and dimensions shown, specified or ordered.

When a curve in the invert channel or some other condition prevents the use of channels as shown on the Drawings, then such channels shall be constructed as directed by the Site Engineer.

When pipes entering and leaving a manhole are of different diameters, the invert channel shall be constructed so as to provide a smooth transition from the inflow pipe(s) to the outflow pipe.

The invert channel shall be carried up to the elevations shown on the Drawings and/or as directed. Channels shall slope smoothly and evenly from the inflow pipe(s) to the outflow pipe.

Invert channels shall be built for future extensions where shown on the Drawings and/or where directed.

F. Frames and Covers - Frames and covers for sewer structures shall be of the types and sizes indicated on the Drawings. Frames shall be well bedded in mortar and shall be set accurately to the correct alignment and grade. In areas to be paved, frames shall be set by using four (4) points of reference, set 90 degrees apart, to insure accurate setting to proposed pavement grade.

G. Steps - Steps shall be installed in all manholes. Steps shall be set securely in place during fabrication of the wall section for precast concrete structures. Spacing of steps shall be as shown in detail on the Drawings.

3.08 CONNECTIONS

A. General Requirements - The Contractor shall make all required connections of the proposed sanitary sewer into existing and proposed sanitary sewer facilities where and as shown on the Drawings and/or as directed.

B. Compliance with Requirements of Owner of Facility - Connections made into existing sanitary sewer facilities owned by others shall be done in accordance with the requirements of the owner of the facility. The Contractor shall be required to comply with all such requirements, including securing of all required permits, and paying the costs thereof. The cost of making the connections in accordance with the requirements of the owner of the existing facility shall be included in the Contract Sum.

3.09 ALTERATION AND/OR RECONSTRUCTION OF EXISTING STRUCTURES

A. General Requirements – Existing structures shall be altered and/or reconstructed where as shown on the Drawings, and/or directed. In general, alterations shall be made with the same type of material used in the original construction unless otherwise indicated on the Drawings or directed.

B. Adjustment to New Grade and Alignment - All castings on existing structures that are to remain shall be adjusted to new grade and alignment. When such adjustment is required the castings shall be carefully removed and the walls of the structures reconstructed as required. The castings shall be cleaned and reset in a firm mortar bed to the new grade and alignment. Existing castings which are broken, damaged or otherwise unfit for incorporation into the new work shall be replaced under the Contract Sum.

1. After the subgrade and/or existing pavement surfaces have been prepared, the Contractor shall check all frames and covers that are located in the proposed new, milled, or overlaid pavement areas to ensure that all such items have been accurately positioned and set to the proper slope and elevation. All covers are to be set flush with the required finished pavement surface. No depressions or mounds will be permitted in the pavement to accommodate inaccuracies in the setting of these appurtenances. All initial and corrective work shall be done by the Contractor at his own expense, regardless of the number of times casting are adjusted to grade.

C. Removal of Portions of Walls of Existing Structures - In all cases of alteration and/or reconstruction of existing structures, existing walls shall be removed to a point where the existing walls will provide sound and adequate foundation for the construction of the new walls.

D. Reconstruction and/or Rebuilding of Existing Invert - Where new pipes are to be installed into an existing structure, the existing invert shall be reconstructed and/or rebuilt as directed to accommodate installation of the new pipes and provide for proper transition of flows into and out of the structure.

E. Damage to Existing Structure and/or Pipe - Extreme care shall be exercised by the Contractor during such alteration and/or reconstruction so as not to damage any portions of the structure and/or pipe shown to remain. Any such damage shall be repaired by the Contractor at his own expense.

F. Structures to be Cleaned - Upon completion of alteration and/or reconstruction of existing structures, all structures shall be cleaned of any accumulation of silt, debris or foreign matter of any kind and shall be kept clean of such accumulation until final acceptance of the work.

3.10 DROP CONNECTION

A. Proper sized hole shall be cored in the existing manhole to effect the pipe installation for the internal drop connection. The cored hole shall be sealed around the pipe with A-Lok, Link Seal (or approved equal) flexible seal assembly.

B. Provide a PVC cross fitting with end cap to facilitate cleaning, at the entrance to the manhole.

C. Use Unistrut pipe clamps to attach the drop pipe to the manhole with 2' 0" O.C. maximum spacing.

D. Patching of manhole shall be accomplished with non-shrinking cement mortar grout, approved equal to Sika-Set as manufactured by the Sika Chemical Corp.

E. Form a new concrete invert at the end of the PCV pipe bend to provide a smooth discharge into the existing invert in accordance with Recommended Standards for Wastewater Facilities, latest edition.

3.11 RELOCATION AND/OR ABANDONMENT OF EXISTING FACILITIES

A. The Contractor shall not abandon, disconnect, obstruct or in any other way interfere with the operation of an existing sewer facility until such time as adequate permanent or temporary substitute facilities have been constructed and placed in operation.

No connections of active services shall be made until sanitary sewer is accepted by the Department of Health, as applicable. The Contractor must bypass the flow for active services.

3.12 SERVICE LINES

A. General Requirements - The Contractor shall make all required connection(s) of the building sanitary sewer service line(s) where and as shown on the Drawings and as directed. Work shall include making the service line connection(s) into the sanitary sewer system, furnishing and installing all service line pipe from the sanitary sewer system to point(s) located five (5) feet outside of the building lines and properly sealing the end(s) with watertight plugs, except that, if the building plumbing contractor has installed his portion of the sanitary sewer service line, work under this Contract shall also include final connection(s) of the sanitary sewer service line(s) five (5) feet outside of the building lines to the building service line installed by the building plumbing contractor. The connection(s) shall be made utilizing proper fittings compatible with the building service line(s) providing watertight connection(s) and shall be done at no additional cost to the Owner.

B. Coordination with Building Plumbing Contractor - The Contractor will be required to coordinate his work with the work of the building plumbing contractor to determine the exact location(s) and elevation(s) of the point(s) of entry into the building(s).

3.13 TESTS

A. General Requirements - The Contractor shall test the completed sanitary sewers for leakage and deflection as specified herein. In the event of conflict between the test requirements specified herein and the test requirements of Authorities having jurisdiction over all or any portion of the sanitary sewers installed under this Contract, the more restrictive requirements shall govern.

The tests shall be conducted by the Contractor, and the Contractor shall furnish all necessary equipment, materials and labor for the tests as specified.

The Contractor shall notify the Owner's Representative and Site Engineer at least 48 hours prior to the start of testing. Testing shall be done only in the presence of the Owner's Representative and Site Engineer.

Runs of pipe and/or manholes tested for leakage prior to completion of the Project shall be subject to additional leakage tests, if warranted, in the opinion of the Owner's Representative or Site Engineer.

B. Gravity Sewers - shall be tested as follows:
   1. Leakage Tests - The test length intervals and type of leakage test shall be approved by the Owner's Representative and Site Engineer. 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. Depending on field conditions and/or desire of the Contractor, the following tests for leakage may be employed:
      a. Hydrostatic Test
         The test period, wherein the measurements are taken shall not be less than four (4) hours in either type of test. The total leakage of any section tested 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, manholes shall be considered as sections of pipe and shall be tested at a level above the highest joint prior to the concrete/rim connection.
         1) Infiltration Test - This test may be used only when ground water levels are at least two (2) feet above the top of the pipe for the entire length of the section to be tested during the entire period of the test. Ground water levels may be measured in an open trench or in standpipes previously placed in backfilled trenches during the backfilling operations. 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.
         2) Exfiltration Test - This test consists of filling the pipe with water to provide a head of at least two (2) feet above the top of the pipe or two (2) 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.
      b. Vacuum Testing of Manholes – shall conform to the requirements of ASTM Designation C-1244 "Standard Test Method for Concrete Sewer Manholes by Negative Air Pressure (Vacuum) Test Prior to Backfill".
      c. Low-Pressure Air Test of Plastic Pipe Lines – shall conform to the requirements of ASTM Designation F-1417 "Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air".
   2. Deflection Tests - The Contractor shall test all thermoplastic main line pipe by use of a calibrated mandrel or other device approved by the Owner's Representative to ensure that no pipe deflection has occurred greater than 5 percent of the inside diameter of the pipe. The Contractor shall test the entire length of the sewer installed. Any pipe section exhibiting greater than 5 percent deflection shall be replaced and retested, at no additional cost to the Owner. If a second deflection test is required, it will be at the Contractor's expense.

C. Correction of Defective Work - If the tests exceed the specified amount, the Contractor shall, at his own expense, make the necessary repairs or replacements required to permanently reduce the leakage and/or deflection to within the specified limit, and the tests shall be repeated until the test requirements are met. All additional tests required by the Owner and Authorities having jurisdiction shall be at the Contractor's expense.

Any defects found in the sanitary sewers shall be made good by and at the expense of the Contractor so as to conform strictly to the Specifications. All repairs shown necessary by the tests shall be made, broken or cracked pipe replaced, all deposits removed, and the sanitary sewers left true to line and grade and entirely clean, free from lumps of cement, protruding gaskets, bulkheads, etc., and ready for use before final acceptance shall be made.

3.14 RECORD DRAWINGS

A. In addition to the requirements stated in Division 1 Specification Sections, an "as-built" set of record drawings shall be kept on the site concurrently with the progress of the work. These "as-built" record drawings shall consist of a marked set of the drawings with additional sketches as required, denoting and dimensioning accurately and neatly all changes and conditions that are variations from the drawings.

B. All changes in alignment and grade of the newly installed underground piping which are not marked by a visible surface structure such as manholes, shall be recorded. These locations shall be located in reference to three (3) separate permanent surface reference points and recorded on the "as-built" record drawings. An accurate record shall also be kept of all existing site items which are reworked or relocated.

C. The as-built may be required for submission to Westchester County Department of Health (DOH), prior to submitting the final record drawings. The newly installed works may not be placed into service, until the completed works approval is received from the DOH, as applicable.

D. Upon completion of the work, the Contractor shall deliver the final "as-built" record drawings in Autocad format and on a thumb drive, and bear the original signature and seal of a licensed land surveyor in the State of New York or the design engineer, prepared pursuant to the New York State Education Law. All modifications must be included on the "as-built" with all changes bubbled in red, including details, and be of the same scale as the approved plans. All information pertaining to the utilities must be included on the plan and profiles, with clear delineation between pre-existing utilities and newly installed utilities. All drawings must include the date and an "as-built" stamp or notation on each sheet, and the full set of plans including detail sheets. A list must be provided of all deviations from the original approved plans shown on the record drawings, together with the Contractor's explanation thereof.

E. If utilities are constructed within easements, the easements must be included, showing dimensions of the utilities located within the easements, demonstrating that they are located wholly within the easement boundaries.

3.15 CLEANING AND REPAIR

A. The Contractor will be required to clean the entire sanitary sewer system of all debris and obstructions. This shall include, but not be limited to, removal of all formwork from structures, concrete and mortar droppings, construction debris and dirt. The system shall be thoroughly flushed clean and the Contractor shall furnish all necessary hose, pumps, pipe and other equipment that may be required for this purpose. No debris shall be flushed into existing sanitary sewers or streams. All debris shall be removed from the system.

After the system has been cleaned, the Contractor shall thoroughly inspect the system and all repairs shown to be necessary shall be promptly performed by the Contractor.

All work of cleaning and repair as specified herein shall be performed at the Contractor's expense and to the complete satisfaction of the Authority having jurisdiction.

3.16 FINAL INSPECTION

A. Upon completion of the Work and before final acceptance, the entire sanitary sewer system shall be subjected to a final inspection in the presence of the Site Engineer and/or Owner's Representative. The work shall not be considered complete until all requirements for line, grade, cleanliness, tests and workmanship have been met.

END OF SECTION

SECTION 33 40 00

STORMWATER UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The Work of this Section includes, but is not limited to:
   1. Installation of drainage system(s) consisting of manholes, drain inlets, finger underdrains, pipe, fittings, headwalls, outlet control structure, bioretention areas including underdrains, and all necessary and required accessory items and operations, including connection(s) to drainage facilities.
   2. Relocation, alteration, reconstruction and/or conversion of existing structures, including resetting existing and/or new castings to grade as required.
   3. Alteration, reconstruction and/or relocation/relaying of existing drainage lines as required as may be indicated on the Drawings.
   4. Installation of piping from the roof leader drain collection pipe to the stormwater system consisting of all pipe, fittings and required accessory items and operations including clean-outs.
   5. Television inspection of existing 30" HDPE pipe both before and after construction of the bioretention area.
   6. Where appropriate, the installation of all drainage facilities within Public Rights-of-Way shall be in accordance with all rules and requirements. Work shall include all items and operations necessary and required to complete the drainage facilities, including maintenance of traffic and protection of pedestrians.

1.02 REFERENCE STANDARDS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section, as well as all applicable construction, fabrication and safety standards.

B. Comply with requirements of the Stormwater Pollution Prevention Plan (SWPPP) and Soil Erosion and Sediment Control specification, plans, and details, and the Contractor's accepted schedule. Refer to Section 01 5713 of these Specifications.

C. The Contractor shall read the Geotechnical Report for subsurface investigations prepared by Carlin-Simpson & Associates, " Report on Subsurface Soil and Foundation Investigation" dated July 14, 2021, revised April 20, 2022, to be fully aware of available subsurface information and current recommendations. No extra claim for ignorance shall be accepted.

D. Comply with all industry standards and requirements of all Authorities having jurisdiction. If requirements specified conflicts with the requirements of Authorities having jurisdiction, the requirements of the Authority having jurisdiction applies.
   1. ASTM A-47 - Malleable Iron Steps, Grade 35018.
   2. ASTM A-48 – Ductile Iron Steps, Class 25A.
   3. ASTM A-167 - Stainless and Heat-Resistant Chromium-Nickel Steel Plate, Sheet and Strip.
   4. ASTM A-615 - Plastic Coated Steel No. 4 Deformed Reinforcement Bar, Grade 60.
   5. ASTM C-139 - Concrete Masonry Units for Construction of Catch Basins and Manholes.
   6. ASTM C-443 - Joints for Precast Concrete Manhole Sections.
   7. ASTM C-478 - Precast Concrete Manhole Sections.
   8. ASTM C-913 - Precast Concrete Square or Rectangular Box Structures.
   9. ASTM C-923 - Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.
   10. ASTM C-990 - Joints for Precast Concrete Box Sections.
   11. ASTM F-2648 – Corrugated Polyethylene Drain Pipe and Fittings (HDPE).
   12. AASHTO M-45 - Mortar Sand.

13. AASHTO M-85 - Portland Cement.
14. AASHTO M-91 - Grade MS - Sewer and Manhole Brick (Clay or Shale).
15. AASHTO M-105 - Gray Cast Iron Castings, Grade 30.
16. AASHTO M-111 – Galvanization.
17. AASHTO M-183 – Fabricated Steel.
18. AASHTO M-278 - Class PS46 (Vinyl Chloride) (PVC) Pipe.
19. AASHTO M-294 – Interior and Exterior Corrugations Type S for HDPE.

1.03 SUBMITTALS

A. Shop Drawings: Provide catalog cuts. Include plans, elevations, sections, and details of fabrications and their connections as applicable, including accessory items, for all stormwater utility items and appurtenances such as pipe, fittings, castings, steps, precast concrete structures, inlets, etc.

1.04 QUALITY ASSURANCE

A. Provide a detailed installation and termination schedule for all items of work included in this Section.

B. Contractor to coordinate a pre-construction meeting prior to all work.

C. Notify the Site and/or Geotechnical Engineer prior to the work taking place.

D. The installation of certain materials and infrastructure including but not limited to earthwork operations, and hardscape and utility installations, may be subject to special subgrade preparation and construction requirements. Subgrade improvement measures and special construction requirements must be followed as indicated by the Geotechnical Engineer. The most stringent geotechnical requirements stated in the Geotechnical Report or any other place in the Contract Documents shall be adhered to by the Contractor.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. The materials to be used in the construction shall be those indicated on the Drawings and specified herein. The Contractor shall supply to the Owner's Representative, prior to installation, certificates of compliance for the materials used. The Contractor shall also submit shop drawings and catalog cuts of all storm drain items and appurtenances (pipe, fittings, joints, castings, steps, precast concrete structures, etc.) to the Site Engineer for review prior to ordering.

B. Where material requirements specified hereinafter conflicts with the requirements of Authorities having jurisdiction, the requirements of the Authority having jurisdiction shall govern.

2.02 STORM DRAIN PIPE, FITTINGS AND JOINTS

A. Corrugated Polyethylene Drain Pipe and Fittings (HDPE) - shall have smooth interior and annular exterior corrugations in accordance with ASTM F-2648 and conform to the requirements of AASHTO Designation M-294, Type S.

B. Pipe shall meet watertight requirements and shall be ADS N-12 WT pipe as manufactured by Advanced Drainage Systems, Inc. or Sure-Lok WT pipe as manufactured by Hancor or approved equal.

2.03 CLEAN-OUTS

A. Clean-Outs - shall be double hand-hole cleanout as Detailed on the Plan, and consist of double PVC pipes SDR-35 or cast iron pipes, as required by the Authority having jurisdiction, encased in concrete with Campbell frames and covers No. 1000, or approved equal, and provided with locking bolts and raised head clean-out plugs.

2.04 FINGER UNDERDRAINS

A. Underdrains shall be perforated polyvinyl chloride pipe (PPVCP) and shall conform to the requirements of AASHTO M-278, and shall be Perforated Highway Underdrains and Fittings as manufactured by Carlon or approved equal.

B. Coarse aggregate underdrain filter material shall be approved material confirming to Size No. 57, ASTM C-33..

C. Filter fabric shall be Mirafi Filterweave 402 or 404 (sandy soils) or 500 (silty/clay soils), or approved equal.

2.05 BIORETENTION AREA

A. Bioretention Areas - shall be constructed where shown and detailed on the Plans including required underdrains.
   1. Underdrains shall be perforated polyvinyl chloride pipe (PPVCP) and shall conform to the requirements of AASHTO M-278, and shall be Perforated Highway Underdrains and Fittings as manufactured by Carlon or approved equal.
   2. Gravel jacket shall be approved 1 1/2" to 2" clean gravel.
   3. Filter fabric shall be Mirafi FW 180N or approved equal.
   4. Refer to the Plans for headwall, basin plantings, mulch, and soil materials.

2.06 POCKET POND

A. Pocket Pond - shall be constructed where shown and detailed on the Plans.
   1. Equipped with observation well/cleanout and overflow control structure.
   2. Refer to the Plans for headwalls, plantings, and soil materials.

2.07 STRUCTURES

A. Brick - shall conform to the "Specifications for Sewer and Manhole Brick (made from Clay or Shale)", AASHTO Designation M-91, Grade MS.

B. Concrete Block - shall be solid block and shall conform to the "Specifications for Concrete Masonry Units for Construction of Catch Basins and Manholes," ASTM Designation C-139.

C. Precast Concrete Structures - Prior to fabrication, the Contractor shall submit four (4) sets of plans of the proposed precast concrete structures to the Site Engineer for review along with design criteria and certification from the manufacturer by a licensed Professional Engineer registered in the State in which the Work is performed that the structure will support the design load. All precast concrete structures shall be designed and fabricated for an H-20 loading. The minimum compressive strength of the concrete used for all precast concrete structures shall be 4,000 psi.

   Precast concrete manhole sections shall conform to ASTM Designation C-478. Precast concrete square or rectangular box structures shall conform to ASTM Designation C-913.

   For precast concrete box structures, there shall be a minimum of six (6) inches of precast concrete wall between the opening for the pipe and the inside wall corner, and a minimum vertical distance of six (6) inches from the opening for the pipe to the bottom of the top slab, unless otherwise shown, specified or ordered by the Owner's Field Representative.

   Joints in the structures shall be tongue and groove joints, formed in such a manner so that a watertight rubber seal can be applied. Joints for precast concrete manhole sections shall conform to ASTM Designation C-443 or ASTM designation C-990. Joints for precast concrete box sections shall conform to ASTM Designation C-990. Provisions shall be made for installation of approved watertight connections to precast concrete structures.

   Where steps are required in structures, steps shall be installed during the casting of the structures, aligned as specified herein. Steps shall be spaced 12 inches vertically on-centers, and shall be arranged so that the lowest rung is no more than 15 inches above the bench in structures with an invert and above the bottom of the structures with no invert. The top rung is

to be installed no more than 24 inches below the top of the casting. Steps shall be arranged out of the alignment of the pipes and/or floor channel and shall be centered in the opening of the grate or cover.

No precast concrete structure shall be fabricated or delivered to the job site until it has received final review status by the Site Engineer. All structures shall have an identifying number and manufacturer's name on each section.

When precast concrete structures are to be used, the Contractor shall bear all responsibility for the proper locations and sizes of all openings to receive the pipe. Final review of shop drawings by the Site Engineer shall not relieve the Contractor of his responsibility in this matter.

D. Concrete Headwalls - shall be reinforced and of the size shown on the Drawings and as detailed, and in accordance with Section 03 3053 of these Specifications. All exposed edges shall be chamfered one inch, and the minimum compressive strength of the concrete shall be 4,000 psi.

E. Manhole Frames and Covers - shall be as specified on the Drawings. Castings shall be gray cast iron, American made by a nationally recognized casting manufacturer conforming to the requirements of AASHTO Designation M-105, Class 30, and shall be true to pattern in form and dimensions as specified, and shall be free from pouring faults, sponginess, cracks, blowholes and other defects that affect their strength and other characteristics for the intended use. All surfaces shall have a workmanlike finish.

All component parts shall fit together in a satisfactory manner and frames and covers shall be of a design that will prevent rocking or rattling under traffic. Frames and covers that are warped or rocking shall be rejected and shall be removed and replaced.

Unless otherwise specified, the word "DRAIN" shall be integrally cast on the cover in raised letters and centered. Letter size shall be two (2) inches.

If directed, and at no additional cost, castings shall be coated with an asphalt paint which shall result in a smooth coating and not be tacky or brittle.

F. Drain Inlet and Open Grate Manhole Cover - shall be as specified on the Drawings and in accordance with the following requirements and shall be American made by a nationally recognized casting manufacturer:
   1. Cast Iron - shall be gray cast iron castings conforming to the requirements of AASHTO Designation M-105, Class 30. All requirements of workmanship and material as specified for manhole castings shall apply herein. If directed, and at no additional cost to the Owner, castings shall be coated with an asphalt paint which shall result in a smooth coating and not be tacky or brittle.
   2. Fabricated Steel - shall meet the requirements of AASHTO Designation M-183. Unless otherwise specified, all frames and grates shall be galvanized in accordance with AASHTO Designation M-111.
      All component parts of the frames and grates shall fit together in a satisfactory manner and frames and covers shall be of a non-rocking design so as to prevent rocking or rattling under traffic. Frames and grates that are warped or rocking, as determined by the Owner's Field Representative, shall be rejected and shall be removed and replaced by the Contractor to the satisfaction of the Owner's Field Representative at no cost to the Owner.
   3. All castings shall be "eco-friendly" with a fish logo or words "Drains to Waterways" cast on it. Castings located in hardscape areas shall have bicycle safe grates.

G. Concrete and Reinforcing - shall conform to the requirements of Section 03 3053 of these Specifications and detailed on the Plans.

H. Mortar - shall be composed of one (1) part Portland cement and two (2) parts sand by volume. Material requirements shall be as follows:
   1. Portland Cement - shall conform to the requirements of AASHTO Designation M-85.

2. Mortar Sand - shall conform to the requirements of AASHTO Designation M-45, except that aggregate shall be no coarser than #8 sieve size.
3. Water - shall be clean and shall not contain any oil, acid, alkali, salts, vegetable matter, organic matter or other deleterious substances. When possible, water shall be from a municipal system.

Hand mixing of mortar will be permitted only when the amount of mortar to be used makes machine mixing undesirable. When hand mixing is used, the ingredients must first be thoroughly mixed dry in a tight box. The proper quantity of clean water shall then be gradually added, and the materials shall be hoed or worked until a uniform mixture is secured. Admixtures may be added only with prior written consent.

No greater quantity of mortar is to be prepared than is required for immediate use, and it shall be worked over constantly with hoe or shovel until used. No mortar shall be retempered, and none shall be used more than one and one-half (1-1/2) hours after mixing. All mortar which remains upon stopping work shall be discarded.

I. Steps - Steps in drainage structures shall be as specified herein and on the details of the Drawings and shall meet the requirements for steps and ladders as specified under ASTM Designation C-478.
   1. Malleable or Ductile Cast Iron - shall be designed for a minimum design live load of a single concentration of 300 pounds. Material shall be of Iron, Class 25A, in accordance with ASTM Designation A-48 or Malleable Iron, Grade 35018 in accordance with ASTM Designation A-47
   2. Plastic Coated Steel - shall be No. 4 deformed reinforcement bar meeting the requirements of ASTM Designation A-615, Grade 60 which shall be coated with polypropylene plastic meeting the requirements of ASTM Designation D-2146 for Type II, Grade 49108.

   All steps shall be true to pattern, form dimensions, and free from defects which would affect their strength. Steps having defects filled with putty or cement of any kind shall be rejected.

J. Outlet Control Structure - shall be precast concrete structure including bypass weir and orifice for multi-stage flow control, and conform to the Plans and Details for all work associated with the supply and installation, as well as the applicable sections of these specifications.

2.08 PIPE-TO-MANHOLE CONNECTOR

A. Pipe-to-manhole connector - shall be equal to "Kor-n-Seal" connector as manufactured by NPC Inc. Rubber boot shall be constructed of resilient EPDM rubber and meet ASTM C923. The internal and external expander-type clamp shall be manufactured of 304-Series stainless steel and meet ASTM C923 and A167.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

A. Pipe shall be of the type and sizes specified and shall be laid accurately to line and grade. Structures shall be accurately located and properly oriented.

B. The installation of all stormwater structures and pipe shall conform to the requirements of all Authorities having jurisdiction.

C. The requirements of the Health Department and any other Authority having jurisdiction shall govern the horizontal and vertical separation of storm drains from water lines.

3.02 VIDEO INSPECTION OF EXISTING PIPE

A. Prior to construction of the bioretention area and again post construction, the Contractor must engage a qualified and experienced company to perform a video inspection of the existing 30" HDPE to ascertain the condition of the pipe prior to, and after construction is completed.

B. Contractor shall furnish video along with a report and photos of the pipe condition to the Owner's Representative.

C. Should there be damage to the pipe of any kind, as solely determined by the Authority having jurisdiction, the Contractor shall repair the pipe to the satisfaction of the Authority, and at the Contractor's sole expense.

3.03 TRENCH EXCAVATION, DEWATERING, BEDDING AND BACKFILL

A. The provisions of Section 31 2316 of these Specifications shall govern all work under this Section including but not limited to dewatering and excavation support (sheeting and shoring).

B. The requirements for excavation, bearing capacity, subsurface preparation, dewatering, and backfill must be in accordance with the Geotechnical Engineer's requirements.

C. Work shall include all excavation, bedding and backfill required to complete the installations in accordance with the requirements of the manufacturers and/or all Authorities having jurisdiction.

3.04 STORAGE AND HANDLING

A. Storage - Storage of pipe and appurtenances on the job shall be in accordance with the manufacturers' recommendations. Storage locations of pipe and appurtenances on the site shall be subject to approval.

B. Handling - All pipe and appurtenances shall be protected against impact, shock and free fall, and only equipment of sufficient capacity and proper design shall be used in handling the pipe and appurtenances.

3.05 DAMAGE

A. General - Pipe and/or appurtenances which are defective from any cause, including damage caused by handling, and determined by the Owner's Representative as unrepairable, shall be unacceptable for installation and shall be replaced by the Contractor at no cost to the Owner.

B. Pipe and/or appurtenances that are damaged or disturbed through any cause prior to acceptance of the Work, shall be repaired, realigned or replaced by the Contractor as directed by the Owner's Representative, at the Contractor's expense.

3.06 PIPE INSTALLATION

A. Laying Pipe - Each length of pipe shall be laid with firm, full and even bearing throughout its entire length, in a trench prepared and maintained in accordance with the details as shown on the Drawings and Section 31 2316 of these Specifications. Pipe shall be laid upgrade unless otherwise directed by the Owner's Field Representative.

Bell and spigot pipe shall be laid with the bell end upgrade; tongue and groove pipe shall be laid with the groove end upgrade. Trimming of the pipe will not be allowed.

Every length of pipe shall be inspected and cleaned of all dirt and debris before being laid. Prior to the placing of a length of pipe, the end of the previously laid length shall be carefully and thoroughly wiped smooth and cleaned to obtain an even and close-fitting joint.

No length of pipe shall be laid until the preceding lengths of pipe have been thoroughly embedded in place, so as to prevent movement or disturbance of the pipe. Sections of pipe shall be joined so that the interior surfaces are flush and even.

B. Full Lengths of Pipe - Only full lengths of pipe are to be used in the installation except that partial lengths of pipe may be used at the entrance to structures where necessary to obtain a proper connection to the structure.

C. Pipe Entrances to Structures - All pipe entering structures (e.g. manholes, drain inlets, catch basins, etc.) shall be cut flush with the inside face of the structure, and the cut ends of the pipe and surface of the structure shall be properly rounded and finished so that there will be no protrusion, ragged edges, or imperfections that will impede the flow of water or affect the hydraulic characteristics of the installation. The method of cutting and finishing shall be subject to the approval of the Owner's Representative.

Pipe connections to structures shall be made watertight.

Only full sections of pipe shall be used where entering a structure which will be exposed to view, such as headwalls, end sections, etc.

D. Bedding and Backfilling - The type of materials to be used in bedding and backfilling and the method of placement shall conform to the requirements of Section 31 2316 of these Specifications and as shown on the details of the Drawings.

E. Protection During Construction - The Contractor shall protect the installation at all times during construction. Movement of construction equipment, vehicles and loads over and adjacent to any pipe shall be done at the Contractor's risk.

At all times when pipe laying is not in progress, all open ends of all pipes shall be closed by approved temporary watertight plugs. If water is in the trench when work is resumed, the plugs shall not be removed until the trench has been pumped dry and all danger of water entering the pipe has been eliminated.

The Contractor shall furnish a sufficient pumping plant and shall provide and maintain at his own expense satisfactory drainage wherever needed in the trench and other excavations during the progress of the Work and at its completion for final inspection. No pipe or other structure shall be laid in water, and water shall not be allowed to flow or rise under any concrete or other masonry. All water pumped or bailed from the trench or other excavation shall be conveyed in proper manner to a suitable point of discharge. The flow in all sewers, drains and watercourses encountered on the Work and in gutters along the sides of or across the Work shall be entirely provided for, both temporarily and permanently, as required, by the Contractor at his expense. All offensive water shall be removed from the Work at once.

F. Grade and Alignment – Pipe for storm drain gravity lines shall be laid accurately to the line and grade shown on the Drawings and/or as directed by the Owner's Representative. Each section of pipe shall be checked for line and grade after being laid. A survey instrument shall be used at all times during pipe laying operations, and all adjustments which must be made shall be made by removing material or filling with select bedding material under the barrel of the pipe as necessary and not by wedging or blocking any portion of the pipe. Deviations from line and grade shall be a basis for rejection of the line of pipe by the Owner's Representative. Any line which has been rejected shall be rebuilt to the correct line and grade by the Contractor at his own expense.

3.07 PIPE JOINTS

A. Jointing Corrugated Polyethylene Pipe – Polyethylene couplers and/or bell and spigot joints that provide watertight connections shall be used. The joints shall be installed according to the manufacturer's specifications and as approved by the Site Engineer.

Unless otherwise permitted, jointing of all pipe and fittings shall be done entirely in the trench.

3.08 STRUCTURES INCLUDING HEADWALLS

A. General Requirements - All drainage structures shall be built in accordance with the details and at the locations shown on the Drawings and as specified herein. Where a specific material of construction is indicated, no substitution will be allowed unless authorized in writing by the Owner's Representative and/or Site Engineer. Where more than one type of material of construction is indicated, the Contractor shall have the option of constructing the structure of any one of the materials specified. Precast concrete structures shall require shop drawing submission for review by the Site Engineer.

Cast-in-place concrete and/or masonry shall not be laid when the temperature is below 40 degrees F., or when indications are for lower temperatures within 24 hours, unless protection of concrete and masonry is approved by the Owner's Representative. In this event, the Contractor shall take measures to prevent concrete and masonry from being exposed to freezing temperatures for a period of not less than five (5) days after installation. Approval of

the method of protection by the Owner's Representative shall not relieve the Contractor of his responsibility to protect the concrete and masonry from freezing, and any damage to the structure because of freezing shall be corrected by the Contractor at his own expense, to the satisfaction of the Owner's Representative.

All cast-in-place concrete and masonry shall be installed by personnel experienced and skilled in this work, and any person not deemed to be such by the Owner's Representative shall be removed and replaced by a person so qualified.

Drainage structures are to be constructed as soon as the pipe laying reaches the location of the structures. Should the Contractor continue his pipe laying without making provision for completion of the structures, the Owner's Representative shall have the authority to stop the pipe laying operations until the structure is completed.

In constructing drainage structures, the Contractor shall accurately locate each structure and set accurate templates to conform to the required line and grade. Any structure which is mislocated or oriented improperly shall be removed and rebuilt in its proper location, alignment and orientation at the Contractor's expense.

The Contractor shall use extreme care in the handling of precast concrete structures. Any damage occurring to the precast concrete structures due to carelessness in handling or due to any of the Contractor's operations shall be repaired or replaced by the Contractor at his own expense to the complete satisfaction of the Owner's Representative and Site Engineer.

Unless otherwise specified, all structures shall be constructed on concrete foundations. All foundations shall rest on firm soil of uniform bearing. If the soil beneath the foundation is unsuitable, the Contractor shall remove this unsuitable material as directed by the Owner's Representative and/or Geotechnical Engineer and replace it with an approved properly compacted granular material conforming to the requirements of the Section 31 2316 of these Specifications to the bottom elevation of the structure.

Pipe connections to structures shall be made watertight.

B. Masonry Structures - The first course of masonry shall be embedded in the concrete foundation immediately after the foundation has been poured. Brick masonry units shall be thoroughly wetted before laying.

All masonry shall be laid in a full bed of mortar, and all vertical and horizontal joints shall be filled solid with mortar. Vertical joints on each succeeding course shall be staggered. Joints shall be not less than three-eighths (3/8) inch or more than one-half (1/2) inch wide. Joints on the inside of the structure shall be neatly struck and pointed.

Corner units for rectangular concrete block structures must be "L" shaped with an inside return side equal to half the length of the normal unit. Units shall be designed so that only full length units are required to lay any one course. Cut block will not be allowed unless approved by the Owner's Representative and/or Site Engineer.

Unless otherwise specified, the interior surface of the walls of masonry structures shall be painted upon completion with three (3) coats of neat cement grout without sand, applied with an interval of at least 24 hours between applications. The exterior surface of the walls of masonry structures shall be plastered with a one-half (1/2) inch coat of 1:2 cement mortar.

C. Cast-in-Place Concrete Structures - Cast-in-place concrete structures shall be constructed of Class "A" concrete with reinforcing as shown in detail on the Drawings and as specified herein.

Material and construction requirements shall be as specified under Section 03 3053 of these Specifications.

D. Precast Concrete Structures - Precast concrete structures shall be installed only after shop drawings have received final review by the Site Engineer. All precast concrete structures shall be designed and fabricated for an H-20 loading.

The base of the precast concrete structures shall be set on a foundation pad of crushed stone eight (8) inches in compacted thickness. Foundations of all precast concrete structures shall rest on firm soil of uniform bearing. If soil beneath the foundation is unsuitable, the Contractor shall remove the unsuitable material as directed by the Owner's Representative and/or Geotechnical Engineer and replace it with an approved properly compacted granular backfill material conforming to the requirements of the Article 31 2316 of these Specifications, to the bottom elevation of the crushed stone pad.

After pipes have been installed, all openings shall be properly sealed and made watertight with non-shrinking cement mortar grout or concrete as directed by the Owner's Representative. Grout around pipes which protrude through the walls of the structure shall contain "Antihydro", or other approved additive, to insure watertightness. Cement grout shall contain one (1) part cement to two (2) parts sand by volume and additive in accordance with manufacturer's recommendations. Mortar shall be applied to the bottom one-third (1/3) of the opening before the pipe is inserted.

The precast concrete top section shall be set sufficiently below finished grade to permit adjustment of the casting using brick or precast concrete adjustment rings as risers to adjust the grade of the casting (minimum 4" – maximum 12" adjustment). Frames shall be set on a grout pad as specified hereinabove.

E. Shallow Circular Structures - For shallow circular structures, the top conical section shall be replaced by a flat reinforced concrete slab with the proper size opening to accommodate the specified casting. The reinforced concrete slab shall have a minimum thickness of six (6) inches and shall be designed for a H-20 design load. In general, and unless otherwise specified or directed, the flat slab top shall be used for circular structures whose depth from pipe invert to finished grade is five (5) feet or less.

F. Inverts - Smooth invert channels shall be constructed in all manholes and in all drain inlets and catch basins which do not have sumps, to insure a smooth flow of water through the structure.

Inverts channels for precast concrete structures shall be constructed of concrete; invert channels for masonry structures may be constructed of concrete or brick.

If brick inverts are specified or permitted, special care shall be taken in laying brick. Joints shall not exceed three-sixteenth (3/16) inch in thickness and each brick shall be carefully laid in full cement mortar joints on bottom, sides and ends in one operation. No grouting or working in of mortar after laying of the brick shall be permitted.

Extreme care shall be taken by the Contractor to construct invert channels to the shape, elevations and dimensions shown, specified or ordered by the Owner's Representative and/or Site Engineer.

When a curve in the invert channel or some other condition prevents the use of channels as shown on the Drawings, then such channels shall be constructed in accordance with the directions of the Owner's Representative and/or Site Engineer.

When pipes entering and leaving a manhole are of different diameters, the invert channel shall be constructed so as to provide a smooth transition from the inflow pipe(s) to the outflow pipe.

The invert channel shall be carried up to the elevations shown on the Drawings and/or as directed by the Owner's Representative. Channels shall slope smoothly and evenly from the inflow pipe(s) to the outflow pipe.

Invert channels shall be built for future extensions where shown on the Drawings and/or where directed by the Owner's Representative.

G. Frames and Covers - Frames and covers for drain structures shall be of the types and sizes indicated on the Drawings. Frames shall be well bedded in mortar and shall be set accurately to the correct alignment and grade. In areas to be paved, frames shall be set by using four (4)

points of reference, set 90 degrees apart, to insure accurate setting to proposed pavement grade.

Where drain inlets and/or catch basins are to be placed on curb lines or at edge of pavements, sufficient length of proposed curb or edge of pavement adjacent to the structure shall be established prior to construction of the drain inlet and/or catch basin to insure that the structure is correctly located and oriented.

H. Steps - Steps shall be installed in all manholes. Steps shall also be installed in all drain inlets and catch basins greater than four (4) feet in depth unless otherwise specified.

Steps shall be set securely in place during the construction of the wall for masonry structures and during fabrication of the wall section for precast concrete structures. Spacing of steps shall be as shown in detail on the Drawings.

3.09 CONNECTIONS

A. General Requirements - The Contractor shall make all required connections of the proposed drainage facilities into existing and proposed drainage facilities where and as shown on the Drawings and/or as directed.

B. Compliance with Requirements of Owner of Facility - Connections made into existing drainage facilities owned by others shall be done in accordance with the requirements of the owner of the facility. The Contractor shall be required to comply with all such requirements, including securing of all required permits, and paying the costs thereof. The cost of making the connections in accordance with the requirements of the owner of the existing facility shall be included in the Contract Sum.

3.10 ALTERATION, RECONSTRUCTION AND/OR CONVERSION OF EXISTING STRUCTURES

A. General Requirements – Existing structures shall be altered and/or reconstructed where as shown on the Drawings, and/or directed. In general, alterations shall be made with the same type of material used in the original construction unless otherwise indicated on the Drawings or directed.

B. Adjustment to New Grade and Alignment - All castings on existing structures that are to remain shall be adjusted to new grade and alignment. When such adjustment is required the castings shall be carefully removed and the walls of the structures reconstructed as required. The castings shall be cleaned and reset in a firm mortar bed to the new grade and alignment. Existing castings which are broken, damaged or otherwise unfit for incorporation into the new work shall be replaced under the Contract Sum.

1. After the subgrade and/or existing pavement surfaces have been prepared, the Contractor shall check all frames, covers, and grates that are located in the proposed new, milled, or overlaid pavement areas to ensure that all such items have been accurately positioned and set to the proper slope and elevation. All covers and grates are to be set flush with the required finished pavement surface. No depressions or mounds will be permitted in the pavement to accommodate inaccuracies in the setting of these appurtenances. All initial and corrective work shall be done by the Contractor at his own expense, regardless of the number of times castings are adjusted to grade.

C. Structures to be Converted - Structures which are to be converted (e.g. manholes to drain inlets or catch basins, drain inlets or catch basins to manholes) shall conform as closely as possible to the design of the proposed structure. Sufficient masonry shall be removed from the existing structure to insure that the walls can be rebuilt to conform to the proposed construction. Furnishing and installation of new castings for the converted structures shall be included in the Contract Sum.

D. Removal of Portions of Walls of Existing Structures - In all cases of alteration and/or reconstruction of existing structures, existing walls shall be removed to a point where the existing walls will provide sound and adequate foundation for the construction of the new walls.

E. Temporary Connections to Structures - Where temporary connections are made to permanent structures, and the temporary connection is removed when no longer needed, the Contractor shall repair the structure to the same or better quality and workmanship as the existing structure, and to the complete satisfaction of the Civil Engineer.

F. Reconstruction and/or Rebuilding of Existing Invert - Where new pipes are to be installed into an existing structure, the existing invert shall be reconstructed and/or rebuilt as directed to accommodate installation of the new pipes and provide for proper transition of flows into and out of the structure.

G. Damage to Existing Structure and/or Pipe - Extreme care shall be exercised by the Contractor during such alteration and/or reconstruction so as not to damage any portions of the structure and/or pipe shown to remain. Any such damage shall be repaired by the Contractor at his own expense.

H. Structures to be Cleaned - Upon completion of alteration and/or reconstruction of existing structures, all structures shall be cleaned of any accumulation of silt, debris or foreign matter of any kind and shall be kept clean of such accumulation until final acceptance of the work.

3.11 RELOCATION AND/OR ABANDONMENT OF EXISTING FACILITIES

A. The Contractor shall not abandon, disconnect, obstruct or in any other way interfere with the operation of an existing facility until such time as adequate permanent or temporary substitute facilities have been constructed and placed in operation.

No connections of active services shall be made until storm sewer is accepted by all Authorities having jurisdiction, as applicable. The Contractor must bypass the flow for active services.

3.12 LEADER DRAINS

A. General Requirements - The Contractor shall make all required connection(s) of the building leader drain(s) into the on-site drainage system where and as shown on the Drawings and as directed. Work shall include making the leader drain connection(s) into the on-site drainage system, furnishing and installing all leader drain pipe from the on-site drainage system to point(s) located five (5) feet outside of the building lines and properly sealing the end(s) with watertight plugs, except that, if the building plumbing contractor has installed his portion of the leader drain line, work under this Contract shall also include final connection(s) of the leader drain line(s) five (5) feet outside of the building lines to the building leader drains installed by the building plumbing contractor. The connection(s) shall be made utilizing proper fittings compatible with the building service line(s) providing watertight connection(s) and shall be done at no additional cost to the Owner.

B. Coordination with Building Plumbing Contractor - The Contractor will be required to coordinate his work with the work of the building plumbing contractor to determine the exact location(s) and elevation(s) of the point(s) of entry into the building(s).

C. Connection into On-site Drainage System - Leader drain connection(s) to the on-site drainage system shall be made at structure(s) or into the pipe where and as shown on the Drawings. Pipe connections shall be made with proper size and type tee and/or wye fittings supplied by the pipe manufacturer, in a manner satisfactory to the Owner's Representative.

3.13 OUTLET CONTROL STRUCTURE

A. Description - The Contractor shall furnish and install precast concrete Outlet Control Structure over existing pipe with all necessary and required openings to accommodate the work where and as shown on the Drawings and/or as directed by the Owner's Representative.

B. Construction Details - The ground surface on which the structure is to be placed shall be graded to a smooth, even, level surface, and any soft and spongy materials shall be removed to the depths as shown on the Drawings or as directed by the Owner's Representative and replaced with approved materials. Filled areas shall be compacted in accordance with the applicable provisions of these Specifications. The structure shall be set on a compacted level

layer of approved crushed stone having a minimum compacted thickness of eight (8) inches. The structure shall be placed at an elevation so that the inlet opening of the structure meets the invert of the incoming drainage pipe, as shown on the Drawings. All pipes shall be cut flush with the inside wall of the structure. Pipe openings shall be provided with flexible rubber sleeves or shall be sealed by the Contractor with non-shrinking cement mortar and shall be sized to accept pipes of the specified size(s) and material(s). All internal walls shall be able to withstand any hydrostatic pressure placed upon it. All necessary patching shall be accomplished with non-shrinking cement mortar grout, approved equal to sika-set as manufactured by the Sika Chemical Corp. Access to the structure shall be provided by constructing brick or precast concrete chimneys, with manhole castings placed on the chimneys and set to proper grade. The structure shall be designed and constructed to be watertight. All joints shall be sealed with a butyl rubber sealant or approved equivalent for watertight construction.

3.14 BIORETENTION BASIN

A. Biorentention Basin shall be graded and constructed as detailed on the Plans. Refer to the Architectural Landscape Plans for installation requirements for plantings, mulch and soil media.

B. Observation well/cleanout must be installed at the termination of every perforated underdrain pipe segment.

C. Refer to Paragraph 3.16 for Underdrains.

3.15 POCKET POND

A. Pocket pond shall be graded and constructed as detailed on the Plans. Refer to the Plans for installation requirements for plantings and soil media.

3.16 UNDERDRAINS

A. General Requirements - The Contractor shall install all underground collection pipes in gravel jackets where and as shown on the Drawings and/or as directed by the Owner's Field Representative.

B. Pipe Installation - A minimum four (4) inch layer of approved underdrain filter material shall be placed and compacted in the bottom of the trench as a bedding for the pipe. Underdrain pipe of the type and size specified shall be embedded firmly in this bedding material to the line and grade shown on the Drawings.

C. Unless otherwise specified, perforated pipe shall be laid with the perforations down and the pipe sections shall be jointed securely with the appropriate fittings or bands. Upgrade ends of pipe underdrains shall be closed with suitable plugs.

D. Backfilling - After the pipe installation has been inspected and approved, underdrain filter material shall be hand-shoveled around and over the pipe to such a depth that, after compaction, it extends a minimum of four (4) inches above the underdrain pipe. The surface of the underdrain filter material shall then be compacted with a vibrating pad compactor, and the remainder of the filter material shall be placed in lifts not more than six (6) inches in thickness with each lift thoroughly compacted with a mechanical vibrating pad compactor. The height of filter material over all pipe shall be as indicated on the Drawings and/or as approved by the Owner's Representative.

E. Geotextile Fabric - Geotextile fabric shall be placed where and as shown in detail on the Drawings and/or as directed by the Owner's Representative. Ends and sides of fabric shall be lapped a minimum of twelve (12) inches.

F. Pipe Connections and Changes in Alignment - Pipe to pipe connections and changes in pipe alignment shall be made only with prefabricated fittings to be supplied by the manufacturer of the pipe (e.g. tees, wye branches, etc.).

3.17 RECORD DRAWINGS

A. In addition to the requirements stated in Division 1 Specification Sections, an "as-built" set of record drawings shall be kept on the site concurrently with the progress of the work. These "as-built" record drawings shall consist of a marked set of the drawings with additional sketches as required, denoting and dimensioning accurately and neatly all changes and conditions that are variations from the drawings.

B. All changes in alignment and grade of the newly installed underground piping which are not marked by a visible surface structure such as manholes, shall be recorded. These locations shall be located in reference to three (3) separate permanent surface reference points and recorded on the "as-built" record drawings. An accurate record shall also be kept of all existing site items which are reworked or relocated.

C. The as-built may be required for submission to Westchester County Department of Health (DOH), prior to submitting the final record drawings. The newly installed works may not be placed into service, until the completed works approval is received from the DOH, as applicable.

D. Upon completion of the work, the Contractor shall deliver the final "as-built" record drawings in Autocad format and on a thumb drive, and bear the original signature and seal of a licensed land surveyor in the State of New York or the design engineer, prepared pursuant to the New York State Education Law. All modifications must be included on the "as-built" with all changes bubbled in red, including details, and be of the same scale as the approved plans. All information pertaining to the utilities must be included on the plan and profiles, with clear delineation between pre-existing utilities and newly installed utilities. All drawings must include the date and an "as-built" stamp or notation on each sheet, and the full set of plans including detail sheets. A list must be provided of all deviations from the original approved plans shown on the record drawings, together with the Contractor's explanation thereof.

E. If utilities are constructed within easements, the easements must be included, showing dimensions of the utilities located within the easements, demonstrating that they are located wholly within the easement boundaries.

3.18 CLEANING AND REPAIR

A. The Contractor will be required to clean the entire drainage system of all debris and obstructions. This shall include, but not be limited to, removal of all formwork from structures, concrete and mortar droppings, construction debris and dirt. The system shall be thoroughly flushed clean and the Contractor shall furnish all necessary hose, pumps, pipe and other equipment that may be required for this purpose. No debris shall be flushed into existing storm drains or streams. All debris shall be removed from the system.

After the system has been cleaned, the Contractor shall thoroughly inspect the system and all repairs shown to be necessary shall be promptly performed by the Contractor.

All work of cleaning and repair as specified herein shall be performed at the Contractor's expense and to the complete satisfaction of the Authority having jurisdiction and/or the Owner’s Representative.

3.19 FINAL TESTS AND INSPECTION

A. Upon completion of the Work and before final acceptance, the entire stormwater drain system shall be subjected to a final inspection in the presence of the Site Engineer and/or Owner's Representative. The work shall not be considered complete until all requirements for line, grade, cleanliness, tests and workmanship have been met.

END OF SECTION

SECTION 33 42 01

GRASSED SWALE

PART 1 - GENERAL

1.01 SUMMARY

A. Work of this Section includes, but is not limited to the following:
   1. Installation of a grassed swale consisting of sod strips over topsoil, including all associated items and operations necessary and required to complete the work.
   2. Preparation of subgrade to include fine grading and compaction.

1.02 SUBMITTALS

A. Submit sod growers certification of grass species. Identify source location.

B. Upon acceptance, submit written maintenance instructions recommending procedures for maintenance of sodded grassed swale.

1.03 QUALITY ASSURANCE

A. Comply with American Sod Producers Association (ASPA) classes of sod materials.

B. Work shall be in accordance with all Authorities having jurisdiction.

C. Provide an installation and termination schedule for work included in this Section. Notify the Site Engineer and all Authorities having jurisdiction prior to the work taking place.

D. Comply with requirements of the Stormwater Pollution Prevention Plan (SWPPP) and Soil Erosion and Sediment Control specification, plans, and details, and the Contractor's accepted schedule. Refer to Section 01 5713 of these Specifications.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Cut, deliver, and install sod within a 24-hour period.
   1. Do not harvest or transport sod when moisture content may adversely affect sod survival.
   2. Protect sod from sun, wind, and dehydration prior to installation.
   3. Do not tear, stretch, or drop sod during handling and installation.

PART 2 - PRODUCTS

2.01 SOD

A. A nursery grown blend of at least 3 improved Kentucky Bluegrass varieties.
   1. Sod containing Common Bermudagrass, Quackgrass, Johnsongrass, Poison Ivy, Nutsedge, Nimblewill, Canada Thistle, Timothy, Bentgrass, Wild Garlic, Ground Ivy, Perennial Sorrel, or Bromegrass weeds will not be acceptable.
   2. Provide well-rooted, healthy sod, free of diseases, nematodes and soil borne insects. Provide sod uniform in color, leaf texture, density, and free of weeds, undesirable grasses, stones, roots, thatch, and extraneous material; viable and capable of growth and development when planted.
   3. Furnish sod machine stripped in square pads or strips not more than 3'-0" long; uniformly 1" to 1-1/2" thick with clean cut edges. Mow sod before stripping.

2.02 TOPSOIL

A. Topsoil from stockpile: Topsoil shall be existing topsoil stripped and stockpiled. Material shall consist of natural topsoil, free from subsoil, obtained for areas on site that have never been stripped. It shall be removed to its full depth. Topsoil shall be of uniform quality screened with a ½" screen and free of hard clods, stiff clay, hardpan, sods, partially disintegrated stone, lime, cement, ashes, slag, concrete, tar residues, tarred paper, boards, chips, glass, sticks, or any other undesirable material, and shall meet all requirements of topsoil borrow as specified below.

B. Topsoil Borrow:

1. The topsoil stripped and stockpiled on the site shall be used provided that, after testing and addition of necessary additives, it meets the following specification. The Contractor shall provide additional topsoil as required to complete the required work.
2. Existing on-site topsoil and new topsoil shall be 'sandy loam' or 'loamy sand' determined by mechanical analysis (ASTM D 422) and based upon the "USDA Classification System". It shall be of uniform composition, without admixture of subsoil. It shall be free of stones greater than one-half (1/2") inch lumps, plants and their roots, debris and other extraneous matter as determined by the Designer. It shall not contain toxic substances harmful to plant growth.
3. Topsoil shall have the following mechanical analysis:

Passing	% Passing by Weight
No. 4 Sieve	100
No. 40 Sieve	60-85
No. 100 Sieve	38-60
No. 200 Sieve	28-40
.002 mm	0-10

4. Maximum size shall be ½-inch largest dimension maximum retained on ¼ inch sieve shall be 20% by weight of the total sample. Testing shall be combined hydrometer and wet sieving as per ASTM D 422 after destruction of organic matter by ignition.
5. Topsoil borrow shall be screened topsoil and shall be free of plants and their roots, debris and other extraneous matter. It shall be uncontaminated by salt, water, foreign matter and substances harmful to plant growth. The electrical conductivity (EC2) of a 1:2 soil-water suspension shall be equal to or less than 1.0 millions/cm. (Test material passing #4 sieve).
6. Material shall consist of natural topsoil, free from subsoil, obtained from an area, which has never been stripped. It shall be removed to a depth of one (1) foot or less if subsoil is encountered. Topsoil shall be of uniform quality screened ½" and free of hard clods, stiff clay, hardpan sods, partially disintegrated stone, lime, cement, ashes, slag, concrete, tar residues, tarred paper, boards, chips, glass, sticks, or any other undesirable material.
7. Topsoil shall have an acidity range of pH 5.5 to pH 6.5 and shall contain not less than 5% nor more than 10% organic matter as determined by the loss on ignition of oven dried samples. Test samples shall be oven dried to constant weight at a temperature of 230 degrees F; plus or minus 9 degrees. To adjust organic matter content, the soil may be amended, prior to site delivery, by the addition of humus or peat moss. Use of organic amendments is acceptable only if random soil sampling indicates thorough incorporation.
8. All topsoil provided from off site sources shall be brought to the site meeting all specification requirements. There must be no mixing or amending of soil on site. No topsoil shall be placed prior to screening. The topsoil borrow must not be handled or moved when in a wet or frozen condition.
9. Topsoil which has been stockpiled on the site may be used provided it can be made to comply with this specification and that it has been screened to meet the above requirements.
10. To assure topsoil borrow purchased and topsoil stockpiled fulfills specified requirements regarding textural analysis, organic matter content, and pH, soil testing results will be obtained by the Contractor and submitted to the Designer for approval before any soil is delivered to the site.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Clear proposed area of brush, trees and stumps, and grade to a smooth surface. Compact fill areas as directed.

B. The Contractor shall be responsible for laying out and installing the grassed swale upon a properly prepared subgrade, in the correct location and to the proper cross sections and slope,

and in accordance with the lines and grades as specified herein and on the Drawings and/or in accordance with the directions of the Owner's Field Representative and/or Site Engineer. Areas which are not constructed to the proper section, grade and/or alignment shall be corrected by repair or replacement by the Contractor in accordance with the directions of the Owner's Field Representative and/or Site Engineer and at no additional cost to the Owner.

C. The installation shall be according to the plans and specifications and any Authority having jurisdiction.

3.02 SUBGRADE

A. General Requirements - Prior to the start, the subgrade surface shall be prepared by installing fill (as required), filling in ruts, erosions and all other ground disturbances, regardless of cause. The ground surface shall be fine graded so that after compaction the subgrade surface will be at the proper elevation (+.05') to accommodate the grassed swale.

B. Compaction - Compaction shall be accomplished to the extent that the upper twelve (12) inches of subgrade shall be compacted to 90% of maximum dry unit weight in accordance with ASTM D1557. Compaction shall be done by means of a roller weighing not less than ten (10) tons or other compaction equipment satisfactory to the Owner's Field Representative.

C. Subgrade Approval - The Owner's Field Representative must approve the subgrade prior to placement. Installation of all or any portion of the work without subgrade approval by the Owner's Field Representative is done at the Contractor's risk.

D. Protection of Approved Subgrade - Approval of the subgrade by the Owner's Field Representative shall not relieve the Contractor of his responsibility to protect the subgrade from damage caused from excessive moisture, rutting, or from any other cause, and any damage occurring to the subgrade either before or during the construction shall be corrected by the Contractor at his own expense to the satisfaction of the Owner's Field Representative.

3.03 TOPSOIL

A. Loosen topsoil to minimum depth of 4". Remove stones over 1/2" in any dimension and sticks, roots, rubbish, and extraneous matter.

B. Grade area to a smooth, free draining even surface with a loose, moderately coarse texture. Roll and rake, remove ridges, and fill depressions as required to drain.

C. Apply limestone and/or fertilizers at rates determined by the soil tests, to adjust pH of topsoil to not less than 6.0 nor more than 6.8. Distribute evenly by machine and incorporate thoroughly into topsoil.

3.04 SOD

A. Lay sod to form a solid mass with tightly-fitted joints. Butt ends and sides of sod strips. Do not overlay edges. Stagger strips to offset joints in adjacent courses. Remove excess sod to avoid smothering of adjacent grass. Provide sod pad top flush with adjacent curbs, sidewalks, drains, and seeded areas.

B. Do not lay dormant sod or install sod on saturated or frozen soil.

C. Install initial row of sod in a straight line, beginning at bottom of slopes, perpendicular to direction of the sloped area. Place subsequent rows parallel to and lightly against previously installed row.

D. Water sod thoroughly with a fine spray immediately after laying.

E. Roll with light lawn roller to ensure contact with sub-grade.

F. Water newly seeded areas. Maintain adequate soil moisture until new grass is established.

3.05 GUARANTEE AND MAINTENANCE

A. The Contractor shall guarantee the installation, including materials and workmanship, for a period of one year from the date of completion and initial acceptance of the Work (as specified in writing to the Owner). The Contractor shall make interim repairs as necessary to maintain the grassed swale in good, usable condition. The Contractor shall receive no additional compensation for maintenance and restoration during this guarantee period. Payment shall be considered as included in the Contract Sum.

END OF SECTION