

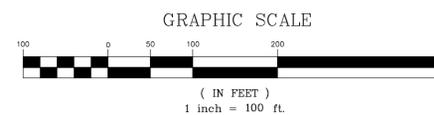
**LEGEND**

- PROPOSED PROPERTY LINE
- - - PROPOSED SETBACK LINE
- PROPOSED CONTOUR
- ==== PROPOSED CURB
- ==== PROPOSED FENCE
- ==== PROPOSED GRAVEL
- ==== PROPOSED PAVEMENT
- ==== PROPOSED GUARD RAIL
- E PROPOSED ELECTRIC
- FM PROPOSED FORCEMAIN
- G PROPOSED GAS
- ST PROPOSED STORM
- S PROPOSED GRAVITY SEWER
- T PROPOSED TELEPHONE
- W PROPOSED WATER
- PROPOSED SWALE

- ⊙ PROPOSED SEWER MANHOLE
- ⊙ PROPOSED STORM MANHOLE
- ⊙ PROPOSED CATCH BASIN
- ⊙ PROPOSED WELL
- ⊙ PROPOSED HYDRANT
- ⊙ PROPOSED SHUT OFF
- ⊙ PROPOSED UTILITY POLE
- ⊙ PROPOSED LIGHT POLE
- ⊙ PROPOSED EDGE OF BRUSHWOODS
- REBAR SET
- CONCRETE MONUMENT SET

**GENERAL NOTES**

1. UTILITIES SHOWN DO NOT PURPORT TO CONSTITUTE OR REPRESENT ALL UTILITIES LOCATED UPON OR ADJACENT TO THE SURVEYED PREMISES. EXISTING UTILITY LOCATIONS ARE APPROXIMATE ONLY. THE CONTRACTOR SHALL FIELD VERIFY ALL UTILITY CONFLICTS. ALL DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER. THE CONTRACTOR SHALL CONTACT DISA SAFE (888-344-7239) PRIOR TO ANY CONSTRUCTION.
2. ALL EXISTING UTILITIES NOT INCORPORATED INTO THE FINAL DESIGN SHALL BE REMOVED OR ABANDONED AS INDICATED ON THE PLANS OR DIRECTED BY THE ENGINEER.
3. THE CONTRACTOR SHALL MAINTAIN AS-BUILT PLANS (WITH TIES) FOR ALL UNDERGROUND UTILITIES. THOSE PLANS SHALL BE SUBMITTED TO THE OWNER AT THE COMPLETION OF THE PROJECT.
4. THE CONTRACTOR SHALL REPAIR/RESTORE ALL DISTURBED AREAS (ON OR OFF THE SITE) AS A DIRECT OR INDIRECT RESULT OF THE CONSTRUCTION.
5. ALL GRASSED AREAS SHALL BE MAINTAINED UNTIL FULL VEGETATION IS ESTABLISHED.
6. MAINTAIN ALL TREES OUTSIDE OF CONSTRUCTION LIMITS.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL WORK NECESSARY FOR COMPLETE AND OPERABLE FACILITIES AND UTILITIES.
8. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR ALL ITEMS AND MATERIALS INCORPORATED INTO THE SITE WORK. WORK SHALL NOT BEGIN ON ANY ITEM UNTIL SHOP DRAWING APPROVAL IS GRANTED.
9. IN ADDITION TO THE REQUIREMENTS SET IN THESE PLANS AND SPECIFICATIONS, THE CONTRACTOR SHALL COMPLETE THE WORK IN ACCORDANCE WITH ALL PERMIT CONDITIONS AND ANY LOCAL PUBLIC WORKS STANDARDS.
10. THE TOLERANCE FOR FINISH GRADES FOR ALL PAVEMENT, WALKWAYS AND LAWN AREAS SHALL BE 0.1 FEET.
11. ANY DEWATERING NECESSARY FOR THE COMPLETION OF THE SITEWORK SHALL BE CONSIDERED AS PART OF THE CONTRACT AND SHALL BE THE CONTRACTOR'S RESPONSIBILITY.
12. THE CONTRACTOR SHALL COORDINATE ALL WORK WITHIN TOWN ROAD R.O.W. WITH TOWN AUTHORITIES.
13. THE CONTRACTOR SHALL INSTALL THE ELECTRICAL, CABLE AND TELEPHONE SERVICES IN ACCORDANCE WITH THE UTILITY COMPANIES REQUIREMENTS.
14. EXISTING PAVEMENT AND TREE STUMPS TO BE REMOVED SHALL BE DISPOSED OF AT AN APPROVED OFF-SITE LOCATION. ALL PAVEMENT CUTS SHALL BE MADE WITH A PAVEMENT SAW.
15. IF THERE ARE ANY CONFLICTS OR INCONSISTENCIES WITH THE PLANS OR SPECIFICATIONS, THE CONTRACTOR SHALL CONTACT THE ENGINEER FOR VERIFICATION BEFORE WORK CONTINUES ON THE ITEM IN QUESTION.
16. PROPERTY LINE INFORMATION IS APPROXIMATE AND BASED ON EXISTING TAX MAP INFORMATION. THIS PLAN IS NOT A BOUNDARY SURVEY AND IS NOT INTENDED TO BE USED AS ONE.
17. IF THE BUILDING IS TO BE SPRINKLERED, BACKFLOW PREVENTION SHALL BE PROVIDED IN ACCORDANCE WITH AWWA M14. THE SITE CONTRACTOR SHALL CONSTRUCT THE WATER LINE TO TWO FEET ABOVE THE FINISHED FLOOR. SEE MECHANICAL PLANS FOR RISER DETAIL.
18. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING TESTING AND INSPECTION SERVICES INDICATED IN THE CONTRACT DOCUMENTS, TYPICAL FOR CONCRETE AND SOIL TESTING.
19. THE CONTRACTOR IS RESPONSIBLE FOR ALL LAYOUT AND FIELD ENGINEERING REQUIRED FOR COMPLETION OF THE PROJECT. CIVIL ENGINEERING ASSOCIATES WILL PROVIDE AN AUTOCAD FILE WHERE APPLICABLE.
20. THE OWNER SHALL BE RESPONSIBLE FOR THE INSTALLATION OF ANY AND ALL SAFETY FENCES OR RAILS ABOVE EXISTING AND PROPOSED WALLS. THE OWNER SHALL VERIFY LOCAL, STATE AND INSURANCE REQUIREMENT GUIDELINES FOR THE INSTALLATION AND VERIFY ANY AND ALL PERMITTING REQUIREMENTS.



SITE ENGINEER:



CIVIL ENGINEERING ASSOCIATES, INC.  
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403  
802-864-2323 FAX: 802-864-2271 web: www.ceavt.com

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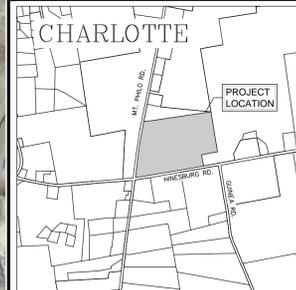
**PHILO RIDGE,  
L.L.C.**

2766 MT. PHILO RD.  
CHARLOTTE, VT.

PROJECT:

**SITE  
IMPROVEMENTS**

2766 MT. PHILO RD.  
CHARLOTTE, VT.



LOCATION MAP

1" = 2000'

DATE	CHECKED	REVISION

**PROPOSED  
OVERALL SITE  
PLAN**

DATE

OCT., 2016

SCALE

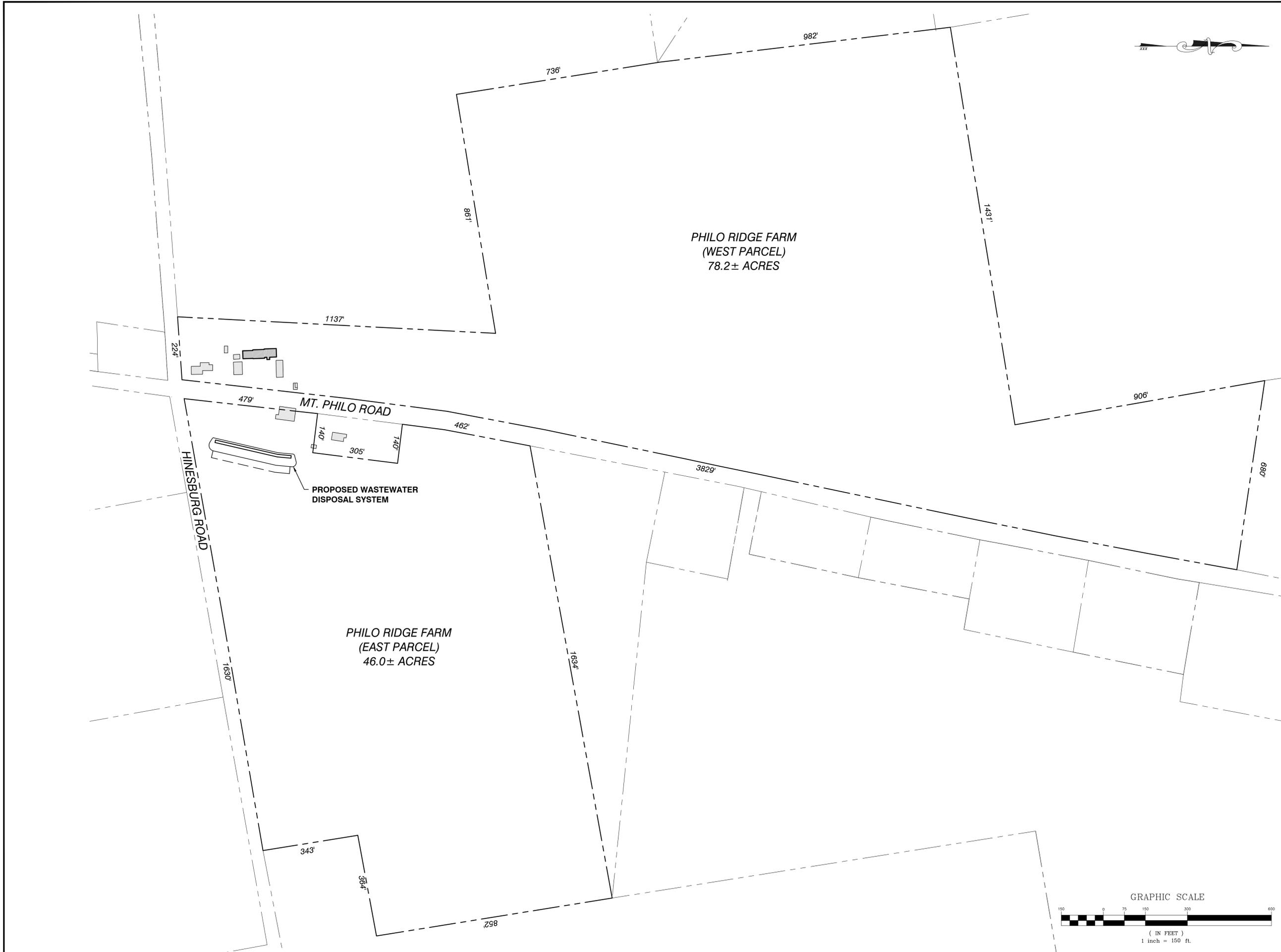
1" = 100'

PROJ. NO.

16107

DRAWING NUMBER

**C1.0**



SITE ENGINEER:



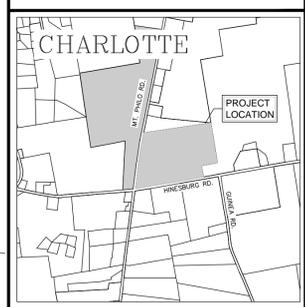
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 L.L.C.**  
  
 2766 MT. PHILO RD.  
 CHARLOTTE, VT.

PROJECT:  
  
**SITE  
 IMPROVEMENTS**  
  
 2766 MT. PHILO RD.  
 CHARLOTTE, VT.

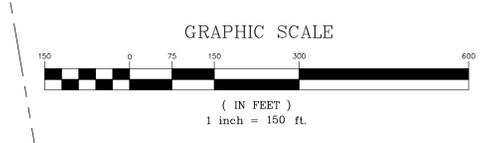


LOCATION MAP  
 1" = 2000'

DATE	CHECKED	REVISION

**OVERALL  
 PROPERTY PLAN**

DATE OCT., 2016	DRAWING NUMBER <b>C1.0A</b>
SCALE 1" = 150'	
PROJ. NO. 16107	



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Philo Ridge - Test Pits  
May 2, 2016

D. Marshall, S. Leclair

**TP A**  
0"-10" Loose dark brown loam, granular  
10"-18" Loose light brown loam blocky  
18"-36" Medium compact to compact silt loam  
36"-49" Medium compact gray brown clayey silt

SHGWT 16" Seeps at 36"  
Roots to 23" No ledge

**TP B**  
0"-8" Loose dark brown loam, granular  
8"-18" Loose light brown loam and cobbles, granular  
18"-48" Medium compact gray-brown silt loam

SHGWT 18" Seeps at 36"  
Roots to 18" No ledge

**TP C**  
0"-8" Loose brown loam, blocky  
8"-14" Loose to medium compact brown loam, blocky  
14"-18" Medium compact light brown loam and cobbles, granular  
18"-22" Medium compact black/brown loam  
22"-42" Medium compact light brown very fine sandy loam

SHGWT 18" No seeps  
Roots to 24" No ledge

**TP D**  
0"-7" Loose dark brown loam, blocky  
7"-14" Loose brown loam, blocky  
14"-24" Medium compact brown loam and cobbles, granular  
24"-38" Firm gray tan silt loam  
38"-48" Very firm gray brown silty clay

SHGWT 16" No seeps  
Roots to 24" No ledge

**TP E**  
0"-10" Loose dark brown loam, blocky  
10"-14" Loose brown loam, blocky  
14"-17" Loose brown loam and cobbles, granular  
17"-28" Medium compact orange-brown silt loam and cobbles  
28"-42" Medium compact orange-brown silt loam  
42"-54" Loose to firm orange-brown silty clay

SHGWT 16" No seeps  
Roots to 26" No ledge

**TP F**  
0"-7" Loose dark brown loam, granular  
7"-15" Loose to medium compact brown loam, blocky  
15"-23" Medium compact light brown loam and cobbles, blocky  
23"-33" Compact brown very fine sandy loam  
33"-42" Compact orange-brown silt loam  
42"-49" Firm gray brown silty clay

SHGWT 17" No seeps  
Roots to 23" No ledge

**TP G**  
0"-8" Loose dark brown loam, granular  
8"-11" Medium compact brown loam, granular  
11"-15" Medium compact light brown loam and cobbles, granular  
15"-37" Medium compact orange-brown loam  
37"-48" Loose orange-brown silty clay

SHGWT 11" No seeps  
Roots to 21" No ledge

**TP H**  
0"-7" Loose dark brown loam  
7"-12" Loose brown very fine sandy loam, granular  
12"-17" Medium compact orange-brown very fine sandy loam, granular  
17"-23" Compact orange-brown very fine sandy loam  
23"-37" Compact orange-brown loam  
37"-45" Medium compact orange-brown silty loam

SHGWT 16" No seeps  
Roots to 21" No ledge

**TP I - Downhill side**  
0"-10" Loose dark brown loam, disturbed  
10"-17" Loose light brown loam, disturbed  
17"-42" Loose light brown loam and cobbles Fill

**TP I - Uphill side**  
0"-9" Loose dark brown loam, blocky  
9"-12" Loose brown loam, blocky  
12"-42" Medium compact light brown loam and cobbles  
42"-48" Loose light brown loam

SHGWT 12" No seeps  
Roots to 21" No ledge

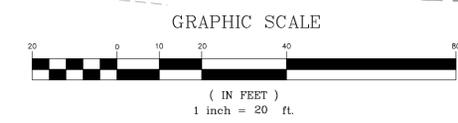
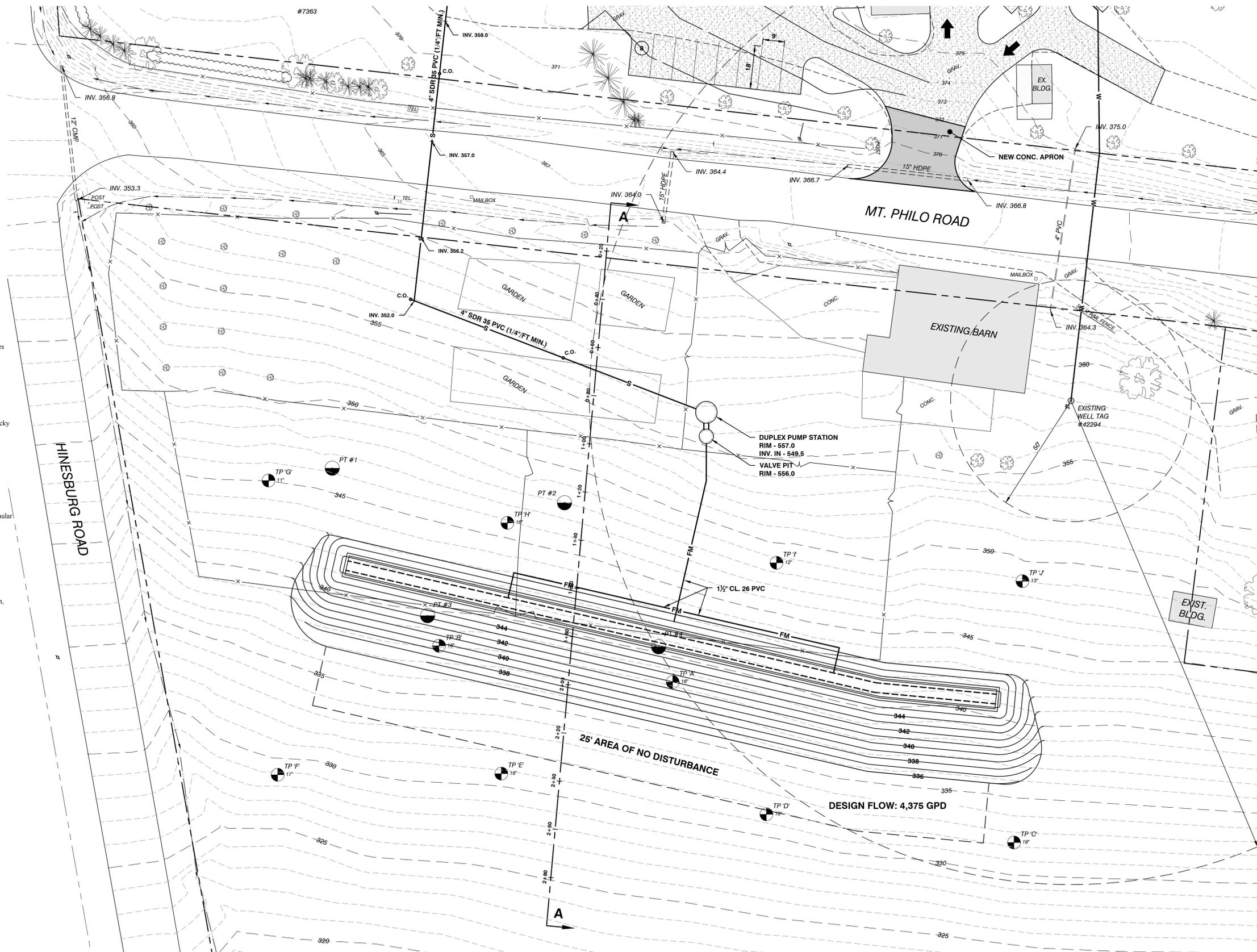
**TP J**  
0"-8" Loose brown very fine sandy loam, granular  
8"-12" Loose brown loam, granular  
12"-26" Loose orange-brown loam, granular  
26"-44" Loose light brown silty loam  
44"-56" Loose brown loam

SHGWT 13" Seeps at 43"  
Roots to 23" No ledge

Philo Ridge - Perc Tests  
June 27, 2016

J. Burt, R. Gilson

Perc Test #1: 106 min/in  
Perc Test #2: 17.1 min/in  
Perc Test #3: 37.4 min/in  
Perc Test #4: 41.2 min/in



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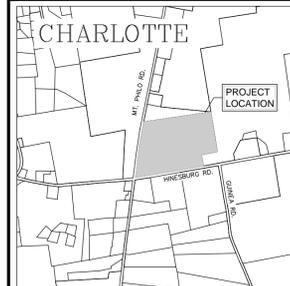
**PHILO RIDGE,  
L.L.C.**

2766 MT. PHILO RD.  
CHARLOTTE, VT.

PROJECT:

**SITE  
IMPROVEMENTS**

2766 MT. PHILO RD.  
CHARLOTTE, VT.



LOCATION MAP

1" = 2000'

DATE	CHECKED	REVISION

**PROPOSED SITE  
UTILITY PLAN -  
EAST**

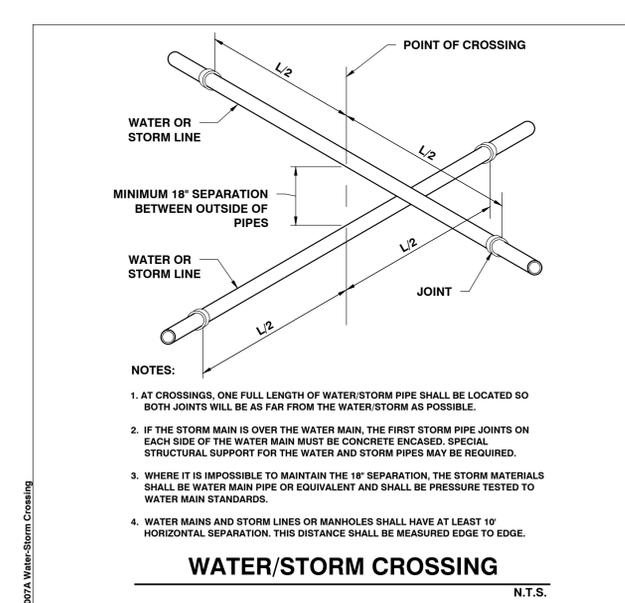
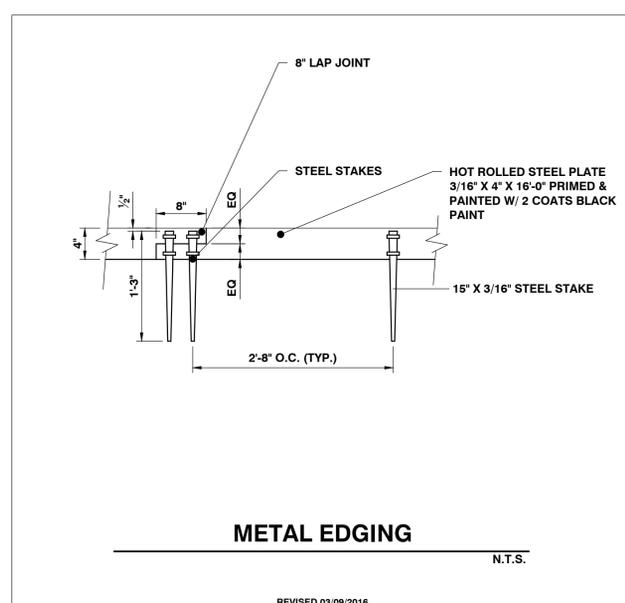
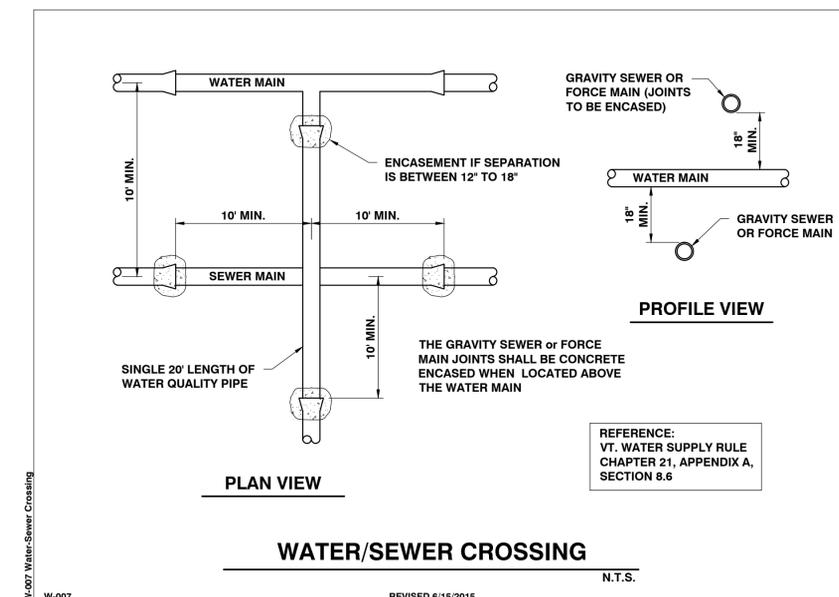
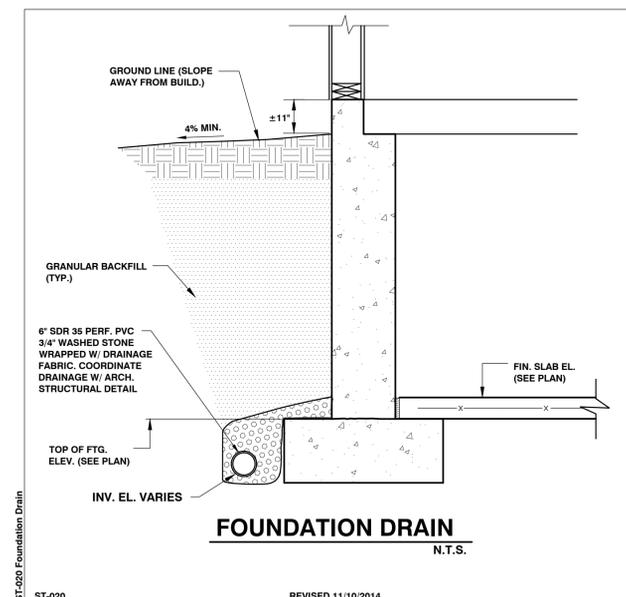
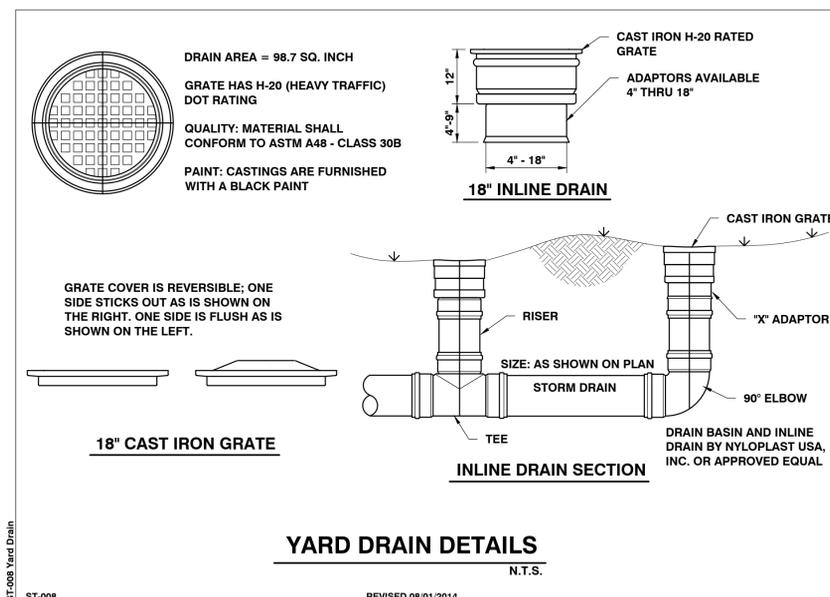
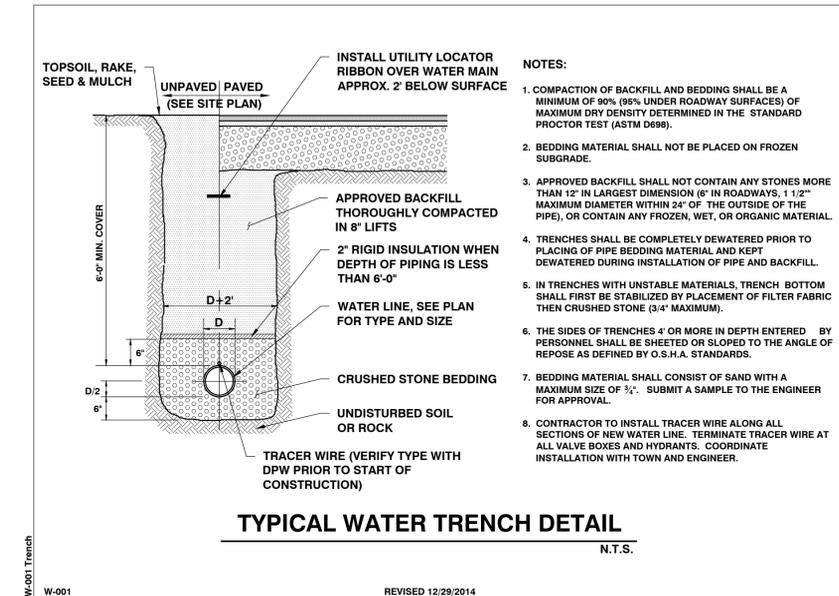
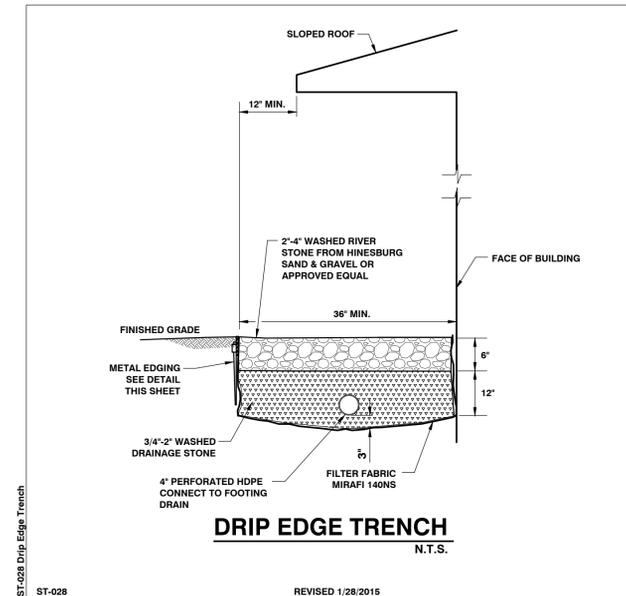
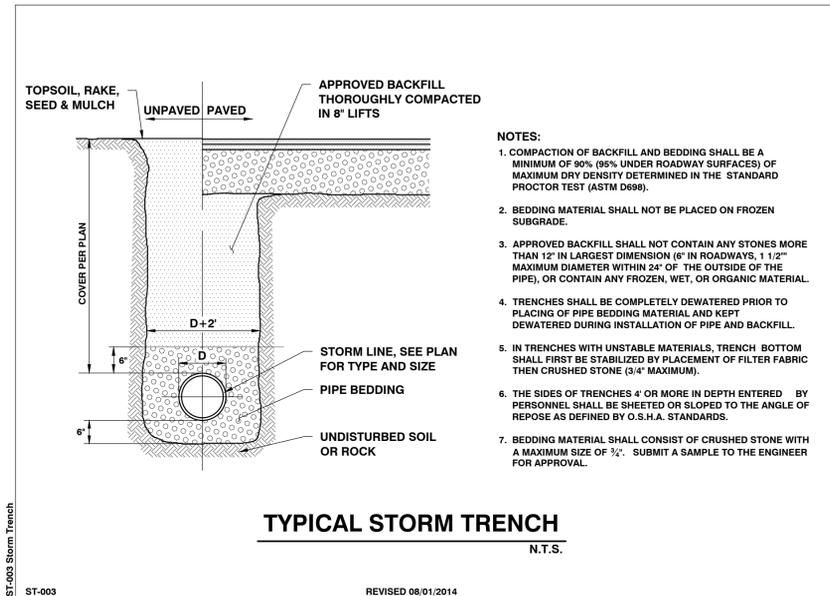
DATE  
OCT., 2016

SCALE  
1" = 20'

PROJ. NO.  
16107

DRAWING NUMBER

**C1.3**



SITE ENGINEER:

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APPROVED: DSM

OWNER:

**PHILO RIDGE, L.L.C.**  
2766 MT. PHILO RD.  
CHARLOTTE, VT.

PROJECT:

**SITE IMPROVEMENTS**  
2766 MT. PHILO RD.  
CHARLOTTE, VT.

DATE	CHECKED	REVISION

**WATER & STORM DETAILS**

DATE: OCT., 2016  
SCALE: AS SHOWN  
PROJ. NO.: 16107

DRAWING NUMBER: **C2.1**







PUMP STATION		SITE ENGINEER:																																															
<p><b>PART 1 - GENERAL</b></p> <p>1.01 SUMMARY</p> <p>A. Section includes:</p> <ol style="list-style-type: none"> <li>Demolition, excavation and backfilling required for the complete construction of a replacement recessed wet well sanitary sewer pump station. This shall include all pumping units and appurtenances, pipes, valves and structures necessary to replace the system as indicated on the drawings.</li> </ol> <p>1.02 GENERAL</p> <p>A. The Town's pressure sewer system has been standardized on the basis of factory built pumping stations of similar quality to those manufactured by Smith &amp; Loveless Inc. of Lenexa, Kansas or Pumping Systems Inc. of East Weymouth, Massachusetts.</p> <p>B. The design of all pumping stations must be reviewed and approved by the Town Wastewater Department prior to construction. 3-phase power shall be used for all stations, wherever feasible.</p> <p>C. Multiple pumps or ejector units shall be provided with each raw wastewater pumping station. For duplex stations, each pump shall be identical and with sufficient capacity to handle the design peak hour effluent flow with one pump off-line.</p> <p>D. Wastewater pumping station structures and electrical and mechanical equipment shall be protected from physical damage as the result of a flood of 100 year recurrence interval. All pumping stations shall be designed to be fully operational and accessible during a flood of 25 year recurrence.</p> <p>E. All pumping station sites shall be fully accessible by maintenance vehicles during all weather conditions. Gravel access roads and associated easements must be conveyed with the pumping station.</p> <p>F. Water supply for wash down and maintenance shall be provided at a yard hydrant to be located within 10 feet of the wet well access hatch. The Town is not obligated to take ownership of any pump station that serves developments. If ownership is transferred and accepted by the Town it must meet the requirements of these specifications in full.</p> <p>1.03 SUBMITTALS</p> <p>A. Shop drawings shall be submitted to the Engineer for approval prior to any equipment being delivered to the site. Shop drawings shall include all structural, mechanical and electrical components with detailed dimensions and specifications.</p> <p>B. Two complete operation and maintenance manuals shall be provided prior to final acceptance of the pump station by the Engineer.</p> <p>1.04 QUALITY ASSURANCE</p> <p>A. All materials and construction of same shall be as shown on the contract drawings and shall meet the requirements of the Town Sewer Department.</p> <p>B. The recessed wet well mounted pump station shall be supplied complete by an experienced pump station manufacturer.</p> <p>C. All applicable regulations of the Occupational Health and Safety Administration should be followed when assembling, installing, or servicing this pump station. In particular, this pump station is a confined space, under no circumstances should it be entered without the required safety equipment and precautions.</p> <p>D. Electrical Equipment: Electrical systems and components (e.g. motors, lights, cables, conduits, switch boxes, control circuits, etc.) shall conform with the National Electrical Code, latest edition. In addition, equipment located in the wet well shall be suitable for use under corrosive conditions.</p> <p>1.05 REFERENCES</p> <p>A. The Standard Specifications shall refer to the Vermont Agency of Transportation Standard Specifications for Construction (1990 Edition).</p> <p>1.06 WARRANTY</p> <p>A. The pump station manufacturer will take full responsibility for startup and operator training. The pump station manufacturer will warrant the station as a unit against defects in material and workmanship for one year from the date of startup.</p> <p><b>PART 2 - PRODUCTS</b></p> <p>2.01 GENERAL</p> <p>A. The Contractor shall provide all fittings, couplings and appurtenances to provide a complete and operable system.</p> <p>2.02 WET WELLS</p> <p>A. A reinforced concrete foundation shall be provided for the wet well and pump chamber, designed by a structural engineer licensed in the State of Vermont.</p> <p>B. The foundation and structure shall be designed to prevent flotation of the dry well and wet well under worst case conditions. Flotation computations shall be submitted as part of the design for review by the Town.</p> <p>C. The effective volume of the wet well shall be established such that the filling time shall not exceed 30 minutes under design average flow conditions (unless equalization is incorporated in the design). When the anticipated initial flow tributary to the pumping station is less than the design average flow, provisions shall be made such that a 30 minute fill time is not exceeded for initial flows.</p> <p>D. Suitable and safe means of access for persons wearing self-contained breathing apparatus shall be provided to both the dry well and to the wet well.</p> <p>E. Pre-cast concrete wet wells shall be of steel reinforced design with a documented compressive strength of 4000 psi at 28 days. Butyl rubber gaskets shall be specified at all joints.</p> <p>F. All pipe penetrations shall be pre-cast openings with flexible rubber boots or compression fittings to create watertight connections.</p> <p>G. The top of the wet well shall be designed with a 30" x 30" wet well access hatch of 1/4" diamond plate aluminum suitable for concrete embedment. The hatch shall include a lockable latching device.</p> <p>H. The pre-cast concrete wet well shall be externally coated with an asphaltic sealant and tested for water tightness using an approved vacuum or water testing procedure.</p> <p>I. The wet well suction inlets shall be designed in accord with the standards set in ASCE Manual #37, Design and Construction of Sanitary and Storm Sewers, to minimize the deposition of solids.</p> <p>2.03 DRY PIT/RECESSED PUMPING STATION</p> <p>A. The station may be prefabricated and factory-built or built on the site. The foundation and structure shall be designed to prevent flotation of the dry well and wet well under worst case conditions. Flotation computations shall be submitted as part of the design for review by the Town.</p> <p>B. As a minimum, the station shall include two vertical dry-pit submersible, non-clog sewage pumps, 3 phase motors (for pump motors over 5 HP in size), valves, internal piping, control panel with circuit breakers, variable frequency drives and automatic level controls, lighting, sump pump, ventilator, dehumidifier, heater with adjustable thermostat, wiring, elapsed time meters for each pump and a remote alarm system tied into the Town's radio telemetry system. The pumping system shall be designed to pass 3" solids without clogging. Lifting equipment shall be provided capable of lifting pumps and motors in and out of the dry well for maintenance.</p> <p>C. A dehumidifier assembly with a hermetically sealed Freon compressor, expansion coil, fan, and condenser coil shall be furnished which shall maintain the relative humidity of the air in the pump chamber low enough to prevent condensation on the walls. The dehumidifier shall be controlled automatically by an adjustable humidistat and low air temperature cutoff. The condensate shall be drained to the sump.</p> <p>D. The station shall be provided with a 36" wide x 6'-10" insulated metal door hinged at one side to provide access to the equipment chamber. The equipment chamber access cover shall be designed with a lockable latching device. The fiberglass cover shall be formed with a drip-lip around the edge to prevent rainwater from entering the equipment chamber or wet well. Aluminum stairs shall be located in the equipment chamber to provide ready access from the surface.</p> <p>E. A heavy synthetic rubber mat shall be cemented to the station floor in the walkway area after the final coat of paint has been applied.</p> <p>F. Light fixture(s) shall be installed in the pump chamber to provide adequate illumination for the control panel and other areas. Lights shall be turned on automatically when the entrance lid is raised, and a manual switch shall be provided to maintain the lighting when the lid is closed.</p> <p>G. Lifting points shall be installed for lifting pumps directly above each pump. The design shall have provision for a sump pump with minimum 100 gph capacity operating off a float switch in the dry pit sump. Two check valves and a gate valve shall be installed on the discharge line. The pipe shall enter the wet well at an elevation of 6 feet or more below final grade and above alarm level.</p> <p>H. A ventilating blower shall provide air circulation to the floor of the pump chamber. The exhaust outlet shall be screened to prevent the entrance of foreign matter and insects and shall have a suitable cover to prevent the entrance of rain and snow.</p> <p>I. Fresh air to the pump chamber shall be drawn from the surface. The air inlet shall be screened to prevent the entrance of foreign matter and insects and shall have a suitable cover to prevent the entrance of rain and snow. The blower shall be sized to exchange the air in the station once every two minutes. The ventilating blower and station lights shall be turned on automatically when the entrance tube cover is raised and shall have a manual cold weather switch located on the inside of the entrance cover. A dual range thermostatically controlled electric heater shall be provided within the pump station to keep the temperature within the pump chamber above freezing.</p> <p>J. The heater will be provided with an automatic circulating fan, thermostatic control and an ON-OFF switch. The heater will be operated by connection to the convenience receptacle located on the control panel.</p> <p>K. A mercury float switch shall not be used. Wet well high and low alarms should be based on the bubbler pressure transmitter signal. Float switches shall each have two normally open and two normally closed contacts. Float switches will be wired to the local alarm system that will automatically activate the alarm at the main pumping station via a radio.</p> <p>2.04 SEWAGE PUMPS</p> <p>A. The sewage pumps shall be designed such that, with any one pump out of service, the remaining unit(s) will have capacity to handle the design peak hourly flow. The pumps shall be new vertical submersible dry-pit, non-clog type specifically designed for raw sewage applications. The pumps shall be 4", 6" or 8" non-clog solids handling pumps designed specifically for handling sanitary sewage.</p> <p>B. Each pump shall be of heavy cast iron construction. The shaft shall be of solid stainless steel construction sealed against leakage by a double mechanical seal. Impellers shall be of the enclosed type made of close-grained cast iron. All impellers less than full diameter shall be trimmed, to prevent the buildup of foreign particles.</p> <p>C. The pump shall be designed such that the rotating element can be easily removed from the volute, without disconnecting the seal system, electrical wiring or removal of the motor from the back head and seal. The pump shall be supported via a floor-mounted cast iron base with four legs to provide rigidity and balance. The motor shall be fitted with heavy lifting eyes or lugs, each capable of supporting the entire weight of the pump and motor.</p> <p>1. Vacuum primed/self primed</p> <p>i. A separate and independent priming system shall be furnished for each main pump, providing complete standby operation. Each priming system shall be complete with vacuum pump, vacuum control solenoid valve, prime level sensing probe, and a float operated check valve installed in the system to prevent liquid entry into the vacuum pump head.</p> <p>ii. Vacuum pumps shall be constructed of corrosion resistant components and shall be capable of priming the main pump and suction piping in not greater than 60 seconds under rated static lift conditions.</p> <p>iii. Unless self-priming sewage pumps are specified, multiple vacuum priming pumps shall be provided. For duplex stations, two priming pumps shall be specified with associated piping to allow use with either sewage pump.</p> <p>iv. Each pump shall be of heavy cast iron construction specifically designed for vacuum priming and use of mechanical seals. The shaft shall be of solid stainless steel construction through the mechanical seal for corrosion and abrasion resistance.</p> <p>2.05 INTERIOR PIPING AND VALVES</p> <p>A. Pump suction and discharge piping shall be drilled and tapped for 125 pound American Standard flanges. All flanged ductile iron pipe shall meet the requirements of ANSI A21.51 (AWWA C151) latest version. All suction and discharge pipes shall be equipped with the appropriate gauges for reading mg/Hg and psi and shall be scaled to read within 1 unit or less.</p> <p>B. Pump suction lines protruding through the equipment chamber wall shall be sealed with multiple link seals or welded to create a gas-tight seal. Suction and discharge valves shall be new non-lubricated eccentric type plug valves with resilient facings and 1/4 turn operating valve. All valves shall be supplied with ANSI 125 pound flange end connections. New check valves shall be placed on the discharge lines between the pumps and the plug valves. Check valves shall be non-slamming, bronze mounted swing type valves with bolted covers and outside levers. Check valves shall have ANSI 125 pound flanged ends.</p> <p>2.06 EMERGENCY STORAGE AND PUMPING REQUIREMENTS</p> <p>A. All wastewater pumping stations shall include provision for emergency power to prevent flooding in the event of a power outage. Manual transfer switches shall be required for all stations. A cord and cap connection shall be installed to connect the generator to the transfer switch. The cord end shall be of the style and size required for connection to the Wastewater Department's portable generator. On a case-by-case basis, emergency storage tanks may be considered by the Town Wastewater Treatment Department. The designer should insure that a minimum emergency storage volume of 25% of the design average daily flow (or 4 hours storage based on a 16 hour operating day) is provided for each pumping station if requested by the Town Wastewater Treatment Department.</p> <p>B. Emergency storage tanks shall have at least one manhole access to grade with aluminum or copolymer plastic ladder rungs at 8" on center. The manhole access shall have a cast iron front and cover (LeBaron LC266 type C or equal) or a 30" x 30" hinged, diamond plate hatch (Bilco or equal).</p> <p>C. The emergency storage system shall be free-draining toward the wet well with the fill/drain pipe invert elevation above the high water alarm level. The emergency storage tanks shall not be used as part of the normal pump dose volume.</p> <p>D. An emergency pumping connection shall be made to allow maintenance personnel to pump into the force main with a portable pump in the event of an emergency. The force main connection shall include a four (4), or six (6) inch quick connect hose fitting and associated valves. On a case-by-case basis, the Town Wastewater Treatment Department may require an emergency generator. (For example, environmentally sensitive locations).</p> <p>2.07 ELECTRICAL</p> <p>A. Variable Frequency Drives shall be used for all pumps. The Town Wastewater Department may request a partial waiver for maintenance and repair reasons. When permitted PVC piping shall be used in all areas that meet the requirements of the National Electrical Code.</p> <p>B. Electrical systems and components (i.e. motors, lights, conduits, switch boxes, control circuits, etc.) shall not be installed in raw sewage wet wells. Electrical systems and components in enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapors may be present, shall comply with the National Electrical Code requirements for Class I Group D, Division 1 locations and shall be corrosion resistant. Each flexible cable shall be provided with a watertight seal and separate strain relief. A fused disconnect switch located above ground shall be provided for the main power feed for all pumping stations. When such equipment is exposed to weather, it shall meet the requirements of weatherproof equipment NEMA 4. A 110 volt power receptacle to facilitate maintenance shall be provided inside the control panel for lift stations that have control panels outdoors. Ground fault interruption protection shall be provided for all outdoor outlets.</p> <p>C. All wiring shall meet the requirements of the National Electrical Code and shall be color-coded as indicated on the wiring diagram. All wiring outside the panel shall be in conduit, except for the 115 volt accessory items that are provided with insulated service cord. Conduit shall be provided from the control panel across the ceiling, and up the entrance tube to receive the feeder lines, and shall terminate in a threaded conduit connection through the wall of the entrance tube. All receptacles shall be of the ground fault type. Accessory items such as the sump pump, heater, dehumidifier and air compressors shall be plugged into polarized grounded convenience outlets located close to their installed position so that such items can be readily removed and serviced if necessary.</p> <p>D. The package pump station shall be completely pre-wired at the factory, except for the power feeder lines. All wires shall meet the requirements of the National Electrical Code and shall be color-coded as indicated on the wiring diagram. All wiring outside the control panel shall be in conduit, except for the 115 volt accessory items that are provided with insulated service cord. Conduit shall be provided from the control panel across the ceiling, and up the entrance tube to receive the feeder lines, and shall terminate in a threaded conduit connection through the wall of the entrance tube. All receptacles shall be of the ground fault type.</p> <p>E. All material and equipment necessary for a complete and workable electrical system shall be furnished and installed including: conduit and fittings, wire and cable, service panel, grounding, alarm system, connections to pump station, power company connection fees, telephone service fees. The above grade panel and signal communicator shall be provided by the pump station manufacturer and shall be PVC, fiberglass, aluminum, or stainless steel construction.</p> <p>F. All materials and equipment shall meet the standards of the National Electrical Manufacturers' Association and Underwriters Laboratories, Inc., and shall bear their label whenever standards have been established and label service is available. Installation of electric systems and controls shall be in conformance with the latest edition of the National Electrical Code, local ordinances and regulations prescribed by the local Power Company.</p> <p>G. Completed electric work performed shall comply with the latest edition of the National Electrical Code Underwriters Laboratories regulations and all Municipal, State and other public or private authorities having jurisdiction. The developer is responsible for acquiring all necessary permits.</p> <p>H. All equipment and workmanship shall be guaranteed to be free from mechanical and electrical defects for a period of one year from the day of final acceptance. Any replacement of parts or adjustments, including labor made necessary by such defects and adjustments, shall be rectified without cost to the Town.</p> <p>Required Testing:</p> <ol style="list-style-type: none"> <li>All mechanical, control and alarm functions shall be tested in the presence of the Town representative to demonstrate that all equipment is fully operational.</li> <li>Any grounds, opens, shorts or other defects shall be rectified at no cost to the Town before acceptance.</li> </ol> <p>2.08 CONTROLS</p> <p>A. Pumping sequence shall be arranged in an alternating lead/lag configuration. When liquid level reaches the predetermined lead pump on elevation, the designated lead pump shall start automatically. This pump shall continue to operate until such time as the liquid level falls below the designated pump off elevation. If flow into the wet well exceeds the capacity of the lead pump, and liquid level rises to the lag pump on elevation, then the designated lag pump shall be automatically activated. Both the lag pump and the lead pump shall continue to operate until liquid level falls to the pump off elevation.</p> <p>B. A high level alarm condition shall occur if liquid level rises above the predetermined alarm level (typically established at an elevation 6" above the lag pump on elevation). The alarm condition shall remain in effect until manually reset from the control panel. The main equipment control system shall be mounted internally within the pump station in a NEMA 4 panel, complete with suitable latching devices.</p> <p>C. All circuit breakers, pump control switches shall be mounted so that they are operable without opening the cabinet. The low voltage, automatic pump control section shall be separate from the high voltage circuit breaker motor section and shall be provided with a hinged access door and latch. The control switches shall be mounted on the face of the automatic pump control section door. A grounding-type convenience duplex outlet shall be provided for 115 volt AC operation.</p> <p>D. An auxiliary control panel shall be provided immediately adjacent to the access door in the dry well and shall contain: pump control switches for each pump, run/stop meters, and pump run lights. Thermal magnetic circuit breakers shall be provided for branch-circuit and over current protection of all motor, control and auxiliary circuits.</p> <p>E. All pump motors shall be provided with VFD control and a VFD bypass switch. Each VFD shall be capable of an alarm condition in the case of malfunction and the pump cannot run. All switches shall be labeled and a coded wiring diagram shall be provided. An automatic alternator with manual ON-OFF switch shall be provided to change the sequence of operation of the pumps on the completion of each pumping cycle.</p> <p>F. Provisions shall also be made for the pumps to operate in parallel, should the level in the wet well continue to rise above the starting level for a low-level pump. The panel shall include a time delay to prevent the simultaneous start-up of both pumps.</p> <p>G. A running time meter shall be supplied for each pump to record the hours of operation. The meter shall be enclosed in a dust and moisture proof molded plastic case. The flush mounted dial shall register in hours and tenths of hours up to 9999.9 hours before repeating. The meter shall be suitable for operation from a 115 volt, 60 cycle supply and be mounted on the surface of the control cabinet.</p> <p>H. An automated generator start, alarm and transfer switch adequate for normal operation of the pump station. All pump stations shall include a level sensing unit capable of providing a 4-20mA signal.</p> <p>I. All pump stations shall be equipped with a back-up control system in the event of a primary control failure. Any of the following primary devices shall be considered acceptable for control of the pumps and for activating alarms based on sewage level in the wet well:</p> <ol style="list-style-type: none"> <li>Ultrasonic level sensors (Badger Meter Model 2100 or equal).</li> <li>Submersible level transducers (Consolidated Electric Model 157GSC or equal).</li> <li>Direct acting non-mercury float switches (Consolidated Electric Model 9G or equal).</li> </ol> <p>2.09 RADIO TELEMETRY SYSTEM</p> <p>A. Each pump station shall be equipped with a radio telemetry unit (RTU) that is capable of being integrated with the Wastewater Department's current system. Each RTU shall be wired to the pump station's control panel and shall input:</p> <ul style="list-style-type: none"> <li>- Sewage pump status</li> <li>- Sewage pump fail</li> <li>- Power failure</li> <li>- Wet well level (continuous)</li> <li>- Wet well high level</li> <li>- Wet well low level</li> <li>- Station flood alarm</li> <li>- Pump 1 and 2 run times</li> </ul> <p>2.10 SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA)</p> <p>A. All Town owned pump stations shall be integrated into the Wastewater Department's SCADA system. The control panel must be able to receive and output a 4-20mA signal. A voltage signal will not be accepted. All costs associated with the integration shall be the expense of the developer or owner. The Town shall not be liable for any costs.</p> <p>2.11 SPARE PARTS</p> <p>A. A complete replacement pump shaft seal assembly shall be furnished with each lift station. The spare seal shall be securely fastened to the control panel and shall include complete installation instructions.</p> <p>B. Two (2) spare volute gaskets shall be provided.</p> <p>C. A spare filter cone for the seal filter shall be provided in the same container as the pump shaft seal.</p> <p>D. Provide 100% spare phase lamps and fuses for control panel.</p> <p>E. Provide all lubricants required for initial operation.</p> <p>F. Provide one (1) spare input and output card, processor, and power supply for the Programmable Logic Controller (PLC) system.</p> <p>G. Provide one (1) spare level transducer.</p> <p>2.12 O &amp; M MANUALS</p> <p>A. Installation of all mechanical equipment shall be done in accordance with written instructions provided by the manufacturer. Installation instructions shall be delivered with the station.</p> <p>B. The manufacturer shall provide 5 copies of a complete and detailed operating and maintenance manual. This manual shall provide all design criteria, general operating procedures, maintenance and servicing procedures for all major components, and as-built drawings of the contributory gravity sewer system, the pumping station and force main. All instructions and parts lists shall be prepared for the specific equipment furnished and shall not refer to similar equipment. Operating manuals must be submitted to the Town prior to final acceptance of the station.</p> <p><b>PART 3 - EXECUTION</b></p> <p>3.01 EXCAVATIONS</p> <p>A. Excavations shall be made to a point at least 6 inches below the existing structures to accommodate the new pump station. All excavations are to be kept dry throughout construction until the structures have been inspected by the Engineer and approval given to commence backfilling operations.</p> <p>3.02 BACKFILL</p> <p>A. Backfill shall consist of materials meeting the granular borrow requirements of the Backfill Section.</p> <p>3.03 FIELD TEST</p> <p>A. Upon completion of installation, the Contractor shall conduct a field test in the presence of the Engineer to demonstrate that the pumping units and all appurtenances are properly installed and deliver the specified flow/head requirements. All necessary equipment and labor to perform the test shall be furnished by the Contractor.</p> <p><b>EXCAVATION AND BACKFILLING</b></p> <p><b>PART 1 - GENERAL</b></p> <p>1.01 SUMMARY</p> <p>A. Section includes:</p> <ol style="list-style-type: none"> <li>Trench, backfill, and compact as specified herein and as needed for installation of underground utilities and the pump station.</li> </ol> <p>1.02 QUALITY ASSURANCE</p> <p>A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.</p> <p>B. Use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.</p> <p>1.03 REFERENCES</p> <p>A. ANSI/ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.</p> <p>B. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil Aggregate Mixtures using 5.5 pound rammer and 12 inch drop.</p> <p>1.04 SUBMITTALS</p> <p>A. Testing laboratory reports indicating that material for backfill meets requirements of this Section.</p> <p>B. Field density test reports of backfill in place.</p> <p><b>PART 2 - PRODUCTS</b></p> <p>2.01 SOIL MATERIALS</p> <p>A. Compacted Fill/Granular Borrow: Free of shale, clay, friable material, debris, and organic matter, graded in accordance with ANSI/ASTM C136 within the following limits:</p> <table border="1"> <thead> <tr> <th>Sieve Size</th> <th>Percent Passing</th> </tr> </thead> <tbody> <tr> <td>3/4 Inch</td> <td>75 - 100</td> </tr> <tr> <td>No. 4</td> <td>20 - 100</td> </tr> <tr> <td>No. 100</td> <td>0 - 20</td> </tr> <tr> <td>No. 200</td> <td>0 - 6</td> </tr> </tbody> </table> <p><b>PART 3 - EXECUTION</b></p> <p>3.01 SURFACE CONDITIONS</p> <p>A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.</p> <p>3.02 PREPARATION</p> <p>A. Identify required lines, levels, contours, and datum.</p> <p>3.03 PROCEDURES</p> <p>A. Existing Utilities:</p> <ol style="list-style-type: none"> <li>Unless shown to be removed, protect active utility lines shown on the drawings or otherwise made known to the Contractor prior to excavations. If damaged, repair or replace at no additional cost to the Owner.</li> <li>When existing underground utilities, which are not scheduled for removal or abandonment, are encountered in the excavation, they shall be adequately supported and protected from damage. Any damage to utilities shall be repaired promptly at no additional cost to the Owner.</li> <li>If the service is interrupted as a result of work under this section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.</li> <li>If existing utilities are found to interfere with the permanent facilities being constructed under this section, immediately notify the Engineer and secure his instructions.</li> <li>Do not proceed with permanent relocation of utilities until instructions are received from the Engineer.</li> </ol> <p>B. Protection of persons and property:</p> <ol style="list-style-type: none"> <li>Barricade open holes and depressions occurring as part of the work, and post warning lights or signs.</li> <li>Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this section.</li> </ol> <p>C. Dewatering: The Contractor, at all times, shall conduct his operations so as to prevent the accumulation of water, ice, and snow in excavations or in the vicinity of excavated areas, and to prevent water from interfering with the progress of quality of the work. Under no conditions shall water be allowed to rise in open excavations after utilities have been placed.</p> <p>D. Accumulated water, ice, and snow shall be promptly removed and disposed of by pumping or other approved means. Disposal shall be carried out in a manner which will not create a hazard to public health, nor cause injury to public or private property, work completed or in progress, or public streets, nor cause any interference in the use of streets and road by the public.</p> <p>3.04 EXCAVATION</p> <p>A. Care shall be exercised by the Contractor to avoid disrupting the operation of existing facilities to remain in place.</p> <p>B. Provide sheeting and shoring necessary for protection of the work and for the safety of personnel.</p> <p>C. Excavation shall not interfere with normal 45° bearing splay of foundations.</p> <p>D. All excavations shall be in accordance with the latest OSHA requirements.</p> <p>E. Where utility runs traverse public property or are subject to governmental or utility company jurisdiction, provide depth, bedding, cover, and other requirements as set forth by legally constituted authority having jurisdiction, but in no case less than the depth shown in the Contract Documents.</p> <p>F. Where excavations occur in existing lawns, remove turf or plantings in sections and keep damp. Replace upon completion of the backfilling.</p> <p>3.05 BACKFILLING</p> <p>A. Backfilling shall not be done in freezing weather, with frozen materials, or when materials already placed are frozen.</p> <p>B. Backfill material shall be evenly spread and compacted in lifts not more than 12 inches thick or as approved by the Engineer. Previously placed or new materials shall be moistened by sprinkling, if required, to ensure proper bond and compaction.</p> <p>C. Take special care that backfilling operations do not damage the pump station or pump station coatings.</p> <p>D. Backfill material shall be compacted to the following percentages of maximum dry density and the in-place moisture content shall not be more than 2% above the optimum moisture content, as determined by Standard Proctor ASTM D698.</p> <ol style="list-style-type: none"> <li>Around all structures, under roadway paving, shoulder and embankments - 95%.</li> <li>All other areas - 90%.</li> </ol>		Sieve Size	Percent Passing	3/4 Inch	75 - 100	No. 4	20 - 100	No. 100	0 - 20	No. 200	0 - 6	 <p><b>CIVIL ENGINEERING ASSOCIATES, INC.</b> 10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403 802-864-2323 FAX: 802-864-2271 web: www.ceai-vt.com</p> <p>COPYRIGHT © 2016 - ALL RIGHTS RESERVED</p> <p>DRAWN <b>SAL</b></p> <p>CHECKED <b>DSM</b></p> <p>APPROVED <b>DSM</b></p> <p>OWNER:</p> <p><b>PHILO RIDGE, L.L.C.</b></p> <p>2766 MT. PHILO RD. CHARLOTTE, VT.</p> <p>PROJECT:</p> <p><b>SITE IMPROVEMENTS</b></p> <p>2766 MT. PHILO RD. CHARLOTTE, VT.</p> <table border="1"> <thead> <tr> <th>DATE</th> <th>CHECKED</th> <th>REVISION</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td></tr> </tbody> </table> <p>DATE <b>OCT., 2016</b></p> <p>SCALE <b>AS SHOWN</b></p> <p>PROJ. NO. <b>16107</b></p> <p>DRAWING NUMBER <b>C2.5</b></p>		DATE	CHECKED	REVISION																																	
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**SANITARY SEWER SYSTEMS**

**PART 1 – GENERAL**

**1.01 SUMMARY**

**A. Section includes:**

1. Gravity Sewer Pipe
2. Manhole Structures and Appurtenances
3. Pressure Sewer Pipe

**B. Related Sections:**

1. Section 02225 – Utility Trenching and Backfilling

**1.02 SUBMITTALS**

- A. Product Data:** Submit published data from manufacturers of products and accessories specified, indicating compliance with requirements.

**1.03 QUALITY ASSURANCE**

- A.** All sanitary sewer materials and construction of same shall be as shown on the Contract Plans and shall meet the requirements of the State of Vermont Agency of Natural Resources (Department of Environmental Conservation) and the Public Works Standards and Specifications of the local municipality.

**PART 2 – PRODUCTS**

**2.01 GENERAL**

- A.** Furnish ells, tees, reducing tees, wyes, couplings, increasers, crosses, transitions and end caps of the same type and class of material as the conduit, or of material having equal or superior physical and chemical properties as acceptable to the Engineer to provide a complete and operable system.

**2.02 PVC GRAVITY SANITARY SEWER PIPE**

- A.** PVC sewer pipe shall conform in all respects to the latest revision of ASTM Specifications D-3034 or F679, Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings, SDR 35 pipe. All pipe and fittings shall be clearly marked as follows:

- Manufacturer's Name and Trademark
- Nominal Pipe Size (as shown on plans)
- Material Designation 12454-C PVC
- Legend "Type PSM SDR 35 PVC Sewer Pipe" or "PS 46 PVC Sewer Pipe"
- Designation ASTM D-3034 or F679

- B.** Joints shall be push-on type using elastomeric gaskets and shall conform to ASTM D-3212. The gaskets shall be factory installed. The pipe shall be furnished in nominal 13 foot lengths. Sufficient numbers of short lengths and full machine fittings shall be provided for use at manholes and connections. All connections will require the use of manufactured fittings. Field fabricated, saddle-type connections will not be considered acceptable.

- C.** Any pipe or fitting having a crack or other defect or which has received a severe blow shall be marked rejected and removed at once from the work site. All field cuts are to be made with saw and 90 degree miter box. Bevel the cut end to the same as the factory bevel and remove all interior burrs. Measure and place a marking mark on the pipe before assembling. The pipe installed under this specification shall be installed so that the initial deflection, measured as described below, shall be less than five percent (5%).

- D.** The manhole water stop gasket and stainless steel clamp assembly must be approved by the Town Wastewater Treatment Department prior to the installation of any pipe.

- E.** The Contractor will submit certification that the materials of construction have been sampled, tested, inspected, and meet all the requirements including wall thickness in accordance with ASTM D-3034 or ASTM F679 for all pipe and fittings to be included in project work. PVC pipe shall not be installed when the temperature drops below 32 degrees Fahrenheit or goes above 100 degrees Fahrenheit. During cold weather, the flexibility and impact resistance of PVC pipe is reduced. Extra care is required when handling PVC pipe during cold weather. PVC pipe shall not be stored outside and exposed to prolonged periods of sunlight, as pipe discoloration and reduction in pipe impact strength will occur. Canvas and other opaque material shall be used to cover PVC pipe when stored outside.

**2.03 PVC PRESSURE SEWER PIPE**

- A.** PVC pipe shall conform in all respects to the latest revisions of ASTM Specifications D-2241. All pipe and fittings shall be SDR 26 clearly marked as follows:

- Manufacturer's Name and Trademark
- Nominal Pipe Size (as shown on plans)
- Material Designation 12454-A PVC ASTM D-1784

- B.** Joints shall be push-on type using elastomeric gaskets factory installed conforming to ASTM Specification D-3212.

**2.04 MANHOLES**

- A.** Manholes shall be sized as indicated on the plan and shall be precast concrete with a monolithic base and shall conform to the latest version of ASTM Specification C478.

- B.** Shelves shall be constructed with concrete having a minimum compressive strength of 3,000 psi at 28 days. Inverts for sewer manholes shall be as shown on the plans and details and shall be constructed with concrete or brick, as per the local municipality's standards. Inverts shall have the exact shape of the sewer to which they are connected, and any change in size or direction shall be gradual and even.

- C.** All manholes are to be provided with copolymer polypropylene plastic steps with steel reinforcement 12 inches on center.

- D.** All manholes shall be provided with rough, gray, cast iron manhole frames and covers. All iron castings shall be

thoroughly cleaned and then coated with hot tar before being delivered. Frames and covers shall be LeBaron LC 266, or an approved equal, and have a minimum weight of 400 pounds.

- E.** Precast risers and bases for manholes shall conform to ASTM Specification C-478. The pipe opening in the precast manhole system shall have a cast-in-place flexible gasket or an equivalent system for pipe installation as approved by the Engineer. Joints between manhole risers shall be 1" minimum width flexible gasket or approved equals.

**2.05 CLEANOUTS**

- A.** Cleanouts for gravity sewers and force mains shall be provided at locations indicated on the plans or as directed by the Engineer. Cleanout frames and covers shall be of tough gray cast iron. Castings shall be true to pattern and free from flaws. The bearing surface of cleanout frames and covers against each other shall be machined to give continuous contact throughout their circumference.

**2.06 PIPELINE INSULATION**

- A.** Approved sewer lines with less than four feet (4'-0") of cover over the crown, five (5'-0") in plowed areas that cross a storm sewer, or where indicated on the plans, shall be protected against freezing by the installation of two inch (2") thick highest available density extruded polystyrene insulating sheets or equivalent. Sheets shall be the lesser of 3' or 2 x diameter of the pipe. The sheets shall be placed six inches (6") above the crown after placement of four to six inches (4"-6") of clean medium or coarse sand below the pipe bottom and four to six inches (4"-6") above the crown. Joints shall be overlapped so there is no gap that will allow frost to penetrate. Care shall be exercised during backfill and compaction over the polystyrene sheets to prevent damage to the sheets. The polystyrene sheets shall meet the comprehensive strength requirements of ASTM D1621-73. In no cases shall the waterline have less than four feet (4') of cover over the top of the pipe. When sewer line passes within 5 feet of a catch basin install 2" min. rigid insulation, polystyrene sheets, between sewer line and cb.

**PART 3 – EXECUTION**

**3.01 GENERAL**

- A.** Care shall be exercised by the Contractor to avoid disrupting the operation of existing sanitary sewer facilities without prior written approval of the Engineer.

- B.** When existing underground utilities not scheduled for removal or abandonment are encountered in the excavation, they shall be adequately supported and protected from damage. Any damage to utilities shall be repaired promptly at no additional cost to the Owner.

- C.** Installation of pipe shall be in accordance with the Utility Trenching and Backfilling and as specified by this section.

**3.02 BEDDING FOR PIPE**

- A.** The bedding material shall be shaped to fit the pipe for a depth of not less than 10 percent of its total height and shall have recesses to receive the bell.

**3.03 LAYING PIPE**

- A.** In general, sewer pipe shall be installed in accordance with the latest detailed instructions of the manufacturer.

- B.** The laying shall begin at the outlet end and the lower segment of the pipe shall be in contact with the shaped bedding throughout its full length. Bell or grooved ends of rigid pipes and the circumferential laps of flexible pipe shall be placed facing upstream.

- C.** All pipe and fittings shall be carefully examined for defects and no pipe or fittings shall be laid which are known to be defective. If any defective piece is discovered after laying, it shall be removed and replaced at the Contractor's expense. All pipes and fittings shall be cleaned before they are laid and shall be kept clean until accepted in the completed work.

- D.** The pipe shall be laid to conform to the lines and grades indicated on the drawings or given by the Engineer. Each pipe shall be so laid as to form a close joint with the next adjoining pipe and to bring the inverts continuously to the required grade.

- E.** The Contractor shall take all necessary precautions to prevent flotation of the pipe in the trench.

- F.** When pipe laying is not in progress, the open ends of the pipe shall be closed with temporary watertight plugs. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe is eliminated.

- G.** For force mains, concrete reaction blocking shall be provided as detailed at all bends deflecting 22½ degrees or more. At the Contractor's option, retainer glands may be used at bends in lieu of concrete blocking. Retainer glands shall also be provided at all joints within three pipe lengths each side of the bends.

- H.** Any pipe that is not laid to grade and alignment shall be re-laid to the satisfaction of the Town Wastewater Department. The bedding material shall be placed and compacted on each side of the pipe to a height equal to one-half (1/2) the pipe diameter and for the full width of the excavated trench and as shown on the accepted plans. Bedding shall be #2 pea stone from Shelburne Limestone or an equivalent approved by the Town Wastewater Department and the Engineer.

- I.** All sewer pipes shall be marked with magnetic marking tape. The marking tape shall be installed one (1) foot directly over . Concrete thrust blocks "sewer" the pipe and shall be labeled or anchored shall be placed at bends, tees, fittings, and other locations on the force main as shown on the contract drawings or as directed by the Town Wastewater Department. Concrete for thrust blocks and anchors shall be Class B concrete. Steel rods and clamps as required shall be galvanized and rust proofed or painted.

**3.04 GRAVITY SEWER PIPE TESTING**

- A.** The Contractor shall provide all necessary equipment and

instrumentation required for proper completion of the flushing and testing. Quality of water, test procedures, and method of disposal of water shall be approved by the Engineer. Prior to testing, flush with water to remove construction debris and pass through a full gauge squeegee.

- B.** All tests shall be made in the presence of the Engineer. Preliminary tests made by the Contractor without being observed by the Engineer will not be accepted. The Engineer will be notified at least eight hours before any work is to be inspected or tested. The Town shall be notified at least at least two (2) days before testing.

- C.** The maximum sewer length to be tested at one time shall be that length between any two manholes.

- D.** Air Testing: Low pressure air testing shall be conducted in accordance with the following procedures:

1. Each end of the test section and laterals shall be plugged, capped and braced. Necessary safety precautions shall be taken to prevent blowouts and possible injury.
2. An air hose shall be connected to a tapped plug used for an air inlet. The hose will be connected to the air control equipment, which shall include valves and pressure gauges. These shall allow air to enter the sewer test line, monitor air pressure in the sewer, shut off air, and provide pressure reduction and relief. The monitoring pressure gauge shall have a range of 0-10 psi with divisions of 0.10 psi and accuracy of 0.05 psi±.
3. The air compressor and air supply shall be connected to the test line and the test section filled slowly, until a constant pressure of 4.0 psig is maintained.
4. A pressure above 3.0 psig shall be maintained for at least five minutes to allow the temperature to stabilize. A check for leaks shall be made and if any are found, the pressure shall be released and the fitting replaced or repaired.
5. After the stabilization period, the pressure shall be adjusted to 3.5 psig and the air supply disconnected.
6. Measure and record the time interval for the test line pressure to drop from 3.5 psig to 2.5 psig.
7. If the groundwater table is above the pipe, increase above test pressures 0.5 psig for each foot the groundwater is above the invert of the pipe.
8. The requirements of this specification shall be considered satisfied if the time required in seconds for the pressure to decrease from 3.5 to 2.5 psi greater than the average back pressure of any groundwater that may submerge the pipe is not less than that computed according to the following table:

Depth of 4" Manhole	Minutes	Seconds
0' - 10'	2	0
10' - 15'	2	30
15' - 20'	3	0
20' - 25'	3	30

- f.** If the vacuum drop exceeds 1" Hg during the specified time periods, the manhole shall be resealed and Steps 2 through 5 above repeated until the vacuum holds for the specified time.

- g.** After the manhole passes the vacuum test, it shall be backfilled carefully so that no leaks are created. Steps 1 through 5 above. If the manhole fails the vacuum test, the Contractor shall test the manhole using the manhole exfiltration test.

- h.** The Contractor shall provide the Engineer with a written log of each manhole leakage test result.

- i.** Manholes shall be tested and accepted prior to building manhole inverts.

- 3.07 PRESSURE PIPE TESTING**

- A.** General: All force mains shall pass the hydrostatic pressure test and leakage test described herein. Prior to testing, all anchors and braces shall be installed. All concrete thrust blocks and restraints shall be in place and cured at least seven days. All buried pipe shall be backfilled. Suitable test plugs shall be installed and air release valves shall be installed at the high points.

- B.** Hydrostatic Test: The following procedure shall be used:

1. All air release valves shall be opened and the pipe shall be filled with water at a rate not to exceed the venting capacity of the air release valves.
2. The water pressure shall be raised to 150 percent of the designed operating pressure or 60 psi minimum at the highest point.
3. Failure to hold the designated pressure within 5 psi of the specified test pressure for the two hour period constitutes a failure of the section tested.

- C.** Leakage Test: The following procedure shall be used:

1. Leakage shall be defined as the quantity of water that must be supplied into the pipe being tested to maintain pressure within 5 psi of the specified test pressure.
2. No pipe installation shall be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{ND(P)^{0.5}}{7,400}$$

$$L = \frac{SD(P)^{0.5}}{133,100}$$

Whichever is less

S = Length of Pipe Testing  
 L = Allowable Leakage in Gal/Hr  
 D = Nominal Diameter of Pipe (")  
 P = Average Test Pressure (psi)  
 N = Number of Joints in the Pipeline Tested

- All testing shall be conducted in accordance with AWWA C600-87 or latest revision.

**3.08 PUMP STATION AND STORAGE TANK TESTING**

- A.** Pump Station and Storage Tank Testing: All manholes and storage tanks shall be tested for leakage in accordance with the following procedure:

- B.** Water Test: After the structure has been assembled in place, all lifting holes and exterior joints shall be filled and pointed with non shrinking mortar. All pipes and other openings into the structure shall be suitably plugged and the plugs placed to prevent blowout.

- 1.** Each structure shall be checked for exfiltration by filling with water to the top of the cone section. A stabilization period of one hour shall be provided to allow for absorption. At the end of this period, the structure shall be refilled to the top of the cone, if necessary, and the measuring time of at least six hours begun. At the end of the test period, the structure shall be refilled to the top of the cone measuring the volume of water added.

- 2.** This amount shall be converted to a 24-hour rate and the leakage determined on the basis of depth and size of structure. The leakage for each structure shall not exceed one gallon per vertical foot per 15 linear feet of well (as measured in plan view) for a 24 hour period for exfiltration and there shall be no visible infiltration.

- C.** Air Test: Alternatively, the manhole may be tested for

- a.** All lifting holes and exterior joints shall be filled and pointed with an approved non-shrinking mortar. The completed manhole shall not be backfilled prior to testing. Manholes which have been backfilled shall be excavated to expose the entire exterior prior to vacuum testing or the manhole shall be tested for leakage by means of the exfiltration leakage test.

- b.** All pipes and other openings into the manhole shall be suitably plugged in a manner to prevent displacement.

- c.** A plate with an inflatable rubber ring the size of the top of the manhole shall be installed by inflating the ring with air to pressure adequate to prevent leakage of air between the rubber ring and the manhole wall.

- d.** Air shall then be pumped out of the manhole through an opening in the plate until a vacuum is created inside of the manhole equal to 10 inches of mercury on an approved vacuum gauge. The removal of air shall then be stopped and the test begun.

- e.** The manhole shall pass this test if the vacuum holds at 10" Hg or drops no lower than 9" Hg within the following times:

Depth of 4" Manhole	Minutes	Seconds
0' - 10'	2	0
10' - 15'	2	30
15' - 20'	3	0
20' - 25'	3	30

- f.** If the vacuum drop exceeds 1" Hg during the specified time periods, the manhole shall be resealed and Steps 2 through 5 above repeated until the vacuum holds for the specified time.

- g.** After the manhole passes the vacuum test, it shall be backfilled carefully so that no leaks are created. Steps 1 through 5 above. If the manhole fails the vacuum test, the Contractor shall test the manhole using the manhole exfiltration test.

- h.** The Contractor shall provide the Engineer with a written log of each manhole leakage test result.

- i.** Manholes shall be tested and accepted prior to building manhole inverts.

**3.09 SERVICE CONNECTION**

- A.** Laterals

Where required on the plans, sewer service connections for one house shall be constructed of four inch (4") pipe, unless otherwise noted on the plans, of the type material specified under this section. The pipe shall be laid and its joints made as required for sewer construction in this specification. Open ends of pipes shall be properly sealed to prevent damage and intrusion of foreign matter where hookup to the building sewer is not coincident with sewer main construction. Additionally, the Contractor will provide a stable, temporary marker approved by the Town Wastewater Department from the sewer service invert up to six inches (6") above the finish grade and seated securely into the ground for ease in relocating the end of sewer service connection for hooking up the building sewer. Two (2) tie points to permanent objects shall be documented. The tie points shall be submitted to the homeowner and to the Wastewater Department.

- B.** Cleanouts for Sewers

Cleanouts for gravity sewers and force mains shall be provided at locations indicated on the plans or as directed by the Town Wastewater Department. Cleanout frames and covers against each other shall be machined to give continuous contact throughout their circumference. All iron castings shall be thoroughly cleaned and then coated with hot coal tar before being delivered. Individual laterals shall have cleanouts every one hundred feet (100'). Cleanouts shall also be installed in laterals with changes of alignment of 45 degrees or greater.

**C. Chimneys**

Chimneys shall be built of four inch (4") pipe and/or as indicated on the contract drawings. Each chimney shall be plugged or capped at end until ready to connect to existing services. Chimneys are required where the vertical drop between the finished grade surface and the main sewer line exceeds fifteen feet (15') at the wye from a service connection.

**3.10 Force Main**

After force mains have been laid and the trench backfilled, the pipe shall be subjected to a hydrostatic pressure test in accordance with AWWA Standard for Installation of Cast Iron Water Main, AWWA C600 (latest issue), Section 13. The hydrostatic pressure shall be 150 percent (150%) of normal operational pressure. After the pressure test has been satisfactorily completed, a leakage test shall be conducted in accordance with AWWA C600 (latest issue), Section 13. The minimum test pressure shall be 75 pounds per square inch at the high point in the system.

**3.11 Wet well**

The pre-cast concrete wet well shall be externally coated with an asphaltic sealant and tested for water tightness using an approved vacuum or water testing procedure.

**PART 4 – PUMP STATION**

**4.00 SPARE PARTS**

- A.** A complete replacement pump shaft seal assembly shall be furnished with each lift station. The spare seal shall be securely fastened to the control panel and shall include complete installation instructions.

- B.** Two (2) spare volute gaskets shall be provided.

- C.** A spare filter cone for the seal filter shall be provided in the same container as the pump shaft seal.

- D.** Provide 100% spare lamps and fuses for control panel.

- E.** Provide all lubricants required for initial operation.

- F.** Provide one (1) spare input and output card, processor, and power supply for the Programmable logic controller (PLC) system.

- G.** Provide one (1) spare level transducer.

leakage using the following procedure:

1. All lifting hole and exterior joints shall be filled and pointed with an approved non-shrinking mortar. The completed manhole shall not be backfilled prior to testing. Structures that have been backfilled shall be excavated to expose the entire exterior prior to vacuum testing or the manhole shall be tested for leakage by means of a hydrostatic test.

2. All pipes and other openings in the manhole shall be suitably plugged in a manner to prevent displacement.

3. A plate with an inflatable rubber ring the size of the top of the manhole shall be installed by inflating the ring with air to a pressure adequate to prevent leakage of air between the rubber ring and the manhole wall.

4. Air shall then be pumped out of the manhole through an opening in the plate until a vacuum is created inside of the manhole equal to 10 inches of mercury on an approved vacuum gauge. The removal of the air shall then be stopped and the test time begun.

5. The vacuum must not drop below 9 inches of mercury within a 2 minute test period. If more than 1 inch of drop in vacuum occurs within the 2 minute test period the manhole has failed the test and shall be repaired or reconstructed and retested.

- D.** Following satisfactory test results, the manhole may be backfilled.

**3.09 SERVICE CONNECTION**

No sanitary sewer shall be placed in service until such time as the Town has given final approval to the sewer installation, including satisfactory completion of all required tests. Service connections shall not be made until all receiving sewer mains have been completed and approved and as-built received along with GPS coordinates and approved by the Town Wastewater Department.

**A. Laterals**

Where required on the plans, sewer service connections for one house shall be constructed of four inch (4") pipe, unless otherwise noted on the plans, of the type material specified under this section. The pipe shall be laid and its joints made as required for sewer construction in this specification. Open ends of pipes shall be properly sealed to prevent damage and intrusion of foreign matter where hookup to the building sewer is not coincident with sewer main construction. Additionally, the Contractor will provide a stable, temporary marker approved by the Town Wastewater Department from the sewer service invert up to six inches (6") above the finish grade and seated securely into the ground for ease in relocating the end of sewer service connection for hooking up the building sewer. Two (2) tie points to permanent objects shall be documented. The tie points shall be submitted to the homeowner and to the Wastewater Department.

In the case of reconnection of existing services, such reconnection will be made only after the new sewer main has been completed, tested, and accepted. The excavation, bedding material, installation, and backfill for service connections shall be the same as for sewer mains.

**B. Cleanouts for Sewers**

Cleanouts for gravity sewers and force mains shall be provided at locations indicated on the plans or as directed by the Town Wastewater Department. Cleanout frames and covers against each other shall be machined to give continuous contact throughout their circumference. All iron castings shall be thoroughly cleaned and then coated with hot coal tar before being delivered. Individual laterals shall have cleanouts every one hundred feet (100'). Cleanouts shall also be installed in laterals with changes of alignment of 45 degrees or greater.

**C. Chimneys**

Chimneys shall be built of four inch (4") pipe and/or as indicated on the contract drawings. Each chimney shall be plugged or capped at end until ready to connect to existing services. Chimneys are required where the vertical drop between the finished grade surface and the main sewer line exceeds fifteen feet (15') at the wye from a service connection.

**3.10 Force Main**

After force mains have been laid and the trench backfilled, the pipe shall be subjected to a hydrostatic pressure test in accordance with AWWA Standard for Installation of Cast Iron Water Main, AWWA C600 (latest issue), Section 13. The hydrostatic pressure shall be 150 percent (150%) of normal operational pressure. After the pressure test has been satisfactorily completed, a leakage test shall be conducted in accordance with AWWA C600 (latest issue), Section 13. The minimum test pressure shall be 75 pounds per square inch at the high point in the system.

**3.11 Wet well**

The pre-cast concrete wet well shall be externally coated with an asphaltic sealant and tested for water tightness using an approved vacuum or water testing procedure.

**PART 4 – PUMP STATION**

**4.00 SPARE PARTS**

- A.** A complete replacement pump shaft seal assembly shall be furnished with each lift station. The spare seal shall be securely fastened to the control panel and shall include complete installation instructions.

- B.** Two (2) spare volute gaskets shall be provided.

- C.** A spare filter cone for the seal filter shall be provided in the same container as the pump shaft seal.

- D.** Provide 100% spare lamps and fuses for control panel.

- E.** Provide all lubricants required for initial operation.

- F.** Provide one (1) spare input and output card, processor, and power supply for the Programmable logic controller (PLC) system.

- G.** Provide one (1) spare level transducer.

SITE ENGINEER:



**CIVIL ENGINEERING ASSOCIATES, INC.**  
 10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403  
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DRAWN <b>SAL</b>
CHECKED <b>DSM</b>
APPROVED <b>DSM</b>



the pressure. Hose and pumper nozzles shall be 1/4 turn type secured by stainless steel or corrosion resistant pins or screws. Pressure seals behind the nozzle flanges shall be "O" rings. A breakable coupling retained in place by stainless steel or corrosion resistant pins shall make the union between the upper and lower stems. The two-piece traffic flange shall be held in place by nuts and bolts. The upper barrel shall be able to rotate 360 degrees without removing any bolts. Hydrant flags shall be required and supplied for each hydrant. Wherever a traffic hazard appears to exist, curbing and/or bollards shall protect the hydrant.

B. For single-family house subdivisions, there will be at least one hydrant at each intersection and a maximum of five hundred feet (500') between hydrants with a minimum water flow of 500 gallons per minute (gpm) at the flow hydrant with a 20-psi residual pressure at the residual hydrant. Hydrants should be located immediately adjacent to street property lines. A 20' x 20' easement will be required around all hydrants. No structures or plantings are to be placed within a 20' x 20' area of any hydrant.

C. Where dead-end mains occur, they shall be provided with a fire hydrant if flow and pressure meet minimum requirements. If flows and pressure are not sufficient, then an approved flushing hydrant or blow off shall be installed for flushing purposes. Flushing devices should be sized to provide flows which will give a velocity of at least 2.5 feet per second in the water main being flushed. The open end of a blow off must be capped and terminate at least eighteen inches (18") above grade.

D. When set in lawn space between the curb and sidewalk, no portion of the hydrant or nozzle cap will be less than one foot off the gutter face of the curb or edge of the sidewalk. Hydrants shall be a minimum of four feet (4') and a maximum of six feet (6') from the edge of the sidewalk to the closest point on the hydrant when placed behind the sidewalk. In the absence of a curb or sidewalk, no hydrant shall be placed more than six feet (6') from the edge of pavement. Hydrants shall be located so as to provide complete accessibility and minimize the possibility of damage from vehicles or injury to pedestrians.

2.15 HYDRANT ASSEMBLIES

A. Hydrant assemblies shall consist of an anchor tee, a six inch (6") mechanical joint gate valve conforming to the above specifications, the appropriate length of six inch (6") Ductile Iron Cement Lined, Class 52 pipe, all necessary anchor couplings and approved restraining glands, the fire hydrant and appropriate thrust block.

B. Core shall be taken to prevent damage to hydrants and appurtenances during handling and installation. All materials shall be carefully inspected for defects in workmanship and materials; all debris and foreign material cleaned out of the hydrant bowl; all operating mechanisms operated to check their proper functioning, and all nuts and bolts checked for tightness. All hydrants shall be carefully incorporated in the water main and supported in their respective positions free from distortion and strain. Hydrants shall be set plumb. All hydrants shall be oriented to most efficiently allow fire truck access and connection for emergency purposes. They shall be installed away from the curb line at sufficient distance to avoid damage from or to vehicles. Traffic model hydrants shall be installed so the breakaway flange is not less than two inches (2"), nor more than six inches (6") above the established grade, according to manufacturer recommendations. Hydrant locations are subject to the approval of the Town Water Department and the appropriate municipality's fire department. Installation for fire hydrants can be found in AWWA Standard C600.

2.16 SERVICE CONNECTIONS

A. Service lines shall be installed so as to run perpendicular, in a straight line from the water main to the curb stop.

B. Each service shall consist of a corporation, curb stop, copper tubing and a curb box with a cast iron or stainless steel service rod. Service lines from three-quarter to two inch (3/4" to 2") shall be copper tubing from the corporation stop to the curb stop. Copper tubing shall be type "K", soft temper, conforming to ASTM B88. The name or trademark of the manufacturer and type shall be stamped at regular intervals along the pipe. Copper service pipe shall be one piece from the corporation to the curb stop. The minimum service for a single-family residence shall be three-quarter inch (3/4"). The minimum service for a duplex shall be one inch (1").

C. Corporations shall be AY McDonald or Cambridge Brass Low-Lead and manufactured in accordance with AWWA C800. Corporations shall have threads per AWWA C800 Table 7 / Figure 2, at the inlet and a compression type fitting at the outlet. Both inlet and outlet shall be the same size. Three-quarter inch and one-inch corporations shall be directly tapped into ductile iron pipe six inches (6") and larger in diameter. Larger size corporations up to two inches (2") shall use a tapping saddle. Pipe less than six inches (6") shall require the use of a tapping saddle and corporation. Corporations shall be used for all taps up to two inches (2"). In no instance, except when a tapping sleeve and valve are used, shall a tap be made without a corporation. Corporations shall be Mueller 110 (3/4" - 1"), or Mueller H 15013 (1 1/2" - 2"). A connection made to a pipe that requires a tapping saddle or is not ductile iron will have a body with a suitable outlet, seal, and suitable means for attachment to the main. The body shall be made to conform to the outside configuration of the main. The service saddle shall be designed to provide a drip tight connection. The body shall be Teflon or Epoxy coated with stainless steel strap(s), bolts, nuts, and mechanism for attaching to the pipe barrel.

D. Curb stops shall be a ball valve type with a minimum allowable pressure rating of 300 psi and be manufactured in accordance with AWWA C800. The curb stop shall open left, have a positive stop, be full port, provide drip-tight shutoff in the closed position and be of the tee design or flat design. No curb stop shall have the ability to drain the service line. Both the inlet and outlet of the curb stop shall have compression type fittings. The tee head of the curb stop shall have the provision for the connection of a service rod. Curb stops shall be AY McDonald or Cambridge Brass Low-Lead, or approved equal. The curb stop shall rest on a

four inch by eight inch by sixteen-inch (4" x 8" x 16") concrete block for support. Curb stops shall be installed just inside the municipality R.O.W.

E. Curb boxes shall be of sliding adjustable type capable of adjusting from five feet to six feet (5' - 6') (Erie Style). The base of the box shall be arch type so as to prevent the box from resting on the curb stop. The adjustable upper section shall be one inch (1") diameter for use with 3/4" and 1" curb stops. For larger curb stops, the upper section shall be 1 1/4" in diameter. Stationary rods affixed to the key of the curb stop with a brass pin shall be thirty inches (30") in length for 3/4" and 1" curb stops and twenty-four inches (24") for large curb stops. Curb box rods may be cast iron or stainless steel, as determined by the Town Water Department. The word "WATER" shall be inscribed on the cover of the box.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Contractors shall notify the Town Water Department and Dig Safe at least seven days prior to any work on the water system.

B. Skilled workers experienced in such work shall install all items. Tools shall be adequate for the work and in good condition so as to produce good, clean cut threads of the correct size, pitch, and taper.

C. Installation of all water lines shall be in accordance with the latest version of AWWA C600 or AWWA C605, as applicable, current edition.

D. Connection to an existing water main shall be done under the supervision of and with the approval of the Town Water Department. It is the applicant's, developer's, or owner of record's responsibility to secure ALL necessary connection permits and pay ALL applicable fees to make the connection, and to coordinate all parties involved in the process. The engineer and the Town Water Department shall be notified at least two working days in advance of the intended connection time. No existing valves, hydrants, curb stops, etc. shall be operated without prior approval of the Town Water Department. The Town Water Department shall operate all valves initially to ensure the integrity of the valve. The Town Water Department may then allow the contractor to operate those valves. Any damage occurring after the use of any valve operated by the contractor shall be the contractor's responsibility.

E. Care shall be taken to prevent damage to valves and other appurtenances during handling and installation. All materials shall be carefully inspected for defects in workmanship and materials; all debris and foreign matter cleaned out of valve openings, etc.; all operating mechanisms operated to check their proper functioning, and all other nuts and bolts checked for tightness. Valves and other equipment, which do not operate easily, or are otherwise defective, shall be replaced. All valves shall be carefully incorporated into the water main and supported in their respective positions free from all distortion and strain. Valves and valve boxes shall be set plumb. Valve boxes, besides being plumb, shall be centered directly over the valves.

F. All pipes showing cracks shall be rejected. If cracks occur in the pipe, the contractor may, at his own expense and after approval of the Town Water Department, cut off cracked portions at a point at least twice the pipe diameter from the visible limits of the crack and use the sound portion of the pipe.

G. All water mains shall have no less than six feet (6') of cover unless waived by the Town Water Department. The pipe shall be laid to conform to the lines and grades indicated on the Department. The Town Water Department may restrict work before November 15 and after April 1 during adverse weather conditions. The Town Water Department may not allow excavating for water mains during the winter months except by special permission for emergencies. Each pipe shall be laid so as to form a close joint with the next adjoining pipe and to bring the inverts continuously to the required grade, and in no cases shall the waterline have less than four feet (4') of cover over the top of the pipe.

H. Temporary support, adequate protection, and maintenance of all underground structures, drains, sewers and other obstructions encountered in the progress of the work shall be provided at all times. If utility service is interrupted as a result of work for the project, the contractor shall immediately restore service by repairing the damaged utility at the contractor's expense.

I. At all times, when pipe laying is not actually in progress, the open ends of the pipe shall be closed by temporary watertight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed. During construction, the contractor shall conduct operations so as to prevent the accumulation of water, ice, and snow in the vicinity of excavations or in the vicinity of excavated areas, and to prevent water from interfering with the progress and quality of the work.

J. Under no conditions shall water be allowed to rise in open trenches after pipe has been laid.

K. Accumulated water, ice, and snow shall be promptly removed and disposed of by pumping or other approved means. Disposal shall be carried out in a manner that will not create a hazard to public health, nor cause injury to public or private property, work completed or in progress, or public streets. Disposal shall not cause any interference in the use of streets and roads by the public. Pipes under construction shall not be used for drainage of excavations.

L. Any deflection of joints in pipe up to twelve-inch (12") diameter shall be within the limits specified by the manufacturer, but not to exceed five degrees or nineteen inches (19") per eighteen feet (18') of pipe length.

M. Concrete thrust blocks shall be installed on all hydrants, plugs, tees, and bends deflecting 1 1/4 degrees or more. Concrete thrust blocks shall be used in conjunction with "Mega-Lug" restraining glands or equivalent. Care shall be taken to ensure that concrete will not come into contact with flanges, joints, or bolts. The required area of thrust blocks shall be indicated on plan typicals and approved by the Town Water Department. Concrete shall be placed against

undisturbed soil. Wooden side forms or equal shall be provided for thrust blocks. No backfilling shall be allowed until concrete masonry has set sufficiently. Where directed by the Town Water Department or engineer, concrete encasement of the waterline may be made for stream crossings and similar purposes. Where required on the plans or as directed by the Town Water Department or engineer, a concrete cradle shall be used to bolster and strengthen the pipe. The Town Water Department or his designee shall inspect all thrust blocks prior to backfilling.

N. All trenching safety standards shall be in conformance with all applicable State and Federal guidelines. The contractor shall be solely responsible for any safety citations by State or Federal inspectors.

O. There shall be no physical connection between the distribution system and any pipes, pumps, hydrants, or tanks that are supplied with water that is, or may be, contaminated.

P. As necessary, temporary PVC markers shall be supplied at all gate valves, curb boxes, and at the end of water lines to a minimum of twelve inches (12") above finish grade until accepted by the Town Water Department.

Q. All surplus material and debris shall be removed as the project progresses, leaving all areas clean and presentable.

R. Unless otherwise required, all paving and sidewalks that may be damaged during construction shall be replaced with the same kind of material that previously existed.

S. The contractor shall be responsible for proper protection of persons and property on the project. The contractor shall barricade open holes and depressions occurring as part of the work, and post warning lights on adjacent property to or with public access.

T. Warning lights shall be operated during hours from dusk to dawn and as otherwise requested.

U. The contractor shall protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by construction operations.

V. No water lines shall be installed after November 15 or before April 1 without prior approval of the Town Water Department.

3.02 BACKFILLING

A. Trenches shall be backfilled to subgrade with, wherever possible, material excavated from the trench, and shall be done only after the approval of the Town Water Department. Material for backfilling shall be free of roots, stumps, and frost. Backfill shall not be placed on frozen material. Materials used for backfilling trenches shall be free of stones measuring more than twenty four (24) pounds. No stones measuring over three inches (3") in the longest dimension shall be placed within one foot (1') of the pipeline being backfilled. Stones found in the trench shall be removed for a depth of at least six inches (6") below the bottom of the pipe. In general, use of blasted rock as trench backfill will not be permitted.

B. Backfill material shall be tamped in layers around the pipe to a sufficient height above the pipe to adequately support and protect the pipe. Backfill for pipelines shall be placed in six inch (6") lifts, each lift being compacted to not less than 95% of maximum dry density as determined by the AASHTO-19 Standard Proctor. If conditions warrant, the backfilling of trenches may be done with mechanical equipment. Particular precautions shall be taken in the placement and compaction of the backfill material in order not to damage the pipe, pipe coating or structure. The backfill shall be brought up evenly. Around valve boxes, the backfill shall be tamped to a distance of four feet (4') on all sides of the box, or to the undisturbed trench face, if less than four feet (4'). Backfilling in all public roadways shall be so compacted as to leave no depression in the road. Additional backfill requirements may apply within State or local Highway Right-of-Ways. All public road surfaces shall be restored to a condition at least equal to that which existed prior to the start of construction. Precautions shall be taken against undue damage to existing surface materials.

C. No compacting shall be done when the material is too wet to be compacted properly. At such times the work shall be suspended until the previously placed and new materials have subsided sufficiently to permit proper compaction, or such other precautions are taken as may be necessary to obtain proper compaction.

D. Surplus excavated materials shall be disposed of in a satisfactory manner. Surplus material or spoil shall be removed promptly and disposed of so as not to be objectionable to abutters or the general public.

E. Trenches that have been improperly backfilled, enclosed or covered before inspection of fittings and joints shall be reopened and re-backfilled at the contractor's expense.

3.03 WATER/SEWER SEPARATION

A. Water mains crossing sewers shall be laid to provide minimum vertical distance of eighteen inches (18") between the outside of the water main and the outside of the sewer line. This shall be the case where the water main is either above or below the sewer. At crossings, one full length of pipe shall be located so both joints will be as far from the sewer as possible. This vertical separation shall be maintained for that portion of the water main located within ten feet (10') horizontally of any sewer it crosses. Water mains must be laid at least five feet (5') horizontally from any existing or proposed storm sewer and ten feet (10') from any existing or proposed sanitary sewer.

B. When it is impossible to obtain horizontal and vertical separation on new installations, both the water main and sewer main shall be constructed of waterworks material with watertight joints and shall be pressure tested before backfilling. A PVC sleeve may be required for one or both mains in addition to the waterworks material. Lines may also be encased in concrete as required by the Retail Department. No water main shall pass through or come in contact with any part of a sewer manhole.

C. Distribution lines shall not be placed closer than fifty feet (50') horizontal distance from any septic tank or leach field unless approved by the VT Water Supply Rule Provisions under

Chapter 21.8.6.4 or the Town Water Department.

D. Force main crossing shall be arranged so that at least one full length of sewer pipe is centered above or below the water line, with the sewer joints as far as possible from the water joints. The new force main line shall be constructed to water main standards for a minimum of twenty feet (20') on either side of the crossing. The section constructed to water main standards shall be pressure tested to maintain 50 psi for fifteen (15) minutes without leakage prior to backfilling. In those areas that proper cover cannot be provided, proper insulation shall be installed.

E. Sewer and waterline separation shall conform to all VT Water Supply Rule requirements, and installed in accordance with the latest edition of the "Ten States Standards - Recommended Standards for Water."

3.04 TESTING AND DISINFECTION

A. All water mains shall be constructed, tested and disinfected in accordance with AWWA Standards C-600, C-605, C651 and The Vermont Water Supply Rule. Minimum testing pressure shall be 1.5 times the working pressure of the installed line or 200 psi, whichever is greater, and will be monitored at the lowest elevation in the length of the pipeline being tested.

Maximum allowable leakage will be:

$$L = \frac{SD \sqrt{P}}{148,000} \text{ as outlined in AWWA Standards}$$

Where:

L = allowable leakage, 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 leakage test, in pounds per square inch (gauge).

1. Testing: All tests shall be conducted by and at the expense of the Contractor. The Engineer will give direction pertaining to the test methods and observe the field-testing. All testing shall be completed by a qualified third party approved by Town Water Department.

2. Hydrostatic Test of Pipeline: The pipeline, including hydrant laterals, shall be tested in accordance with AWWA Standard C-600-87 Section 4.

3. Disinfection: Disinfection of the pipeline shall be directed by the Engineer and at the Contractor's expense. AWWA Standard C-651 shall be used as a basis for the disinfection process.

B. The Engineer or Town Water Department will require as minimum:

1. Complete flushing of the pipeline to wash out all dirt, debris, etc. which may have accumulated in the pipeline during construction. A reducing agent shall be used at the point of flushing to eliminate the free chlorine residual per the direction of the Town Water Department.

2. Following flushing to clean clear water, the Contractor will add chlorine through continuous flow to the entire pipeline volume of water such that the water will have no less than 25 mg/L free chlorine, and let the mixture set for at least 24 hours.

3. After the 24-hour duration, the water in the pipeline shall be tested for residual free chlorine and must contain a minimum of 10 mg/L chlorine. If less than 10 mg/L are found, then the disinfection procedure shall be repeated until at least 10 mg/L chlorine residual is indicated by test.

4. Upon successful completion of step 3 above, the pipeline shall be flushed again until the chlorine concentration in the pipeline is no higher than that prevailing in the supply system. A reducing agent shall be used to eliminate the free chlorine residual in the flushing process per the direction of the Town Water Department.

C. After final flushing and before the new water main is connected to the distribution system, two consecutive sets of acceptable samples, taken at least 24 hours apart, shall be collected from the new main, and submitted to the Vermont Health Department for analysis. At least one set of samples shall be collected from every 1,000 feet of the new water main, plus one set from the end of the line and at least one set from each branch. All samples shall show the absence of coliform organisms and, if required, the presence of a chlorine residual (AWWA C651-99). If the initial disinfection fails to produce samples which pass the V.S.H.D. requirements for potable drinking water, then the new main shall be refushed and shall be resampled until satisfactory test results are obtained.

D. Upon satisfactory results by the Vermont State Health Department, the pipeline may be placed in service. All costs for water, materials, equipment and labor to perform the required testing, disinfection, and flushing of the pipeline shall be paid by the Contractor.

3.05 SUBMITTAL OF TEST RESULTS

A. A. The Applicant or Project Engineer shall be responsible for submittal of test results to the Town Water Department. The Applicant or Project Engineer shall also provide a letter to the Town Water Department certifying that the water system has passed all tests, is constructed in accordance with the approved plans, except as may have been modified by approved Change Order, and is in condition to be placed in service. Submittal of all test results shall be required prior to the water main being placed into service.

3.06 FINAL INSPECTION

A. For one year from the date the new system is placed into service, the applicant's developer/contractor will be responsible for any necessary repairs or corrections as part of the project warranty. At the end of a one-year period, an inspection will be performed by the Town Water Department prior to the system owner assuming ownership of any of the

lines and appurtenances. The contractor shall correct any punch list items accumulated during the inspection after receipt of this list. Incomplete work on the system shall not be included in the initial inspection, but shall be inspected as the project continues. The contractor shall repair, replace, or retest promptly as directed by the Town Water Department and without further charges, all work equipment, materials or parts, which may fail during the one year warranty period.

B. A final walk-through inspection shall be conducted by the Town Water Department prior to the water system being accepted for ownership by the system owner. This inspection shall include but not be limited to:

1. Valves, hydrants, and curb stops operating properly.
2. Valve boxes and covers set plumb and at proper elevations.
3. Proper hydrant nozzle height above grade.
4. Proper hydrant opening direction, nozzle thread, and barrel color.
5. Proper distance from the face of the curb of hydrant nozzles.
6. Hydrant flags meeting Town Water Department specifications installed on each fire hydrant at the time of installation.
7. Static and residual hydrant pressures and flow rates.
8. Curb boxes inside ROW, set to grade, containing operating rod, and plumb.
9. Tie information and record drawings complete and submitted.
10. Material testing results, lab reports, manufacturers' certificates, and leakage test results complete and on file.
11. General appearance and restoration.
12. Submittal of O&M manuals in hard copy and Adobe Acrobat Reader (.pdf) format.
13. Submittal of As-Builts in hard copy format and Auto-CAD.DWG Version 2000 format or newer within 14 days of completion.

3.07 GENERAL INFORMATION

A. All persons taking water must keep the fixtures and service pipe within their own premises in good repair and fully protected from frost, and must prevent unnecessary leakage of water. The Town Water Department shall not be liable for leakage of hydrants, pipes or fixtures upon the premises of any consumer, nor for obstructions therein by freezing or otherwise, nor for damages resulting from any of the foregoing causes. All leaks that are on the building side of the curb stop will be the owner's responsibility and repaired at the owner's expense.

B. Water rates shall be collected for all water used until the water is shut off at the curb stop by the Town Water Department. No abatement of water rates will be allowed by reason of disuse, diminished use, or vacancy of premises without proper notice to the Town Water Department.

C. The Town Water Department or system owner shall not be liable for any injury, loss or damage of whatever nature occasioned by the failure to maintain a constant or uniform pressure in the water mains, or for damages occasioned by or growing out of a stoppage of said water by frost or other cause, or for damage occasioned by or growing out of an insufficient supply of the same, or for accident or damage of any kind caused by or growing out of the use or failure of said water.

D. No person shall open any hydrant or draw water there from except the Town Water Department personnel or persons under their direction, or the officers or designees of the municipal fire department and members of the fire companies under their direction for fire purposes, or those individuals who have been granted approval on a hydrant use application by the Town Water Department, in which case, all such usage shall be metered. Fines for unauthorized use of any hydrant or connection may be incurred, according to the Rules and Regulations of the Town Water Department.

E. One curb stop and one water meter shall be installed for each individual dwelling unit, condominium unit, apartment unit, commercial or office occupancy. Exceptions may be permitted in cases where a condominium association signs a binding agreement to be responsible for all collection of water bills. In cases where condominiums are converted into separate apartments, separate curb stops and water meters shall be installed for each unit. Town Water Department employees shall install all water meters. Under no circumstances are plumbers or persons other than those authorized by the Town Water Department permitted to turn water on or off at the curb stop. The water will not in any instance be turned on to any premise for use until the Town Water Department has suitably attached a meter.

F. The owner of the premises shall be responsible for all water payments. A change of tenants or premises will not relieve the owners from payment of a back bill.

SEEDING

PART 1 - GENERAL

1.1 Section Includes:

- A. Seeding.
1. Furnish all labor, materials and equipment to complete all seeding work as shown on the drawings and specified herein.
  2. Except where otherwise shown or specified, the Contractor shall seed all areas where new contours are shown on the drawings and all areas where existing ground cover has been disturbed by the Contractor's operations.

1.2 SUBMITTALS

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

SITE ENGINEER:



CIVIL ENGINEERING ASSOCIATES, INC.  
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403  
802-864-2323 FAX: 802-864-2271 web: www.cca-vt.com

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DRAWN

SAL

CHECKED

DSM

APPROVED

DSM

OWNER:

**PHILO RIDGE,  
L.L.C.**

2766 MT. PHILO RD.  
CHARLOTTE, VT.

PROJECT:

**SITE  
IMPROVEMENTS**

2766 MT. PHILO RD.  
CHARLOTTE, VT.

DATE	CHECKED	REVISION

**SITE  
SPECIFICATIONS**

DATE  
**OCT., 2016**

SCALE  
**NONE**

PROJ. NO.  
**16107**

DRAWING NUMBER

**C4.4**