



**Select Board  
Town Manager**  
2198 Main Street  
Brewster, Massachusetts 02631-1898  
(508) 896-3701  
FAX (508) 896-8089

### **ADDENDA AND MODIFICATIONS**

1. Date: July 03, 2024
2. Re: Addendum No. 1
3. Project: Millstone Road Reconstruction IFB
4. Issued: June 19, 2024
5. To: Current Plan holders through Town procurement webpage: [Millstone Road Reconstruction IFB June 2024 | Town of Brewster \(brewster-ma.gov\)](https://www.brewster-ma.gov/procurement)
6. From: Donna J. Kalinick, Assistant Town Manager/Procurement Officer  
Town of Brewster, 2198 Main St. Brewster MA 02631
7. This Addendum forms part of and modifies Bidding and contract Documents for the project named above. Acknowledge receipt of this Addendum on the attached Bid form.
8. Where any original item called for in the Project manual or indicated on the Drawings is supplemented by this addenda, the supplemental requirements shall supersede the previous item.
9. Where any original item is amended, voided, or superseded hereby, the other provisions of such items not specifically amended, voided, or superseded shall remain in effect.
10. This Addendum consists of this document and the following attachments:

1. Updated Millstone Road Bid Tab
2. Updated Millstone Road Special Provisions
3. Updated Millstone Road Reconstruction Plan Sheets

# Supplemental Form for General Bid - Base Bid



## Supplemental Form for General Bid Base Bid

Project: Millstone Road Improvements

Location: Brewster, Massachusetts

Item Number	Quantity	Item with Unit Bid Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
101.	1.8	CLEARING AND GRUBBING at _____ A				
102.1	2,000	TREE TRIMMING at _____ FT				
102.511	67	TREE PROTECTION - ARMORING & PRUNING at _____ EA				
102.521	200	TREE AND PLANT PROTECTION FENCE at _____ FT				
103.	57	TREE REMOVED - DIAMETER UNDER 24 INCHES at _____ EA				

## Supplemental Form for General Bid - Base Bid

Item Number	Quantity	Item with Unit Bid Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
120.1	9,500	UNCLASSIFIED EXCAVATION at _____ CY				
141.1	490	TEST PIT FOR EXPLORATION at _____ CY				
142.	2,050	CLASS B TRENCH EXCAVATION at _____ CY				
144.	50	CLASS B ROCK EXCAVATION at _____ CY				
145.	3	DRAINAGE STRUCTURE ABANDONED at _____ EA				
146.	28	DRAINAGE STRUCTURE REMOVED at _____ EA				
151.	7,100	GRAVEL BORROW at _____ CY				



## Supplemental Form for General Bid - Base Bid

Item Number	Quantity	Item with Unit Bid Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
151.2	165	GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES at _____ CY				
153.	20	CONTROL DENSITY FILL - EXCAVATABLE at _____ CY				
156.	50	CRUSHED STONE at _____ TON				
170.	19,000	FINE GRADING AND COMPACTING - SUBGRADE AREA at _____ SY				
201.	102	CATCH BASIN at _____ EA				
202.	12	MANHOLE at _____ EA				
204.	23	GUTTER INLET at _____ EA				

## Supplemental Form for General Bid - Base Bid

Item Number	Quantity	Item with Unit Bid Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
205.	39	LEACHING BASIN at _____ EA				
205.1	145	LEACHING GALLEY at _____ EA				
220.	7	DRAINAGE STRUCTURE ADJUSTED at _____ EA				
220.2	20	DRAINAGE STRUCTURE REBUILT at _____ FT				
220.5	5	DRAINAGE STRUCTURE REMODELED at _____ EA				
222.3	230	FRAME AND GRATE (OR COVER) MUNICIPAL STANDARD at _____ EA				
223.2	15	FRAME AND GRATE (OR COVER) REMOVED AND DISCARDED at _____ EA				

## Supplemental Form for General Bid - Base Bid

Item Number	Quantity	Item with Unit Bid Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
227.3	49	REMOVAL OF DRAINAGE STRUCTURE SEDIMENT at _____ CY				
227.31	150	REMOVAL OF DRAINAGE PIPE SEDIMENT at _____ FT				
238.10	170	10 INCH DUCTILE IRON PIPE at _____ FT				
252.12	2,100	12 INCH CORRUGATED PLASTIC PIPE at _____ FT				
302.06	50	6 INCH DUCTILE IRON WATER PIPE at _____ FT				
309.	1,680	DUCTILE IRON FITTINGS FOR WATER PIPE at _____ LB				
350.06	5	6 INCH GATE AND GATE BOX at _____ EA				

## Supplemental Form for General Bid - Base Bid

Item Number	Quantity	Item with Unit Bid Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
358.	15	GATE BOX ADJUSTED at _____ EA				
376	5	HYDRANT at _____ EA				
376.4	5	HYDRANT REMOVED AND DISCARDED at _____ EA				
376.5	6	HYDRANT ADJUSTED at _____ EA				
381.3	39	SERVICE BOX ADJUSTED at _____ EA				
384.2	39	CURB STOP ADJUSTED at _____ EA				
390.	1	REMOVE AND RESET IRRIGATION at _____ LS				
402.	950	DENSE GRADED CRUSHED STONE FOR SUB-BASE at _____ CY				

## Supplemental Form for General Bid - Base Bid

Item Number	Quantity	Item with Unit Bid Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
415.1	31,700	PAVEMENT STANDARD MILLING at _____ SY				
431.	3,800	HIGH EARLY STRENGTH CEMENT CONCRETE BASE COURSE at _____ SY				
440.	55,900	CALCIUM CHLORIDE FOR ROADWAY DUST CONTROL at _____ LB				
443.	25	WATER FOR ROADWAY DUST CONTROL at _____ MGL				
450.23	4,100	SUPERPAVE SURFACE COURSE - 12.5 (SSC - 12.5) at _____ TON				
450.31	5,000	SUPERPAVE INTERMEDIATE COURSE - 12.5 (SIC - 12.5) at _____ TON				
450.41	1,000	SUPERPAVE BASE COURSE - 25.0 (SBC - 25.0) at _____ TON				

## Supplemental Form for General Bid - Base Bid

Item Number	Quantity	Item with Unit Bid Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
450.52	300	SUPERPAVE LEVELING COURSE - 9.5 (SLC - 9.5) at _____ TON				
451.	2,000	HMA FOR PATCHING at _____ TON				
452.	4,650	ASPHALT EMULSION FOR TACK COAT at _____ GAL				
453.	40,900	HMA JOINT ADHESIVE at _____ FT				
470.2	15,550	HOT MIX ASPHALT BERM - TYPE A MODIFIED at _____ FT				
472.	470	TEMPORARY ASPHALT PATCHING at _____ TON				
504.	6,300	GRANITE CURB TYPE VA4 - STRAIGHT at _____ FT				

## Supplemental Form for General Bid - Base Bid

Item Number	Quantity	Item with Unit Bid Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
504.1	200	GRANITE CURB TYPE VA4 - CURVED at _____ FT				
505.	75	GRANITE CURB TYPE VA5 - STRAIGHT at _____ FT				
509.	1,050	GRANITE TRANSITION CURB FOR PEDESTRIAN CURB RAMPS - STRAIGHT at _____ FT				
509.1	260	GRANITE TRANSITION CURB FOR PEDESTRIAN CURB RAMPS - CURVED at _____ FT				
580.	10	CURB REMOVED AND RESET at _____ FT				
590.	20	CURB REMOVED AND STACKED at _____ FT				
655.4	80	SPLIT RAIL WOOD FENCE at _____ FT				

## Supplemental Form for General Bid - Base Bid

Item Number	Quantity	Item with Unit Bid Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
656.1	100	8 FOOT VINYL FENCE at _____ FT				
657.	100	TEMPORARY FENCE at _____ FT				
670.	250	FENCE REMOVED AND RESET at _____ FT				
691.	50	BALANCE STONE WALL REMOVED AND REBUILT at _____ FT				
697.1	180	SILT SACK at _____ EA				
701.2	360	CEMENT CONCRETE PEDESTRIAN CURB RAMP at _____ SY				
702.	1,550	HOT MIX ASPHALT SIDEWALK OR DRIVEWAY at _____ TON				
702.1	15	SHELL DRIVEWAY at _____ CY				



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Item Number	Quantity	Item with Unit Bid Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
702.2	45	COBBLESTONE DRIVEWAY at _____ SY				
702.3	20	BLUESTONE GRAVEL DRIVEWAY at _____ CY				
706.9	10	COBBLESTONES REMOVED & STACKED at _____ SY				
707.82	4	POST REMOVED AND DISCARDED at _____ EA				
709.	2	WETLAND MARKER POST at _____ EA				
711.	17	BOUND REMOVED AND RESET at _____ EA				
715.	69	RURAL MAILBOX REMOVED AND RESET at _____ EA				

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Item Number	Quantity	Item with Unit Bid Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
740.	16	ENGINEERS FIELD OFFICE AND EQUIPMENT (TYPE A) at _____ MO				
748.	1	MOBILIZATION at _____ LS				
751.	1,150	LOAM FOR ROADSIDES at _____ CY				
756.	1	NPDES STORMWATER POLLUTION PREVENTION PLAN at _____ LS				
765.	9,900	SEEDING at _____ SY				
767.121	150	SEDIMENT CONTROL BARRIER at _____ FT				
772.039	23	ARBORVITAE - DEGROOTS SPIRE 5-6 FEET at _____ EA				

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Item Number	Quantity	Item with Unit Bid Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
772.338	6	EASTERN RED CEDAR - 6-7 FEET at _____				
		EA				
776.524	2	MAPLE - RED - ARMSTRONG 2-2.5 INCH CALIPER at _____				
		EA				
777.828	3	SASSAFRAS - 1.5-2-INCH at _____				
		EA				
785.633	5	INKBERRY / #3 at _____				
		EA				
786.109	1	JUNIPER - COMMON / #2 at _____				
		EA				
787.716	10	SPICEBUSH - 5-6 FEET at _____				
		EA				
789.333	13	BAYBERRY - NORTHERN / 2-3 FEET at _____				
		EA				
789.335	3	BAYBERRY - NORTHERN / 3-4 FEET B & B at _____				
		EA				

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Item Number	Quantity	Item with Unit Bid Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
789.435	2	BEACH PLUM / 4-5 FEET B & B at _____				
		EA				
789.633	45	BLUEBERRY - HIGHBUSH / #1 at _____				
		EA				
793.445	19	ROSE - VIRGINIA / 18-24 INCH at _____				
		EA				
794.333	33	SUMAC SHRUB - FRAGRANT / 18-24" SPD at _____				
		EA				
794.343	8	SUMAC SHRUB - STAGHORN / 2-3 FEET at _____				
		EA				
795.011	4	VIBURNUM - ARROWWOOD / 24-30 INCH at _____				
		EA				
795.157	4	WINTERBERRY / #3 at _____				
		EA				

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Item Number	Quantity	Item with Unit Bid Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
796.231	135	SWITCH GRASS / 1 GAL. at _____ EA				
796.341	173	NORTHERN SEA OATS / 1 GAL. at _____ EA				
796.501	10,666	DAFFODIL / BULB at _____ EA				
804.3	275	3 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC - (UL) at _____ FT				
811.31	3	PULL BOX 12 X 12 INCHES - SD2.031 at _____ EA				
824.211	1	RECTANGULAR RAPID FLASHING BEACON (SOLAR) LOCATION NO. 1 at _____ LS				
824.212	1	RECTANGULAR RAPID FLASHING BEACON (SOLAR) LOCATION NO. 2 at _____ LS				

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Item Number	Quantity	Item with Unit Bid Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
824.213	1	RECTANGULAR RAPID FLASHING BEACON (SOLAR) LOCATION NO. 3 at _____ LS				
824.401	1	RECTANGULAR RAPID FLASHING BEACON (AC POWER) LOCATION NO. 1 at _____ LS				
826.7	10	ELECTRIC SERVICE RISER RELOCATION at _____ EA				
832.	300	WARNING-REGULATORY AND ROUTE MARKER - ALUM. PANEL (TYPE A) at _____ SF				
847.1	50	SIGN SUP (N/GUIDE)+RTE MKR W/1 BRKWAY POST ASSEMBLY - STEEL at _____ EA				
851.1	100	TRAFFIC CONES FOR TRAFFIC MANAGEMENT at _____ DAY				
852.	700	SAFETY SIGNING FOR TRAFFIC MANAGEMENT at _____ SF				

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Item Number	Quantity	Item with Unit Bid Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
852.11	75	TEMPORARY PEDESTRIAN BARRICADE at _____ FT				
853.1	5	PORTABLE BREAKAWAY BARRICADE TYPE III at _____ EA				
854.016	9,800	TEMPORARY PAVING MARKINGS - 6 INCH (PAINTED) at _____ FT				
854.036	9,800	TEMPORARY PAVING MARKINGS - 6 INCH (TAPE) at _____ FT				
854.6	45	TEMPORARY PORTABLE RUMBLE STRIP at _____ DAY				
856.12	340	PORTABLE CHANGEABLE MESSAGE SIGN at _____ DAY				
859.	3,900	REFLECTORIZED DRUM at _____ DAY				

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Item Number	Quantity	Item with Unit Bid Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
859.1	25	REFLECTORIZED DRUMS WITH SEQUENTIAL FLASHING WARNING LIGHTS at _____ DAY				
860.112	20	12 INCH REFLECTORIZED WHITE LINE (PAINTED) at _____ FT				
861.104	200	4 INCH REFLECTORIZED YELLOW LINE (PAINTED) at _____ FT				
864.	85	PAVEMENT ARROW REFLECTORIZED WHITE (PAINTED) at _____ SF				
864.04	125	PAVEMENT ARROWS AND LEGENDS REFLECTORIZED WHITE (THERMOPLASTIC) at _____ SF				
865.2	1,200	PAVEMENT SURFACE COATING at _____ SF				
866.112	150	12 INCH REFLECTORIZED WHITE LINE (THERMOPLASTIC) at _____ FT				



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Item Number	Quantity	Item with Unit Bid Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
868.04	25,500	4 INCH REFLECTORIZED WHITE LINE (EPOXY) at _____ FT				
868.12	2,000	12 INCH REFLECTORIZED WHITE LINE (EPOXY) at _____ FT				
869.04	26,000	4 INCH REFLECTORIZED YELLOW LINE (EPOXY) at _____ FT				
874.01	76	STREET NAME SIGN - TOWN STANDARD at _____ EA				
874.2	10	TRAFFIC SIGN REMOVED AND RESET at _____ EA				
874.4	100	TRAFFIC SIGN REMOVED AND STACKED at _____ EA				
903.	2	3000 PSI, 1.5 INCH, 470 CEMENT CONCRETE at _____ CY				

## Supplemental Form for General Bid - Base Bid

Item Number	Quantity	Item with Unit Bid Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
999.	1	CONSTRUCTION STAKING at _____ LS				
999.1	1	POLICE DETAILS at _Four hundred fifty-six thousand six hundred sixty_ ALL	\$456,660	00	\$456,660	00

**TOTAL BASE BID:** \_\_\_\_\_

(Written in Words):

\_\_\_\_\_

## SECTION 00900

### SPECIFICATIONS

#### **SCOPE OF WORK**

The work under this Contract consists of drainage structure installation, roadway milling and resurfacing, full depth pavement reconstruction, HMA sidewalk and cement concrete pedestrian curb ramp construction along Millstone Road in the Town of Brewster between Route 6A and Route 137. New Rectangular Rapid Flashing Beacon Systems (RRFBs) are proposed at the midblock crossings near Lund Farm Way, Fern Lane, and the Cape Cod Rail Trail.

The work includes unclassified excavation, standard milling, hot mix asphalt overlay, full depth pavement reconstruction, sidewalk construction, drainage improvements, granite curb, pavement markings, signs, wall construction, landscaping, and other incidental work.

All work under this contract shall be done in conformance with the MassDOT *2024 Standard Specifications for Highways and Bridges*, the *March 31, 2024 Supplemental Specifications*, the *2017 Construction Standard Details*, the *Traffic Management Plans and Detail Drawings*, the *1990 Standard Drawings for Signs and Supports*; the *2015 Overhead Signal Structure and Foundation Standard Drawings*, the *2009 Manual on Uniform Traffic Control Devices (MUTCD)* with Massachusetts Amendments; the *1968 Standard Drawings for Traffic Signals and Highway Lighting*; *The American Standard for Nursery Stock*; the Plans and these Special Provisions.

#### **WORK SCHEDULE**

The normal hours of operation shall be 7:00AM to 3:30PM unless otherwise approved by the Town.

No work that will disrupt travel on the existing roadways (lane closures, lane shifts, trenching, etc.) shall be done from 7:00AM to 7:30AM unless coordinated in advance with the Town.

No work shall be done on this Contract on Saturdays, Sundays or holidays or on the day before or the day after a long weekend which involves a holiday without prior approval by the Town.

Cape Cod moratorium work note: No work shall be allowed on any roadway between June 15<sup>th</sup> and Labor Day without prior written approval of the Engineer and Town.

#### **AS-BUILT DRAWINGS**

Full compensation for these plans shall be included in the prices bid for the various Contract items of work and no additional compensation will be allowed therefore.

**CONTRACTOR LAYDOWN/STOCKYARD LOCATION**

The Contractor laydown and stockyard location is at the Cape Cod Sea Camps/Town of Brewster property located at 3057 Main Street (Route 6A). The hours of access to the stockyard area shall be 6:30AM to 4:00PM unless otherwise approved by the Town.

The specific location available for use is shown here, located 330 feet east of the Millstone Road/Route 6A intersection –



## **TREE REMOVAL**

The Contractor shall flag/stake the limit of clearing & grubbing and allow 48 hours for Town to review prior to start of clearing operations. The Contractor will adjust the clearing limits as directed by the Engineer and Town.

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The Contractor shall flag individual trees to be removed outside the clearing & grubbing limits and allow 48 hours for the Town to review prior to the start of removal operations.

## **NEW DRIVEWAY CURB CUTS**

The Contractor shall coordinate the location of all new driveway curb cuts with the property owner and the Town. A representative from DPW must be aware of the location prior to start of curb setting or driveway layout.

## **COOPERATION OF THE CONTRACTOR**

Agents of various public service agencies, municipal and State Departments, and private site contractors may be entering on the work site to remove existing utilities, to construct or place new facilities or to make alterations to existing facilities.

The Contractor shall perform the work in cooperation with the various agencies in a manner which causes the least interference with the operations of the aforementioned agencies and shall have no claim for delay which may be due, or result, from said work of these agents.

Contractor will be required to meet with the Town Police and Resident Engineer (if available) to coordinate the temporary traffic control setup for the day.

Contractor shall develop all necessary temporary traffic control plans and detour plans as needed to complete the work. All drawings shall be submitted, in sufficient detail such that all maintenance of traffic, pedestrians, emergency and abutter access are properly addressed during construction, to the Town of Brewster for review and acceptance, as part of the shop drawing process. Contractor shall submit the documents for approval at least two weeks in advance of start of work. Information contained within the project plan set are suggested and do not get into contractor means and methods. These plans may be used as a guide to prepare the temporary traffic control plans.

## **PUBLIC SAFETY AND CONVENIENCE**

The Contractor shall provide necessary access for fire apparatus and other emergency vehicles through the work zones to abutting properties at all times.

Sweeping and cleaning of surfaces beyond the limits of the project required to clean up material caused by spillage or vehicular tracking during the various phases of the work shall be considered as incidental to the work being performed under the Contract and there will be no additional compensation.

## **NOTICE TO OWNERS OF UTILITIES**

Written notice shall be given by the Contractor to all public service corporations or municipal and State officials owning or having charge of publicly or privately owned utilities at least one week in advance of the commencement of operations that will affect the utilities. The Contractor shall, at the same time, file a copy of such notice with the Town.

Before commencing work on service connections, the Contractor shall be responsible for contacting the Electric Company servicing the area to obtain construction requirements, standards, and to give adequate notice of commencement of work. The Contractor's attention is further directed to the requirements of Work in the Immediate Vicinity of Certain Underground Structures and Poles herein included in these Special Provisions.

The following are the names of owners and representatives of the principal utilities affected, but completeness of this list is not guaranteed by the Town:

**OTHER**

Open Cape  
PO Box 1145  
Barnstable, MA 02630-2148

Gary Farrenkopf  
gfarrenkopf@opencape.com

**ELECTRIC**

Eversource Electric "B"  
50 Duchaine Blvd.  
New Bedford, MA 01745

Brian Mello  
[brian.mello@eversource.com](mailto:brian.mello@eversource.com)

**TELEPHONE**

Verizon  
385 Myles Standish Blvd.  
Taunton, MA 02780

Karen Mealey  
Phone: (774) 409.3160  
karen.m.mealey@verizon.com

**WATER**

Brewster Water Dept.  
165 Commerce Park Road  
Brewster, MA 02631

Paul Anderson  
(508) 896.5454  
panderson@brewster-ma.gov

**GAS**

National Grid Gas  
40 Sylvan Road  
Waltham, MA 02451

Melissa Owens  
Phone: (781) 907.2845  
Melissa.Owens@nationalgrid.com

**CABLE**

Evercourse Fiber  
247 Station Drive, Mail Stop: SUM SE 320  
Westwood, MA 02090

Tomi Fadipe  
Phone: (781) 441.3864  
oloruntomi.fadipe@eversource.com

**DESIGN ENGINEER**

VHB, Inc.  
260 Arsenal Place #2  
Watertown, MA 02472-4026

Stephen Rhoads  
Project Manager  
Phone: (617) 607.2723

The Contractor shall make his own investigation to assure that no damage to existing structures, drainage lines, traffic signal conduits, and other utilities will occur as a result of construction operations. The Contractor shall notify "Mass. DIG SAFE" and procure a DIG SAFE number of each location prior to disturbing ground in any way.

**"DIG-SAFE" Call Center: Telephone 1-888-344-7233**

### **PROTECTION OF UTILITIES AND PROPERTY**

The Contractor, in constructing or installing facilities alongside or near sewers, drains, water or gas pipes, electric or telephone conduits, poles, sidewalks, walls, vaults or other structures shall sustain them securely in place. The Contractor shall coordinate with the officers and agents of the various utility companies and municipal departments to assure that the services of these structures are maintained. The Contractor shall also be responsible for the repair or replacement, at no additional cost to the Town, of any damage to such structures caused by construction operations. The Contractor is responsible to leave them in the same condition as they existed prior to commencement of the work. In case of damage to utilities, the Contractor shall promptly notify the utility owner and shall, if requested by the Town, furnish labor and equipment to work temporarily under the utility owner's direction. Pipes or other structures damaged by the operation of the Contractor may be repaired by the Town or by the utility owner which suffers the loss. The cost of such repairs shall be borne by the Contractor, without compensation therefor.

If during construction there is an existing utility and/ or structure found to be in conflict with the proposed work under this Contract, the Contractor shall protect and maintain the services to the utilities and structures. The Engineer will, as soon as possible identify the utilities to be relocated or other such activities deemed suitable for resolution.

If live service connections are to be interrupted by excavations of any kind, the Contractor shall not break the service until new services are provided. Abandoned services shall be plugged off or otherwise made secure.

Full compensation for furnishing all labor, materials, tools, equipment and incidentals for doing all the work involved in protecting or repairing property as specified in this Section, shall be considered included in the prices paid for the various Contract items of work and no additional compensation will be allowed therefor.

### **WORK IN THE IMMEDIATE VICINITY OF CERTAIN UNDERGROUND STRUCTURES AND UTILITY POLES**

For overhead connections, the Electric Company servicing the area will make the connection from the top of the riser on the utility pole to the power source. The Contractor shall supply all labor, materials and equipment to install the service connection, complete in place and in accordance with the Electric Company procedures, from the controller to and including the riser with enough wire coiled above the riser to permit the Electric Company servicing the area to make the final connection.

For underground connections, the Electric Company servicing the area will perform the actual wiring of the service connections from its power source to the sweep at the local controllers, but all steel sweeps, ducts, entrance holes into manholes, patching and all other necessary labor, materials and equipment required to install the electric service, complete in place, shall be furnished by the Contractor.

The Contractor shall pay the Electric Company servicing the area for their services rendered for the connection of overhead and underground service connections.

Before starting work at existing manholes, the Contractor shall test for gas and blow out the manholes.

### **TEMPORARY ACCESS**

The Contractor shall provide safe and ready means of ingress and egress to all public, private and professional offices and any other businesses or residences in the project area, both day and night, for the duration of the project.

### **WORK DONE BY OTHERS**

Relocation and/or resetting to new grades of all private utilities, including utility poles, made necessary by the construction of this project, will be accomplished by the respective utility companies.

### **MATERIAL REMOVED AND STACKED**

The Contractor shall carefully remove, transport and stack all material that, in the opinion of the Engineer, is salvageable. The material shall be stacked at the Town of Brewster Department of Public Works; 201 Run Hills Road, Brewster, MA 02631. The Contractor shall coordinate with the Town of Brewster to schedule drop-off time and location.

### **DRAINAGE**

All pipes and structures installed as part of this Contract shall be left in a clean and operable condition at the completion of the work.

All existing pipes to be abandoned shall be plugged with brick masonry not less than 8 inches in thickness in conformance with the Standard Specifications, Section 201.62.

No separate payment will be made for the maintenance of the existing drainage system or for plugging of pipes, but all costs in connection therewith shall be included in the unit prices bid for the various Contract items.

### **DRAINAGE STRUCTURES**

Where new pipe is shown on the drawings to be connected into an existing drainage structure to remain, the existing structure shall be first cleaned to remove all mud, debris and other material. The existing structure wall shall be carefully and neatly cut to provide the minimum size opening required for the insertion of the new pipe. The proposed pipe end shall be set or cut off flush with the inside face of the existing structure wall and the remaining space around the pipe completely filled with cement grout for the full thickness of the structure wall.



Existing shaped inverts shall be reconstructed as necessary to provide a smooth and uniform flow channel from the new pipe through the existing structure.

No separate payment will be made for the cost of connecting new pipes into existing structures and necessary alterations of existing structures, but all costs in connection therewith shall be included in the unit prices bid for the various pipe items.

### **SAWCUTS**

Existing pavements to remain shall be sawcut at all openings for utility work, for new or reset curb and at all joints with proposed full-depth hot mix asphalt pavement, as shown on the plans and as directed by the Engineer. All sawcutting will be considered incidental to the respective items, and no additional payment will be made for sawcutting.

### **QUALIFIED ELECTRICIANS**

Within 10 days after opening of bids, the low bidder shall submit a list of the Journeyman Electricians (Massachusetts License) who will perform the electrical work in this contract.

Also, the low bidder shall submit copies of each Journeyman Electrician's and Master Electrician's current Massachusetts Licenses.

### **PROPERTY BOUNDS**

The Contractor shall exercise due care when working around all property bounds which are to remain. Should any damage to a bound result from the actions of the Contractor, the bound shall be replaced and/or realigned by the Contractor as directed by the Engineer at no cost to the Owner.

### **ARCHITECTURAL ACCESS BOARD TOLERANCES**

The Contractor is hereby notified that they are ultimately responsible for constructing all project elements in strict compliance with the current AAB/ADA rules, regulations and standards.

All construction elements in this project associated with sidewalks, walkways, wheelchair ramps and curb cuts are controlled by 521CMR – Rules and Regulations of the Architectural Access Board.

The AAB Rules and Regulations specify maximum slopes and minimum dimensions required for construction acceptance. There is no tolerance allowed for slopes greater than the maximum slope nor for dimensions less than the minimum dimensions.

Contractors shall establish grade elevations at all wheelchair ramp locations, and shall set transition lengths according to the appropriate table in the Construction Standards (or to the details shown on the plans).

All wheelchair ramp joints and transition sections which define grade changes shall be formed, staked and checked prior to placing cement concrete. All grade changes are to be made at joints.

Detectable warning panels are considered incidental to Item 701.2 Cement Concrete Wheelchair Ramp and shall meet MassDOT Standard Detail E107.6.5. Color shall be federal yellow.

## **RESTRICTED MATERIALS**

All new construction materials shall be asbestos-free including any roofing felt, adhesives, waterproofing materials, grout, or sealer that may be used in project construction.

All yellow temporary and permanent pavement markings, including all pavement marking tape, placed as part of this project shall be lead-free.

**ITEM 102.511****TREE PROTECTION – ARMORING & PRUNING****EACH**

The work under this item shall conform to the relevant provisions of Sections 771 and shall be for furnishing and installing temporary tree trunk protection and for limb pruning to prevent injury to the tree from construction equipment and activities.

Trunk armoring is for instances where construction activity (the use of heavy equipment) comes close enough to potentially damage the tree trunk or limbs. It is to be used where shown on the plans and as directed by the Engineer.

**References**

If requested, the Contractor shall provide to the Engineer one copy of the latest edition of the American National Standards Institute (ANSI) A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance: Part 1-Pruning and Part 5-Construction Management Standard. Provision of reference shall be incidental to this item.

**Materials**

Trunk armoring shall be such that it prevents damage to the trunk from construction equipment. Selected material shall be such that installation and removal will not damage the trunk.

Acceptable materials include 2x4 wood cladding with wire or metal strapping, or, for instances when duration of construction activities is less than three months, corrugated plastic pipe mounted with duct tape. Height of cladding shall be from base of tree (including root flare) to the bottom of the first branch or as recommended by the Arborist. Material and methods shall be approved by the Engineer.

Other materials or methods may be acceptable if approved by an Arborist.

**Methods of Work**

Prior to construction activities, the Engineer, the Contractor, the Town Tree Warden, and the Arborist, if specified, shall review trees noted on the plans to be protected. Final decision as to trees armored and/or pruned shall be per the Engineer.

Care shall be taken to avoid damage to the bark during installation and removal of armoring. Trunk armoring shall be replaced and maintained such that it is effective for as long as required and shall be removed immediately upon completion of work activities adjacent to trees.

Pruning of limbs shall conform to the techniques and standards of the most recent ANSI A300 standards.

**Damages & Penalties**

In the event that trees designated for protection under this item are damaged, including root damage from unapproved trespassing onto the root zone, the Contractor shall, at his own expense obtain a Certified Arborist.

**ITEM 102.511** (Continued)

If, based on the recommendations of the Arborist, the Engineer determines that damages can be remedied by corrective measures, such as repairing trunk or limb injury, soil compaction remediation, pruning, and/or watering, the damage will be repaired as soon as possible within the appropriate season for such work and according to industry standards.

If the Engineer determines that damages are irreparable, the Contractor shall pay for the damages in the amount of \$500.00 per diameter inch at breast height (DBH) per tree.

Additionally, if the Engineer determines that the damages are such that the tree is sufficiently compromised as to pose a future safety hazard, the tree shall be removed. Tree removal will include clean up of all wood parts, grinding of the stump to a depth sufficient to plant a replacement tree or plant, removal of all chips from the stump site, and filling the resulting hole with topsoil.

**METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

Item 102.511 will be measured and paid at the contract unit price per each. This will include full compensation for all labor, equipment, materials, and incidentals for the satisfactory completion of the work and the subsequent removal and satisfactory disposal of the protective materials upon completion of the contract.

In the event of tree damage, cost of Arborist services, of remediation measures, and/or tree removal will be borne by the Contractor.

Payment under this item will be scheduled throughout the length of contract:

- 40% of value shall be paid upon installation of trunk armoring and completion of pruning work, if required.
- 60% shall be paid at the end of construction operations that would damage the tree and after protection materials have been removed and properly disposed of by the Contractor. In the event of repairable damages, payment shall be made after the completion of remediation measures.

In the event of irreparable damage due to lack of proper protective measures being take there will be no compensation in addition to the \$500.00 per diameter inch penalty.

**ITEM 102.521**

**TREE AND PLANT PROTECTION FENCE**

**FOOT**

The work under this Item shall conform to the relevant provisions of Sections 644 and 771 of the Standard Specifications and the following:

Work under this item consists of furnishing, installing, removing and resetting, maintaining fence in a vertical and effective position at all times, and final removal of temporary fence.

The purpose of the fence is to prevent damage to tree roots, tree trunks, soil, and all other vegetation within a delineated Tree and Plant Protection Zone (TPPZ) as shown on the plans, as directed by the Engineer, and as described herein.

Protection shall be for the duration of the construction activities unless otherwise directed.

**Materials**

Temporary Fence shall be such that it provides a minimum 48-inch tall barrier that remains vertical and effective (not sagging) for the duration of period required. Fence shall be plastic orange safety fence (recommended where high visibility is necessary), wooden snow fencing, or other approved material.

Per the Arborist or Engineer, additional posts, deeper post depths, and/or additional attachments will be used if the fabric or fence sags, leans or otherwise shows signs of failing to create a sufficient barrier to access.

**References**

If requested, the Contractor shall provide to the Engineer one copy of the American National Standards Institute (ANSI) A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance Part 1, Pruning and Part 5, Construction Management Standard. Provision of reference shall be incidental to this item.

**Establishment of TPPZ**

Fencing shall be used for construction areas, staging areas, and stockpile areas as shown on the plans and as directed by the Engineer to establish the Tree and Plant Protection Zone (TPPZ).

Fence shall be located as close to the work zone limit and as far from the trunk as possible to maximize the area to be protected. Fence shall run parallel and adjacent to construction activity to create a barrier between the work zone and the root zone or designated limit of plants and soils to be protected.

When construction activities surround (or have the potential to surround) trees or plants to be protected, a circular enclosure shall be used. In these instances, the TPPZ limit shall be the Drip Line of each tree or as close as possible to the Drip Line, and as shown on the plans and details. The Drip Line is defined as the limit of tree canopy.

The Contractor shall not engage in any construction activity within the TPPZ without the approval of the Engineer, including: operating, moving or storing equipment; storing supplies or materials; locating temporary facilities including trailers or portable toilets; and shall not permit employees

to traverse the area to access adjacent areas of the project or use the area for lunch or any other work breaks.

### Method of work

Fence shall be installed prior to any construction work or staging activities and shall be installed and maintained in a vertical and effective position at all times.

Fence shall be repositioned where and as necessary for optimum effectiveness. Repositioning shall be incidental to this item. Fence shall not be moved without prior approval by the Engineer.

The TPPZ shall be protected at all times from compaction of the soil; damage of any kind to trunks, bark, branches, leaves, and roots of all plants; and contamination of the soil with construction materials, debris, silt, fuels, oils, and any chemicals substance. In the event of spills, compaction or damage, the Contractor shall take corrective action immediately using methods approved by the Engineer in coordination with an Arborist.

After construction activities are completed, or when directed by the Engineer, fence, stakes, and other materials shall be removed and disposed off-site by the Contractor.

### Required Work within the TPPZ

In the event that grading, trenching, utility work, or storage is unavoidable within the TPPZ, the Engineer shall be notified. Measures may be required for tree protection and preservations, including air spading, the use of six inch depth of wood chips or approved matting for root protection, pruning of branches, and/or trunk protection. These protection measures will be paid under applicable items.

Landscaping work specified within the TPPZ shall be accomplished by hand tools. Where hand work is not feasible, with permission of the Engineer, work shall be conducted with the smallest mechanized equipment necessary.

### Tree and Plant Damages or Loss

If the TPPZ is intruded upon, at the discretion of the Engineer, the Contractor will be required to provide a more durable barrier (e.g., Jersey Barriers) to secure the area. Cost of furnishing and installing additional or more durable barrier shall be borne by the Contractor.

If the Contractor intrudes into a TPPZ without approval, soil will be considered compacted and tree root damage will be assumed. Action will be taken as specified below.

In the event that trees designated for protection under this item are damaged, including root damage from unapproved trespassing onto the root zone, the Contractor shall, at his own expense obtain a Certified Arborist.

If, based on the recommendations of the Arborist, the Engineer determines that damages can be remedied by corrective measures, such as repairing trunk or limb injury, soil compaction remediation, pruning, and/or watering, the damage will be repaired as soon as possible within the appropriate season for such work and according to industry standards.

If the Engineer determines that damages are irreparable, the Contractor shall pay for the damages in the amount of \$500.00 per diameter inch at breast height (DBH) per tree.

Additionally, if the Engineer determines that the damages are such that the tree is sufficiently compromised as to pose a future safety hazard, the tree shall be removed. Tree removal will include clean up of all wood parts, grinding of the stump to a depth sufficient to plant a replacement tree or plant, removal of all chips from the stump site, and filling the resulting hole with topsoil.

Shrubs will be replaced with a plant of similar species and equal size or the largest size plants reasonably available. The Engineer will approve the size and quality of the replacement plant. Replacement will include a minimum of one year of watering and care.

**METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

Item 102.521 will be measured and paid for payment by the foot of Tree and Plant Protection Fence, complete in place. This includes all labor, materials, equipment, maintenance, final removal and disposal of the protective materials, damages repair, and all incidental cost required to complete the work.

Payment of 40 percent of value will be made upon installation of Fence. The remaining 60 percent will be made when protection materials have been removed and disposed off-site.

No separate payment will be made for costs of remedial actions, including addition of more durable barriers, or arborist services, but all costs in connection therewith shall be included in the Contract unit price bid.

In the event of irreparable damage due to lack of proper protective measures being take there will be no compensation in addition to the \$500.00 per diameter inch penalty.

<b><u>ITEM 201.</u></b>	<b><u>CATCH BASIN</u></b>	<b><u>EACH</u></b>
<b><u>ITEM 202.</u></b>	<b><u>MANHOLE</u></b>	<b><u>EACH</u></b>
<b><u>ITEM 204.</u></b>	<b><u>GUTTER INLET</u></b>	<b><u>EACH</u></b>

The work under these items shall consist of furnishing and installing catch basins, gutter inlets, and manholes at the locations shown in the Plans and shall conform to the relevant provisions of Section 201 of the Standard Specifications and the following:

Contractor shall submit shop drawings of proposed catch basins, gutter inlets & manholes to the Engineer for approval, prior to materials arriving at the site.

All proposed catch basins shall be constructed with a minimum 4-foot sump.

When utility conflicts are encountered alternate offset cones or flat top slabs designed to meet or exceed H-20 loading shall be used in place of the standard cone section at no additional cost. Cutting into the cone sections will not be allowed.

**METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

Item 201, Item 202 and Item 204 will be paid for at the Contract unit price per each, complete in place, regardless of depth. Contract unit price per each, shall include all labor, materials, equipment and incidental costs required to complete the work.

No separate payment will be made for excavation, backfill, crushed stone, concrete collars, geotextile filter fabric but all costs in connection therewith shall be included in the unit prices bid per each. Frames and grates/covers will be paid for under Item 222.3.

**ITEM 205.**  
**ITEM 205.1**

1

**LEACHING BASIN**  
**LEACHING GALLEY**

**EACH**  
**EACH**

The work under these items shall consist of furnishing and installing subsurface leaching basins & leaching galley at the locations shown in the Plans and shall conform to the relevant provisions of Section 201 of the Standard Specifications and the following:

Contractor shall submit shop drawings of proposed leaching basins, leaching galleys and filter fabric to the Engineer for approval, prior to ordering the materials.

Contractor shall install ¼” mesh galvanized wire screen, 23 gauge, completely around each leaching basin and leaching galley prior to backfilling with crushed stone to prevent crushed stone from entering leaching basins.

Contractor shall use filter fabric in leaching basins and leaching galley installations between crushed stone and granular soils. Filter fabric shall meet the requirements of Table III – Type III

Geotextile Fabric for Filtration/Drainage of Section M9.50.0 of the MassDOT Standard Specifications.

Filter fabric shall be furnished and installed at leaching basins and leaching galleys, as shown on the construction plans and details. Fabric shall be stored and installed in accordance with manufacturer recommendations. Areas shall be smooth and free from rocks and other obstructions that may damage the fabric. Fabric shall be secured in place per manufacturer recommendations.

1 Leaching basins and leaching galleys shall be designed to withstand HS-20 loads

**CONSTRUCTION**

For the long-term function of the leaching basins and galleys, care shall be taken in these areas during construction in accordance with the following:

1. The systems shall not be used as a construction sediment basin without prior approval of the Engineer.
2. Stormwater runoff from exposed surfaces shall be directed away from the systems.
3. Construction equipment, vehicular traffic, parking of vehicles, and stockpiling of construction materials shall be outside of the system area.
4. Excavation for construction of the systems shall ensure that the soil at the bottom of the excavation is not compacted or smeared.
5. The perimeter of the systems shall be staked and flagged to prevent the use of the area for activities that might damage the infiltration ability of the system.



CLEANING AND REPAIR

After the areas contributing to the leaching systems have been stabilized, the Contractor shall clean the system of all debris and obstructions. The systems shall be thoroughly flushed clean and the Contractor shall furnish all necessary hose, pumps, pipe and other equipment that may be required for this purpose. No debris shall be flushed into the systems or existing drains, storm recharge chambers, storm drains and/or streams.

FINAL INSPECTION

Upon completion of the work, and before final acceptance by the Engineer, the entire drainage system shall be subjected to a final inspection in the presence of the Engineer. The work shall not be considered as complete until all requirements for line, grade, cleanliness, and other requirements have been met.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

1

Item 205. and Item 205.1 will be paid for at the Contract unit price per each, complete in place, regardless of depth. The contract unit price per each for 205. and 205.1 shall include all labor, materials, equipment and incidental costs required to complete the work.

No separate payment will be made for excavation, backfill, crushed stone, concrete collars, geotextile filter fabric but all costs in connection therewith shall be included in the unit price bid per each. Frames and covers will be paid for under Item 222.3.

**ITEM 222.3**

**FRAME AND GRATE (OR COVER)**  
**MUNICIPAL STANDARD**

**EACH**

The work performed under these items shall conform to the relevant provisions of Section 201 of the Standard Specifications and the following:

The work under Item 222.3 and shall also include the furnishing and placement of these frames and grates to the line and grade as shown on the plans, or as directed by the Engineer.

Frame and grates (or covers) shall be as approved by the DPW. Frames and grates (or covers) shall be H20 rated cast iron.

Shop Drawings for frame and grates or covers must be submitted to the Town for approval prior to ordering the casting.

Casting frames shall be set in a full mortar bed with bricks, a maximum of 8 inches thick. All cast shall be set in full concrete collar.

Item 222.3 Frame and Grate (Or Cover) Municipal Standard shall be paid for at the contract unit price bid per each and will include all labor, materials, tools, equipment and work necessary for the completion of the item.

<u>ITEM 302.06</u>	<u>6 INCH DUCTILE IRON WATER PIPE</u>	<u>FOOT</u>
<u>ITEM 309.</u>	<u>DUCTILE IRON FITTINGS FOR WATER PIPE</u>	<u>POUND</u>
<u>ITEM 350.06</u>	<u>6 INCH GATE AND GATE BOX</u>	<u>EACH</u>
<u>ITEM 376.</u>	<u>HYDRANT</u>	<u>EACH</u>
<u>ITEM 376.5</u>	<u>HYDRANT - ADJUSTED</u>	<u>EACH</u>
<u>ITEM 376.4</u>	<u>HYDRANT – REMOVED AND DISCARDED</u>	<u>EACH</u>

The work under these items shall conform to the relevant provisions of Section 300 of the Standard Specifications and the following:

The work shall include the furnishing and installation of all materials required to (1) Relocate the existing water pipes at any locations where the existing pipes are found to conflict with proposed drainage or utility construction; (2) to install new hydrants; (3) vertically adjust existing hydrants and (4) to construct water system alterations as shown on the plans.

### **Approval of Materials**

The Contractor shall submit the names of the material suppliers, shop drawings and certificates of compliance to the Engineer for approval prior to ordering any materials.

### **Pipe and Fittings**

6-inch pipe for hydrant relocations throughout the project limits shall be ductile iron, Class 52, conforming to ANSI A21.50/AWWA C150 and ANSI A21.51/AWWA C151.

Fittings for all pipe shall be ductile iron, Class 250 minimum, conforming to applicable ANSI, NEWWA, and AWWA specifications.

Ductile iron pipe and fittings shall have a cement mortar lining and bituminous seal coat on the inside and a coal tar enamel coat on the outside in accordance with ANSI A21.4 (AWWA C104) and ANSI A21.6 (AWWA C106), as amended, except that the cement mortar lining shall be 1/8-inch in thickness for pipe 2 inches to 12 inches in diameter. Bituminous seal coat shall be a product acceptable to the National Sanitation Foundation (NSF) for use in potable water and shall be so listed in the most current NSF summary of approved products under ANSI/NSF Standards 61.

Pipe shall be either the rubber-ring type push-on joint or standard restrained mechanical joint pipe, to be determined by the Town during the shop drawing review process.

Rubber gaskets for push-on and mechanical joints shall conform to ANSI A21.11/AWWA C111.

Pipe shall be supplied in lengths not exceeding 20 feet. Each pipe and fitting shall markings in accordance with ANSI A21.10/AWWA C110, including manufacturer's identification, country material was made in, pressure rating, nominal diameter and degrees or fraction of circle (for bends).

## **Pipe and Fittings Installation**

The Contractor shall make all necessary arrangements with the Town of Brewster Water and Fire Departments for the necessary shutdowns of service.

The Brewster Water Department may establish the time of shutdown to be within the normal daily low demand period.

Care shall be taken in loading, transporting, and unloading to prevent injury to the pipes, fittings or coatings. Pipe and fittings shall not be dropped. All pipe or fittings shall be examined before laying and no piece shall be installed which is found to be defective. Any damage to the pipe coatings shall be repaired as directed by the Engineer. Any pipe found to be defective, before or after laying, shall be satisfactorily removed and replaced with sound pipe at no additional cost to the Owner.

All pipe and fittings shall be installed in conformance with AWWA Standard Specifications C600 & C900, except as otherwise provided herein. All pipe and fittings shall be sound and clean before laying and shall be laid on a shaped bedding providing uniform, firm support over the entire length of each section barrel. **BLOCKING WILL NOT BE PERMITTED.** The select bedding material shall be placed and tamped along the sides of the pipe to complete the bedding.

Pipe shall be laid with good alignment and at a uniform 5-foot depth to top of pipe below proposed grade except where extra depth is required to clear other utilities and to connect to existing pipes, valves or fittings. Joint deflection shall not exceed that recommended by the manufacturer. Additional fittings shall be furnished and installed as required to cross existing utilities. Solid sleeves shall be used only where approved by the Engineer.

When pipe laying is stopped for any length of time, including short periods, the open ends of the pipe and fittings shall be closed with a watertight plug or cap as approved by the Engineer.

Necessary pipe cutting shall be accomplished by power saw and shall leave a smooth cut at right angles to the axis of the pipe. Cut ends of pipe to be used with a push-on bell shall be beveled to conform to the manufactured spigot end. Cement lining shall be undamaged.

Push-on joints shall be made in strict accordance with the manufacturer's instructions. The rubber gasket shall be inserted in the groove of the bell end of the pipe, the joint surfaces cleaned and lubricated. The plain end of the pipe to be entered shall then be inserted in alignment with the bell of the pipe to which it is to be joined and pushed home with a jack or by other means. After jointing the pipe, a metal feeler shall be used to make certain that the rubber gasket is correctly located.

Mechanical joints shall be installed in accordance with the "Notes of Method of Installation" of ANSI A21.11 and the instructions of the manufacturer. The Contractor shall thoroughly clean the joint surfaces and rubber gasket with soapy water before tightening the bolts. Bolts shall be tight to the specified torques. Extension wrenches or pipe over handle or ordinary ratchet wrench shall not be used to secure greater leverage.

## **Valves**

Gate valves shall be resilient wedge valves conforming to AWWA C509 and shall be rated for 200 psi minimum working pressure and shall be shell tested at a minimum of 400 psi. Valves shall be Underwriters Laboratory (UL) and Factory Mutual (FM) approved. Stuffing boxes shall be of the O-ring type. The operating nut shall be standard AWWA 2-inch square. Buried valves shall have mechanical joint ends conforming to AWWA C111. Exposed valves in vaults shall have flanged joint ends conforming to AWWA C111 unless shown as mechanical joints on plans.

All valves shall open left (counter clockwise) as required by the Brewster Water Department.

All valves shall be of the iron body type, bronze mounted, double disc parallel seal, non-rising stem type. All ferrous parts of the valves, except finished or bearing surfaces, shall be given two coats of asphalt varnish.

After the valves are assembled and tested, a third coat shall be applied on the exterior.

Valve shall be as manufactured by the Mueller Company, Decatur, Illinois, Darling Valve Co., Williamsport, Penn, or approved equal.

## **Valve Boxes**

Valve boxes shall be two-section, cast iron, heavy pattern adjustable type, with cast iron cover. The upper sections shall have a bottom flange of sufficient bearing area to prevent settling. The bottom section shall enclose the valve stuffing box and operating nut. Boxes shall be of lengths adapted to 5-foot pipe cover or more and have a minimum of 6 inches of overlap in the most extended position. Covers shall have the word "WATER" cast in the top and shall be held in place with bronze bolts.

## **Couplings**

Couplings shall be used to (1) repair split pipe or replace sections of damaged pipe; (2) install or cut-in hydrants or valves into a water main; (3) couple different pipe types; and (4) correct misaligned pipe ends. Couplings shall have a pressure rating of 250 psi or greater. Materials shall be manufactured in accordance with the following:

- (1) Center and end rings: ASTM-A536
- (2) Gaskets: ASTM D2000
- (3) Bolts & Hex Nuts: AWWA C111

Couplings shall be epoxy-coated.

## **Pipe Insulation**

Pipe insulation shall be installed when water main cannot be installed with at least 5 feet of cover. Pipe insulation shall be installed with waterproof jacket in accordance with MHD M11.0 and MHD Section 301.60. Insulation thickness shall be directed by the Engineer.

## Hydrants

Hydrants shall be Mueller Centurion A423 or specific model as requested by the Brewster Water Department and shall conform to the "Standard" Specifications for Fire Hydrants for Ordinary Water Works Service," AWWA C502 and the following:

Hydrants shall be according to manufacturer's standard pattern of standard size and shall have one 4-1/2-inch pumper nozzle and two 2-1/2-inch hose nozzles.

Hydrant inlet connections shall have mechanical joints for 6-inch ductile iron pipes.

Hydrant valve opening shall have an area at least equal to the area of a 5-1/4-inch diameter circle and be obstructed only by the valve rod. Each hydrant shall be able to deliver 500 gallons per minute through its two 2-1/2-inch hose nozzles when opened together with a loss of not more than 2 psi in the hydrant.

Each hydrant shall be designed for installation in a trench that will provide 5 feet of cover. Hydrant extension shall be as manufactured by the company furnishing the hydrants and of a style appropriate for the hydrants as furnished.

Hydrants shall be hydrostatically tested as specified in AWWA C502.

All nozzle threads shall be American National Standard.

Hydrant operating nut shall be AWWA Standard pentagonal type measuring 2-1/2 inches point to flat.

Hydrants shall be equipped with "O" ring packing.

Each nozzle cap shall be provided with a Buna N rubber washer.

Hydrants shall be so arranged that the direction of outlets may be turned 90 degrees without interference with the drip mechanism and without the mechanism obstructing the discharge from any outlet.

A bronze or rustproof steel nut and check nut shall be provided to hold the main hydrant valve on its stem.

Hydrants shall open by turning an operating nut left (counterclockwise) as required by the Brewster Water Department and must be marked with an arrow and word "OPEN" to indicate the direction to turn stem to open hydrant.

All iron work to be set below ground shall be thoroughly cleaned and painted with two coats of asphalt varnish specified in AWWA C502, and iron work to be exposed above ground shall be shop painted with two coats of paint of quality and color conforming to the present Town standard.

Each hydrant shall be designed such that the hydrant valve closes with line pressure preventing loss of water and consequent flooding in the event of traffic damage.

Each hydrant shall be furnished with a steel chair holder, double steel hose cap chain, steel pumper cap chair and any other hooks or appurtenances required for proper use.

## **Hydrant Installation**

Hydrants shall be set at the locations shown on the drawings, or as directed by the Engineer, and bedded on a firm foundation. A drainage pit 2 feet 6 inches in diameter shall be back-filled with crushed stone in conformance to M2.01.1 and satisfactorily compacted. Additional stone shall be brought up and around 6 inches over the drain ports. Each hydrant shall be set in true vertical alignment and properly braced. A concrete thrust block shall be placed between the back of the hydrant inlet and undisturbed soil at the end of the trench. Felt roofing paper shall be placed around hydrant elbow before placing concrete. Care shall be taken to insure that concrete does not plug the drain ports. Hydrant paint shall be touched up as required after installation.

## **Thrust Restraints**

Thrust restraints shall be installed at all tees, bends, plugs, caps, tapping sleeves and other locations as directed by the Engineer in accordance with the dimensions and details shown on the plans.

Whenever water pipes can be placed against undisturbed earth, concrete thrust blocks may be installed. The back of thrust blocks shall be placed against undisturbed earth and the sides shall be formed. Felt roofing paper shall be placed to protect pipe joints. Concrete shall not be placed over bolts or nuts, or in a manner which prevents the removal of joints.

Concrete shall have a minimum strength Class of 3,000 psi.

Whenever water pipes are installed within fill sections, the Contractor shall use mechanical restrained joint pipe and wedge-type mechanical joint restraints rated for 350 psi.

## **METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

All couplings, pipe insulation necessary, and any miscellaneous parts required to complete the work shall be inclusive to the prices bid under items 302.06, 309, 350.06, 376 and 376.5.

**ITEM 381.3**  
**ITEM 384.2**

**SERVICE BOX ADJUSTED**  
**CURB STOP ADJUSTED**

**EACH**  
**EACH**

Work under these Items shall conform to the relevant provisions of Section 300, the Town of Brewster Water Department, and the following:

The work under this Item shall include the furnishing of all labor, equipment and materials required to adjust existing curb stops and service boxes as shown on the Plans or as directed.

Service boxes adjusted shall be measured and paid for at the contract unit bid price each for Item 381.3. Curb stops adjusted shall be measured and paid for at the contract unit bid price each for Item 384.2.

**ITEM 390.**

**REMOVE AND RESET IRRIGATION**

**LUMP SUM**

The work under this item shall conform to the relevant provisions of Section 300 of the Standard Specifications and the following:

This work shall consist of the removal and resetting of existing irrigation line and any other related hardware for the existing irrigation system as required at #139 Millstone Road, #861 Millstone Road, #1033 Millstone Road or as directed by the Engineer. Existing tracer wire will be reset above the irrigation line in the same approximate location of the irrigation line after disturbance due to construction.

If any irrigation system elements are damaged during construction, the Contractor shall replace or repair the elements at no cost to the Town.

**METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

The work under Item 348. Remove And Reset Irrigation Line will be measured and paid for at the Contract price lump sum, which price shall include all labor, material, equipment and incidental costs required to complete the work.

**ITEM 470.2**

**HOT MIX ASPHALT BERM,**  
**TYPE A - MODIFIED**

**FOOT**

The work under this item shall conform to the relevant provisions of Section 470 of the Standard Specifications and the following:

Hot mix asphalt berm, type A - modified, shall be constructed by means of an approved extrusion machine in conformance with the dimensions and at the locations shown on the plans.

Prior to placing the HMA berm, the surface shall be swept clean and RS-1 asphalt emulsion shall be applied to the surface.

Hot mix asphalt berm, type A - modified will be measured for payment by the foot, complete in place, along the gutter line.

Hot mix asphalt berm, type A—modified, will be paid for at the Contract unit price per foot, which price shall include all labor, materials, equipment, and incidental costs required to complete the work.

<b><u>ITEM 504.</u></b>	<b><u>GRANITE CURB TYPE VA4 - STRAIGHT</u></b>	<b><u>FOOT</u></b>
<b><u>ITEM 504.1</u></b>	<b><u>GRANITE CURB TYPE VA4 - CURVED</u></b>	<b><u>FOOT</u></b>
<b><u>ITEM 505.</u></b>	<b><u>GRANITE CURB TYPE VA5 - STRAIGHT</u></b>	<b><u>FOOT</u></b>
<b><u>ITEM 509.</u></b>	<b><u>GRANITE TRANSITION CURB FOR</u></b>	<b><u>FOOT</u></b>
	<b><u>PEDESTRIAN CURB RAMPS - STRAIGHT</u></b>	
<b><u>ITEM 509.1</u></b>	<b><u>GRANITE TRANSITION CURB FOR</u></b>	<b><u>FOOT</u></b>
	<b><u>PEDESTRIAN CURB RAMPS - CURVED</u></b>	

The work under these items shall conform to the relevant provisions of Section 501 of the Standard Specifications and the following:

All proposed granite curbing shall be provided with a buzzed chamfer edge. The Contractor shall provide a shop drawing of the curbing for review and approval and shall provide a sample piece of straight curbing for the Town to review with the shop drawing.

Granite curb type VA5 – straight shall be installed according to the plans and as directed by the Engineer. The curbing shall be furnished at 24” in height. The intent of this curbing item is to tie to the existing grade at the back of proposed sidewalk.

<b><u>ITEM 590.</u></b>	<b><u>CURB REMOVED AND STACKED</u></b>	<b><u>FOOT</u></b>
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The work under this item shall conform to the relevant provisions of Section 501 of the Standard Specifications and the following:

Existing granite curbing / curb corners to be removed and not needed to be reset, shall be removed and stacked at the Town of Brewster Department of Public Works; 201 Run Hill Road, Brewster, MA 02631, unless, in the judgment of the Engineer, they are unsuitable for salvage. Unsuitable granite curbing shall become the property of the Contractor and shall be disposed of off the site at no additional cost to the Town.

Item 590. Curb Removed and Stacked will be measured and paid at the Contract unit price per foot, which shall include all labor, materials, equipment and incidental costs required to complete the work.

No separate payment will be made for disposal, storage, transporting and handling of curbing to be removed, stacked and other incidental work, but all costs in connection therewith shall be included in the unit prices bid for this item.



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**ITEM 655.4****SPLIT RAIL WOOD FENCE****FOOT**

The work under this item shall conform to the relevant provisions of Section 600 of the Standard Specifications and the following:

This work of this item shall consist of the furnishing and installing split rail wood fence at the locations indicated on the plans or as directed by the Engineer.

Existing utility locations shall be verified in the field prior to starting this work. The Contractor shall provide the Engineer with a plan showing existing utility locations and elevations prior to undertaking this work. Post holes located within 24 inches of an underground utility measured from the bottom of post embedment shall be hand dug.

The post shall be red pine, treated in accordance with the requirements of AASHTO M133-86. The post shall have a diameter between five and six inches, a length of seven feet and have three openings, to receive the treated rails. The rails shall be southern yellow pine or poplar, treated in accordance with the requirements of AASHTO M133-86. The dimensions of the rails shall be eight feet long with paddle board end detail. The shape of the rails shall vary, with an average girth of fourteen inches.

The Contractor shall submit a shop drawing of the wood fence indicating dimensions and material for review and approval.

The split rail wood fence shall be installed conforming to the contour of the finished ground surface. Posts shall be installed plumb. Backfill around posts shall be thoroughly tamped and compacted. Rails shall be secured in place by toe nailing through the paddle board section of the rail into the post with a galvanized nail at each end.

**METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

Split rail wood fence will be measured per foot, end-to-end along the top of fence, of continuous sections installed in accordance with the plans and/or as directed by the Engineer.

Split rail wood fence will be paid for at the contract unit price per foot, complete in place which price shall include all labor, materials, equipment, excavation and backfill, posts, rails and incidental costs required to complete the work.

**ITEM 656.1****8 FOOT WHITE VINYL FENCE****FOOT**

The work under this item shall conform to the relevant provisions of Section 665 of the Standard Specifications and the following:

The work shall include the construction and installation of a 8 FOOT white vinyl fence. The vinyl fence shall be placed as shown on the Plans unless otherwise agreed to by the Property Owner and the Engineer.

The Property Owner shall be notified at least one (1) week prior to the removal of the existing fence and construction of the new fence.

Loam and seed at new post holes shall be carefully removed and replaced around the posts after backfilling. Loam and seed shall also be placed at existing post holes.

**METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

8 foot white vinyl fence will be measured for payment, complete in place, by the foot along the top of the rail between posts.

8 foot white vinyl fence will be paid for at the Contract unit price per foot, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

No separate payment will be made for excavation, backfill and necessary new materials, but all costs in connection therewith shall be included in the bid price per foot.

Loam will be paid for under Item 751.

Seed will be paid for under Item 765.

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**ITEM 657.****TEMPORARY FENCE****FOOT**

The work under this item shall conform to the relevant provisions of Section 600 of the Standard Specifications and includes installation of a chain link fence with screening fabric as directed by the Town and Engineer.

The fence shall be chain link and shall meet the requirements of the Standard Specifications and the Construction Standards, except the material need not be in new condition. Gates shall be used at all locations that are to be opened on a regular basis.

All posts and fence fabric will be paid for at the contract unit price per foot complete in place, which shall include all posts, gates, fasteners and/or clips, fence fabric and the necessary excavation and equipment to complete the work to the satisfaction of the Engineer.

Rock excavation, if required, will be paid for at the contract unit price per cubic yard under the item for Class B Rock Excavation.

**ITEM 670.****FENCE REMOVED AND RESET****FOOT**

The work under this item shall conform to the relevant provisions of Section 665 of the Standard Specifications and the following:

The work shall include the removal of existing abutting property fences and resetting of the fences along the proposed right-of-way lines or fence layout as directed by the Engineer.

The fence removal and resetting shall be accomplished before commencing any construction in the area and without delay between the removal and resetting operations.

Existing fence elements which, in the judgment of the Engineer, are unsuitable for reuse due to deterioration or due to damage caused by the Contractor's operations shall be replaced with new material of matching type and wood species.

Fence posts shall be installed plumb in excavated holes and the holes backfilled with suitable material and thoroughly compacted.

Lawn sod at new post holes shall be carefully removed and replaced around the posts after backfilling.

Reset fence shall be set at a uniform height matching the existing fences to remain and along the proposed road right-of-way lines, as shown on the plans and as directed by the Engineer. The fence shall be located with the face of rail on the proposed right-of-way lines and the posts on the abutting properties.

Wood fence removed and reset will be measured for payment complete in place by the foot along the top of the rail between existing posts to remain at the ends of each run of relocated fence.

Wood fence removed and reset will be paid for at the Contract unit price per foot, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

No separate payment will be made for excavation, backfill and necessary new materials, but all costs in connection therewith shall be included in the foot price bid.

**ITEM 691.****BALANCE STONE WALL REMOVED AND REBUILT****FOOT**

The work under this item shall conform to the relevant provisions of Section 690 of the Standard Specifications and the following:

The work shall include the removing and rebuilding of a dry stacked landscape stone wall as shown on the plans and as directed by the Engineer.

Item 691 will be measured for payment by the foot, complete in place.

Item 691 will be paid for at the Contract unit price bid per foot, which price shall include all labor, material, equipment and incidental costs required to complete the work.

No separate payment will be made for excavation, removal and handling of existing stones, gravel borrow base and gravel borrow backfill, but all costs in connection therewith shall be included in the unit price bid.

**ITEM 697.1**

**SILT SACK**

**EACH**

Work under this item shall conform to the relevant provisions of Sections 227 and 670 of the Standard Specifications and the following:

The work under this item includes the furnishing, installation, maintenance and removal of a reusable fabric sack to be installed in drainage structures for the protection of wetlands and other resource areas and the prevention of silt and sediment from the construction site from entering the storm water collection system. Devices shall be ACF Environmental (800)-448-3636; Reed & Graham, Inc. Geosynthetics (888)-381-0800; The BMP Store (800)-644-9223; or approved equal.

**Construction**

Silt sacks shall be installed in retained existing and proposed catch basins and drop inlets within the project limits and as required by the Resident Engineer.

The silt sack shall be as manufactured to fit the opening of the drainage structure under regular flow conditions and shall be mounted under the grate. The insert shall be secured from the surface such that the grate can be removed without the insert discharging into the structure. The filter material shall be installed and maintained in accordance with the manufacturer's written literature and as directed by the Engineer.

Silt sacks shall remain in place until the placement of the pavement overlay or top course and the graded areas have become permanently stabilized by vegetative growth. All materials used for the filter fabric will become the property of the Contractor and shall be removed from the site.

The Contractor shall inspect the condition of silt sacks after each rainstorm and during major rain events. Silt sacks shall be cleaned periodically to remove and disposed of accumulated debris as required. Silt sacks, which become damaged during construction operations, shall be repaired or replaced immediately at no additional cost.

When emptying the silt sack, the contractor shall take all due care to prevent sediment from entering the structure. Any silt or other debris found in the drainage system at the end of construction shall be removed at the Contractors expense. The silt and sediment from the silt sack shall be legally disposed of offsite. Under no condition shall silt and sediment from the insert be deposited on site and used in construction.

All curb openings shall be blocked to prevent stormwater from bypassing the device.

All debris accumulated in silt sacks shall be handled and disposed of as specified in Section 227 of the Standard Specifications

**METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

Item 697. 1 Silt Sack will be measured and paid at the Contract unit price per each, complete in place, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No

separate payment will be made for removal and disposal of the sediment from the insert, but all costs in connection therewith shall be included in the Contract unit price bid.

**ITEM 702.1**

**SHELL DRIVEWAY**

**CUBIC YARD**

The work under this item shall conform to the relevant provisions of Section 700 of the Standard Specifications and the following:

The work shall include the furnishing and placing of crushed shells upon a gravel base course as shown on the Drawings and as directed by the Engineer.

Gravel Borrow shall conform to Section M1.03.0 Type C.

Place, grade and compact the gravel base to a thickness of 8". Place, grade and compact the crushed shells to produce a minimum 4" thickness with a firm, uniform surface at the lines and grades shown on the plans and as directed by the Engineer.

Item 702.1 Shell Driveway will be measured for payment by the cubic yard, complete in place.

Item 702.1 Shell Driveway will be paid for at the Contract unit price bid per cubic yard, which price shall include all labor, material, equipment and incidental costs required to complete the work.

Gravel borrow will be paid for under Item 151.

**ITEM 702.2**

**COBBLESTONE DRIVEWAY**

**SQUARE YARD**

The work under this item shall conform to the relevant provisions of Section 700 of the Standard Specifications and the following:

The work under this item includes furnishing and placing cobblestone pavement and a new setting bed at locations indicated on the plans or as directed by the Engineer.

Cobblestones blocks shall be granite, basically light grey in color, free from seams and other structural imperfections or flaws which would impair its structural integrity, and of a smooth splitting appearance. Natural color variations characteristic of the deposit from which the paving blocks are obtained will be permitted. Rubble pavement blocks shall be not less than 4 in. nor more than 12 in. in length, not less than 3.5 in. nor more than 4.5 in. in width and depth. Cobblestones shall be rectangular in shape with one good face. Opposite faces of cobblestones shall be approximately parallel and adjoining faces shall be approximately at right angles to each other. Blocks shall be dressed so that they may be laid with 1 in. to 1.5 in. joints.

Gravel Borrow shall conform to Section M1.03.0 Type C. Stone Dust shall conform to the following gradation:

<u>Sieve No.</u>	<u>Percent Passing</u>
No. 4	100
No. 50	90
No. 200	65

The proposed driveway area shall be excavated to proposed subgrade and fine graded and compacted under Item 170.

The gravel borrow and a 4-inch minimum thickness bed of stone dust shall be placed and compacted. The stone dust bed shall be excavated manually to bed the larger stones and additional stone dust material placed around the smaller stones as they are laid.

The cobblestones shall be set with the long axis of each stone vertical to the roadway surface and with each cobblestone touching another cobblestone.

The cobblestones shall be tamped with a mechanical plate compactor or other method approved by the Engineer.

After a sufficient area of pavement has been laid, the pavement surface shall be tested with a 10-foot straight edge laid parallel with the centerline and any variations exceeding 1/2-inch shall be corrected and brought to proper grade.

The cobblestones shall be swept with stone dust. The pavement surface shall be vibrated to insure compaction between the joints. Additional stone dust shall be uniformly distributed as necessary to fill all of the voids. The process shall be repeated for a maximum of five days until all joints are full.

Item 702.2 Cobblestone Driveway will be measured for payment by the square yard complete in place.

Item 702.2 Cobblestone Driveway will be paid for at the contract unit price per square yard, which price shall include all labor, material, equip-ment and incidental costs required to complete the work.

No separate payment will be made for excavation or stone dust, but all costs in connection therewith shall be included in the unit price bid.

Gravel borrow will be paid for under Item 151.

**1** ITEM 702.3 BLUESTONE GRAVEL DRIVEWAY CUBIC YARD

The work under this item shall conform to the relevant provisions of Section 700 of the Standard Specifications and the following:

The work shall include the furnishing and placing of bluestone gravel as shown on the Drawings and as directed by the Engineer.

Place, grade and compact the bluestone gravel to produce a minimum 8” thickness with a firm, uniform surface at the lines and grades shown on the plans and as directed by the Engineer.

Item 702.3 Bluestone Gravel Driveway will be measured for payment by the cubic yard, complete in place.

Item 702.3 Bluestone Gravel Driveway will be paid for at the Contract unit price bid per cubic yard, which price shall include all labor, material, equipment and incidental costs required to complete the work.

**ITEM 706.9**                      **COBBLESTONES REMOVED & STACKED**                      **SQUARE YARD**

The work under this item shall conform to the relevant provisions of Section 701 of the Standard Specifications and the following:

This work shall consist of removing existing cobblestones and stacking them as directed by the Engineer.

**Construction Methods**

A trench of sufficient width and depth shall be excavated so that the present cobblestones can be removed without damage. Existing pavements shall be sawcut in accordance with the requirements of Subsection 482: Sawcutting as shown on the plans and as required by the Engineer.

**Stacking**

The Contractor shall accept and hold entire responsibility for the removal, handling, stacking at a location convenient for removal by owner, and protection of all cobblestones until their final removal as designated in accordance with the following:

Any cobblestones damaged through lack of protection or carelessness by the Contractor shall be replaced at their expense. The Contractor's responsibility will cease upon final acceptance of the work or 60 days from the time a certified notice, with copy to the Engineer, is sent by Contractor to owner of material that all material is available for removal.

**Method of Measurement and Basis of Payment**

The quantity of cobblestones measured will be the area actually removed and stacked measured in square yards.

Removing and stacking cobblestones will be paid for at the contract unit price per square yard.

**ITEM 707.82**                                      **POST REMOVED AND DISCARDED**                                      **EACH**

The work under this item shall conform to the relevant provisions of Section 700 of the Standard Specifications and the following:

After removing the existing posts, the existing ground shall be thoroughly compacted, and finished with a surface material similar to the adjacent ground. All excavation, backfill, and compaction required, shall be considered incidental to the items of work.

All posts designated to be removed and discarded shall be carefully removed, transported, and discarded in accordance with all applicable regulations.

Item 707.82 Post Removed and Discarded will be measured for payment as units, complete in place.

Item 707.82 Post Benches Removed and Discarded will be paid for at the Contract unit price per each, which price shall include all labor, material, equipment and incidental costs required to complete the work, unless otherwise noted.

No separate payment will be made for disposal, storage, transporting and handling of posts to be removed, disposed and other incidental work, but all costs in connection therewith shall be included in the unit prices bid for these items.

**ITEM 709.**    **WETLAND MARKER POST**    **EACH**

The work under this item shall conform to the relevant provisions of Section 700 of the Standard Specifications and the following:

The Contractor shall install, at locations shown on the plans (the wetland resource area) and as directed by the Engineer and Town, fiberglass wetland markers to delineate the north and south edges of the wetland flags (WF1-101 and WF1-104).

The marker posts shall be brown in color, have a minimum width of 4”, have a minimum length of 52” and be installed to an exposed height of 40” and as shown on the plans or as directed by the Engineer.

Item 709. will be paid for at the Contract unit price per each, which price shall include all labor, material, equipment and incidental costs required to complete the work, unless otherwise noted.

No separate payment will be made for storage, transporting and handling of posts or other incidental work, but all costs in connection therewith shall be included in the unit price bid for this item.

**ITEM 740.**    **ENGINEERS FIELD OFFICE AND EQUIPMENT (TYPE A)**    **MONTH**

Work under this item shall conform to the relevant provisions of Section 740 and the following:

Two computer systems, a printer system and a digital camera meeting the requirements set forth below including installation, maintenance, power, paper, disks and other supplies shall be provided at the Resident Engineer's Office:

All equipment shall be UL approved and Energy Star compliant.

The Computer System shall meet the following minimum criteria or better:

- RAM:                                        8 GB
- Hard disk:                                500GB, 7200RPM
- Monitor:                                    24" LCD with Built-in speakers, 1600 x 1050 at 24 bit true color
- DVD-RW/CD-RW:                        Combo drive including DVD ± RW



Network Adapter: 10/100 Mbit/s  
 USB Ports: 6 USB 3.0 ports  
 Mouse: Optical mouse with scroll, MS-Mouse compliant  
 OS: Windows 8, Professional with all security updates  
 Web Browser: Internet Explorer with all security updates  
 Applications: Latest MS Office Professional with all security updates  
 Latest Adobe Acrobat Professional with all security updates  
 Latest Autodesk, AutoCAD LT  
 Antivirus software with all current security updates maintained through the life of the contract.  
 Flash drives: 2 - 32GB USB 3.0  
 Internet access: High speed internet access with router.

The Multifunction Printer System shall meet the following minimum criteria or better:

Color laser printer, fax, scanner, email and copier all in one with the following minimum capabilities:

- Estimated volume 8,000 pages per month
- LCD touch panel display
- 50 page reversing automatic document feeder (RADF)
- Reduction/enlargement capability
- Ability to copy and print 11" x 17" paper size
- email and network pc connectivity
- Microsoft and Apple compatability
- ability to overwrite latent images on hard drive
- 600 x 600 dpi capability
- 30 pages per minute print speed (color),
- 4 Paper Trays Standard (not including the bypass tray)
- Automatic duplexing
- Finisher with staple functions
- Standard Ethernet. Print Controller
- Scan documents to PDF, PC and USB
- ability to print with authenticated access protection

Contractor must supply a maintenance contract for next day service, and all supplies (toner, staples, paper) necessary to meet estimated monthly usage.

A Digital Camera shall meet the following minimum criteria or better:

Resolution:	14 Megapixel
Optical Zoom:	5x
Waterproof:	to a depth of 33ft (10m)
Shockproof:	up to 6.6ft (2m)
Freezeproof:	14°F (-10°C)
Memory:	8 GB SD Card
USB Port:	USB 2.0 with PC cable
Screen:	2.7+ inch LCD with scratch-resistance and anti-reflectance
Battery Power:	2 rechargeable batteries and a battery charger
Carrying Case:	Rain-proof with shoulder strap

The Engineer's Field Office and the equipment included herein including the computer system, printer and camera shall remain the property of the Contractor at the completion of the project. Disks, flash drives, and card readers with cards shall become the property of the Town.

Compensation for this work will be made at the contract unit price per month which price includes full compensation for all services and equipment, and incidentals necessary to provide equipment, maintenance, insurance as specified and as directed by the Engineer.

#### **ITEM 756. NPDES STORM WATER POLLUTION PREVENTION PLAN LUMP SUM**

This Item addresses the preparation and implementation of a Storm Water Pollution Prevention Plan required by the National Pollutant Discharge Elimination System (NPDES) and applicable Construction General Permit (CGP) issued by the U.S. Environmental Protection Agency (EPA).

Pursuant to the Federal Clean Water Act, construction activities which disturb one acre or more are required to apply to the EPA for coverage under the NPDES General Permit for Storm Water Discharges from Construction Activities. On February 16, 2012 (77 FR 12286), EPA issued the final NPDES Construction General Permit (CGP) for construction activity. The Contractor shall be fully responsible for compliance with the CGP. Should a fine or penalty be assessed against it, or the Town, as a result of a local, state, or federal enforcement action due to non-compliance with the CGP, the Contractor shall take full responsibility.

The NPDES CGP requires the submission of a Notice of Intent (NOI) to the EPA prior to the start of construction (defined as any activity which disturbs land, including clearing and grubbing). There is a fourteen (14) day review period commencing from the date on which EPA enters the Notice into their database. The Contractor is advised that, based on the review of the NOI, EPA may require additional information, including but not limited to, the submission of the Storm Water Pollution Prevention Plan (SWPPP) for review. Work may not commence on the project until final authorization has been granted by EPA. Any additional time required by EPA for review of submittals will not constitute a basis for claim of delay.

In addition, if the project discharges to an Outstanding Resource Water, vernal pool, or is within a coastal ACEC as identified by the Massachusetts Department of Environmental Protection (DEP), a separate notification to DEP is required. DEP may also require submission of the Storm Water Pollution Prevention

Plan for review and approval. Filing fees associated with the notification to DEP and, if required, the SWPPP filing to DEP shall be paid by the Contractor.

The CGP also requires the preparation and implementation of a SWPPP in accordance with the aforementioned statutes and regulations. The Plan will include the CGP conditions and detailed descriptions of controls of erosion and sedimentation to be implemented during construction. It is the responsibility of the Contractor to prepare the SWPPP to meet the requirements of the most recently issued CGP. The Contractor shall submit the Plan to the Engineer for approval at least four (4) weeks prior to any site activities. It is the responsibility of the Contractor to comply with the CGP conditions and the conditions of any state Wetlands Protection Act Order, Water Quality Certification, Corps of Engineers Section 404 Permit and other environmental permits applicable to the project and to include in the SWPPP the methods and means necessary to comply with applicable conditions of said permits (reference to Part 9.1.1 of the 2012 CGP).

It is the responsibility of the Contractor to complete the SWPPP in accordance with the EPA CGP, provide all information required, and obtain any and all certifications as required by the CGP. Any amendments to the SWPPP required by site conditions, schedule changes, revised work, construction methodologies, and the like are the responsibility of the Contractor. Amendments will require the approval of the Engineer prior to implementation.

Included in the CGP conditions is the requirement for inspection of all erosion controls and site conditions on a weekly basis as well as after each incidence of rainfall exceeding 0.25 inches in twenty-four hours. For multi-day storms, EPA requires that an inspection must be performed during or after the first day of the event and after the end of the event. The CGP requires that inspections be performed by a qualified individual. The Town requires proof of completion of a 4 hour minimum sedimentation and erosion control training class current to the latest CGP. This individual can be, but not limited to, someone that is either a certified inspector, certified professional, or certified storm water inspector. The documentation shall be included as an appendix in the SWPPP. The Engineer must approve the contractor's inspector. This individual shall be on-site during construction to perform these inspections. In addition, if the Engineer determines at any time that the inspector's performance is inadequate, the Contractor shall provide an alternate inspector. Written weekly inspection forms, storm event inspection forms, and Monthly Summary Reports must be completed and provided to the Engineer. Monthly Summary Reports must include a summary of construction activities undertaken during the reporting period, general site conditions, erosion control maintenance and corrective actions taken, the anticipated schedule of construction activities for the next reporting period, any SWPPP amendments, and representative photographs.

The Contractor is responsible for preparation of the Plan, all SWPPP certifications, inspections, reports and any and all corrective actions necessary to comply with the provisions of the CGP. Work associated with performance of inspections is not included under this Item. The Standard Specifications require adequate erosion control for the duration of the Contract. All Control measures must be properly selected, installed, and maintained in accordance with manufacturer

specifications and good engineering practices. If periodic inspections or other information indicates a control has been used inappropriately or is no longer adequate, it is the responsibility of the Contractor to replace or modify the control for site conditions at no additional cost to the Department. Contractor must maintain all control measures and other protective measures in effective operating condition and shall consider replacement of erosion controls for each construction season.

This Item addresses acceptable completion of the SWPPP, any revisions/amendments required during construction, and preparation of monthly reports. In addition, any erosion controls beyond those specified in bid items elsewhere in this contract which are selected by the Contractor to facilitate and/or address the Contractor's schedule, methods and prosecution of the work shall be considered incidental to this item.

The Contractor is advised The CGP provides specific requirements for temporary and final stabilization. This shall be incorporated into the project schedule. The permit defines specific deadline requirements for Initial Stabilization ("immediately", i.e., no later than the end of the next work day following the day when earth-disturbing activities have temporarily or permanently ceased) and for Complete Stabilization Activities (no later than 14 calendar days after the initiation of stabilization). Stabilization criteria for vegetative and non-vegetative measures are provided in the CGP.

The CGP requires the submission of a Notice of Termination (NOT) from all operators when final stabilization has been achieved, as well as removal and proper disposal of all construction materials, waste and waste handling devices, removal of all equipment and construction vehicles, removal of all temporary stormwater controls, etc. . Approval of final stabilization by the Engineer and confirmation of submission of the NOT will be required prior to submission of the Resident Engineer's Final Estimate. The permittee is required to use EPA's electronic NOI system or "eNOI system" to prepare and submit NOT. The electronic NOT form can be found at <https://www.epa.gov/npdes/stormwater-discharges-construction-activities#ereporting> . If you are given approval by the EPA Regional Office to use a paper NOT, you must complete the form in Appendix K of the 2012 CGP.

### Compensation

Payment for all work under this Item shall be made at the contract unit price, lump sum, which shall include all work detailed above, including Plan preparation, required revisions, revisions/addenda during construction, monthly reports and filing fees.

Payment of fifty (50) % of the contract price shall be made upon acceptance of the Stormwater Pollution Prevention plan. Payment of forty (40) % of the contract price shall be made in equal installments for implementation of the Stormwater Pollution Prevention plan. Payment of the final ten (10) % of the contract price shall be paid upon satisfactory submissions of a Notice of termination (NOT) when final stabilization has been achieved.

### **ITEM 767.121**

### **SEDIMENT CONTROL BARRIER**

### **FOOT**

The work under this item shall conform to the relevant provisions of Subsections 670, 751 and 767 of the Standard Specifications and shall include the furnishing and placement of a sediment control barrier. Sediment control barrier shall be installed prior to disturbing upslope soil.

The purpose of the sediment control barrier is to slow runoff velocity and filter suspended sediments from storm water flow. Sediment barrier may be used to contain stockpile sediments, to break slope length, and to slow or prevent upgradient water or water off road surfaces from flowing into a work zone. Contractor shall be responsible for ensuring that barriers fulfill the intent of adequately controlling siltation and runoff.

Twelve-inch diameter (after installation) compost filter tubes with biodegradable natural fabric (i.e., cotton, jute, burlap) are intended to be the primary sedimentation control barrier. Photo-biodegradable fabric shall not be used.

For small areas of disturbance with minimal slope and slope length, the Engineer may approve the following sediment control methods:

- 9-inch compost filter tubes
- Straw bales which shall be trenched

No straw wattles may be used. Additional compost filter tubes (adding depth or height) shall be used at specific locations of concentrated flow such as at gully points, steep slopes, or identified failure points in the sediment capture line.

As required by the Order of Conditions permit, additional sediment barrier shall be stored on-site for emergency use and replacement for the duration of the contract.

Where shown on the plans or when required by permits, sedimentation fence shall be used in addition to compost filter tubes and straw bales and shall be compensated under that item.

Sediment control barriers shall be installed in the approximate location as shown on the plans and as required so that no excavated or disturbed soil can enter mitigation areas or adjacent wetlands or waterways. If necessary to accommodate field conditions and to maximize effectiveness, barrier locations may be shifted with approval from the Engineer. Barriers shall be in place prior to excavation work. No work shall take place outside the barriers.

## MATERIALS AND CONSTRUCTION

Prior to initial placement of barriers, the Contractor and the Engineer shall review locations specified on the plans and adjust placement to ensure that the placement will provide maximum effectiveness.

Barriers shall be staked, trenched, and/or wedged as specified herein and according to the Manufacturer's instructions. Barriers shall be securely in contact with existing soil such that there is no flow beneath the barrier.

### Compost Filter Tube

Compost material inside the filter tube shall meet M1.06.0, except for the following: no peat, manure or bio-solids shall be used; no kiln-dried wood or construction debris shall be allowed; material shall pass through a 2-inch sieve; and the C:N ratio shall be disregarded.

Outer tube fabric shall be made of 100% biodegradable materials (i.e., cotton, hemp or jute) and shall have a knitted mesh with openings that allow for sufficient water flow and effective sediment capture.

Tubes shall be tamped, but not trenched, to ensure good contact with soil. When reinforcement is necessary, tubes shall be stacked as shown on the detail plans.

### Straw Bales

Straw bales shall be used if shown on the plans or when specified by Orders of Condition or other permit requirements.

Bales should be placed in a single row, lengthwise on the contour, with ends of adjacent bales tightly abutting one another. All bales should be either wire-bound or string-tied. Straw bales should be installed so that bindings are oriented around the sides (rather than along the tops and bottoms) of the bales in order to prevent deterioration of the bindings.

The barrier should be entrenched and backfilled. A trench should be excavated the width of a bale and the length of the proposed barrier to a minimum depth of 4 inches. The trench must be deep enough to remove all grass and other material which might allow underflow. After the bales are staked and chinked (filled by wedging), the excavated soil should be backfilled against the barrier. Backfill soil should conform to the ground level on the downhill side and should be built up to 4 inches against the uphill side of the barrier.

Each bale should be securely anchored by at least 2 stakes or re-bars driven through the bale. The first stake in each bale should be driven toward the previously laid bale to force the bales together. Stakes or re-bars should be driven deep enough into the ground to securely anchor the bales. For safety reasons, stakes should not extend above the bales but should be driven in flush with the top of the bale.

The gaps between the bales should be chinked (filled by wedging) with straw to prevent water from escaping between the bales. Loose straw scattered over the area immediately uphill from a straw bale barrier tends to increase barrier efficiency. Wedging must be done carefully in order not to separate the bales.

When used in a swale, the barrier should be extended to such a length that the bottoms of the end bales are higher in elevation than the top of the lowest middle bale to assure that sediment-laden runoff will flow either through or over the barrier but not around it.

### Sedimentation Fence

Materials and Installation shall be per Section 670.40 and 670.60 of the Standard Specifications and the following:

Sedimentation fence shall only be used if shown on the plans or when specified by Orders of Condition or other permit requirements.

When used with compost filter tubes, the tube shall be placed on a minimum of 8 inches of folded fabric on the upslope side of the fence. Fabric does not need to be trenched.

When used with straw bales, an 8-inch deep and 4-inch wide trench or V-trench shall be dug on the upslope side of the fence line. One foot of fabric shall be placed in the bottom of the trench followed by backfilling with compacted earth or gravel. Stakes shall be on the down slope side of the trench and shall be spaced such that the fence remains vertical and effective.

Width of fabric shall be sufficient to provide a 36-inch high barrier after fabric is folded or trenched. Sagging fabric will require additional staking or other anchoring.

### MAINTENANCE

Maintenance of the sediment control barrier shall be per Section 670.60 of the Standard Specifications or per the Stormwater Pollution Prevention Plan (SWPPP), whichever is more restrictive.

The contractor shall inspect the sediment barrier in accordance with relevant permits. At a minimum, barriers shall be inspected at least once every 7 calendar days and after a rain event resulting in 0.25 inches or more of rainfall. Contractor shall be responsible for ensuring that an effective barrier is in place and working effectively for all phases of the Contract.

Barriers that decompose such that they no longer provide the function required shall be repaired or replaced as directed. If the resulting berm of compost within the fabric tube is sufficiently intact (despite fabric decay) and continues to provide effective water and sediment control, barrier does not necessarily require replacement.

### DISMANTLING & REMOVING

Barriers shall be dismantled and/or removed, as required, when construction work is complete and upslope areas have been permanently stabilized and after receiving permission to do so from the Engineer.

Regardless of site context, nonbiodegradable material and components of the sediment barriers, including photo-biodegradable fabric, plastic netting, nylon twine, and sedimentation fence, shall be removed and disposed off-site by the Contractor.

For naturalized areas, biodegradable, natural fabric and material may be left in place to decompose on-site. In urban, residential, or other locations where aesthetics is a concern, the following shall apply:

- Compost filter tube fabric shall be cut and removed, and compost shall be raked to blend evenly (as would be done with a soil amendment or mulch). No more than a 2-inch depth shall be left on soil substrate.
- Straw bales shall be removed and disposed off-site by the Contractor. Areas of trenching shall be raked smooth and disturbed soils stabilized with a seed mix matching adjacent seeding or existing grasses (i.e., lawn or native grass mix).
- Sedimentation fence, stakes, and other debris shall be removed and disposed off-site. Site shall be restored to a neat and clean condition.

### **METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

Item 767.121 will be measured and paid for at the contract unit price per foot of sediment control barrier which price shall include all labor, equipment, materials, maintenance, dismantling, removal, restoration of soil, and all incidental costs required to complete the work.

Additional barrier, such as double or triple stacking of compost filter tubes, will be paid for per foot of tube installed.

Barriers that have been driven over or otherwise damaged by construction activities shall be repaired or replaced as directed by the Engineer at the Contractor's expense.

Sedimentation fence used in conjunction with compost filter will be measured and paid for separately under Standard Item 697, Sedimentation Fence.

<u>ITEM 772.039</u>	<u>ARBORVITAE – DEGROOTS SPIRE 5-6 FEET</u>	<u>EACH</u>
<u>ITEM 772.338</u>	<u>EASTERN RED CEDAR 6-7 FEET</u>	<u>EACH</u>
<u>ITEM 777.524</u>	<u>MAPLE – RED – ARMSTRONG 2-2.5 INCH CALIPER</u>	<u>EACH</u>
<u>ITEM 777.828</u>	<u>SASSAFRAS - 1.5-2-INCH</u>	<u>EACH</u>
<u>ITEM 785.633</u>	<u>INKBERRY / #3</u>	<u>EACH</u>
<u>ITEM 786.109</u>	<u>JUNIPER – COMMON / #2</u>	<u>EACH</u>
<u>ITEM 787.716</u>	<u>SPICEBUSH / 5-6 FEET</u>	<u>EACH</u>
<u>ITEM 789.333</u>	<u>BAYBERRY - NORTHERN / 2-3 FEET</u>	<u>EACH</u>
<u>ITEM 789.335</u>	<u>BAYBERRY - NORTHERN / 3-4 FEET B &amp; B</u>	<u>EACH</u>
<u>ITEM 789.435</u>	<u>BEACH PLUM / 4-5 FEET B &amp; B</u>	<u>EACH</u>
<u>ITEM 789.633</u>	<u>BLUEBERRY - Highbush / #1</u>	<u>EACH</u>
<u>ITEM 793.445</u>	<u>ROSE – VIRGINIA / 18-24 INCH</u>	<u>EACH</u>
<u>ITEM 794.333</u>	<u>SUMAC SHRUB – FRAGRANT / 18-24” SPD</u>	<u>EACH</u>
<u>ITEM 794.343</u>	<u>SUMAC SHRUB – STAGHORN / 2-2 FEET</u>	<u>EACH</u>
<u>ITEM 795.011</u>	<u>VIBURNUM – ARROWOOD / 24-30 INCH</u>	<u>EACH</u>
<u>ITEM 795.157</u>	<u>WINTERBERRY / #3</u>	<u>EACH</u>
<u>ITEM 796.231</u>	<u>SWITCH GRASS / 1 GAL</u>	<u>EACH</u>
<u>ITEM 796.341</u>	<u>NORTHERN SEA OATS / 1 GAL</u>	<u>EACH</u>
<u>ITEM 796.501</u>	<u>DAFFODIL / BULB</u>	<u>EACH</u>

The work under these items shall conform to the relevant provisions of the American Nursery Standards and Section 771 of the Standard Specifications and the following:

The work shall include furnishing and installing all plantings as shown on the Plans. The work shall include excavation of pits, furnishing and placing of planting mix, mulches, fertilizer and all other pertinent materials as described in Section 771 of the Standard Specification or as defined in the details.

The Contractor shall provide and install plant material of genus, species, variety, size and quantities in locations as directed on the plans or as directed by the Engineer.

DAFFODIL BULB PLANTING

Prepare bulb planting bed by application of fertilizers and pH-altering amendments per soil testing agency recommendations and thoroughly incorporate into the top 12 in. prior to planting bulbs.

Bulbs shall be planted at spacing indicated on the Drawings.

Bulbs shall be planted at a depth equal to 3 times the height of the bulb.

After bulbs are placed, cover halfway with planting soil, water thoroughly, then cover completely with planting soil and water again.

MAINTENANCE MANUAL

The contractor shall submit a written manual prepared for the Owner that outlines a schedule for proper maintenance of the plantings. This maintenance schedule shall include timing and methods for watering, fertilization, mulching, pruning, and other maintenance operations.



## MATERIALS

Plant materials: Unless otherwise directed, plant sizes, species, and specific varieties shall be as shown on the plans. All plants shall be in conformance with Section 771 of the Supplemental Standard Specifications.

## INSTALLATION

No planting shall be installed until after the completion of installation of all piping and conduit for irrigation and other utilities.

The limits of planting beds shall be laid out as indicated on the Drawings, and as approved in the field by the Engineer. Where the limits of planting beds are indicated as smoothly curving lines on the Drawings, the smoothly curved limits shall be field marked using marking paint for review.

The Contractor shall notify the Engineer a minimum of five (5) days in advance of anticipated dates of plant delivery and layout for inspection and approval.

Construction methods shall be per the MassDOT Standard Specification for planting. Warranty for all plants shall be at minimum two years from installation, but may extend to end of contract, whichever is later. Inspection and replacement of plantings as required shall occur at least twice. Interim inspection of planting shall occur in the early fall after spring plantings and in the early spring after fall plantings.

## **METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

Measurement and payment for planting items listed shall be in accordance with Sections 771.80 and 771.81.

### **ITEM 804.3**

### **3-INCH ELECTRICAL CONDUIT** **TYPE NM PLASTIC (UL)**

### **FOOT**

The work under this Item shall conform to the relevant provisions of Section 801 of the Standard Specifications and the following:

The work shall include the furnishing and installation of 3-inch non-metallic conduit for the RRFB system (Item 824.401) in accordance with the plans and as directed by the Engineer.

The conduit material shall be Schedule 80 polyvinyl chloride (PVC) plastic conduit.

The length of conduit estimated under this Item is not guaranteed by the Engineer; it may be increased or decreased by the Engineer depending upon actual conditions encountered as provided for in Section 4.06 of the Standard Specifications.

Where conduit is installed in existing sidewalk or paved median areas to remain, the work shall include replacement of the gravel base material and the surface pavement to match preconstruction conditions. No separate payment will be made for this work, but all costs in connection therewith shall be included in the unit price bid.

Metallic warning tape shall be placed above the conduit as shown on the Construction Details.

**Measurement and Payment**

Item 804.03 will be measured and paid for at the Contract unit price per foot, which price shall include sawcutting, excavation, ordinary borrow, gravel borrow, control density fill, metallic warning tape, sand bedding, all labor, materials, equipment, and incidental costs required to complete the work.

Hot mix asphalt trench patching will be paid for under Item 451. - HMA for Patching.

**ITEM 824.211**    **RECTANGULAR RAPID FLASHING BEACON (SOLAR)**    **LUMP SUM**  
**LOCATION NO. 1**

**ITEM 824.212**    **RECTANGULAR RAPID FLASHING BEACON (SOLAR)**    **LUMP SUM**  
**LOCATION NO. 2**

**ITEM 824.213**    **RECTANGULAR RAPID FLASHING BEACON (SOLAR)**    **LUMP SUM**  
**LOCATION NO. 3**

Work under these items shall conform to the relevant provisions of Section 800 of the Standard Specifications, the 2009 Manual on Uniform Traffic Control Devices (MUTCD), and the following:

The work shall include the furnishing and installation of part or all of the following items: side-of- post mounted control cabinets; dual rectangular yellow LED beacons in NEMA enclosures; traffic signal posts with foundations; APS pedestrian push buttons; batteries; solar panels; wireless radios; all cable and wiring; ground rods, equipment grounding and bonding; signs; and all other equipment, materials and incidental costs necessary to provide complete, fully operational solar-powered, pedestrian actuated, rectangular rapid flashing beacon (RRFB) systems as specific herein and as shown on the plans. The locations are as follows:

- Millstone Road at Land Farm Way (Item 824.211)
- Millstone Road at Fern Lane (Item 824.212)
- Route 6A at Millstone Road (tem 824.213)

A list of major items required at these locations are included on the plans.

### **Shop Drawings**

Within 30 days following execution of the Contract, the Contractor shall submit shop drawings for beacon supports, signs, a list of equipment, and manufacturer's equipment specifications to the Engineer in accordance with the relevant provisions of Section 815.20.

No work shall be commenced by the Contractor until approval of the shop drawings and manufacturer's data has been received in writing from the Engineer. Approval of these drawings will be general in character and shall not relieve the Contractor from the responsibility of, or the necessity of, furnishing materials and workmanship conforming to the plans and specifications.

The Design Consultant shall return the shop drawings within 15 days from the date of receipt from the Engineer.

The Contractor shall deliver to the Engineer a certificate of compliance with the manufacturer for all materials purchased from the manufacturer.

### **Test Pits**

Test pits to locate underground structures and utilities, shall be excavated only at the locations, dimensions and depths directed by the Engineer.

## **Equipment Bonding**

Special purpose bonding wire shall be No. 8 AWG or larger conforming to the requirements of ASTM B-3.

## **Materials**

Each of the RRFB systems shall, at a minimum, consist of the following items:

- (2) 15' Traffic signal posts with foundations;
- (2) APS pushbutton systems with R10-25 signs;
- (4) dual rectangular yellow LED beacons in NEMA enclosures;
- (2) 9"x12" R10-25 (PUSH BUTTON TO TURN ON WARNING LIGHTS) signs;
- (4) 30"x30" W11-2 signs;
- (2) 24"x12" W16-7pL (DIAGONAL ARROW) signs;
- (2) 24"x12" W16-7pR (DIAGONAL ARROW) signs;
- (2) SP-1 signs
- (2) solar panels;
- (2) NEMA Type 3R or higher enclosures to house:
  - Electrical components, including wiring and solid-state circuit boards;
  - On-board user interface;
  - Battery; and
  - Frequency hopping spread spectrum (or other alternate FCC approved) wireless activation unit with a minimum 150' range; and
- All mounting and supporting hardware and wiring necessary to complete a working system.

Any proprietary software required for the programming and/or operation of the system shall be included at no additional cost.

RRFB controller and LED beacons shall be listed on the MassDOT Qualified Traffic Control Equipment List.

The APS pushbutton systems shall be listed on the MassDOT Qualified Traffic Control Equipment List.

The RRFB housings shall be painted per Town standards.

The light intensity of the LED beacons during daytime conditions shall meet the minimum specifications for Class 1 yellow peak luminous intensity in the Society of Automotive Engineers (SAE) Standard J595 (Directional Flashing Optical Warning Devices for Authorized Emergency, Maintenance, and Service Vehicles) dated January 2005. An automatic signal dimming device shall be included to reduce the brilliance of the LED beacons during nighttime conditions.

A pilot light shall be integrated into the housing of the dual rectangular yellow LED beacons, facing pedestrians in the crosswalk, to provide confirmation that the RRFB is in operation.

All signs shall be MUTCD-compliant. R10-25 signs shall have a black border and legend on a white background. All sign sheeting materials shall be per Subsection 828.41.

R10-25 signs may be integrated into the APS pushbutton system as a single unit or mounted separately on Type A aluminum.

All other signs shall be Type A aluminum per Subsection 828.42.

The solar panels shall be affixed to an aluminum plate and bracket, adjustable at an angle of 45° to 60° and each assembly shall be mounted on top of the support and adjustment for maximum solar collection and optimal battery strength. The solar panel assemblies shall be rated for 90 mph wind conditions.

The batteries shall conform to Battery Council International specifications and have a capacity allowing up to 30 days of autonomy without sunlight and varying with ambient temperature and number of activations. The batteries shall be rated for a minimum lifespan of 3 years. Batteries shall be replaceable independently of other components.

The solar panels and battery shall have a minimum operating temperature range of -40° to 122°F (-40° to 50°C).

The Contractor shall provide shop drawings and calculations to confirm solar panel sizing and battery/solar energy storage will meet the functional requirements of the systems.

Components (i.e. signal posts beacon enclosures, housings) of the RRB systems shall be per MassDOT standards.

### **Functional Requirements**

The RRFB systems shall remain dark until pedestrian actuation.

Upon actuation, all LED beacons shall activate and flash in a rapidly flashing sequence. Each sequence shall last 800 milliseconds and there shall be 75 sequences per minute. The sequence shall be the same for each pair of LED beacons in an enclosure and shall be as follows:

1. The RRFB indication on the left-hand side shall be illuminated for approximately 50 milliseconds.
2. Both RRFB indications shall be dark for approximately 50 milliseconds.
3. The RRFB indication on the right-hand side shall be illuminated for approximately 50 milliseconds.
4. Both RRFB indications shall be dark for approximately 50 milliseconds.
5. The RRFB indication on the left-hand side shall be illuminated for approximately 50 milliseconds.
6. Both RRFB indications shall be dark for approximately 50 milliseconds.
7. The RRFB indication on the right-hand side shall be illuminated for approximately 50 milliseconds.
8. Both RRFB indications shall be dark for approximately 50 milliseconds.
9. Both RRFB indications shall be illuminated for approximately 50 milliseconds.
10. Both RRFB indications shall be dark for approximately 50 milliseconds.
11. Both RRFB indications shall be illuminated for approximately 50 milliseconds.
12. Both RRFB indications shall be dark for approximately 250 milliseconds.

The flash rate of each individual RRFB indication, as applied over the full flashing sequence, shall not be between 5 and 30 flashes per second.

All RRFBs within the system shall commence and cease operation simultaneously.

The length of the flashing cycle upon actuation and the minimum allowable time between actuations shall be per the plans. These settings shall be user-programmable through the on-board user interface. No-fee wireless (Wi-Fi, Bluetooth®, etc.) may be used as an alternative programming method.

The flash cycle shall be immediately initiated each and every time as a result of a pedestrian pressing the APS pushbutton, including when pedestrians press the pushbutton while the RRFBs are already flashing and when pedestrians press the pushbutton immediately after the RRFBs have ceased flashing.

### **APS Pedestrian Push Buttons**

Each APS pushbutton shall have a tactile arrow and locator tone. The tactile arrow shall be oriented to point in the direction of the crosswalk. The locator tone shall have a duration of 0.15 seconds or less and shall repeat at 1-second intervals. The locator tone shall be set 2 to 5 dBA above ambient sound, shall automatically adjust intensity, but cap at a maximum volume of 100 dBA. The tone shall be audible whenever the LED modules are not active.

Upon activation of the LED modules, a speech message shall state, “Yellow lights are flashing.” This message shall be stated twice. No vibrotactile or percussive indications shall be used.

A maximum mounting height of 42 inches above the finish sidewalk grade shall be used for pedestrian push buttons.

APS pushbuttons shall be accessible per AAB/CMR, without the use of extension brackets.

If a pushbutton is pressed before the minimum time between actuation intervals is met, a speech message shall state, “Wait,” and the locator tone shall resume until the LED modules activate.

The push button housings shall be painted per Town Standards.

### **Posts and Bases**

Signal posts and bases shall be steel shafts with transformer bases. All posts and bases shall be painted per Town standard.

Post shall be of enough length to provide seven (7) feet between the finish grade and the bottom of the supplemental downward diagonal arrow sign (W16-7p).

Base foundations shall not obstruct a sidewalk or crosswalk so that passage by physically challenged persons is impaired. Location of base shall not block an ADA/AAB-compliant pedestrian access route.

### **Construction Methods**

No work shall commence until the shop drawings for the RRFB system are approved.

Layout and design of the RRFB system shall conform to the plans.

The Contractor shall diagnose and replace any part of the pedestrian activated warning systems that are found to be defective in workmanship, material, or manner of functioning within six months of final acceptance by the Engineer. This requirement does not supersede the one-year warranty period on materials specified in Subsection 815.20.

### **System Documentation and Keys**

The Contractor shall submit to the Town two (2) copies of the operating and maintenance instructions for all equipment installed.

Two sets of wiring diagrams with both internal and external wiring for the control cabinet and all accessories as actually used in the field shall be furnished to the Town by the Contractor. All actual and potential terminal strip connections shall be shown. All identification on the wiring diagrams shall be as installed, and all field labeling shall be consistent with the diagram.

The Contractor shall also supply two (2) sets of cabinet keys to the Town.

### **Property Bounds**

The Contractor shall exercise due care when working around all property bounds which are to remain. Should any damage to a bound result from the actions of the Contractor, the bound shall be replaced and/or realigned by the Contractor as directed by the Engineer at no cost to the Town.

### **Maintenance of Rectangular Rapid Flashing Beacon**

It shall be the responsibility of the Contractor to provide all labor, equipment and material required for the total maintenance and repair of the proposed Rectangular Rapid Flashing Beacon systems equipment, including damage by automobile accidents until final completion and acceptance of the project, unless otherwise specified under Subsection 7.17 "Traffic Accommodation" of the Standard Specifications as amended, in which case Subsection 7.17 will govern.

These provisions will apply to the Rectangular Rapid Flashing Beacon location included as part of this construction Contract from the date of written notice given to the Engineer that the Contractor will work on or adjacent to the proposed Rectangular Rapid Flashing Beacon system until the date when the Town accepts the complete project. This written notice must be given

before the Contractor may proceed with any work on specified beacon locations. For the purpose of these Special Provisions, the phrase "Rectangular Rapid Flashing Beacon Equipment" is intended to include, but is not limited to, supporting structures, cabinet accessories and panels, wires, and all other ancillary electrical equipment used for traffic control.

### **Fine Tuning, Adjustment, and Testing Period**

After the Contractor has finished installing the Rectangular Rapid Flashing Beacons and has set the beacon systems to operate as specified in the Contract documents, the fine tuning, adjusting and testing period shall begin.

The Contractor shall advise the Engineer, in writing, of the date of the beginning of the fine-tuning and testing period. This period shall not start until the work at the locations are complete. During this period, the Contractor, under the direction of the Engineer, shall make necessary adjustments and tests to insure safe and efficient operation of the equipment. This period shall last for more than 30 days and the Contract completion date has taken this testing period into consideration. No request for final acceptance will be considered until successful completion of the testing period.

The Contractor shall notify the Engineer in writing of the starting date of the fine-tuning period prior to the starting date.

### **Final Inspection and Acceptance**

Upon successful completion of the 30-day testing period wherein the Rectangular Rapid Flashing Beacon installations has operated for 30 days without failure, the Contractor shall notify the Town. The Engineer will make a final inspection of the installations in the presence of the Engineer/the Town and the Contractor. An inspection check will be made to ensure that all equipment, materials, installations and operations are in accordance with the construction contract, plans and specifications.

Items to be checked will include, but not be limited to, beacon system operation, documents (wiring diagrams, as-built plans, instruction manuals, parts list, warranties, grounding test report, etc.), signs, pavement markings, and street hardware (posts, bases, housings, brackets, etc.).

The Engineer will notify the Contractor in writing of any items in which the inspection reveals that the work is incomplete, defective, or does not otherwise meet the project specifications. The Contractor shall perform the corrective actions necessary to achieve final acceptance by the Town. These corrective actions shall be done by and at the expense of the Contractor and within 15 days of the date of the inspection report, unless otherwise approved in writing by the Town.

### **Guarantee After Final Acceptance**

The Contractor shall diagnose (troubleshoot) the system and replace any part of the rectangular rapid flashing beacon equipment found to be defective in workmanship, material or manner of functioning within six months from date of final acceptance of all the installations under this Contract. This requirement does not affect the one-year warranty period on equipment specified in Subsection 815.20 of the Standard Specifications.

Upon the date of acceptance of the project by the Town, the Contractor shall turn over all guarantees and warranties to the Town.

### **Method of Measurement and Basis of Payment**

Items 824.211, 824.212, and 824.213 will be measured and paid for at the Contract LUMP SUM prices, which prices shall include all labor, material, equipment and incidental costs required to complete the work.

Warning signs (i.e. W11-2, W16-7p, W16-9p, SP-1) mounted on the signal posts with the RRFB will be paid for separately under Item 832. Warning, Regulatory and Route Marker, Aluminum Panel (Type A).



**ITEM 824.401****RECTANGULAR RAPID FLASHING BEACON  
(AC POWER) LOCATION NO. 1****LUMP SUM**

Work under this item shall conform to the relevant provisions of Section 800 of the Standard Specifications, the 2009 Manual on Uniform Traffic Control Devices (MUTCD), and the following:

The work shall include the furnishing and installation of part or all of the following items: side-of- post mounted control cabinet; signal posts and foundations; dual rectangular rapid flashing beacons; APS pedestrian push buttons; passive infrared detection system; service connection; all cable and wiring; ground rods, equipment grounding and bonding; and all other equipment, materials and incidental costs necessary to provide complete, fully operational, pedestrian actuated, rectangular rapid flashing beacon (RRFB) system as specific herein and as shown on the plans. The location is as follows:

- Millstone Road at Cape Cod Rail Trail

A list of major items required at this location is included on the plans.

**Shop Drawings**

Within 30 days following execution of the Contract, the Contractor shall submit shop drawings for beacon supports, signs, a list of equipment, and manufacturer's equipment specifications to the Engineer in accordance with the relevant provisions of Section 815.20.

No work shall be commenced by the Contractor until approval of the shop drawings and manufacturer's data has been received in writing from the Engineer. Approval of these drawings will be general in character and shall not relieve the Contractor from the responsibility of, or the necessity of, furnishing materials and workmanship conforming to the plans and specifications.

The Contractor shall deliver to the Engineer a certificate of compliance with the manufacturer for all materials purchased from the manufacturer.

**Existing Signal Equipment**

Under this item the existing RRFB system shall be maintained in operation throughout the construction period unless otherwise directed by the Engineer.

Once construction is completed and the proposed RRFB system is in operation, the existing RRFB system shall be completely removed, stacked, and delivered to the Town's maintenance facility. The Contractor shall coordinate with the Engineer to schedule drop-off time a minimum of 48-hours in advance.

**Service Connection**

The service connection shown on the plans is approximate only. The Contractor shall determine exact location from the servicing utility, arrange to complete the service connections, and be responsible for all charges incidental thereto.

On the service connection include an Eversource approved polymer concrete electric handhole which shall be placed on a 6" layer of ¾" crushed stone in conformance with Section M2.01.4 of the Standard Specifications for drainage.

The respective utility company is responsible for making the connections from the respective riser to the overhead wires.

### **Test Pits**

Test pits to locate underground structures and utilities, shall be excavated only at the locations, dimensions and depths directed by the Engineer.

### **Equipment Bonding**

Special purpose bonding wire shall be No. 8 AWG or larger conforming to the requirements of ASTM B-3.

### **Materials**

The RRFB system shall, at a minimum, consist of the following items, which shall be included in the lump sum bid items:

- (2) concrete foundations;
- (2) 15' traffic signal posts and pedestals;
- (2) APS pushbutton systems;
- (4) dual rectangular yellow LED beacons in NEMA enclosures;
- (4) 30"x30" W11-15 signs;
- (2) 24"x12" W16-7pL (DIAGONAL ARROW) signs;
- (2) 24"x12" W16-7pR (DIAGONAL ARROW) signs;
- (2) 9"x12" R10-25 (PUSH BUTTON TO TURN ON WARNING LIGHTS) signs;
- (2) 9"x12" SP-1 (WAIT FOR VEHICLES TO STOP BEFORE CROSSING) signs;
- Passive infrared activation system (4 bollards w/ foundations);
- (1) service connection;
- (1) NEMA Type 3R or higher enclosure to house:
  - Electrical components, including wiring and solid-state circuit boards;
  - On-board user interface;
- All mounting and supporting hardware and wiring necessary to complete a working system.

Any proprietary software required for the programming and/or operation of the system shall be included at no additional cost.

RRFB controller and LED beacons, APS pushbutton systems, and traffic signal posts and pedestals shall be listed on the MassDOT Qualified Traffic Control Equipment List.

The APS pushbutton systems shall be listed on the MassDOT Qualified Traffic Control Equipment List.

The RRFB housings shall be painted per Town standards.

The light intensity of the LED beacons during daytime conditions shall meet the minimum specifications for Class 1 yellow peak luminous intensity in the Society of Automotive Engineers (SAE) Standard J595 (Directional Flashing Optical Warning Devices for Authorized Emergency, Maintenance, and Service Vehicles) dated January 2005. An automatic signal dimming device shall be included to reduce the brilliance of the LED beacons during nighttime conditions.

A pilot light shall be integrated into the housing of the dual rectangular yellow LED beacons, facing pedestrians in the crosswalk, to provide confirmation that the RRFB is in operation.

All signs shall be MUTCD-compliant. R10-25 signs shall have a black border and legend on a white background. SP-1 signs shall have black border and legend on a yellow background. All sign sheeting materials shall be per Subsection 828.41.

R10-25 signs may be integrated into the APS pushbutton system as a single unit or mounted separately on Type A aluminum.

SP-1 signs shall be Type A aluminum per Subsection 828.42.

### Functional Requirements

The RRFB systems shall remain dark until pedestrian actuation.

Upon actuation, all LED beacons shall activate and flash in a rapidly flashing sequence. Each sequence shall last 800 milliseconds and there shall be 75 sequences per minute. The sequence shall be the same for each pair of LED beacons in an enclosure and shall be as follows:

13. The RRFB indication on the left-hand side shall be illuminated for approximately 50 milliseconds.
14. Both RRFB indications shall be dark for approximately 50 milliseconds.
15. The RRFB indication on the right-hand side shall be illuminated for approximately 50 milliseconds.
16. Both RRFB indications shall be dark for approximately 50 milliseconds.
17. The RRFB indication on the left-hand side shall be illuminated for approximately 50 milliseconds.
18. Both RRFB indications shall be dark for approximately 50 milliseconds.
19. The RRFB indication on the right-hand side shall be illuminated for approximately 50 milliseconds.
20. Both RRFB indications shall be dark for approximately 50 milliseconds.
21. Both RRFB indications shall be illuminated for approximately 50 milliseconds.
22. Both RRFB indications shall be dark for approximately 50 milliseconds.
23. Both RRFB indications shall be illuminated for approximately 50 milliseconds.
24. Both RRFB indications shall be dark for approximately 250 milliseconds.

The flash rate of each individual RRFB indication, as applied over the full flashing sequence, shall not be between 5 and 30 flashes per second.

All RRFBs within the system shall commence and cease operation simultaneously.

The length of the flashing cycle upon actuation and the minimum allowable time between actuations shall be per the plans. These settings shall be user-programmable through the on-board user interface. No-fee wireless (Wi-Fi, Bluetooth®, etc.) may be used as an alternative programming method.

The flash cycle shall be immediately initiated each and every time as a result of a pedestrian pressing the APS pushbutton, including when pedestrians press the pushbutton while the RRFBs are already flashing and when pedestrians press the pushbutton immediately after the RRFBs have ceased flashing.

### **APS Pedestrian Push Buttons**

Each APS pushbutton shall have a tactile arrow and locator tone. The tactile arrow shall be oriented to point in the direction of the crosswalk. The locator tone shall have a duration of 0.15 seconds or less and shall repeat at 1-second intervals. The locator tone shall be set 2 to 5 dBA above ambient sound, shall automatically adjust intensity, but cap at a maximum volume of 100 dBA. The tone shall be audible whenever the LED modules are not active.

Upon activation of the LED modules, a speech message shall state, "Yellow lights are flashing." This message shall be stated twice. No vibrotactile or percussive indications shall be used.

A maximum mounting height of 42 inches above the finish sidewalk grade shall be used for pedestrian push buttons.

If a pushbutton is pressed before the minimum time between actuation intervals is met, a speech message shall state, "Wait," and the locator tone shall resume until the LED modules activate.

The push button housings shall be painted per Town Standards.

A maximum mounting height of 42 inches above the finish sidewalk grade shall be used for pedestrian push buttons.

APS pushbuttons shall be accessible per AAB/CMR, without the use of extension brackets.

If a pushbutton is pressed before the minimum time between actuation intervals is met, a speech message shall state, "Wait," and the locator tone shall resume until the LED modules activate.

The push button housings shall be painted per Town Standards.

### **Passive Infrared Activation System**

The Contractor shall supply and install fully automatic passive pedestrian detection system as specified herein and as shown on the plans. The units supplied shall base pedestrian detection on the interruption of an internally generated infrared beam. The optical beam sensors in each bollard shall automatically activate the RRFBs upon the interruption of the beam by a person/bicyclists entering between the bollards and attempting to cross the roadway (Note: the RRFBs shall flash simultaneously when activated). Activation of the system shall not occur when a person exits the roadway through the bollards.

The Contractor shall follow all manufacturer's written instructions/recommendations and requirements related to the install. The Contractor shall submit a list of personnel that will be involved in the installation and provide certification that the technician has received factory approved/authorized training.

The passive infrared activation system shall be installed by the Contractor in accordance with the manufacturer's recommended procedure for installation.

The control cabinet shall contain a circuit breaker connected to the incoming electric service rated at a level appropriate for the system supplied.

The control equipment shall be housed in the cabinet for the RRFB systems. The control units shall be capable of supporting such functions as duration of flashing RRFBs settings.

- Duration - This timer unit shall control the amount of time, in seconds, that the RRFBs are active after a valid pedestrian call has dropped. The Timer shall automatically reset upon deactivation. The timer shall be initially set to the timr noted on the plans.
- Lock-out – This timer unit shall control the amount of time between activation of the RRFBs via pedestrian/bicyclist calls. This time shall be initially set for 0 seconds.

Each bollard shall be approximately 42” high x 8” square and shall be constructed of aluminum. The bollards shall be manufactured by LaneLight Traffic Technologies, Inc. or an approved equivalent, and conforming to these special provisions. The unit shall be factory painted flat per Town standards.

Foundations for the bollards shall be per manufacturer’s recommendation for the units supplied.

The cabinet box documentation (box prints) shall show all wiring between the passive infrared activation system and the RRFBs.

Warranty – The supplier shall provide a five-year warranty on the passive infrared activation system.

### **Posts and Bases**

Signal posts and bases shall be steel shafts with transformer bases. All posts and bases shall be painted per Town standard.

Post shall be of sufficient length to provide a distance of seven (7) feet between the finish grade and the bottom of the supplemental downward diagonal arrow sign (W16-7p).

Base foundations shall not obstruct a sidewalk or crosswalk so that passage by physically challenged persons is impaired. Location of base shall not block an ADA/AAB-compliant pedestrian access route.

### **Construction Methods**

No work shall commence until the shop drawings for the RRFB systems are approved.

Layout and design of the RRFB systems shall conform to the plans.

The Contractor shall diagnose and replace any part of the pedestrian activated warning system that are found to be defective in workmanship, material, or manner of functioning within six months of final acceptance by the Engineer. This requirement does not supersede the one-year warranty period on materials specified in Subsection 815.20.

### **System Documentation and Keys**

The Contractor shall submit to the Town two (2) copies of the operating and maintenance instructions for

all equipment installed.

Two sets of wiring diagrams with both internal and external wiring for the control cabinet and all accessories as actually used in the field shall be furnished to the Town by the Contractor. All actual and potential terminal strip connections shall be shown. All identification on the wiring diagrams shall be as installed, and all field labeling shall be consistent with the diagram.

The Contractor shall also supply two (2) sets of cabinet keys to the Town.

### **Property Bounds**

The Contractor shall exercise due care when working around all property bounds which are to remain. Should any damage to a bound result from the actions of the Contractor, the bound shall be replaced and/or realigned by the Contractor as directed by the Engineer at no cost to the Town.

### **Maintenance of Rectangular Rapid Flashing Beacon**

It shall be the responsibility of the Contractor to provide all labor, equipment and material required for the total maintenance and repair of the proposed Rectangular Rapid Flashing Beacon systems equipment, including damage by automobile accidents until final completion and acceptance of the project, unless otherwise specified under Subsection 7.17 "Traffic Accommodation" of the Standard Specifications as amended, in which case Subsection 7.17 will govern.

These provisions will apply to the Rectangular Rapid Flashing Beacon location included as part of this construction Contract from the date of written notice given to the Engineer that the Contractor will work on or adjacent to the proposed Rectangular Rapid Flashing Beacon system until the date when the Town accepts the complete project. This written notice must be given before the Contractor may proceed with any work on specified beacon locations. For the purpose of these Special Provisions, the phrase "Rectangular Rapid Flashing Beacon Equipment" is intended to include, but is not limited to, supporting structures, cabinet accessories and panels, wires, and all other ancillary electrical equipment used for traffic control.

### **Fine Tuning, Adjustment, and Testing Period**

After the Contractor has finished installing the Rectangular Rapid Flashing Beacons and has set the beacon systems to operate as specified in the Contract documents, the fine tuning, adjusting and testing period shall begin.

The Contractor shall advise the Engineer, in writing, of the date of the beginning of the fine-tuning and testing period. This period shall not start until the work at the locations are complete. During this period, the Contractor, under the direction of the Engineer, shall make necessary adjustments and tests to insure safe and efficient operation of the equipment. This period shall last for more than 30 days and the Contract completion date has taken this testing period into consideration. No request for final acceptance will be considered until successful completion of the testing period.

The Contractor shall notify the Engineer in writing of the starting date of the fine-tuning period prior to the starting date.

### **Final Inspection and Acceptance**

Upon successful completion of the 30-day testing period wherein the Rectangular Rapid Flashing Beacon installations has operated for 30 days without failure, the Contractor shall notify the Town. The Engineer will make a final inspection of the installations in the presence of the Engineer/the Town and the Contractor. An inspection check will be made to ensure that all equipment, materials, installations and operations are in accordance with the construction contract, plans and specifications.

Items to be checked will include, but not be limited to, beacon system operation, documents (wiring diagrams, as-built plans, instruction manuals, parts list, warranties, grounding test report, etc.), signs, pavement markings, and street hardware (posts, bases, housings, brackets, etc.).

The Engineer will notify the Contractor in writing of any items in which the inspection reveals that the work is incomplete, defective, or does not otherwise meet the project specifications. The Contractor shall perform the corrective actions necessary to achieve final acceptance by the Town. These corrective actions shall be done by and at the expense of the Contractor and within 15 days of the date of the inspection report, unless otherwise approved in writing by the Town.

### **Guarantee After Final Acceptance**

The Contractor shall diagnose (troubleshoot) the system and replace any part of the rectangular rapid flashing beacon equipment found to be defective in workmanship, material or manner of functioning within six months from date of final acceptance of all the installations under this Contract. This requirement does not affect the one-year warranty period on equipment specified in Subsection 815.20 of the Standard Specifications.

Upon the date of acceptance of the project by the Town, the Contractor shall turn over all guarantees and warranties to the Town.

### **Method of Measurement and Basis of Payment**

Item 824.401 will be measured and paid for at the Contract LUMP SUM price, which price shall include all labor, material, equipment and incidental costs required to complete the work.

Conduit will be paid for separately under Item 804.3, 3 Inch Electrical Conduit Type NM Plastic (UL).

Pull boxes will be paid for separately under Item 811.31, Pull Box 12 x 12 Inches – SD.031.

Warning signs (i.e. SP-1, W11-15, W16-7p) mounted on the signal posts with the RRFB will be paid for separately under Item 832. Warning, Regulatory and Route Marker, Aluminum Panel (Type A).

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**ITEM 826.7****ELECTRIC SERVICE RISER RELOCATION****EACH**

The work shall conform to the relevant provisions of Section 800 of the Standard Specifications and the following:

**Description**

The work under this item shall consist of the removal and relocation of existing underground secondary electrical services from relocated utility poles.

New utility poles will be installed by “By Others”. The contractor shall supply and install a new rigid galvanized riser pipe and sweep assembly, SCH 80 PVC conduit with sand bedding, hand-hole (polymer concrete) with  $\frac{3}{4}$ ” crushed stone (M2.01.4) bedding 6” min. below base of hand-hole, wiring and appurtenances as necessary per the latest edition of the national Electrical Code, Massachusetts Electrical Code, Utility Company Specifications and Local Codes/Guidelines to complete the service relocation.

The work shall include all excavation, sand bedding, backfill, compaction, and materials or any other requirements in accordance with the latest edition of the National Electric Code, Massachusetts Electrical Code, Utility Company Specifications and Local Codes/Guidelines.

The work associated with the disconnecting power and reconnecting power to the utilities secondary power lines should be performed at a time convenient to the property owners or tenants occupying the building. The actual time of day or evening for the disconnecting and reconnecting will be agreed upon between the Engineer, Power Company and the property owner/tenant during construction. No additional compensation shall be given for this work outside of normal work hours if required.

**Method of Measurement and Basis of Payment**

Item 826.7 will be measured and paid for at the at the contract unit price per EACH. This shall be full compensation for the furnishing of all labor, risers, sweeps, conduit, sand bedding, hand-holes w/ crushed stone bedding, wiring, and miscellaneous materials, tools and equipment associated with the work complete in place.

The work associated with the relocation of the utility poles and the transfer of the Utilities overhead primary and secondary wiring shall be the responsibility of the respective utility companies and shall not be paid for under this item.



**ITEM 852.11****TEMPORARY PEDESTRIAN BARRICADE****FOOT**

Work under this item consists of furnishing, deploying, maintaining in proper operating conditions, and removing temporary pedestrian barricades as part of a Temporary Pedestrian Access Route (TPAR) in order to guide pedestrians around a fully- or partially-closed sidewalk. These devices are intended to prevent pedestrians from entering the work area and to prevent pedestrians from inadvertently entering the vehicle travel lane by providing visual and physical separation between each space.

**MATERIALS**

The Temporary Pedestrian Barricade shall have a continuous bottom rail or edge no more than two (2) inches above the ground and eight (8) inches in height (minimum) to accommodate cane users, have a smooth and continuous hand railing along the top edge no less than 32 inches above the ground and not obstruct or project into the pedestrian path of travel. Barricade walls shall be nearly vertical and generally within the same plane.

If exposed to traffic, Temporary Pedestrian Barricades shall be crashworthy.

**CONSTRUCTION METHODS**

The Temporary Pedestrian Barricade shall be placed in an area that will provide pedestrians with a TPAR on a smooth, continuous hard surface for its entirety. The geometry and alignment of the facility shall meet the applicable requirements of the “Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities” and the Massachusetts Architectural Access Board.

The recommended width of the TPAR is 60 inches, but if constraints exist a minimum clear width of 48 inches shall be provided along its entirety. If a 60 inch width cannot be accommodated in full, a 60 inch by 60 inch passing space shall be provided every 200 feet or less along the TPAR. Turning areas shall be 60 inches by 60 inches minimum.

Lateral joints between any surfaces shall not exceed 0.5 inches. Lateral edges may be vertical up to 0.25 inches high and shall be beveled at 1V:2H between 0.25 inches and 0.5 inches.

The TPAR shall be kept clear of debris, snow, and ice and the Temporary Pedestrian Barricades and Temporary Pedestrian Curb Ramps shall not obstruct drainage.

Removal and/or resetting of Temporary Pedestrian Barricades shall be considered incidental.

**BASIS OF PAYMENT**

Payment for Temporary Pedestrian Barricades will be made at the contract price per foot installed in place, including all incidental items. This price shall include the cost of furnishing, installing, resetting, removal, and maintaining in good working condition for the duration of the project.

**ITEM 859.1**

**REFLECTORIZED DRUMS WITH SEQUENTIAL  
FLASHING WARNING LIGHTS**

**DAY**

Work under this item consists of furnishing, installing, maintaining in proper operating conditions, and removing reflectorized drums, and any necessary ballast, equipped with sequential flashing warning lights.

**Materials**

Reflectorized drums shall be listed on the MassDOT Qualified Traffic Control Equipment List.

Reflective sheeting on drums shall meet or exceed ASTM D4956 Type VIII. All drums shall be maintained in a satisfactory manner including the removal of oils, dirt, and debris that may cause reduced retroreflectivity.

The Contractor shall use one of the following sequential flashing warning light systems unless otherwise approved by the Engineer:

Empco-Lite LWCSO.  
pi-Lit® Sequential Barricade-Style Lamp; or  
Unipart Dorman SynchroGUIDE.

Sequential flashing warning lights shall be secured to reflectorized drums per the light manufacturer's specifications.

**Construction Methods**

The first ten (10) drums in any merging or shifting taper as designated in the Temporary Traffic Control Plan shall be equipped with sequential flashing warning lights. These lights shall be operating, at a minimum, between dusk and dawn when the taper is deployed.

The successive flashing of the sequential warning lights shall occur from the upstream end of the merging or shifting taper to the downstream end of the taper in order to identify the desired vehicle path. Each warning light in the sequence shall be flashed at a rate of not less than 55, nor more than 75 times per minute.

Warning lights shall be powered off when drums are not deployed in a taper.

**METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

A group of ten (10) reflectorized drums with sequential flashing warning lights is considered one (1) unit and will be measured by the day. Each period of up to 24 hours during which this unit is in use will be measured as one day regardless of the number of times that the drums are positioned, repositioned, removed, or returned to service.

Reflectorized Drums with Sequential Flashing Warning Lights will be paid for at the contract unit price per day, which shall include full compensation for furnishing, positioning, repositioning, and removing the group of ten (10) drums as directed by the Engineer.

**ITEM 861.104      4 INCH REFLECTORIZED YELLOW LINE (PAINTED)      FOOT**

The work under this item shall conform to the relevant provisions of Section 860 of the Standard Specifications and the following:

All permanent pavement markings supplied under this item shall conform to the applicable MassDOT's standards for 6 Inch ReflectORIZED Yellow Line (Painted).

The work under these items shall consist of providing, installing, maintaining the 4-inch reflectORIZED yellow (painted) lines for the single yellow center lines on the Cape Cod Rail Trail near the roadway crossing.

**METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

Item 861.104 shall be measured and paid at the Contract unit price per foot, which price shall include all labor, materials, equipment, and incidental costs required to complete the work.

**ITEM 865.2****PAVEMENT SURFACE COATING****SQUARE FOOT**

The work under this Item shall be in accordance with Section 860 of Standard Specifications for Highways and Bridges and the following: The work under this Item shall include preparation of the paved surfaces in conjunction with the application of one or more courses of a polymer modified flexible cement surfacing material that may be used as a complete light, durable, skid resistant, composite wearing surface, or textured and colored on sections of pavement to simulate hand laid brick and/or conventional masonry where shown on the plans or as directed by the Engineer.

This work shall be for the proposed Cape Cod Rail Trail splitter islands and proposed crosswalks and for surface areas labeled as “stamped pavement” and “pvmnt surface coating” on the plans. The color shall be brick red, gray background, and the pattern shall be standard size brick arranged in a running bond, brick orientation.

**Preparation**

The areas to be surfaced with the specified material(s) must be structurally sound and may consist of either asphalt or cement concrete. When these material(s) are intended for application on a newly paved asphalt surface a curing period will be required to ensure that no concentration of oils are present. A suitable approved pavement heater may be employed to expedite curing when a delayed work schedule is not advisable.

Surface preparation will then be performed in the following general manner:

The pavement surface is to be thoroughly cleaned by approved methods removing all contaminants that may prevent proper adhesion of the new surfacing material(s). A suitable approved pavement heater shall be employed where surface oils, fuel and the like exist on the surface, to remove these incompatible materials. New bituminous concrete shall be added as necessary, thermally bonded to the pavement and compacted to achieve a density equal to the surrounding or adjacent pavement. No work shall be initiated until the surface condition conforms to manufacturer recommended standards for both structure and cleanliness.

All applications shall be installed in a neat and uniform manner by approved methods. The Contractor will be responsible for furnishing and placing a sufficient number of safety cones together with caution tape to adequately protect all work zones, and to insure the orderly flow of vehicular and pedestrian traffic.

Residues resulting from this element of the work shall be immediately removed from the jobsite(s) and must be disposed of in a proper manner. There will be no additional compensation for the disposal of excess or unused materials. Pavement sections where the surfacing work is incomplete must be left in a neat and clean condition, satisfactory to the Engineer at the end of each workday.

**Installation**

Contractor shall be responsible for the preparation, placement and patterning of the polymer modified flexible concrete surfacing material(s) for all applications according to the manufacturer's guidelines and subject to the approval of the Engineer. When required, this composite paving material shall be uniformly and homogeneously formulated with color stable pigments and surface textured to simulate hand laid brick and/or masonry.

A simulated mockup consisting of the color(s) and pattern(s) as selected by the Engineer and the Town, will be constructed, within a designated section of the overall work area, at least five working (5) days prior to the initiation of this phase of construction. The mockup site will be determined by the Engineer. Weather permitting and only with approval of the completed sample section, the work shall begin. The cost of the mockup shall be included in the unit price for this item and shall encompass a minimum surface area of 3'x3'.

A working knowledge of the specialized technology contained within these specifications is required. Only certified applicators may be employed for this work. In the event that this material and/or surfacing system constitutes, or is claimed to constitute proprietary technology subject to U.S. Patent protection, the Contractor will be required to furnish written evidence satisfactory to the Owner that he/she is an accredited, authorized and/or licensed installer of the patented material/process.

The installation phase of this work shall be performed in the following general manner:

Using manufacturer prescribed methods and equipment as described herein, the Contractor shall properly blend and mix the water, polymer modified cement, aggregate and pigments (color will be selected by the Town) to achieve the desired consistency. The polymer shall be an acrylic based material furnished in an aqueous emulsified state to prevent the loss of internal strength and bond which may result in cohesive and adhesive failure. The measuring and mixing operation shall be capable of producing a workable, consistent, homogeneous mixture for the intended application. Only then shall the Contractor apply the composite to the surface of a hardened, structurally sound bituminous concrete pavement as directed. Using specialized equipment and tools as necessary the desired ultra-thin composite mixture shall be sufficiently and uniformly applied to the surface. The finished material must be capable of being spread to a consistent build thickness of as little as .0625 inches per layer. Segregation of the mixed material shall be avoided. Should this condition present itself the material and/or application must be corrected immediately or replaced, as determined by the Engineer. When this newly constructed ultra-thin finish is applied over bituminous concrete it shall provide a flexible, fuel, skid and UV resistant surface, which results in a reduction of susceptibility to natural oxidation.

No material shall be applied when precipitation is present or imminent inclement weather will prevent proper curing. No material may be allowed to exceed the workability limitations of the composite mixture.

Hand applications will be utilized for smaller sections when a color distinction and/or surface pattern is required. Patterned applications intended to resemble masonry will be constructed in two (2) layers and colors in accordance with the design drawings or as otherwise directed by the Town. Finish patterns and colors may only be applied after the first course has adequately cured.

Once the newly finished surfaces have cured sufficiently, the application area may be opened to vehicular and/or pedestrian traffic. Any residue resulting from this work shall be removed and disposed of in a proper manner. The completed work area is to be left in a neat and clean condition, satisfactory to the Engineer.

The Contractor shall take reasonable precautions and steps during construction to prevent bodily harm or injury or damage to adjacent structures such as curbing, sidewalks, drainage, or water supply facilities. If during the execution of the work, the Contractor, through willfulness or carelessness, permits or causes any damage to public or private property, the cost of repair or replacement shall be the responsibility of the Contractor at no expense to the Town.

The Contractor shall maintain minimum eleven (11) foot vehicular travel lanes at all times during this operation unless otherwise approved.

**MATERIALS**

The composite material(s) used for this polymer modified thin surfacing system must support a documented performance history satisfactory to the Towns and DCR that is compatible with the functions and characteristics detailed within these specifications. This material must also be able to demonstrate long term adhesion, flexibility and abrasion resistance characteristics, scrub ability, as well as color stability, chemical and fuel resistance.

The Contractor will be required to furnish to the Engineer five (5) applications that have been placed on main thoroughfares, complete with contact information and locations using the material(s) as specified herein. The ultra-thin layer polymer composite(s) used on these projects must support a documented history of field performance and integrity for the type of work described herein for a minimum period of five (5) years. No waiver of this condition will be allowed.

The composite material shall be flexible with form stability which is compatible with existing bituminous pavements and be formulated using polymer modifications as necessary to suit local traffic and climate conditions. The specified polymer modified composite material(s) when mixed and cured in accordance with manufacturer's guidelines shall demonstrate the physical properties outlined in the following table.

**MATERIAL PROPERTIES**

<b><u>Physical Properties</u></b>	<b><u>Test Method</u></b>	<b><u>Minimum Test Value</u></b>
Compressive Strength	ASTM C 39	3,100 PSI
Solar Reflectivity Index	ASTM EI918 ASTM C 1549	>29
Shear Bond Adhesion	ASTM C 1583	>250 PSI
Skid Resistance (mixed)	ASTM E-274	>40
Tensile Strength	ASTM C 190	615 PSI (3.9 MPa)
Freeze-Thaw Scaling Resistance	ASTM C672-98	0

**MATERIAL COMPONENTS**

**Water.** The water used in mixing these composite(s) shall be of potable quality and free from soluble salts.

**Chemical Admixtures/pigments.** All chemical admixtures shall be introduced during the manufacturing process. Pigments may only be added on site to achieve a particular color quality or tint preference as directed.

**Surface Sealer.** A suitable approved surface sealer, if required, may be applied to the polymer modified composite(s) to provide additional protection in fueling areas, or to prevent surface efflorescence when colors are utilized.

**Material Verification.** Upon request the Contractor shall provide a Certificate of Analysis (COA) for the polymer emulsion, aggregate and aggregate dry blend verifying that the materials meet the specific requirements outlined herein.

Questionable product with just cause may be subjected to all of the specified testing procedures. All material testing will be conducted by a third party independent certified laboratory acceptable to the Engineer, and will be the financial responsibility of the Contractor. Samples failing in any test category will result in immediate rejection of the material from further consideration or use and may disqualify the contractor from this phase of the work.

Material(s) furnished pursuant to this work shall not be harmful to humans or the environment and must possess a Design for the Environment (DfE) as designated by the United States Environmental Protection Agency (EPA).

No payment will be rendered for any work until a manufacturer's certificate of compliance has been furnished by the Contractor. A Material Safety Data Sheet (MSDS) will also be required before any work is initiated.

### **EQUIPMENT**

Contractor must have access to and be familiar with the specialized machinery and tools necessary to perform the procedures as outlined and contained within these technical specifications. These items shall include but not be limited to dedicated surfacing equipment designed exclusively for use in applying thin layer polymer modified composite(s), appropriate trucks, air compressors, miscellaneous dispensers, mixers, applicators, heaters, cutters and/or specialized tools etc.

To ensure optimum work site efficiency and project safety considerations, multiple crews may be required when hand applications or custom patterns as described previously are necessary.

### **MOBILIZATION**

Construction of these flexible ultra-thin surfaces shall commence within twenty-four (24) hours of written notification to proceed as issued by the Contractor. Work shall commence within this timeframe without regard to the number of mobilizations that may be required by the Engineer to complete this work.

Due to the logistical complications inherent to this type of specialized construction, and given the general project size, scope, schedule and public safety concerns, the Contractor may not assume that a single mobilization will be sufficient to complete this entire phase of the work required in a safe and orderly fashion. No separate payment will be made for any additional mobilization or demobilization as may be necessary to complete the project.

### **GUARANTEE / WARRANTY**

The Contractor shall warranty all applications from defects resulting from improper workmanship and faulty or inferior materials for a minimum period of three (3) years. All defective materials and/or substandard work will be corrected or replaced within the warranty period as directed by the Engineer.

## **METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

Item 865.2 Pavement Surface Coating will be measured for payment by the Square Foot, completed in place.

Item 865.2 Pavement Surface Coating will be paid for at the Contract unit price per Square Foot, which price shall include all labor, materials, equipment, mobilization, expansion joint filler, mockup and incidental costs required to complete this work including ancillary preparation of the pavement. No payment deductions will be made for structures within the work area such as light foundations, pull boxes, manholes, catch basins or water covers.



**ITEM 868.04**                      **4 INCH REFLECTORIZED**                      **FOOT**  
**WHITE LINE (EPOXY)**

**ITEM 868.12**                      **12 INCH REFLECTORIZED**                      **FOOT**  
**WHITE LINE (EPOXY)**

**ITEM 869.04**                      **4 INCH REFLECTORIZED**                      **FOOT**  
**YELLOW LINE (EPOXY)**

Work under these items shall conform to the relevant provisions of Section 860 of the Standard Specifications and the following:

Work under these items shall include furnishing and installing white and yellow epoxy reflectorized pavement striping material that is sprayed onto the pavement. Following a surface application of glass beads and upon drying, the resultant marking is a reflectorized stripe of specified thickness and width, that is capable of resisting deformation by traffic.

**Material Requirements**

*A. Regular-Dry Epoxy Suggested Suppliers*

BRAND NAME	SUPPLIER/LOCATION
Epoplex LS50	Epoplex - Stonhard Inc. Maple Shade, NJ
Hotline TM 8212 (Part A White) Hotline TM 8213 (part A Yellow) Hotline TM 8214 (Part B Hardener or Converter)	Baltimore Paint and Chemical Co. Division of Sherwin- Williams Baltimore, MD Edison, NJ
Lumiline, Lumiline II	Accent Stripe, Inc. Orchard Park, NY
Poly-Carb Mark 5.3	Poly-Carb Inc. Solon, OH
Super Lifeline II, III	Linear Dynamics Ball Ground, GA
Thermopoxy Series 100 Part A (Series 101 White) Part A (Series 102 Yellow) Part B (Series 103)	Technical Coatings Corp. Alpharetta, GA

## B. Epoxy Material

### 1. Composition

The epoxy resin composition shall be specifically formulated for use as a pavement marking material and for hot-spray application at elevated temperatures. The type and amounts of epoxy resins and curing agents shall be at the option of the manufacturer, providing the other composition and physical requirements of this specification are met.

The epoxy marking material shall be two-component (Part A and Part B), 100% solids type system formulated and designed to provide a simple volumetric mixing ratio (e.g. two volumes of Part A to one volume of Part B).

The epoxy marking material shall be supplied as either a regular-dry or a slow-dry material. Regular-dry may be used for all marking patterns. Slow-dry material is intended for marking hatchlines, edgelines, and other marking patterns located out of the general path of traffic.

All acceptances of uninstalled epoxy marking material shall expire six (6) months after the date of manufacture.

Part A of both white and yellow shall conform to the following requirements:

#### **PERCENT BY WEIGHT OF PART A .**

WHITE Pigment - 18 Minimum, Titanium Dioxide (ASTM D476, Type II)  
Epoxy Resin - 75 to 82

YELLOW Pigment - 18 Minimum, Titanium Dioxide (ASTM D476, Type II)  
5 Minimum, Organic Yellow,  
Epoxy Resin – 73 to 77

The entire pigment composition shall consist of either titanium dioxide or titanium dioxide and organic yellow. No extender pigments are permitted. Yellow pigment shall be lead-free.

The epoxy content of the epoxy resin in Part A will be tested in accordance with ASTM D 1652 and calculated as the weight per epoxy equivalent (WPE) for both white and yellow. The epoxy content will be determined on a pigment free basis. The epoxy content (WPE) shall meet a target value provided by the manufacturer and approved by the Department. A  $\pm 50$  tolerance will be applied to the target value to establish the acceptance range.

The amine value of Part B shall be tested in accordance with ASTM D2074(2) to determine its total amine value. The total amine shall meet a target value provided by the manufacturer and approved by the Department. A  $\pm 50$  tolerance will be applied to the target value to establish the acceptance range. The manufacturer may specify an alternate test method for determining the amine value subject to the approval of the Engineer.

2. Physical Properties of Mixed Components (Part A and Part B).

Unless otherwise noted, all samples are to be prepared tested at an ambient temperature of  $23 \pm 2^\circ\text{C}$ .

a) Color.

Yellowness Index (ASTM D-1925).

- cure 72 hours after sample preparation
- Take yellow index reading, XYZ C/2°, following 72 hour cure and preceding QUV
- Maximum index before QUV: 8.0
- Place sample in QUV for 72 hours
- Maximum index after QUV: 20

Typical White Standard	Typical Yellow Standard
X78.5	X52.7
Y81.1	Y48.1
Z90.4	Z7.6
Y14.7	

b) Directional Reflectance

The white epoxy composition (without glass spheres) shall have a daylight directional reflectance of not less than 84% relative to a magnesium oxide standard when tested in accordance with ASTM E1347.

The yellow epoxy composition (without glass spheres) shall have a daylight directional reflectance of not less than 55 % relative to a magnesium oxide standard when tested in accordance with ASTM E 1347.

c) Drying Time (Laboratory)

When tested in accordance with ASTM D711 as modified below, regular-dry epoxy marking material shall reach a no-pick-up time in 30 minutes or less. Under these same test conditions, slow-dry epoxy marking material shall reach a no-pick-up time in 60 minutes or less. A Bird

Applicator or other suitable instrument shall be used to spread a nominal  $15 \pm 1$  mil thick wet film. Reflective glass spheres shall be immediately dropped onto the epoxy film at a rate of 18 pounds per gallon.

d) **Drying Time (Field)**

When installed at 77°F at the specified wet film thickness and reflectorized with glass spheres, regular-dry and slow-dry epoxy markings shall reach a no-track condition in approximately 30 minutes, and 60 minutes, respectively.

Dry to "no-tracking" shall be considered as the condition where no visual deposition of the epoxy marking to the pavement surface is observed when viewed from a distance of 50 feet, after a passenger car is passed over the line.

e) **Hardness.**

The epoxy composition when tested in accordance with ASTM D2240 shall have a Shore D hardness of between 75 and 100. Samples shall be allowed to cure for not less than 72 hours nor more than 96 hours prior to testing.

f) **Infrared Spectrophotometer Analysis (ASTM D2621)**

Samples of Part A and Part B shall be analyzed by infrared spectrography. The spectrum of each component shall be a reasonable match to the spectrum of the original formulation accepted by the Town.

*C. Reflective Glass Spheres*

Reflective glass spheres for drop-on application shall conform to the following requirements:

The glass spheres shall be colorless, clean, transparent, free from milkiness or excessive air bubbles, and essentially clean from surface scarring or scratching. They shall be spherical in shape and at least 80 % of the glass beads shall be true spheres when tested in accordance with ASTM D-1155, Procedure A. The refractive index of the spheres shall be a minimum of 1.5 as determined by the liquid immersion method at 77°F. The silica content of the glass spheres shall not be less than 60 % .The glass spheres shall have the following gradation when tested in accordance with ASTM D-1214.

## DOUBLE DROP METHOD

### TYPE I

Sieve Opening	%Retained
No. 10	0
No. 12	0-5
No. 14	5-20
No. 16	40-80
No. 18	10-40
No. 20	0-5
Pan	0-2

### TYPE II

Sieve Opening	%Retained
No. 20	0-5
No. 30	5-20
No. 50	30-50
No. 80	0-5
No. 100	0-5
Pan	0-2

The glass spheres, Type I, shall be coated with a silane-type adherence coating to enhance embedding in and adherence to the applied binder film. The coated beads shall emit a yellow-green fluorescence when tested by the Danayl Chloride test procedure. The Type II glass spheres shall be treated with a moisture-proof coating. The beads shall show no tendency to adsorb moisture in storage and shall remain free of clusters and lumps. The beads shall flow freely from the dispensing equipment at any time when surface and atmospheric conditions are satisfactory for marking operations. The moisture-resistance of the glass spheres shall be determined on the basis of the following test:

Place one kilogram of spheres in a washed cotton bag having a thread count of approximately 52 per square inch (warp and woof) and immerse the bag in a container of water for 30 seconds. Remove the bag and force excess water from the sample by squeezing the bag. Suspend and allow to drain for two hours at room temperature ( $73 \pm 2^{\circ}\text{F}$ ). Then mix the sample in the bag by shaking thoroughly. Pour the sample slowly into a clean, dry glass funnel having a stem 4 inches in length, with a 0.4 inch inside diameter stem entrance opening and a minimum exit opening of 0.25 inches. The entire sample shall flow freely through the funnel without stoppage. When first introduced into the funnel, if the spheres clog, it is permissible to lightly tap the funnel to initiate the flow.

Reflective glass spheres may be accepted at the job site on the basis of the manufacturer's certification, or they may be submitted to the Town for testing.

#### *D. Packaging and Shipment*

Epoxy pavement marking materials shall be shipped to the job site in strong, substantial containers. Individual containers shall be plainly marked with the following information:

1. Name of Product
2. Item Number
3. Lot Number
4. Batch Number
5. Test Number
6. Date of Manufacture
7. Date of Expiration of Acceptance (6 months from date of manufacture)

8. The Statement (as appropriate): "Part A - Contains Pigment and Epoxy Resin," or "Part B - Contains Catalyst"
9. Quantity
10. Mixing Proportions, Application Temperature and Instructions
11. Safety Information
12. Manufacturer's Name and Address

Reflective glass spheres shall be shipped in moisture resistant bags. Each bag shall be marked with the name and address of the manufacturer and the name and net weight of the material.

## **Equipment and Application Requirements**

### *A. Striping Equipment*

The equipment shall have a system capable of spraying the epoxy paint in the manufacturer's recommended proportions and be mounted on a truck of sufficient size and stability, and with an adequate power source to produce lines of uniform dimension and prevent application failure. It shall be capable of placing stripes on the left and right sides and of placing two intermittent lines simultaneously. It shall also be capable of applying glass beads at the rate of 25 pounds per gallon. All guns must be in full view of the operator at all times. The equipment shall be provided with a metering device to register the accumulated installed footage for each gun each day. Each vehicle shall include at least one operator who shall be a technical expert in equipment operations and epoxy application techniques.

Equipment shall have such a design that the pressure gauges for each proportioning pump are constantly visible to the operator at all times during its operation so that any fluctuation and pressure difference can be addressed immediately.

### *B. Surface Preparation*

The pavement surface on which the epoxy paint material is placed shall be clean and dry. Existing traffic markings shall be removed by blasting or grinding. The curing compound on Portland cement concrete shall also be removed. Existing markings shall be removed so that at least 95% of the underlying pavement is visible. The abrasive material shall be removed from the pavement surface before the pavement is opened to uncontrolled traffic flow.

### *C. Application*

#### 1. Epoxy -

The epoxy paint markings shall have a thickness of 25 mils  $\pm$  1mil, calculated without drop-on glass beads. All markings shall have uniform thickness with a uniform distribution of glass beads throughout the line width. The width of lines shall be as specified with a tolerance of 0.25 inch. Markings shall have sharp edges and cutoff at the ends.

2. Glass Beads -  
The glass beads shall be applied by the double drop method, which requires that Type I and Type II reflective glass spheres be injected into or dropped onto the liquid epoxy marking. Each type shall be applied simultaneously, at a minimum rate of 10 to 13 pounds per gallon of resin with a minimum total application of 25 pounds per gallon. Type I beads shall be applied first, immediately followed by Type II beads. The beads shall adhere to the cured epoxy or all marking operations shall cease until corrections are made.
3. Temperature Limitations -  
During marking operations, the pavement surface where the epoxy is to be placed shall have a minimum temperature of 40° F and the air temperature shall be at least 35° F. The pavement surface temperature, and the air temperature shall be determined at the start of each day of marking operation and at any time deemed necessary by the Engineer. The spraying temperatures shall be in accordance with the manufacturer's recommendations.
4. Application Rates -  
Application rates will be checked by the Engineer at convenient intervals by comparing tallies of materials used to the length of lines placed. For initial application and occasionally during the course of work, the Engineer may also check application to a pre-weighed sheet specifically placed for test purposes. Drop-on spheres shall not be applied in this test.
5. Protecting Newly installed Markings -  
Newly installed markings shall be protected from tracking during the setting period by one or more of the following methods:
  - a) Cone off wet lines from traffic
  - b) Use a convoy of moving vehicles to prevent traffic from crossing wet lines
  - c) Saturate lines with glass beads to prevent tracking.

### Portable Spectrophotometer for Measuring Color Specification

#### *A. Use*

Perform objective color measurements of road signs, pavement markings, barricades, and other traffic safety devices for the purpose of acceptance, approval or maintenance.

#### *B. Measurement Parameters*

Geometry: The spectrophotometer shall have a measurement geometry of 45° circumferential (illumination) and 0° (observation).

Spectral Range: The instrument shall have a spectral range of 400 to 700 nm.

Spectral Interval: The instrument shall have a spectral interval output of 20 nm. The internal computation spectral interval shall be 5nm.

Photometric Range: The instrument shall have a photometric range of 0 to 100% with a resolution of 0.01.

Standards: The instrument shall conform to the following standards:

- DIN 5033, 5036, 6174
- ISO 7724
- ASTM D2244, E308, E313, E1164

### *C. Calibration*

Calibration Standards: The instrument shall be supplied with one durable white traceable calibration standard. The instrument shall also be supplied with one black and one green durable calibration standards.

### *D. Construction*

Basic Construction: The instrument shall be rigidly constructed to maintain a fixed geometry and must not contain any foldable or collapsible parts.

Illumination: the instrument shall utilize an LED lamp system for sample illumination.

This lamp system shall consist of 30 individual LED's. There shall be 3 LED's per color oriented at 120 degrees from each other to provide accurate light control and a larger sample port size.

The illumination system shall not raise the temperature of the sample being measured either during a single measurement or during multiple, repeated measurements.

Dimensions: The instrument's physical dimensions shall be 3,75 inches wide, 3.5 inches tall and 7 inches long. The instrument shall weigh 32 ounces.

Power Source: The instrument shall be powered by four AA size alkaline, NiCd or MH batteries. The instrument shall be capable of taking at least 5000 measurements on one set of fully charged batteries.

### *E. Use and Control*

Display: The instrument shall use a 2.4 x 1.2 inch liquid crystal display, 126 x 64 pixels.

Illuminants: The instrument shall be able to measure samples with type A, C, D65, F2, F7, and F11 illuminants.

Observers: The instrument shall be able to measure samples with 2° and 10° observer.

Display Modes: The instrument shall be capable of operating in several different modes including:

- Absolute color data



- Pass/Fail
- Color difference
- Metamerism
- Spectral Curve

Color Systems: The instrument shall be capable of measuring and displaying color data with different color systems including:

- Yxy
- CIELab
- CEILCh/H
- Lab(h)
- FMC2
- XYZ
- RxRyRz

Indices: The instrument shall be capable of measuring and displaying different color indices including:

- YIE313
- YID1925
- WIE313
- CIE
- Berger
- Color Strength
- Opacity
- Metamerism MI

Color Differences: The instrument shall be able to measure and display color differences including:

- Delta E\*
- Delta E(h)
- Delta E<sub>FMC2</sub>
- Delta E<sub>94</sub>
- Delta E<sub>CMC</sub>

Data Storage: The instrument shall utilize internal, memory for storing measurement data. The instrument shall be capable of storing approximately 1000 samples. In addition, the instrument shall be capable of storing approximately 200 standards. A 15-year lithium battery shall independently power the data memory.

Data Output: The instrument shall be equipped with a data port to allow for data output directly to a printer or Windows™ applications.

*F. Equipment*

The instrument shall be equipped complete with a user's manual, batteries, carrying case, black calibration standard, white calibration standard, green calibration standard, sample area locator, PC interface cable with adapter, wrist strap, and a color theory guide.

One manufacturer of the above piece of equipment is BYK-Gardner Color Guide Portable Spectrophotometer Cat# 530160. The additional set of calibration standards may be obtained from Flint Trading, Inc., Thomasville, NC (Tel 336-475-6600).

**METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

Items 868.04, 868.12, and 869.04 will be measured and paid for at the respective Contract prices per foot, which prices shall include all labor, material, equipment and incidental costs required to complete the work.

**ITEM 874.01**  
**ITEM 874.2**

**STREET NAME SIGN – TOWN STANDARD**  
**TRAFFIC SIGN REMOVED AND RESET**

**EACH**  
**EACH**

The work under these items shall conform to the relevant provisions of Section 828 of the Standard Specifications and the following:

The Contractor shall carefully remove and reset at new locations all existing signs, attachment hardware and sign support posts not included under other sign items as shown on the drawings and as directed by the Engineer.

Street name signs shall be installed as shown on the plans and as directed by the Engineer. Final location of street signs shall be as approved by the Town.

Signs, attachment hardware and sign support posts shall be satisfactorily stored and protected until reset in the proposed work.

Signs, attachment hardware and sign support posts lost, damaged or otherwise made unsuitable for reuse while being removed, transported, stored or reset shall be replaced with new materials at no additional cost to the Owner. New attachment hardware shall be furnished and installed as necessary to replace any missing or unusable existing hardware.

Included under Item 874.2 are Warning-Regulatory and Route Marker signs, and miscellaneous directional signs and decorative street name signs.

**Method of Measurement and Basis of Payment**

Street name sign – town standard & Traffic sign removed and reset will be measured for payment as a unit, complete in place.

Street name sign – town standard & Traffic sign removed and reset will be paid for at the respective Contract unit price per each, which prices shall include all labor, material, equipment and incidental costs required to complete the work.

**ITEM 874.4****TRAFFIC SIGNS REMOVED AND STACKED****EACH**

The work under this item shall conform to the relevant provisions of Section 828 of the Standard Specifications and the following:

The work shall include the careful removal, transporting and stacking of signs, attached hardware and supports from locations shown on the plans and as directed by the Engineer.

The Contractor shall accept and hold entirely responsibility for the removal, handling and stacking at a location convenient for removal by the owner. Any signs and posts damaged or lost either directly or indirectly as a result of the Contractor's operations shall be replaced by the Contractor at no additional cost. The Contractor shall coordinate the removal of signs and posts with the Town by notifying the Town prior to and at the completion of the above work. Existing signs shall remain in place until proposed new signs are in place.

The signs shall be neatly stacked at the Brewster DPW Yard.

**Measurement and Payment**

Traffic Sign Removed and Stacked will be measured by number of signs stacked.

Traffic Sign Removed and Stacked will be paid for at the Contract unit price per each, which price shall include all labor, material, equipment and incidental costs required to complete the work.

**ITEM 999.****CONSTRUCTION STAKING****LUMP SUM**

Under this item, the Contractor shall layout and set all lines, grades, and measurements necessary for construction of the work. The Engineer shall provide information on the baseline system and elevation control available.

All staking shall be directed and performed by qualified engineering or surveying personnel who are trained, experienced and skilled in construction layout of the type required under this Contract. The Contractor shall submit the qualifications of the survey personnel to the Owner for review and approval. The Owner reserves the right to reject any personnel which, in the Owner's judgment, are not adequately qualified. The Owner also reserves the right to evaluate the performance of the survey personnel during the course of the work and to require the replacement of any personnel whose work, in the judgment of the Owner, is unsatisfactory.

The Engineer may check the layout as established by the Contractor at any time as the work progresses. The Contractor shall be informed of the results of these checks, but the Engineer by doing so in no way relieves the Contractor of his responsibility for the accuracy of the layout work. The Contractor shall correct or replace any deficient layout and construction work which may be the result of inaccuracies in the Contractor's layout at no additional cost to the Owner.

The Contractor shall obtain accurate elevations of the existing pavements and compare them with the proposed elevations shown on the drawings to determine the extent and depth of milling and/or leveling course required within the proposed pavement overlay areas.

Construction staking will be paid for at the Contract lump sum price for Item 999, which price shall include all labor, material, equipment and incidental costs required to complete the work.

**ITEM 999.1**

**POLICE DETAILS**

**ALLOWANCE**

The Contractor shall furnish police services required to direct traffic on existing roadways where traffic is maintained.

The Contractor shall provide such police officers as may be deemed necessary by either the Engineer or the Town for the direction and control of all traffic traveling within and through the project area. The police officers shall be obtained from the Town Police Department as applicable. The police officers shall be paid by the Contractor at the prevailing rate of wages established by the Town.

**METHOD OF MEASUREMENT**

Item 999.1 Police Details is measured by multiplying the number of hours estimated as necessary by the prevailing hourly rate of wages established for such services. The Contractor shall submit certified copies of itemized bills of services rendered for review and approval by the Engineer.

**Payment**

The quantity to be paid for under this item shall be the actual amount paid by the Contractor to provide satisfactory police services as stipulated and required. Any overhead costs shall be considered to be included in the prices bid for the other items of the Contract.

GENERAL ABBREVIATIONS

ABAN	ABANDON
ADJ	ADJUST
APPROX	APPROXIMATE
A.C.	ASPHALT CONCRETE
ACCM PIPE	ASPHALT COATED CORRUGATED METAL PIPE
BIT.	BITUMINOUS
BC	BOTTOM OF CURB
BD.	BOUND
BL	BASELINE
BLDG	BUILDING
BM	BENCHMARK
BO	BY OTHERS
BOS	BOTTOM OF SLOPE
BR.	BRIDGE
CC	CEMENT CONCRETE
CCM	CEMENT CONCRETE MASONRY
CEM	CEMENT
CI	CURB INLET
CLF	CHAIN LINK FENCE
CL	CENTERLINE
CO.	COUNTY
CONC	CONCRETE
CONT	CONTINUOUS / CONTINUED
CONST	CONSTRUCTION
CR GR	CROWN GRADE
DIA	DIAMETER
DWY	DRIVEWAY
ELEV (or EL.)	ELEVATION
EMB	EMBANKMENT
EOP	EDGE OF PAVEMENT
EQ	EQUAL
EXIST (or EX)	EXISTING
EXC	EXCAVATION
FDN.	FOUNDATION
FDP	FULL DEPTH PAVEMENT
FLDSTN	FIELDSTONE
GAR	GARAGE
GD	GROUND
GRAN	GRANITE
GRAV	GRAVEL
GRD	GUARD
HMA	HOT MIX ASPHALT
HOR	HORIZONTAL
HWY	HIGHWAY
JCT	JUNCTION
LOAM	LOAM BORROW
LSA	LANDSCAPED AREA
LT	LEFT
MAHWL	MEAN AVERAGE HIGH WATER LINE
MAX	MAXIMUM
MB	MAILBOX
MHB	MASSACHUSETTS HIGHWAY BOUND
MIN	MINIMUM
MOD	MODIFIED
MSE	MECHANICALLY STABILIZED EARTH
NERR	NEW ENGLAND RAILROAD
NIC	NOT IN CONTRACT
NO.	NUMBER
NTS	NOT TO SCALE
O.C.	ON CENTER
O.D.	OUTSIDE DIAMETER
P.G.L.	PROFILE GRADE LINE
PREV	PREVIOUS/PREVIOUSLY
PROJ	PROJECT
PROP	PROPOSED
PSB	PLANTABLE SOIL BORROW
PVMT	PAVEMENT
R&D	REMOVE AND DISCARD
R&R	REMOVE AND RESET
R&S	REMOVE AND STACK
RD	ROAD
RDWY	ROADWAY
REB	REBUILD
REM	REMOVE
REMOD	REMODEL
RET	RETAIN
RET WALL	RETAINING WALL
ROW	RIGHT OF WAY
RR	RAILROAD
RT	RIGHT
SB	STONE BOUND
SHLD	SHOULDER
SHLO/S.H.L.O.	STATE HIGHWAY LAYOUT LINE

GENERAL ABBREVIATIONS (CONT)

ST	STREET
STA	STATION
STD	STANDARD
SW	SIDEWALK
TEMP	TEMPORARY
TC	TOP OF CURB
TOS	TOP OF SLOPE
TRANS	TRANSITION
TRM	TURF REINFORCING MAT
TYP	TYPICAL
VAR	VARIES
VERT	VERTICAL
WCR	WHEEL CHAIR RAMP
WP	WORKING POINT
X-SECT	CROSS SECTION

UTILITY ABBREVIATIONS

CB	CATCH BASIN
CBCI	CATCH BASIN WITH CURB INLET
CIP	CAST IRON PIPE
CIT	CHANGE IN TYPE
CMP	CORRUGATED METAL PIPE
CSP	CORRUGATED STEEL PIPE
DI	DROP INLET
DIP	DUCTILE IRON PIPE
FES	FLARED END SECTION
F&C	FRAME AND COVER
F&G	FRAME AND GRATE
GG	GAS GATE
GI	GUTTER INLET
GIP	GALVANIZED IRON PIPE
HDPE	HIGH DENSITY POLYETHYLENE PIPE
HDW	HEADWALL
HYD	HYDRANT
INV	INVERT
LB	LEACHING BASIN
LG	LEACHING GALLEY
LPL	LIGHT POLE
MH	MANHOLE
MTR	METER
MW	MONITORING WELL
OHW	OVERHEAD WIRE
PED	PEDESTAL
PVC	POLYVINYLCHLORIDE PIPE
PWW	PAVED WATER WAY
RCP	REINFORCED CONCRETE PIPE
SMH	SEWER MANHOLE
TSV&B	TAPPING SLEEVE VALVE & BOX
UP	UTILITY POLE
WG	WATER GATE
WIP	WROUGHT IRON PIPE
WM	WATER METER/WATER MAIN

ALIGNMENT & GRADING ABBREVIATIONS

CC	CENTER OF CURVE
HP	HIGH POINT
I.T.	INTERSECTION OF TANGENT
LP	LOW POINT
PC	POINT OF CURVATURE
PCC	POINT OF COMPOUND CURVATURE
PI	POINT OF INTERSECTION
PNT	POINT
POC	POINT ON CURVE
POT	POINT ON TANGENT
PRC	POINT OF REVERSE CURVATURE
PT	POINT OF TANGENCY
LPT	ANGLE POINT
R	RADIUS OF CURVATURE
T	TANGENT DISTANCE OF CURVE
TAN	TANGENT
25.45	SPOT ELEVATION

PROFILE ABBREVIATIONS

AD	ALGEBRAIC DIFFERENCE IN RATES OF GRADE
HSD	HORIZONTAL SIGHT DISTANCE
K	RATE OF VERTICAL CURVATURE
L	LENGTH OF CURVE
PVC	POINT OF VERTICAL CURVATURE
PVCC	POINT OF VERTICAL COMPOUND CURVATURE
PVI	POINT OF VERTICAL INTERSECTION
PVRC	POINT OF VERTICAL REVERSE CURVATURE
PVT	POINT OF VERTICAL TANGENCY
SSD	STOPPING SIGHT DISTANCE
VC	VERTICAL CURVE

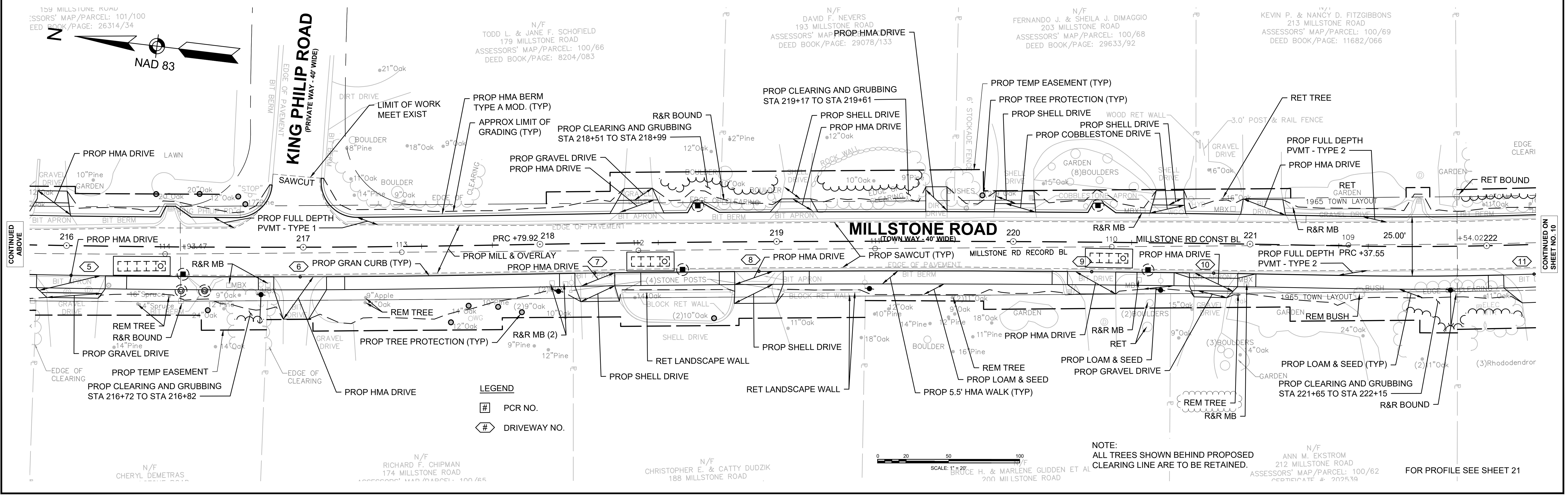
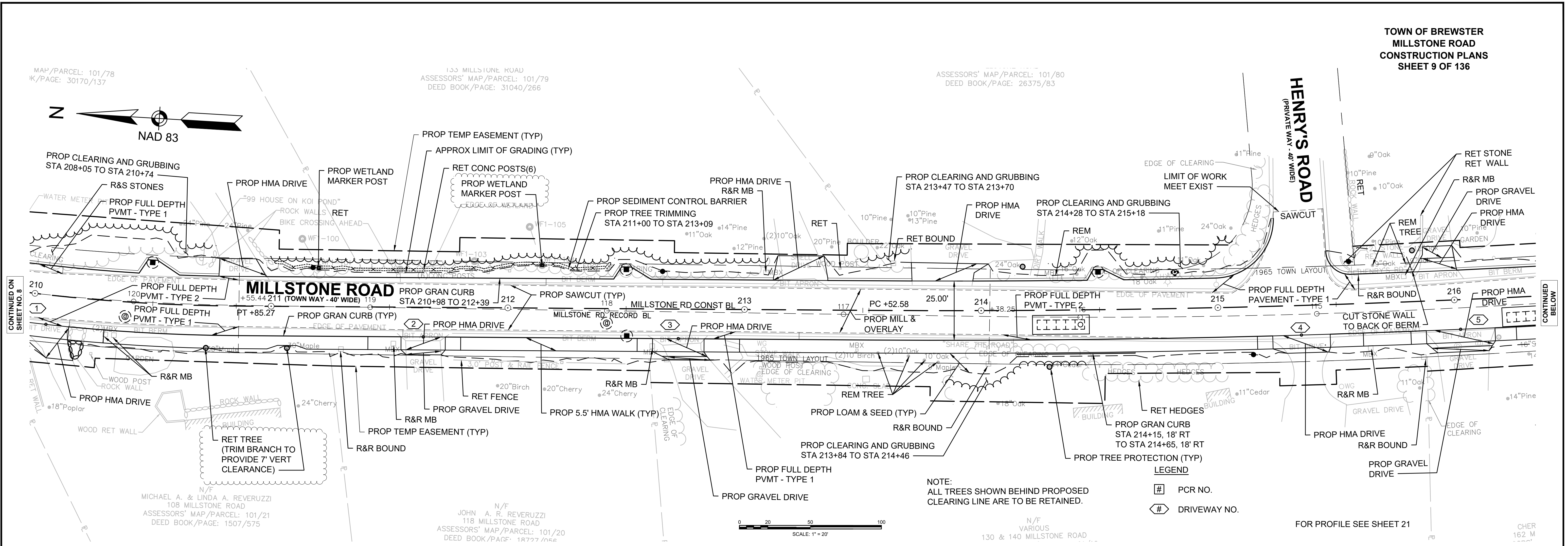
TRAFFIC & SIGNAL ABBREVIATIONS

AADT	ANNUAL AVERAGE DAILY TRAFFIC
CAB.	CABINET
CCVE	CLOSED CIRCUIT VIDEO EQUIPMENT
COND	CONDUIT
CW	CROSS WALK
DW	STEADY DON'T WALK - PORTLAND ORANGE
DHV	DESIGN HOURLY VOLUME
FDW	FLASHING DON'T WALK
FR	FLASHING CIRCULAR RED
FRL	FLASHING RED LEFT ARROW
FRR	FLASHING RED RIGHT ARROW
FY	FLASHING CIRCULAR AMBER
FYL	FLASHING AMBER LEFT ARROW
FYR	FLASHING AMBER RIGHT ARROW
G	STEADY CIRCULAR GREEN
GL	STEADY GREEN LEFT ARROW
GR	STEADY GREEN RIGHT ARROW
GSL	STEADY GREEN SLASH LEFT ARROW
GSR	STEADY GREEN SLASH RIGHT ARROW
GV	STEADY GREEN VERTICAL ARROW
HH	HAND HOLE
OL	OVERLAP
PB	PULL BOX
PED	PEDESTRIAN
PTZ	PAN, TILE, ZOOM
R	STEADY CIRCULAR RED
RL	STEADY RED LEFT ARROW
RR	STEADY RED RIGHT ARROW
SL	STOP LINE
T	TRUCK %
TS OR TR SIG	TRAFFIC SIGNAL
TSC	TRAFFIC SIGNAL CONDUIT
W	STEADY WALK
Y	STEADY CIRCULAR AMBER
YL	STEADY AMBER LEFT ARROW

GENERAL NOTES:

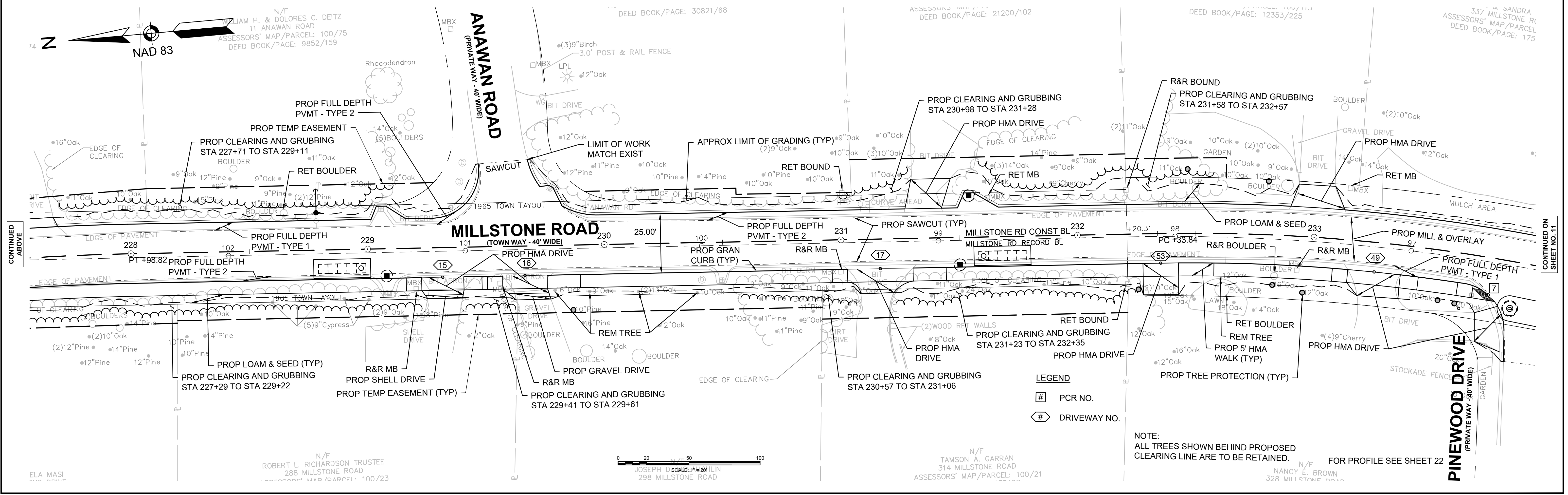
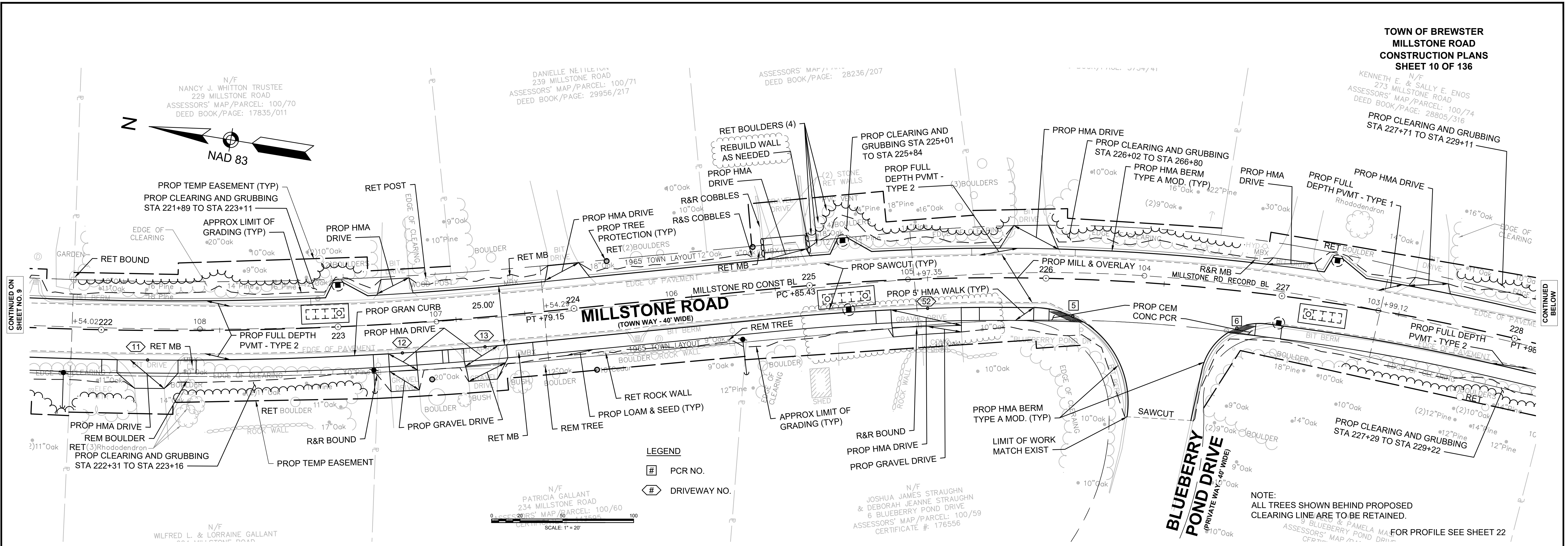
1. EXISTING CONDITIONS AND TOPOGRAPHICAL INFORMATION FROM AN ACTUAL FIELD SURVEY CONDUCTED BY J.M. O'REILLY IN JULY 2018. SUPPLEMENTED IN MAY 2024.
2. THE HORIZONTAL CONTROL IS BASED ON THE MASSACHUSETTS MAINLAND STATE PLANE COORDINATE SYSTEM AND THE NATIONAL GEODETIC SURVEY (NAD83). ALL ELEVATION IS US FEET, REFERENCED TO THE NORTH AMERICA VERTICAL DATUM OF 1988 (NAVD88).
3. THE CONTRACTOR SHALL VERIFY ALL EXISTING DIMENSIONS AND GRADES IN THE FIELD BEFORE COMMENCING WORK AND PROMPTLY NOTIFY THE ENGINEER OF ANY DISCREPANCIES.
4. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.
5. DRAINAGE ELEVATIONS ARE PROVIDED FOR DESIGN PURPOSES ONLY. THE CONTRACTOR SHALL VERIFY BY TEST PIT, THE LOCATIONS OF EXISTING UTILITIES WHICH MAY CONFLICT WITH THE PROPOSED DRAINAGE DESIGN. ANY FIELD ADJUSTMENTS REQUIRED WILL BE MADE AS APPROVED OR DIRECTED BY THE ENGINEER. ONLY AFTER THE CONTRACTOR VERIFIES ELEVATIONS FOR THE CONSTRUCTABILITY OF THE DRAINAGE SYSTEM SHALL ANY STRUCTURES BE ORDERED. ANY FIELD ADJUSTMENTS TO LINE & GRADE UP TO A DEPTH OF 5' SHALL BE INCLUDED IN THE COST OF THE PIPE. PIPE EXCAVATION GREATER THAN 5' WILL BE PAID UNDER CLASS B TRENCH EXCAVATION.
6. THE CONTRACTOR SHALL VERIFY BY TEST PIT, THE LOCATIONS OF EXISTING UTILITIES WHICH MAY CONFLICT WITH PROPOSED UTILITIES. ANY FIELD ADJUSTMENTS REQUIRED WILL BE MADE AS APPROVED OR DIRECTED BY THE ENGINEER.
7. WHERE AN EXISTING UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR, AND THE INFORMATION FURNISHED TO THE ENGINEER FOR RESOLUTION OF THE CONFLICT.
8. THE CONTRACTOR SHALL ALTER THE MASONRY OF THE TOP SECTION OF ALL EXISTING DRAINAGE AND SEWER STRUCTURES AS NECESSARY FOR CHANGES IN GRADE, AND RESET ALL WATER AND DRAINAGE FRAMES, GRATES AND BOXES TO THE PROPOSED FINISH SURFACE GRADE. REQUIRED NEW MASONRY SHALL BE CLAY BRICK.
9. THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS FOR THE ALTERATION AND ADJUSTMENT OF GAS, ELECTRIC, TELEPHONE AND ANY OTHER PRIVATE UTILITIES BY THE UTILITY COMPANIES.
10. EXISTING UTILITY POLES WILL BE RELOCATED BY OTHERS IF REQUIRED.
11. TREES AND SHRUBS WITHIN THE LIMITS OF GRADING SHALL BE REMOVED ONLY UPON APPROVAL OF THE ENGINEER.
12. AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION AT NO EXPENSE TO THE OWNER.
13. THE TERM "PROPOSED" (PROP) MEANS WORK TO BE CONSTRUCTED USING NEW MATERIALS OR, WHERE APPLICABLE, RE-USING EXISTING MATERIALS IDENTIFIED AS "REMOVE AND RESET" (R&R).
14. JOINTS BETWEEN NEW ASPHALT CONCRETE ROADWAY PAVEMENT AND SAWCUT EXISTING PAVEMENT SHALL BE SEALED WITH BITUMEN AND BACKSANDED.
15. AFTER MILLING OPERATIONS AND PRIOR TO PAVING THE SUPERPAVE INTERMEDIATE OR SURFACES COURSES THE ENGINEER SHALL EVALUATE THE MILLED SURFACE AND SHALL APPLY THE APPROPRIATE REPAIR METHOD IF REQUIRED.
16. ALL EXISTING STATE, COUNTY, AND TOWN LOCATION LINES AND PRIVATE PROPERTY LINES HAVE BEEN ESTABLISHED FROM AVAILABLE INFORMATION AND THEIR EXACT LOCATIONS ARE NOT GUARANTEED.
17. THE CONTRACTOR SHALL EXERCISE DUE CARE WHEN WORKING AROUND ALL PROPERTY BOUNDS WHICH ARE TO REMAIN. SHOULD ANY DAMAGE TO A BOUND RESULT FROM THE ACTIONS OF THE CONTRACTOR, THE CONTRACTOR SHALL HAVE THE BOUND REPLACED AND/OR REALIGNED BY A LICENSED PROFESSIONAL SURVEYOR AS DIRECTED BY THE ENGINEER AT NO ADDITIONAL COST.
18. DISPOSAL OF ALL SURPLUS MATERIAL SHALL BE AS APPROVED BY THE ENGINEER AND TOWN.
19. LATERAL DRAIN PIPES SHALL BE INSTALLED WITH A PITCH OF 0.01 FOOT PER FOOT (MINIMUM) UNLESS NOTED OTHERWISE ON THE PLANS.
20. THE CONTRACTOR SHALL COORDINATE THE NEW LOCATION OF ALL PRIVATE MAILBOXES THAT ARE TO BE REMOVED AND RESET WITH THE PROPERTY OWNER.
21. ALL ABANDONED UNDERGROUND PIPE SHALL BE CAPPED WITH A MASONRY PLUG AS INDICATED AND ABANDONED IN PLACE UNLESS NOTED OTHERWISE.
22. ALL NEW CURB CUTS ARE TO BE COORDINATED WITH OWNER AND TOWN OF BREWSTER DPW.
23. CONTRACTOR TO REPLACE ALL IRRIGATION SYSTEMS THAT ARE DISTURBED DURING CONSTRUCTION. TO BE COORDINATED WITH OWNER AND TOWN OF BREWSTER DPW.
24. THE CONTRACTOR SHALL FLAG/STAKE THE LIMIT OF CLEARING AND GRUBBING AND ALLOW 48 HOURS FOR TOWN TO REVIEW PRIOR TO START OF CLEARING OPERATIONS. THE CONTRACTOR SHALL FLAG INDIVIDUAL TREES TO BE REMOVED OUTSIDE THE CLEARING AND GRUBBING LIMITS AND ALLOW 48 HOURS FOR TOWN TO REVIEW PRIOR TO THE START OF REMOVAL OPERATIONS. THE CONTRACTOR WILL ADJUST THE CLEARING LIMITS AS DIRECTED BY THE ENGINEER AND TOWN.





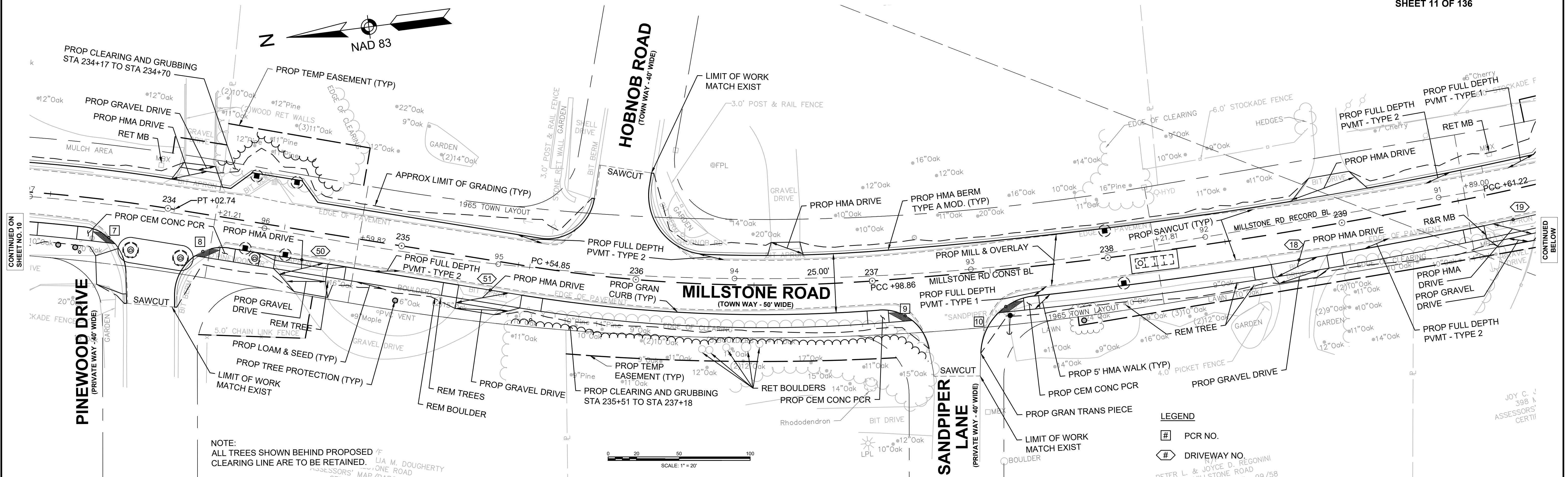


**TOWN OF BREWSTER  
MILLSTONE ROAD  
CONSTRUCTION PLANS  
SHEET 10 OF 136**

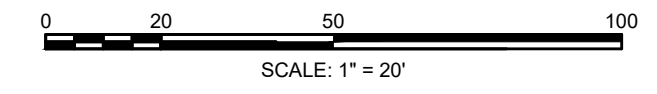


14170.00\_HDGENV.DWG  
Plotted on 3-Jul-2024 2:41 PM

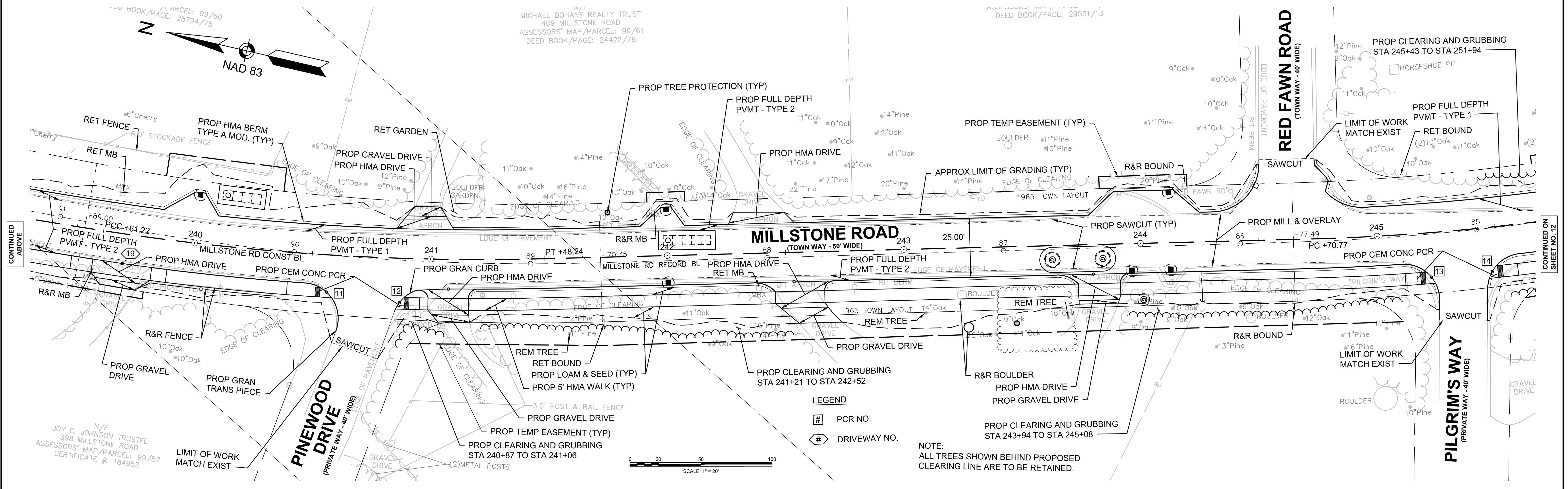




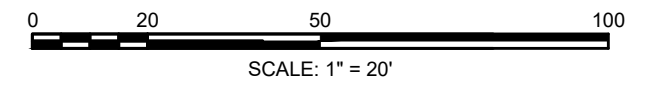
NOTE:  
ALL TREES SHOWN BEHIND PROPOSED CLEARING LINE ARE TO BE RETAINED.



**LEGEND**  
 # PCR NO.  
 # DRIVEWAY NO.

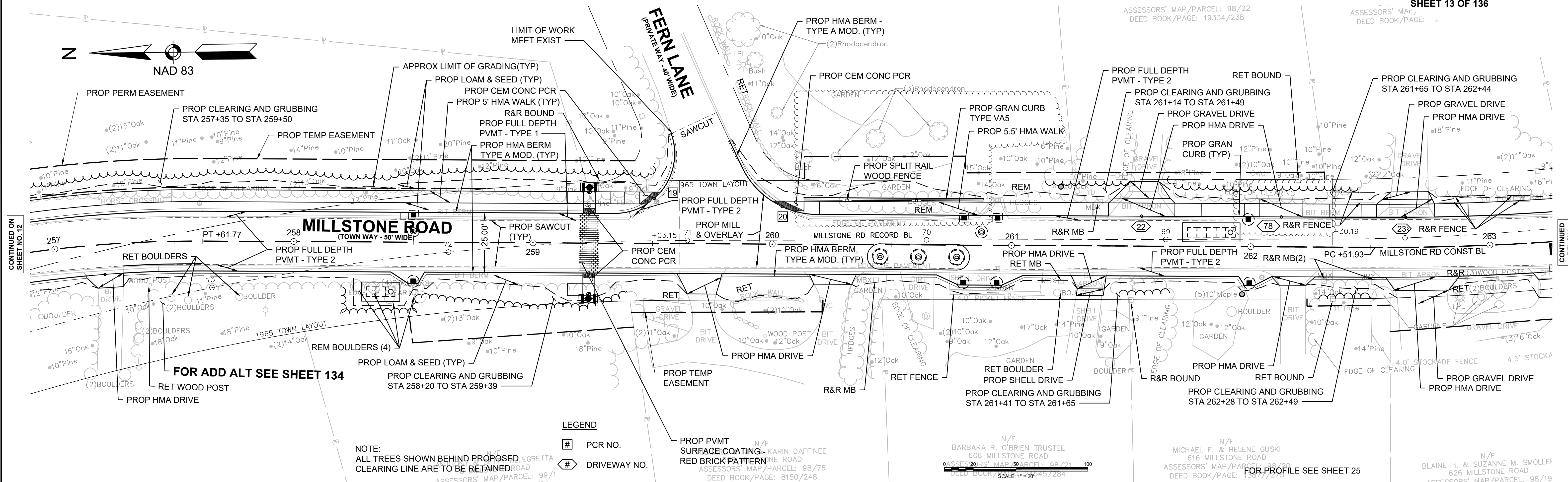


NOTE:  
ALL TREES SHOWN BEHIND PROPOSED CLEARING LINE ARE TO BE RETAINED.



**LEGEND**  
 # PCR NO.  
 # DRIVEWAY NO.



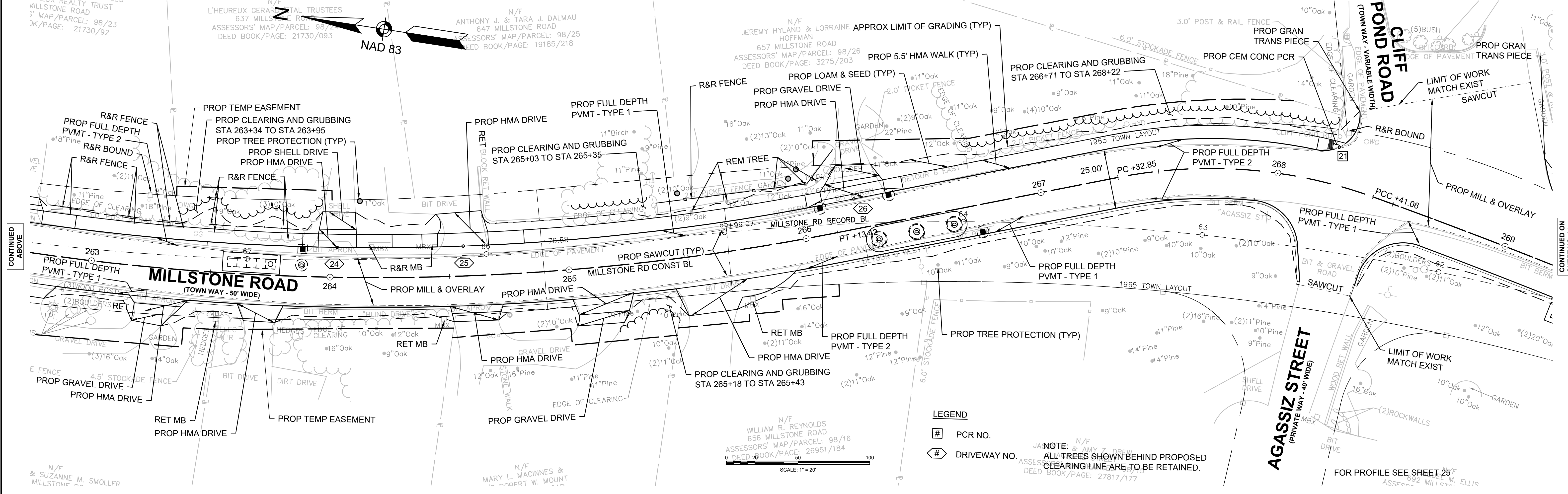
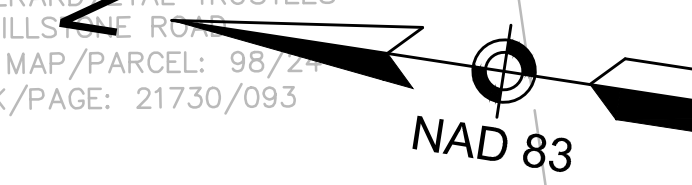


NOTE:  
ALL TREES SHOWN BEHIND PROPOSED  
CLEARING LINE ARE TO BE RETAINED.

LEGEND  
# PCR NO.  
# DRIVEWAY NO.

CONTINUED ON  
SHEET NO. 12

CONTINUED  
BELOW



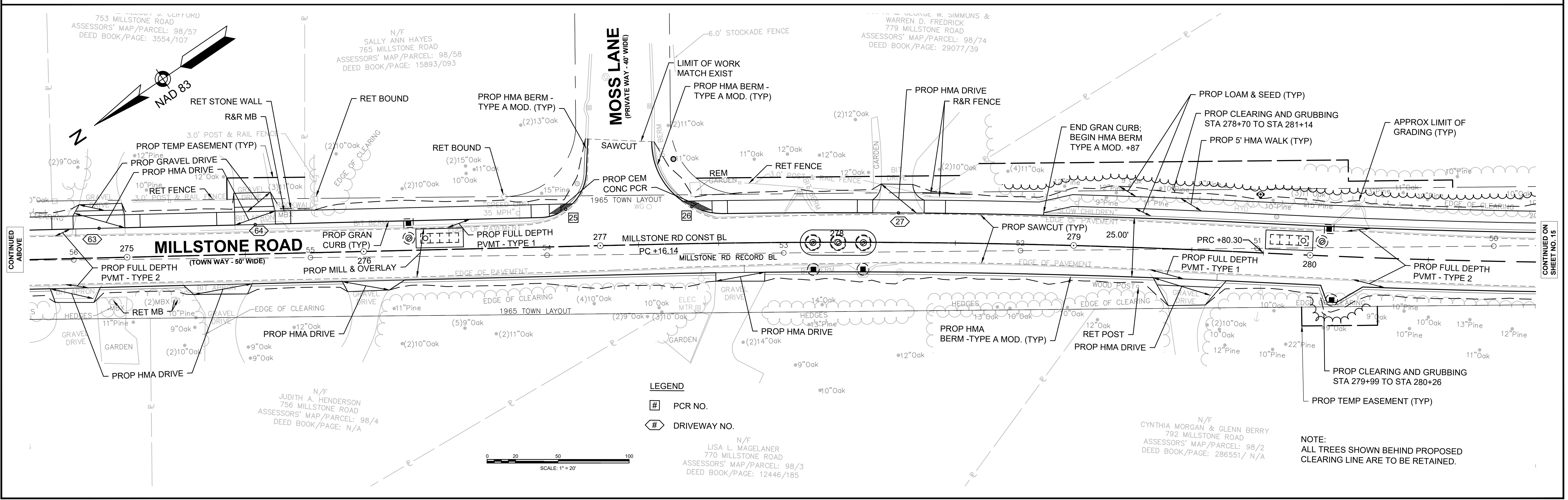
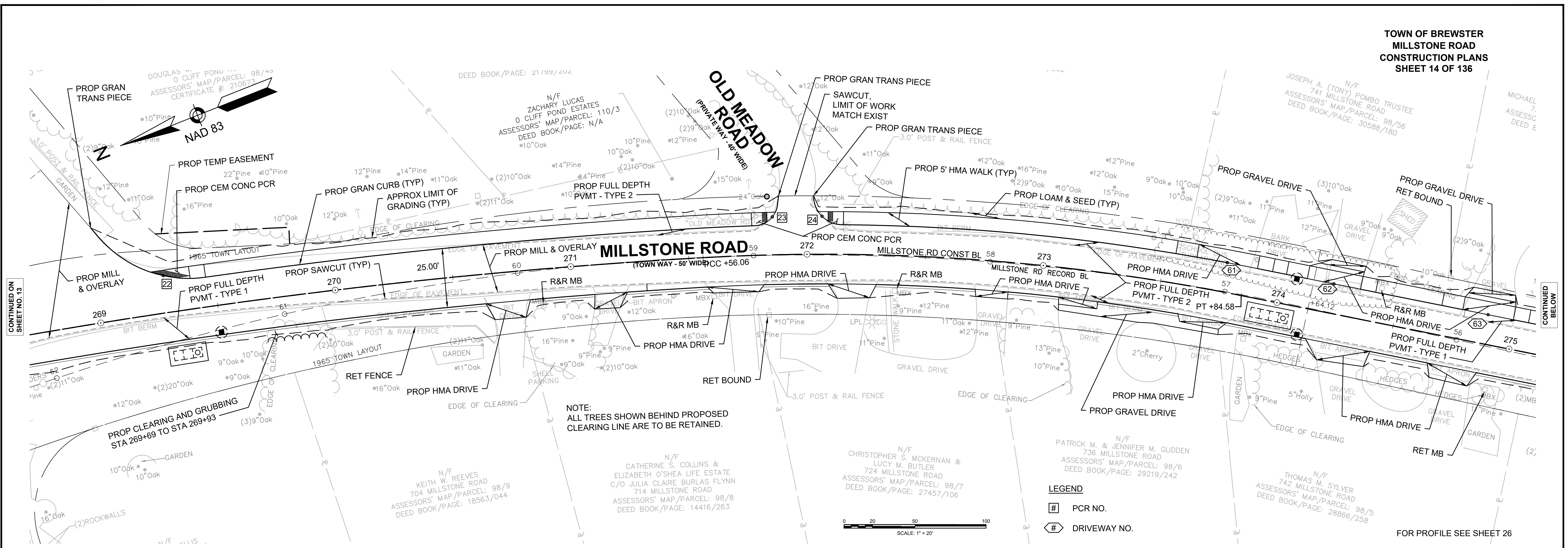
NOTE:  
ALL TREES SHOWN BEHIND PROPOSED  
CLEARING LINE ARE TO BE RETAINED.

LEGEND  
# PCR NO.  
# DRIVEWAY NO.

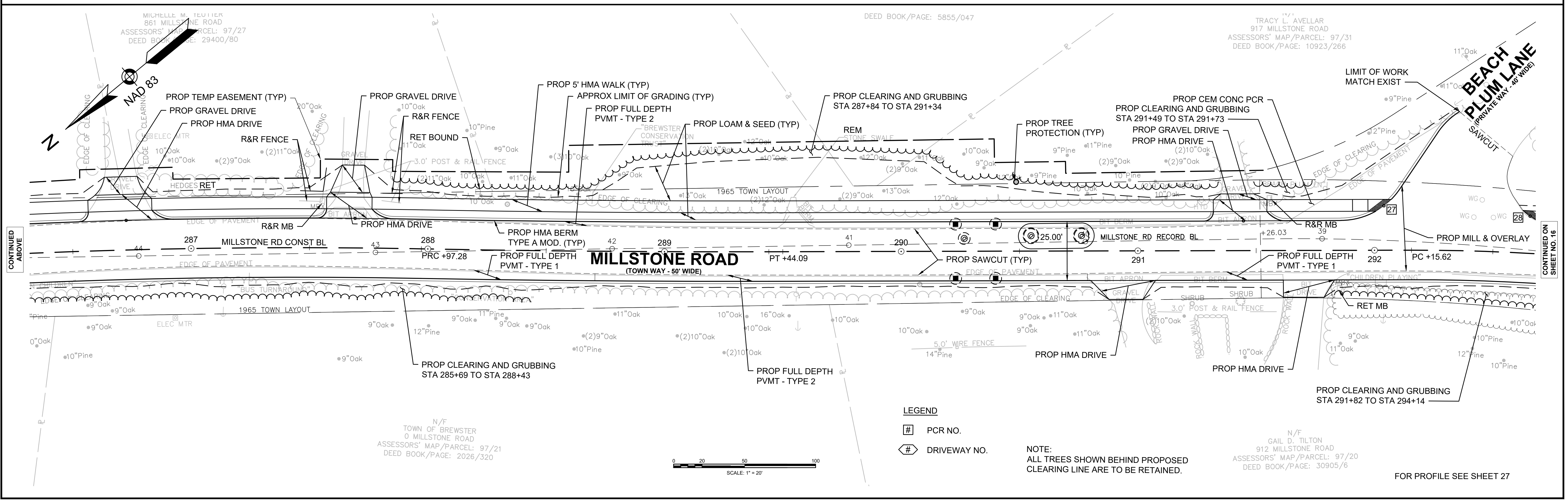
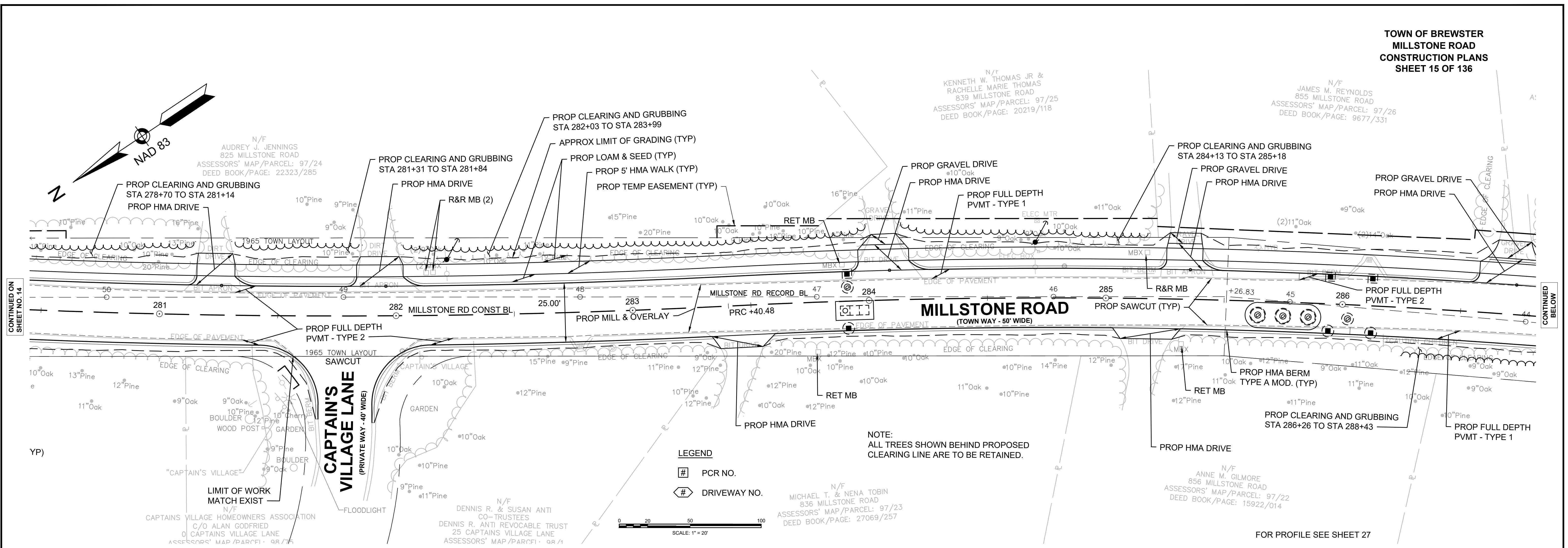
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CONTINUED ON  
SHEET NO. 14









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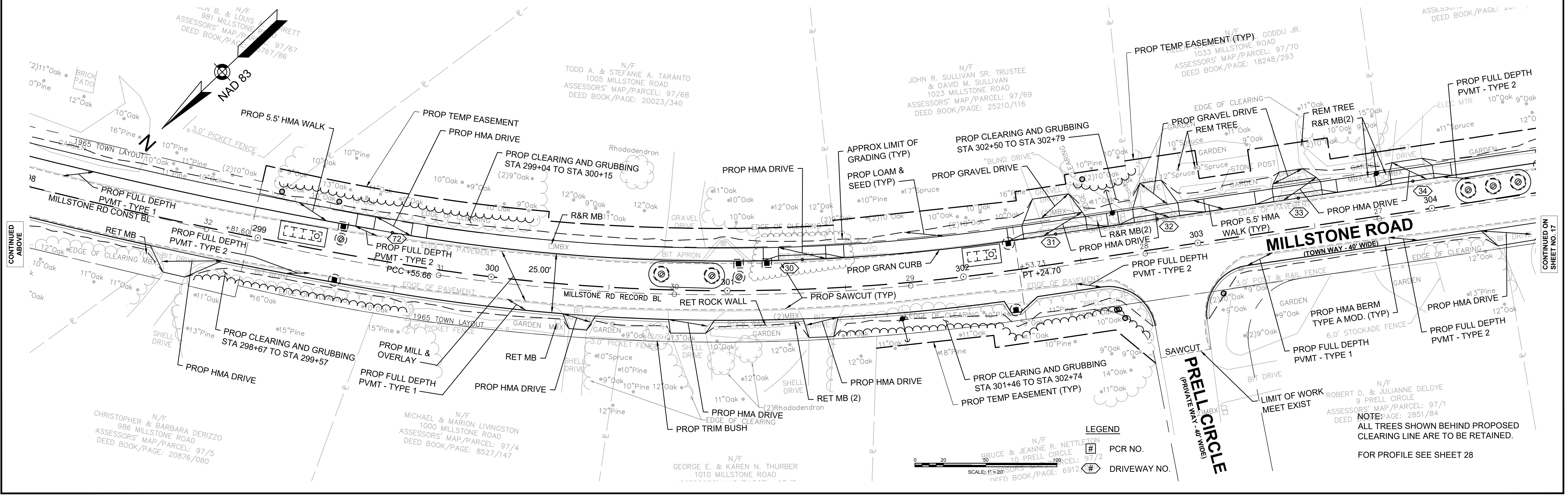
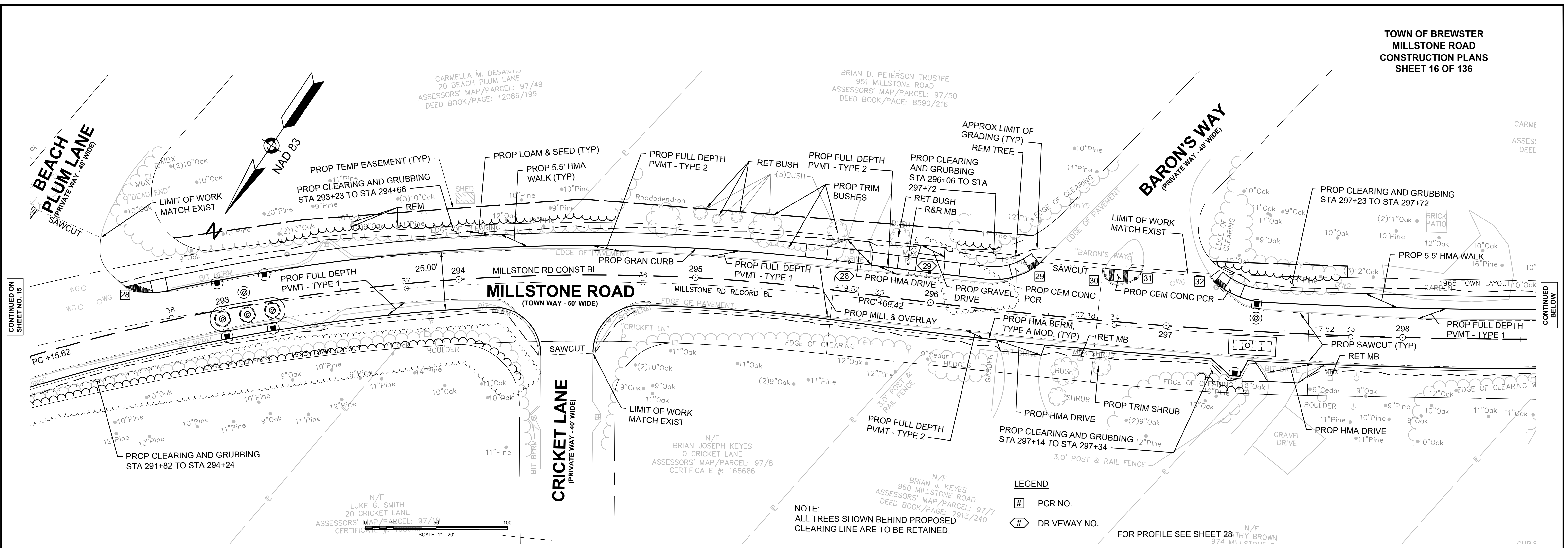
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FOR PROFILE SEE SHEET 27

FOR PROFILE SEE SHEET 27





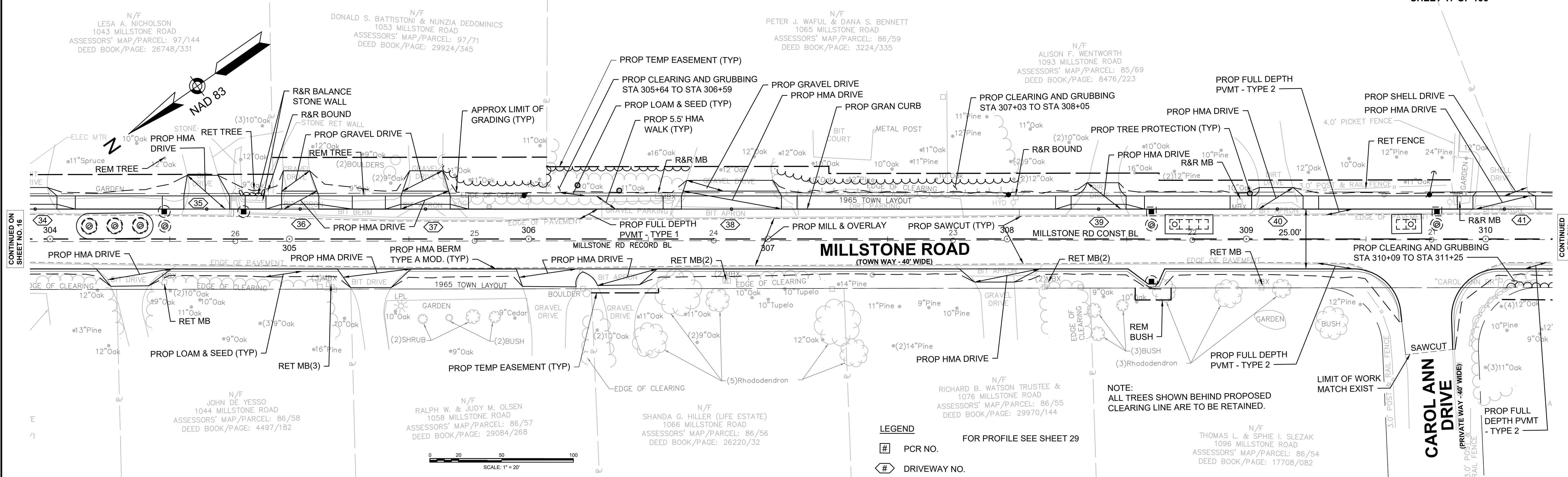
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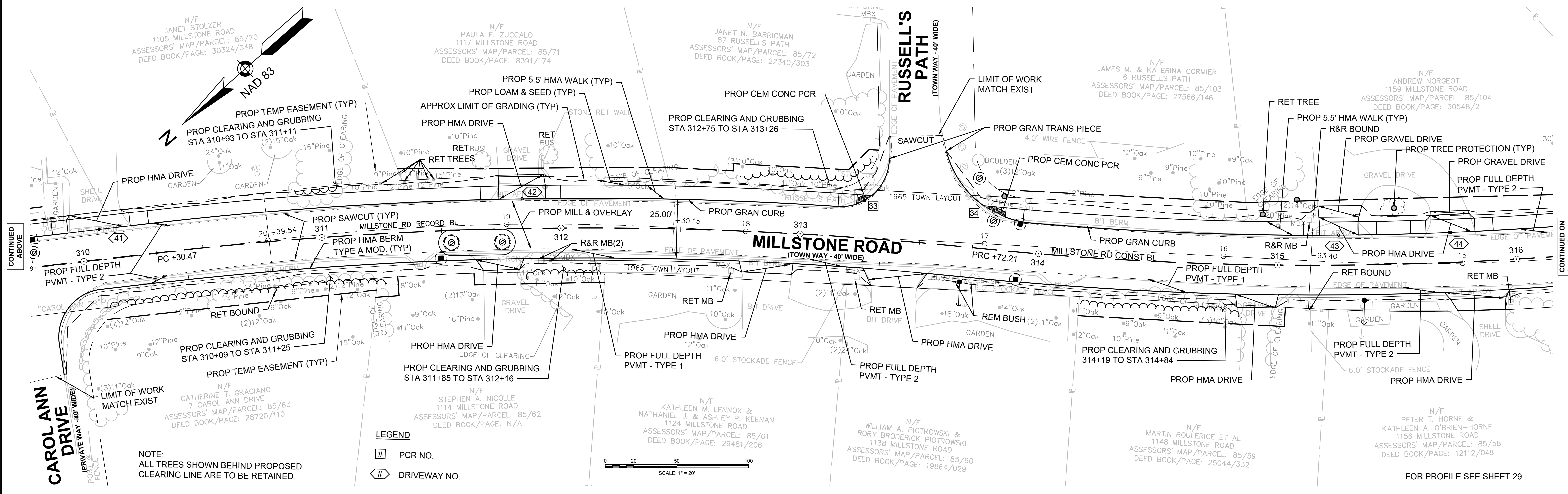
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ON  
SHEET NO. 17





CONTINUED ON  
SHEET NO. 16

CONTINUED  
BELOW



CONTINUED  
ABOVE

CONTINUED  
ON  
SHEET NO. 18

**LEGEND**  
# PCR NO.  
# DRIVEWAY NO.  
FOR PROFILE SEE SHEET 29

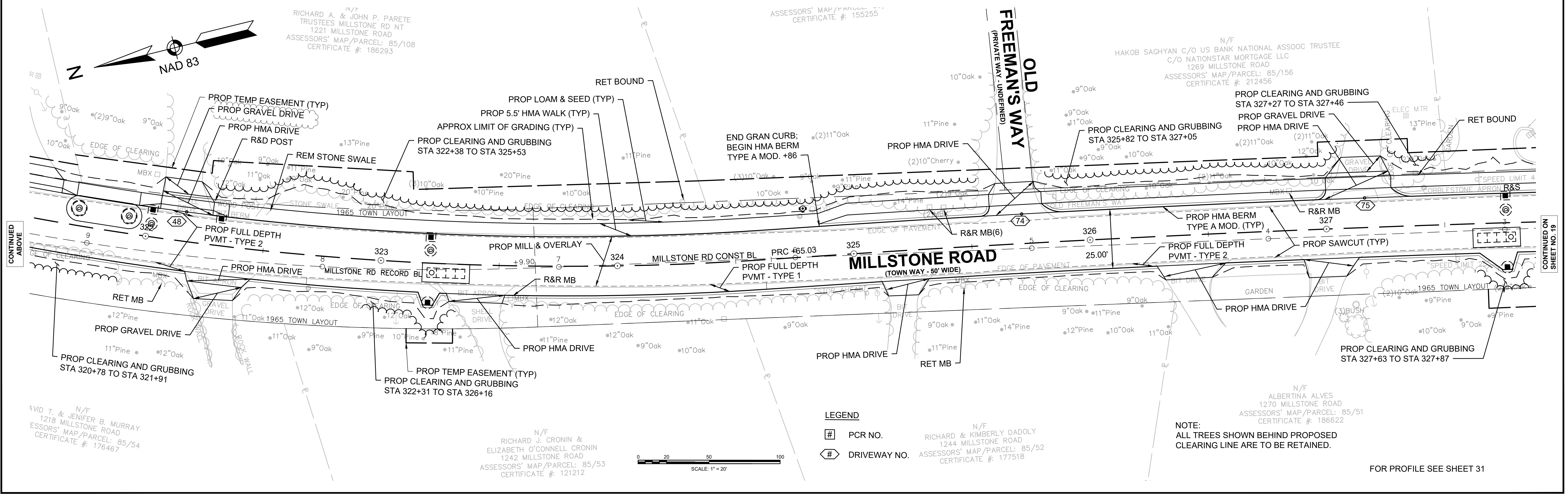
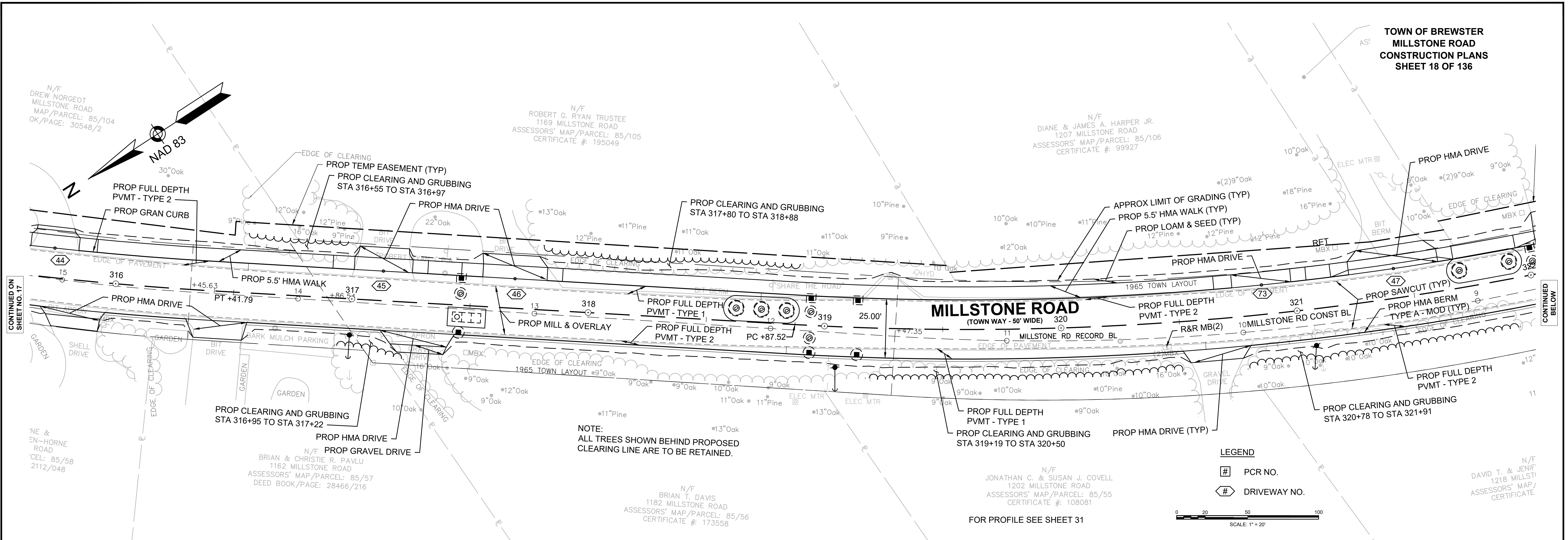
NOTE:  
ALL TREES SHOWN BEHIND PROPOSED  
CLEARING LINE ARE TO BE RETAINED.

NOTE:  
ALL TREES SHOWN BEHIND PROPOSED  
CLEARING LINE ARE TO BE RETAINED.

**LEGEND**  
# PCR NO.  
# DRIVEWAY NO.

FOR PROFILE SEE SHEET 29





CONTINUED ON  
SHEET NO. 17

CONTINUED BELOW

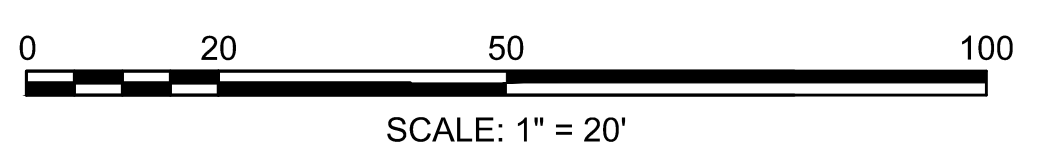
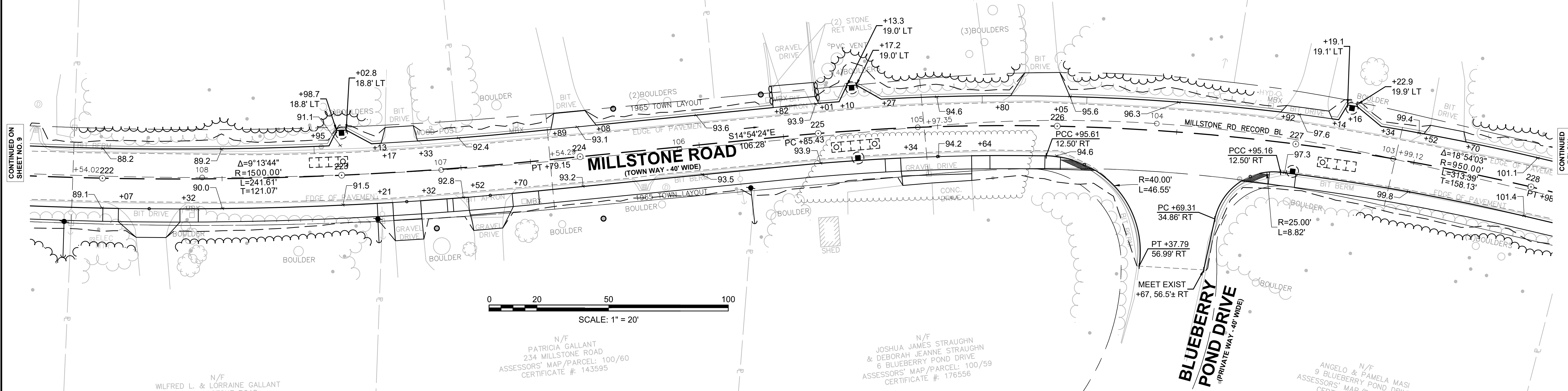
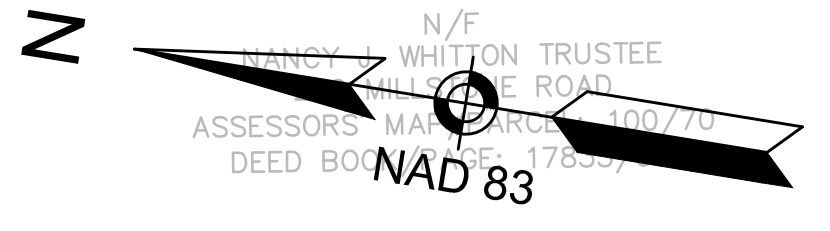
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CONTINUED ON  
SHEET NO. 19



**TOWN OF BREWSTER  
MILLSTONE ROAD  
ALIGNMENT & GRADING PLANS  
SHEET 34 OF 136**

N/F  
KENNETH E. & SALLY E. ENOS  
273 MILLSTONE ROAD  
ASSESSORS' MAP/PARCEL: 100/74  
DEED BOOK/PAGE: 28805/316

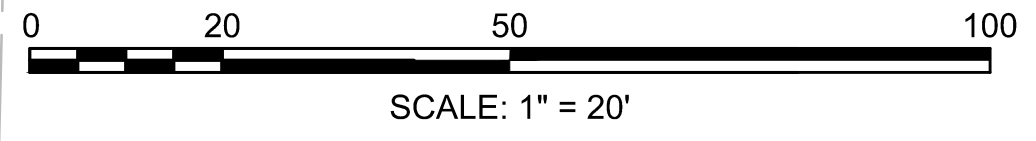
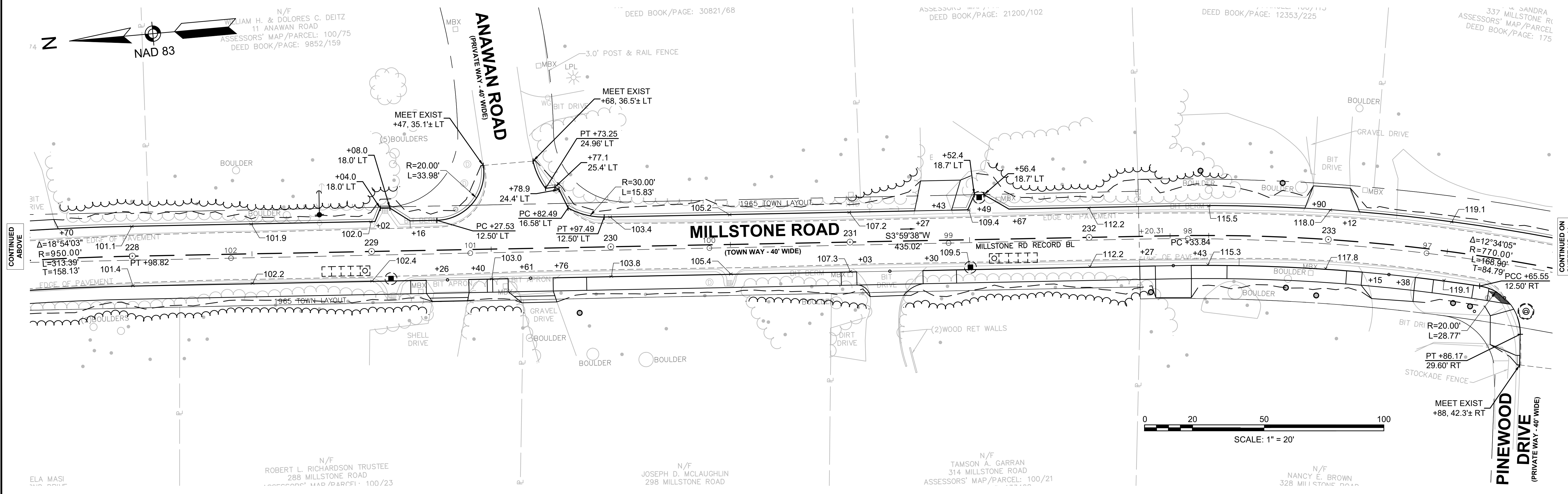


N/F  
PATRICIA GALLANT  
234 MILLSTONE ROAD  
ASSESSORS' MAP/PARCEL: 100/60  
CERTIFICATE #: 143595

N/F  
JOSHUA JAMES STRAUGHN  
& DEBORAH JEANNE STRAUGHN  
6 BLUEBERRY POND DRIVE  
ASSESSORS' MAP/PARCEL: 100/59  
CERTIFICATE #: 176556

N/F  
ANGELO & PAMELA MASI  
9 BLUEBERRY POND DRIVE  
ASSESSORS' MAP/PARCEL: 100/58  
CERTIFICATE #: 176556

N/F  
WILFRED L. & LORRAINE GALLANT  
234 MILLSTONE ROAD

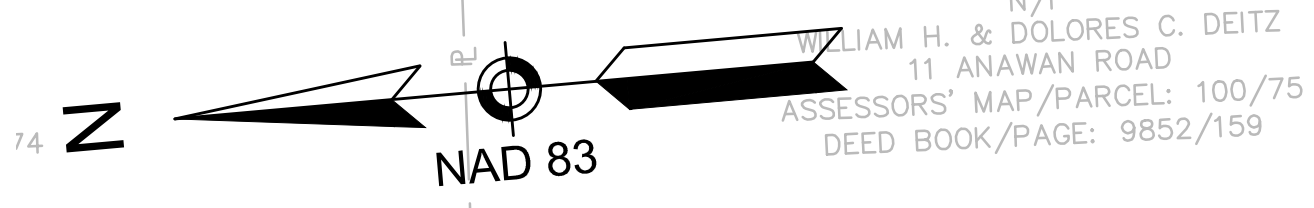


N/F  
ROBERT L. RICHARDSON TRUSTEE  
288 MILLSTONE ROAD  
ASSESSORS' MAP/PARCEL: 100/23

N/F  
JOSEPH D. MCLAUGHLIN  
298 MILLSTONE ROAD

N/F  
TAMSON A. GARRAN  
314 MILLSTONE ROAD  
ASSESSORS' MAP/PARCEL: 100/21

N/F  
NANCY E. BROWN  
328 MILLSTONE ROAD



N/F  
WILLIAM H. & DOLORES C. DEITZ  
11 ANAWAN ROAD  
ASSESSORS' MAP/PARCEL: 100/75  
DEED BOOK/PAGE: 9852/159

N/F  
DANIELLE NEHEMIAH  
239 MILLSTONE ROAD  
ASSESSORS' MAP/PARCEL: 100/71  
DEED BOOK/PAGE: 29956/217

N/F  
ASSASSORS' MAP/PARCEL: 100/110  
DEED BOOK/PAGE: 21200/102

N/F  
ASSASSORS' MAP/PARCEL: 100/110  
DEED BOOK/PAGE: 12353/225

N/F  
SANDRA  
337 MILLSTONE ROAD  
ASSESSORS' MAP/PARCEL: 100/110  
DEED BOOK/PAGE: 175

N/F  
ANAWAN ROAD  
(PRIVATE WAY - 40' WIDE)

N/F  
PINWOOD DRIVE  
(PRIVATE WAY - 40' WIDE)

CONTINUED ON  
SHEET NO. 9

CONTINUED  
BELOW

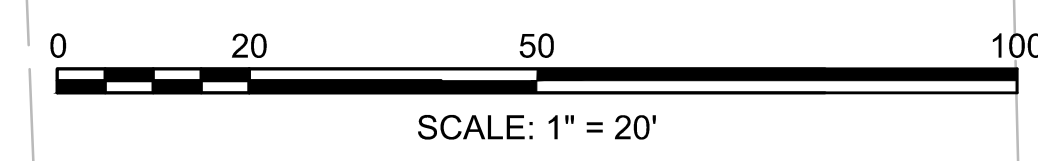
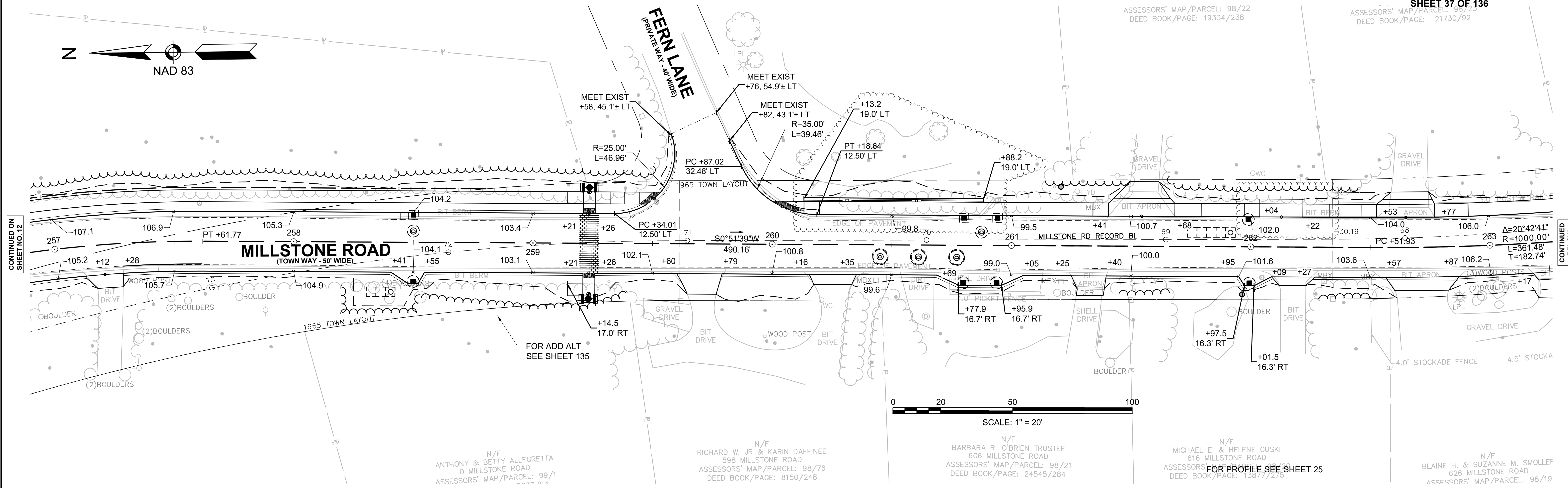
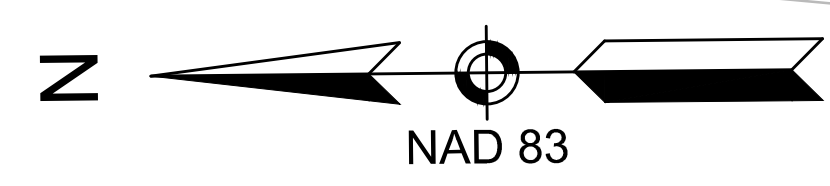
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ON  
SHEET NO. 11

**TOWN OF BREWSTER  
MILLSTONE ROAD  
ALIGNMENT & GRADING PLANS  
SHEET 37 OF 136**

ASSESSORS' MAP/PARCEL: 98/23  
DEED BOOK/PAGE: 21730/92

ASSESSORS' MAP/PARCEL: 98/22  
DEED BOOK/PAGE: 19334/238



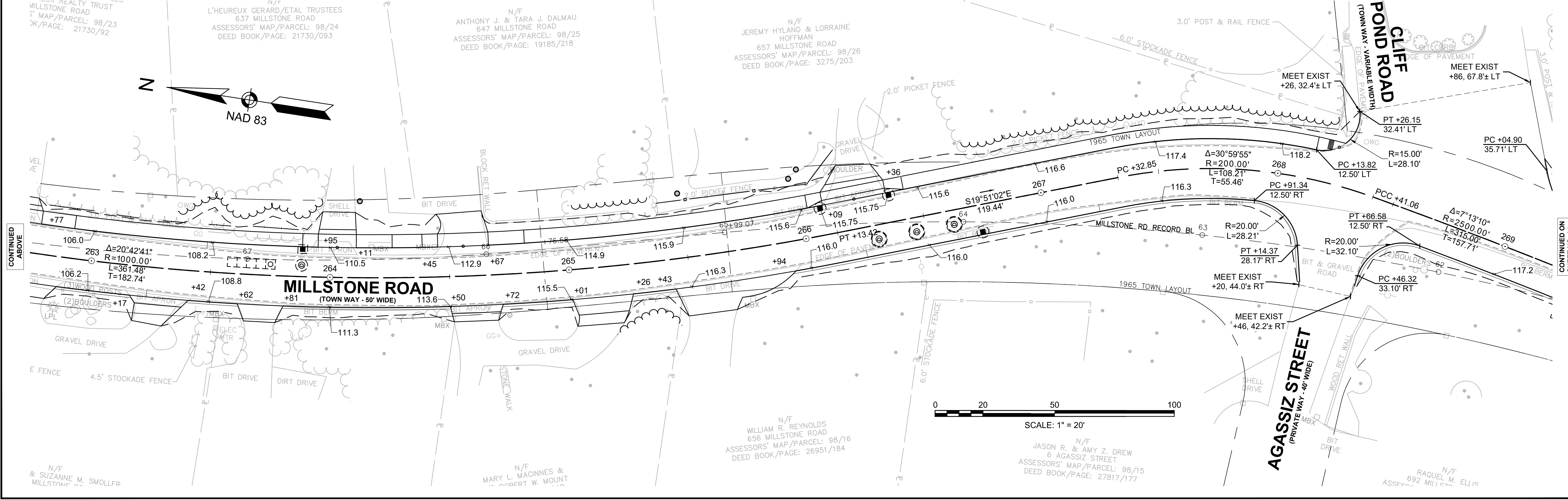
N/F  
ANTHONY & BETTY ALLEGRETTA  
0 MILLSTONE ROAD  
ASSESSORS' MAP/PARCEL: 99/1

N/F  
RICHARD W. JR & KARIN DAFFINEE  
598 MILLSTONE ROAD  
ASSESSORS' MAP/PARCEL: 98/76  
DEED BOOK/PAGE: 8150/248

N/F  
BARBARA R. O'BRIEN TRUSTEE  
606 MILLSTONE ROAD  
ASSESSORS' MAP/PARCEL: 98/21  
DEED BOOK/PAGE: 24545/284

N/F  
MICHAEL E. & HELENE GUSKI  
616 MILLSTONE ROAD  
ASSESSORS' MAP/PARCEL: 98/20  
DEED BOOK/PAGE: 13877/275

N/F  
BLAINE H. & SUZANNE M. SMOLFF  
626 MILLSTONE ROAD  
ASSESSORS' MAP/PARCEL: 98/19



N/F  
WILLIAM R. REYNOLDS  
656 MILLSTONE ROAD  
ASSESSORS' MAP/PARCEL: 98/16  
DEED BOOK/PAGE: 26951/184

N/F  
JASON R. & AMY Z. DREW  
6 AGASSIZ STREET  
ASSESSORS' MAP/PARCEL: 98/15  
DEED BOOK/PAGE: 27817/177

N/F  
RAQUEL M. ELLIS  
ASSESSORS' MAP/PARCEL: 98/18

CONTINUED ON  
SHEET NO. 12

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BELOW

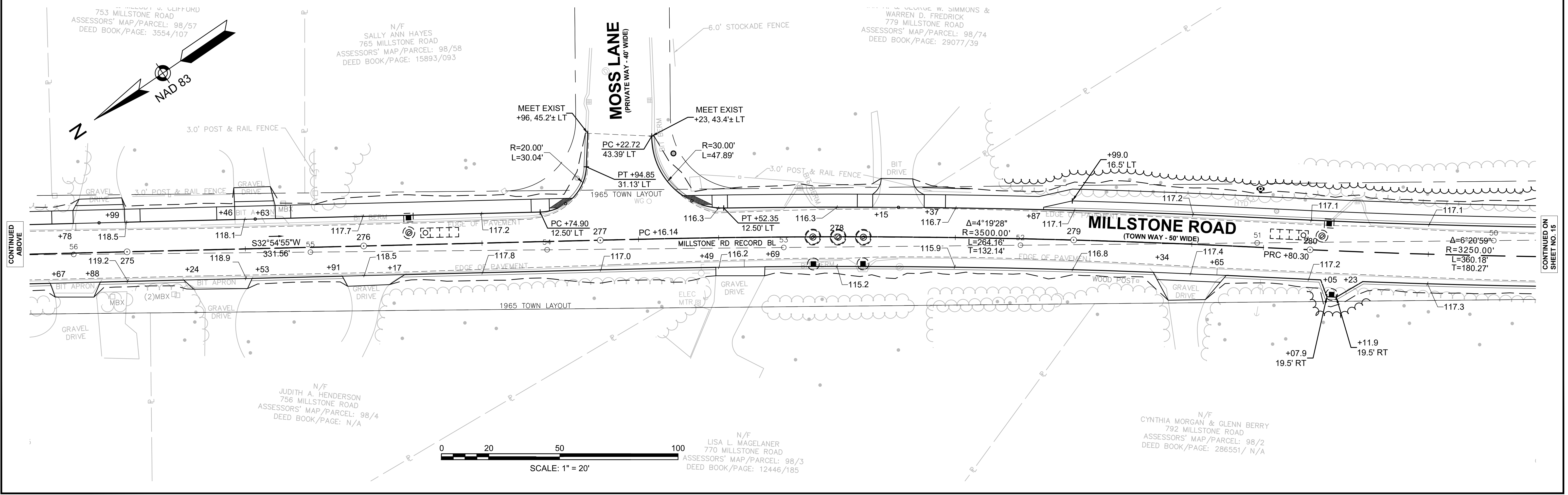
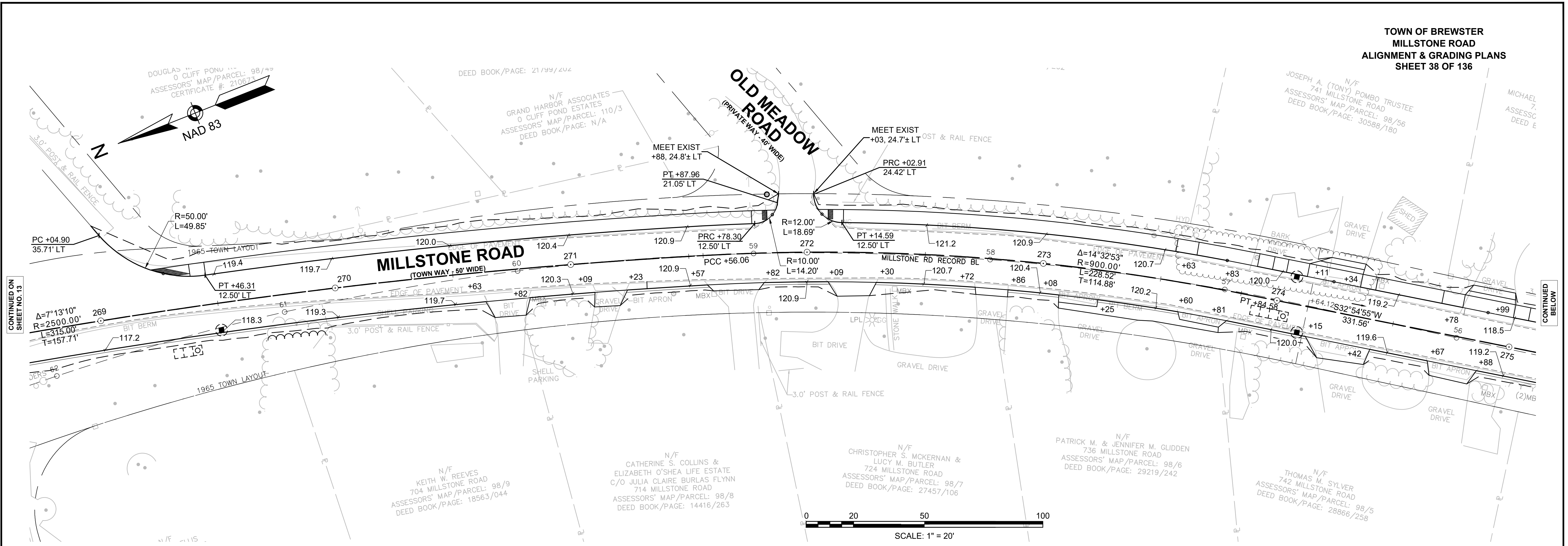
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ABOVE

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ON  
SHEET NO. 14



TOWN OF BREWSTER  
MILLSTONE ROAD  
ALIGNMENT & GRADING PLANS  
SHEET 38 OF 136

14170.00\_HD(ALGN)DWG Plotted on 3-Jul-2024 2:47 PM





MILLSTONE RD DRAINAGE STRUCTURE DATA						
NO.	TYPE	STATION	RIM ELEV.	INV. IN	INV. OUT	REMARKS
1	CB	200+49.6 13.5 LT	44.32		(2) 38.30	
2	LB	200+67.4 6.2 LT	44.53	(1) 38.00		

MILLSTONE RD DRAINAGE STRUCTURE DATA						
NO.	TYPE	STATION	RIM ELEV.	INV. IN	INV. OUT	REMARKS
5	CB	202+53.7 5.9 RT	44.51	(7) 39.98	(10) 40.09	PROP FRAME & COVER
6	CB	202+53.6 11.5 RT	44.34		(10) 40.17	
7	EX CB	202+74.2 11.5 RT	44.36		(5) 40.37	REMODEL
8	LB	202+13.0 6.3 RT	45.05	(9) 39.51		
9	LB	202+29.4 6.6 RT	44.81	(10) 39.80	(8) 39.59	

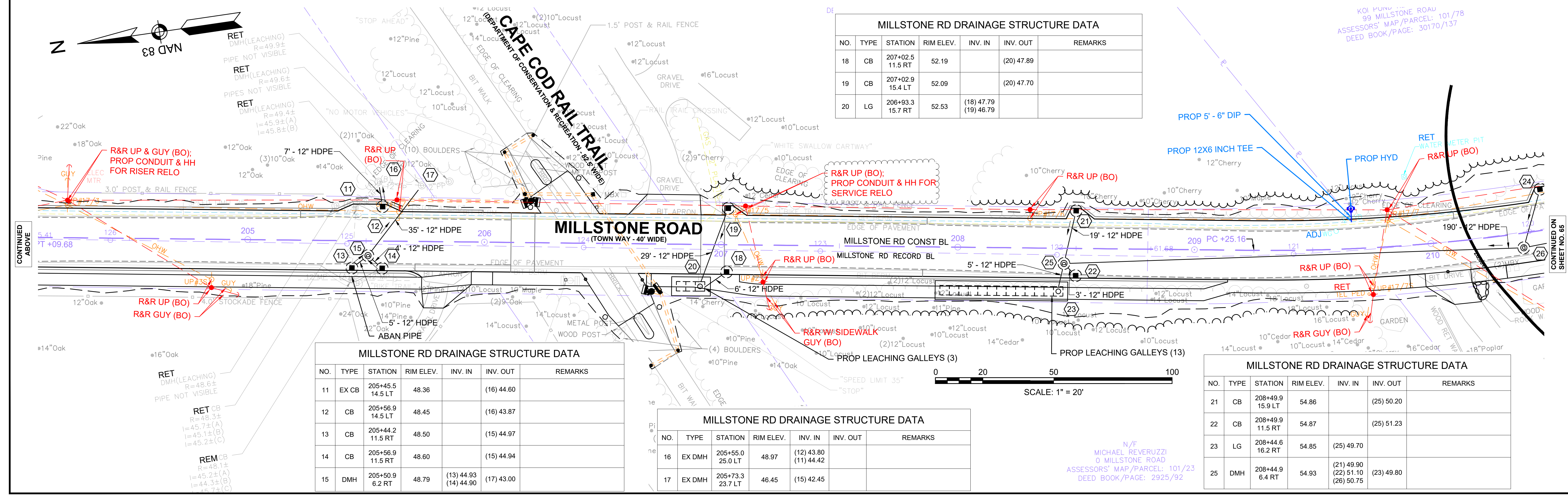
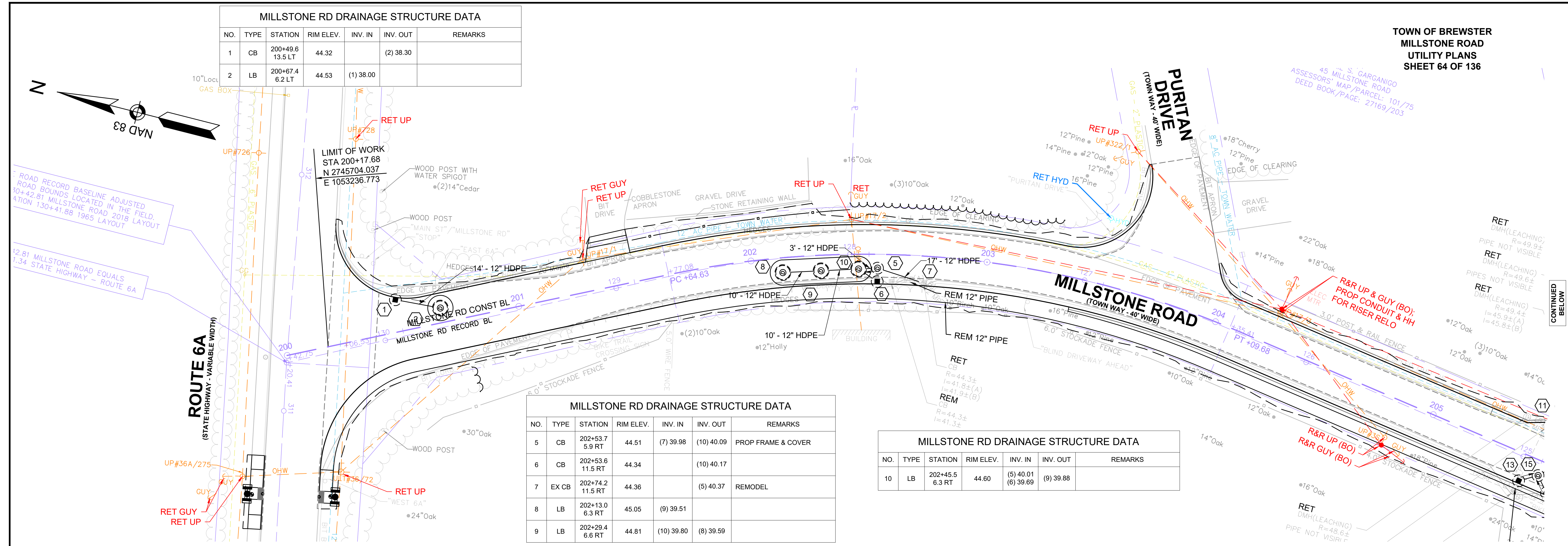
MILLSTONE RD DRAINAGE STRUCTURE DATA						
NO.	TYPE	STATION	RIM ELEV.	INV. IN	INV. OUT	REMARKS
10	LB	202+45.5 6.3 RT	44.60	(5) 40.01 (6) 39.69	(9) 39.88	

MILLSTONE RD DRAINAGE STRUCTURE DATA						
NO.	TYPE	STATION	RIM ELEV.	INV. IN	INV. OUT	REMARKS
18	CB	207+02.5 11.5 RT	52.19		(20) 47.89	
19	CB	207+02.9 15.4 LT	52.09		(20) 47.70	
20	LG	206+93.3 15.7 RT	52.53	(18) 47.79 (19) 46.79		

MILLSTONE RD DRAINAGE STRUCTURE DATA						
NO.	TYPE	STATION	RIM ELEV.	INV. IN	INV. OUT	REMARKS
11	EX CB	205+45.5 14.5 LT	48.36		(16) 44.80	
12	CB	205+56.9 14.5 LT	48.45		(16) 43.87	
13	CB	205+44.2 11.5 RT	48.50		(15) 44.97	
14	CB	205+56.9 11.5 RT	48.60		(15) 44.94	
15	DMH	205+50.9 6.2 RT	48.79	(13) 44.93 (14) 44.90	(17) 43.00	

MILLSTONE RD DRAINAGE STRUCTURE DATA						
NO.	TYPE	STATION	RIM ELEV.	INV. IN	INV. OUT	REMARKS
16	EX DMH	205+55.0 25.0 LT	48.97	(12) 43.80 (11) 44.42		
17	EX DMH	205+73.3 23.7 LT	46.45	(15) 42.45		

MILLSTONE RD DRAINAGE STRUCTURE DATA						
NO.	TYPE	STATION	RIM ELEV.	INV. IN	INV. OUT	REMARKS
21	CB	208+49.9 15.9 LT	54.86		(25) 50.20	
22	CB	208+49.9 11.5 RT	54.87		(25) 51.23	
23	LG	208+44.6 16.2 RT	54.85	(25) 49.70		
25	DMH	208+44.9 6.4 RT	54.93	(21) 49.90 (22) 51.10 (26) 50.75	(23) 49.80	





TOWN OF BREWSTER  
MILLSTONE ROAD  
UTILITY PLANS  
SHEET 66 OF 136

N/F  
KENNETH E. & SALLY E. ENOS  
273 MILLSTONE ROAD  
ASSESSORS' MAP/PARCEL: 100/74  
DEED BOOK/PAGE: 28805/316

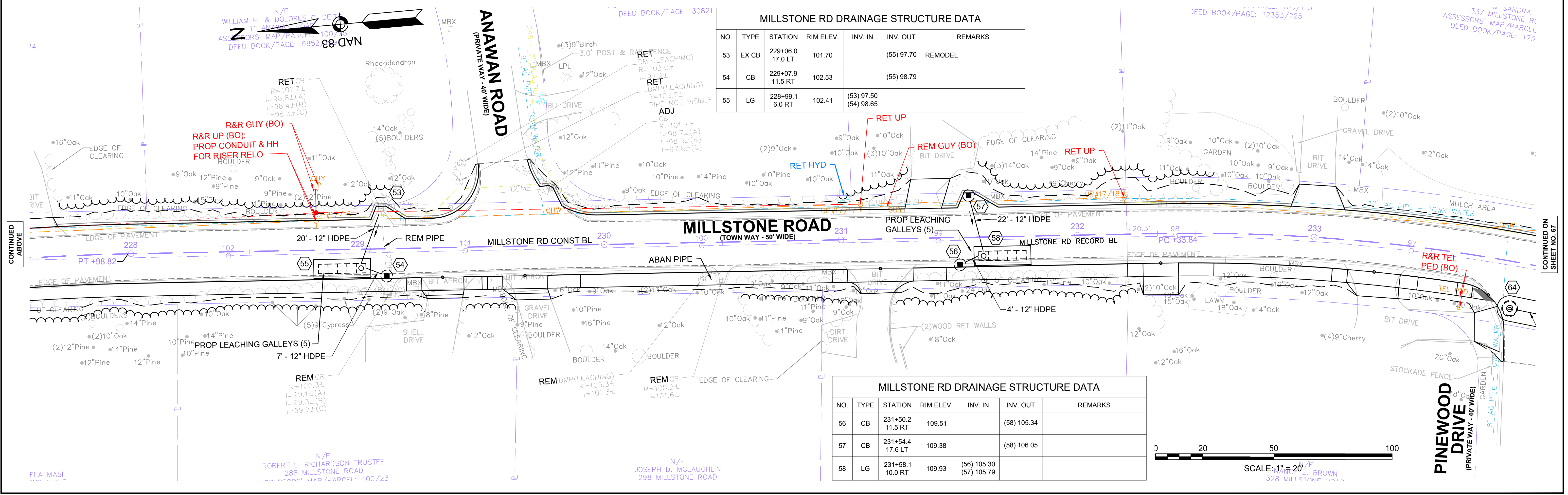
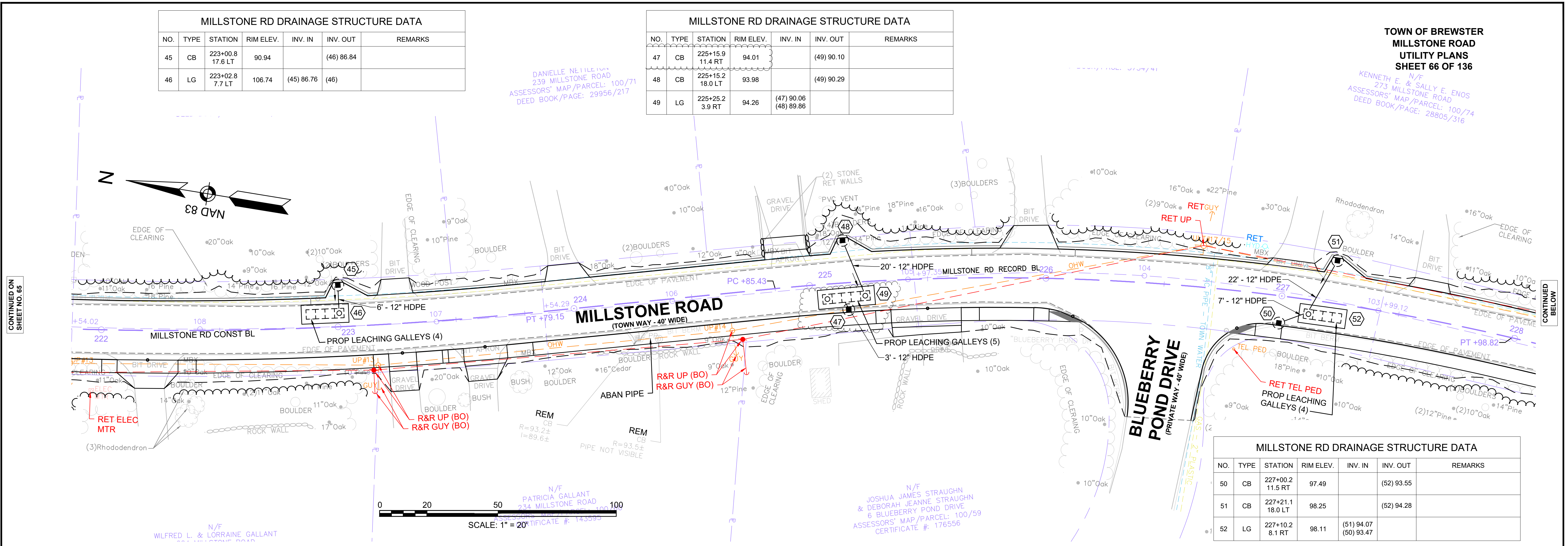
MILLSTONE RD DRAINAGE STRUCTURE DATA						
NO.	TYPE	STATION	RIM ELEV.	INV. IN	INV. OUT	REMARKS
45	CB	223+00.8 17.6 LT	90.94		(46) 86.84	
46	LG	223+02.8 7.7 LT	106.74	(45) 86.76	(46)	

MILLSTONE RD DRAINAGE STRUCTURE DATA						
NO.	TYPE	STATION	RIM ELEV.	INV. IN	INV. OUT	REMARKS
47	CB	225+15.9 11.4 RT	94.01		(49) 90.10	
48	CB	225+15.2 18.0 LT	93.98		(49) 90.29	
49	LG	225+25.2 3.9 RT	94.26	(47) 90.06 (48) 89.88		

MILLSTONE RD DRAINAGE STRUCTURE DATA						
NO.	TYPE	STATION	RIM ELEV.	INV. IN	INV. OUT	REMARKS
50	CB	227+00.2 11.5 RT	97.49		(52) 93.55	
51	CB	227+21.1 18.0 LT	98.25		(52) 94.28	
52	LG	227+10.2 8.1 RT	98.11	(51) 94.07 (50) 93.47		

MILLSTONE RD DRAINAGE STRUCTURE DATA						
NO.	TYPE	STATION	RIM ELEV.	INV. IN	INV. OUT	REMARKS
53	EX CB	229+06.0 17.0 LT	101.70		(55) 97.70	REMODEL
54	CB	229+07.9 11.5 RT	102.53		(55) 98.79	
55	LG	228+99.1 6.0 RT	102.41	(53) 97.50 (54) 98.65		

MILLSTONE RD DRAINAGE STRUCTURE DATA						
NO.	TYPE	STATION	RIM ELEV.	INV. IN	INV. OUT	REMARKS
56	CB	231+50.2 11.5 RT	109.51		(58) 105.34	
57	CB	231+54.4 17.6 LT	109.38		(58) 106.05	
58	LG	231+58.1 10.0 RT	109.93	(56) 105.30 (57) 105.79		



CONTINUED ON  
SHEET NO. 65

CONTINUED  
BELOW

CONTINUED  
ABOVE

CONTINUED  
ON  
SHEET NO. 67

N/F  
WILFRED L. & LORRAINE GALLANT  
234 MILLSTONE ROAD

N/F  
PATRICIA GALLANT  
234 MILLSTONE ROAD  
CERTIFICATE # 143899

N/F  
JOSHUA JAMES STRAUGHN  
& DEBORAH JEANNE STRAUGHN  
6 BLUEBERRY POND DRIVE  
ASSESSORS' MAP/PARCEL: 100/59  
CERTIFICATE # 176556

N/F  
WILLIAM H. & DOLORES C. DEITZ  
11 MILLSTONE ROAD  
ASSESSORS' MAP/PARCEL: 100/71  
DEED BOOK/PAGE: 9852

R&R GUY (BO)  
R&R UP (BO);  
PROP CONDUIT & HH  
FOR RISER RELO

ELA MASI  
288 MILLSTONE ROAD

N/F  
ROBERT L. RICHARDSON TRUSTEE  
288 MILLSTONE ROAD  
ASSESSORS' MAP/PARCEL: 100/23

N/F  
JOSEPH D. McLAUGHLIN  
298 MILLSTONE ROAD

N/F  
MARTIN E. BROWN  
328 MILLSTONE ROAD

N/F  
SANDRA  
337 MILLSTONE RD  
ASSESSORS' MAP/PARCEL  
DEED BOOK/PAGE: 175



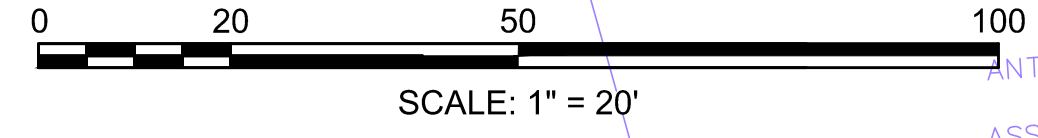
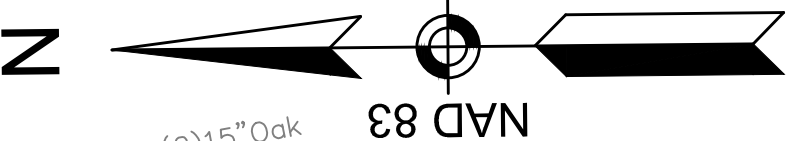
TOWN OF BREWSTER  
MILLSTONE ROAD  
UTILITY PLANS  
SHEET 69 OF 136

MILLSTONE RD DRAINAGE STRUCTURE DATA						
NO.	TYPE	STATION	RIM ELEV.	INV. IN	INV. OUT	REMARKS
102	GI	258+50.0 11.5 LT	104.21		(103) 98.84	
103	CB	258+50.0 4.7 LT	104.33	(102) 98.60	(105) 98.72	PROP FRAME & COVER
104	CB	258+50.0 16.3 RT	103.94		(105) 98.26	
105	LG	258+30.4 22.8 RT	104.46	(104) 98.20 (103) 98.43		

MILLSTONE RD DRAINAGE STRUCTURE DATA						
NO.	TYPE	STATION	RIM ELEV.	INV. IN	INV. OUT	REMARKS
106	GI	260+80.2 11.5 LT	99.56		(108) 97.06	
107	GI	260+84.2 11.5 LT	99.51		(108) 97.00	
108	CB	260+87.5 5.6 LT	99.67	(106) 97.00 (107) 96.95	(112) 96.85	PROP FRAME & COVER
109	CB	260+79.9 15.7 RT	98.81		(112) 94.82	
110	CB	260+93.9 15.7 RT	98.74		(112) 94.74	

MILLSTONE RD DRAINAGE STRUCTURE DATA						
NO.	TYPE	STATION	RIM ELEV.	INV. IN	INV. OUT	REMARKS
111	LB	260+61.2 5.0 RT	99.59	(112) 94.45	(113) 94.35	
112	LB	260+77.2 5.1 RT	99.50	(108) 96.70 (109) 94.78 (110) 94.65	(111) 94.55	
113	LB	260+45.2 5.0 RT	99.85	(111) 94.25		

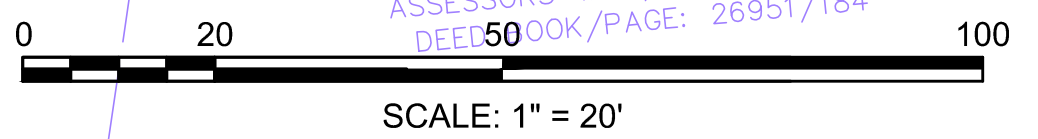
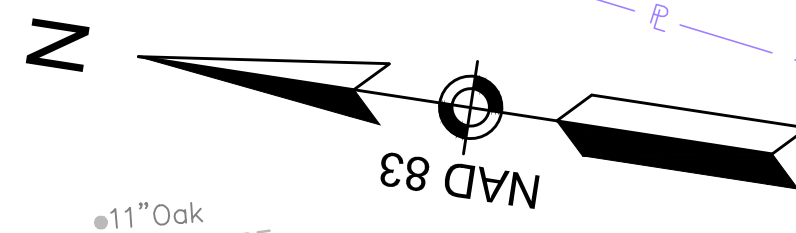
MILLSTONE RD DRAINAGE STRUCTURE DATA						
NO.	TYPE	STATION	RIM ELEV.	INV. IN	INV. OUT	REMARKS
115	CB	261+99.5 15.2 RT	101.65		(117) 97.65	
116	CB	261+99.0 11.4 LT	101.99		(117) 98.36	
117	LG	261+93.4 7.8 LT	101.83	(116) 98.05 (115) 97.50		



CONTINUED ON SHEET NO. 68

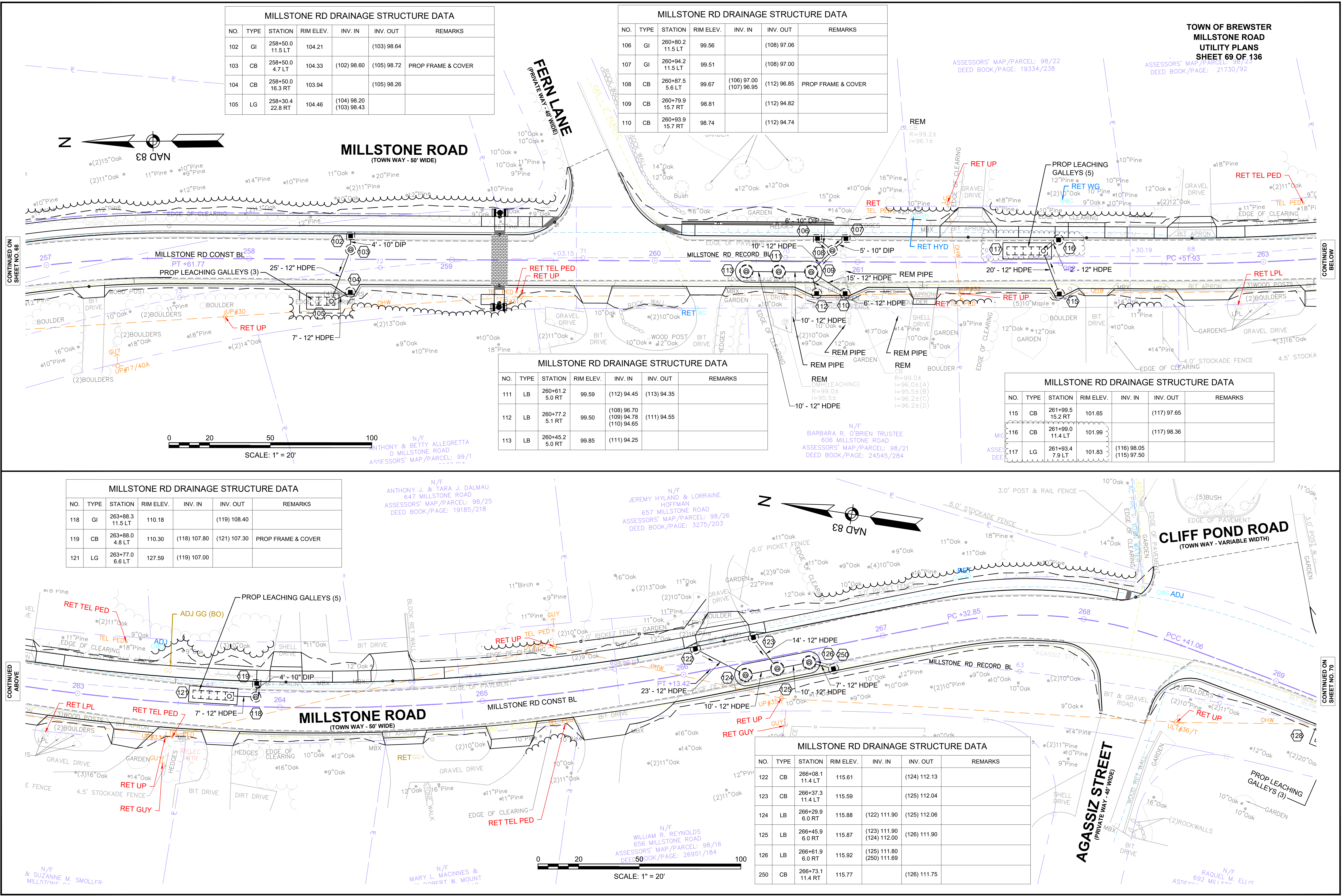
CONTINUED BELOW

MILLSTONE RD DRAINAGE STRUCTURE DATA						
NO.	TYPE	STATION	RIM ELEV.	INV. IN	INV. OUT	REMARKS
118	GI	263+88.3 11.5 LT	110.18		(119) 108.40	
119	CB	263+88.0 4.8 LT	110.30	(118) 107.80	(121) 107.30	PROP FRAME & COVER
121	LG	263+77.0 6.6 LT	127.59	(119) 107.00		

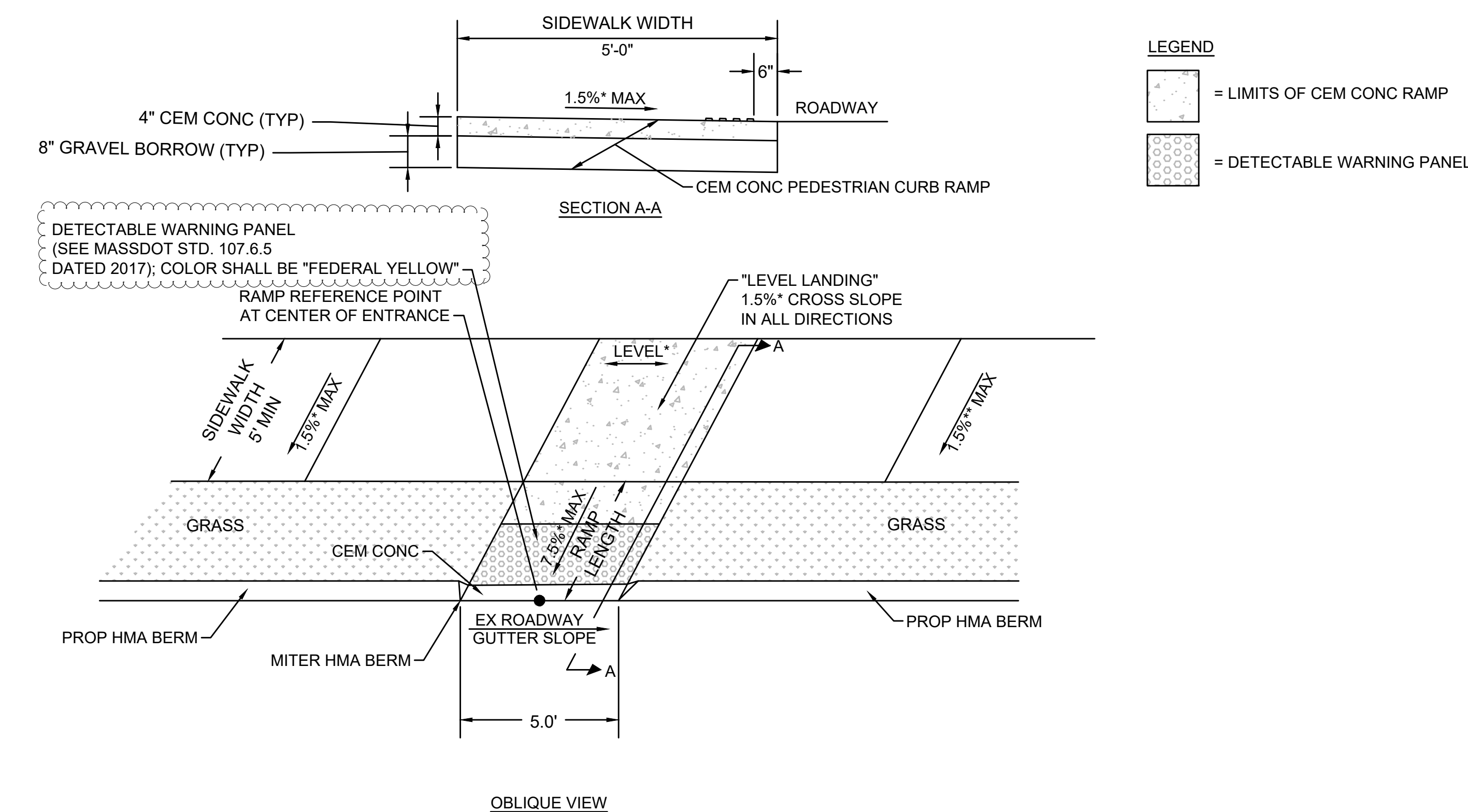
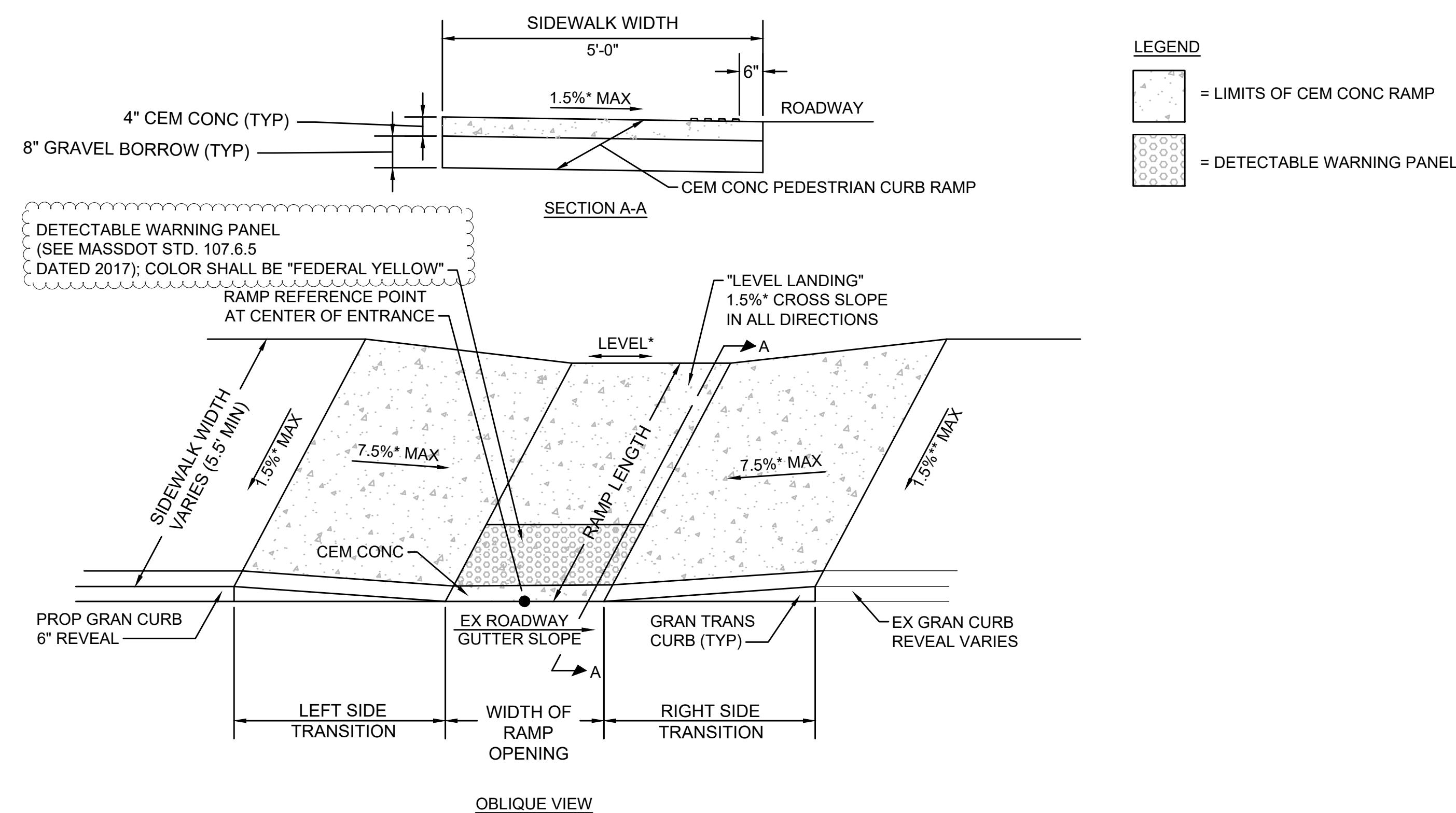


CONTINUED ABOVE

CONTINUED ON SHEET NO. 70







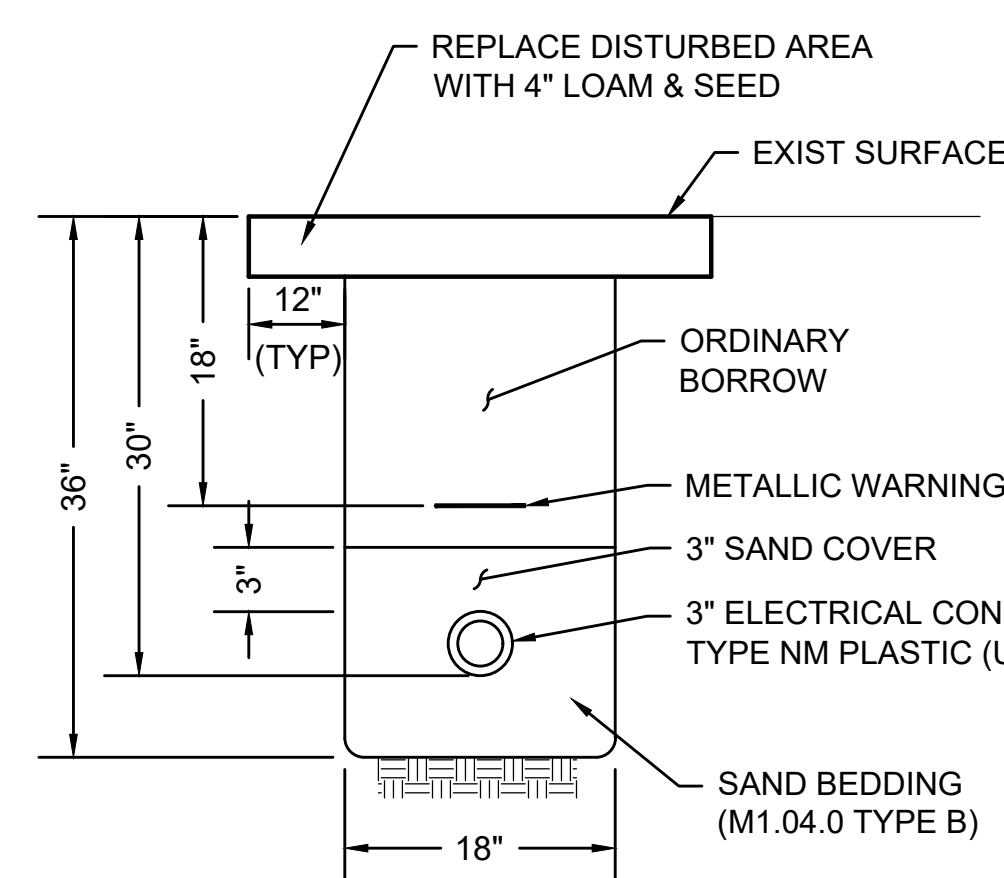
**PEDESTRIAN CURB RAMP - LESS THAN 6.50' WIDTH**

SCALE: N.T.S.

**PEDESTRIAN CURB RAMP - LESS THAN 6.50' WIDTH WITH GRASS STRIP**

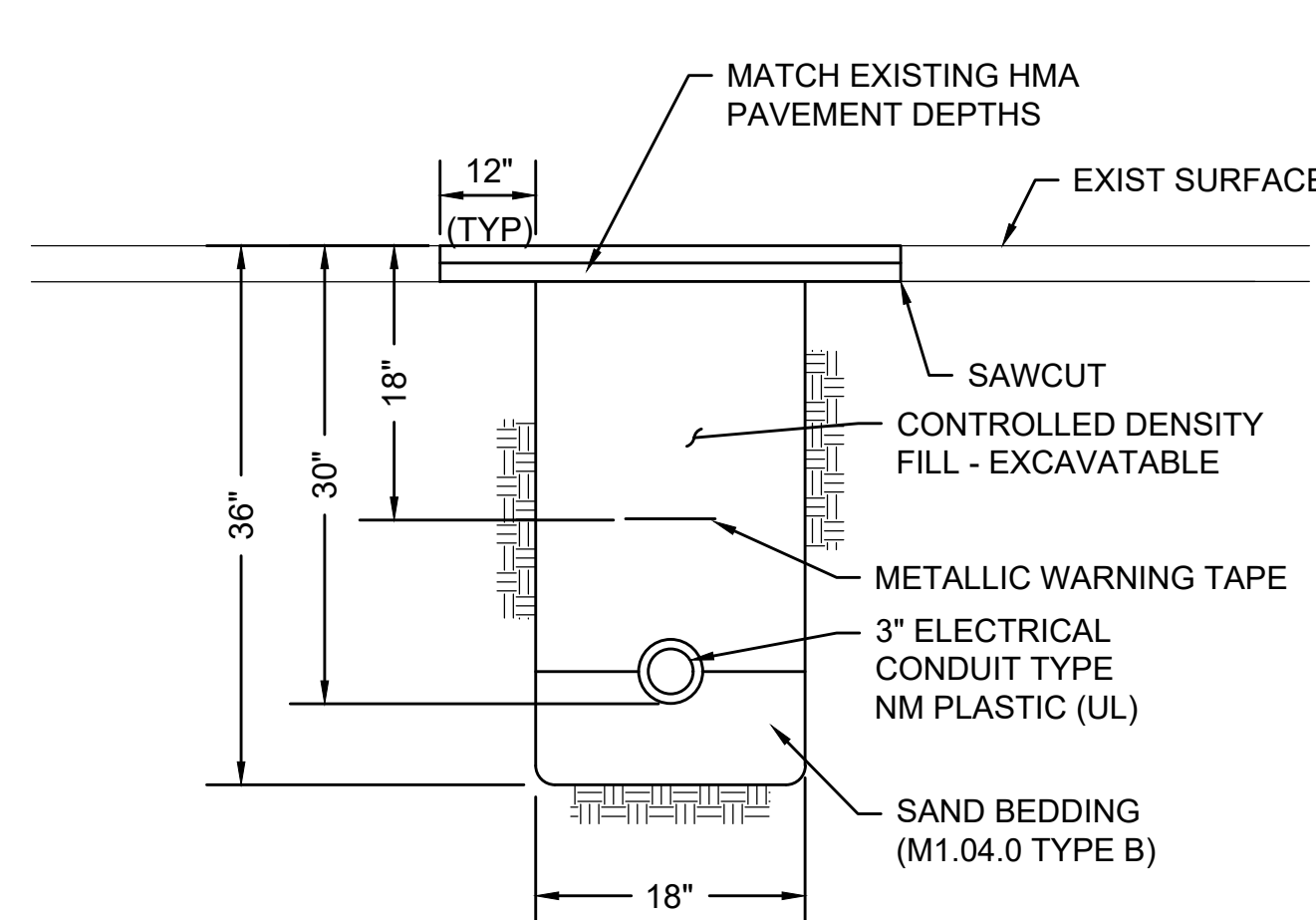
SCALE: N.T.S.

PEDESTRIAN CURB RAMP DATA											
NO.	LOCATION (REF POINT)	SIDEWALK WIDTH	RAMP WIDTH	RAMP LENGTH	OPENING ELEV	LEFT SIDE			RIGHT SIDE		
						ROADWAY GUTTER	REVEAL	TRANS	ROADWAY GUTTER	REVEAL	TRANS
1	STA 311+35.46, 6.9 RT ALGN - ROUTE 6A RECORD BASELINE	5.4'-5.5'	5'-0"	5'-5"	44.24	-1.23%	6"	6.5'	0.65%	6"	7.67'
2	STA 311+35.36, 17.0 LT ALGN - ROUTE 6A RECORD BASELINE	5'-6"	5'-0"	5'-6"	44.25	1.67%	6"	9.0'	-1.54%	6"	6.5'
29	STA 296+42.31, 19.8 LT ALGN - MILLSTONE RD CONST BASELINE	5'-6"	5'-0"	5'-6"	111.78	-0.20%	6"	7.67'	N/A	6"	N/A
30	STA 297+21.26, 18.4 LT ALGN - MILLSTONE RD CONST BASELINE	5'-6"	5'-0"	5'-6"	111.33	N/A	6"	N/A	-0.50%	6"	6.5'



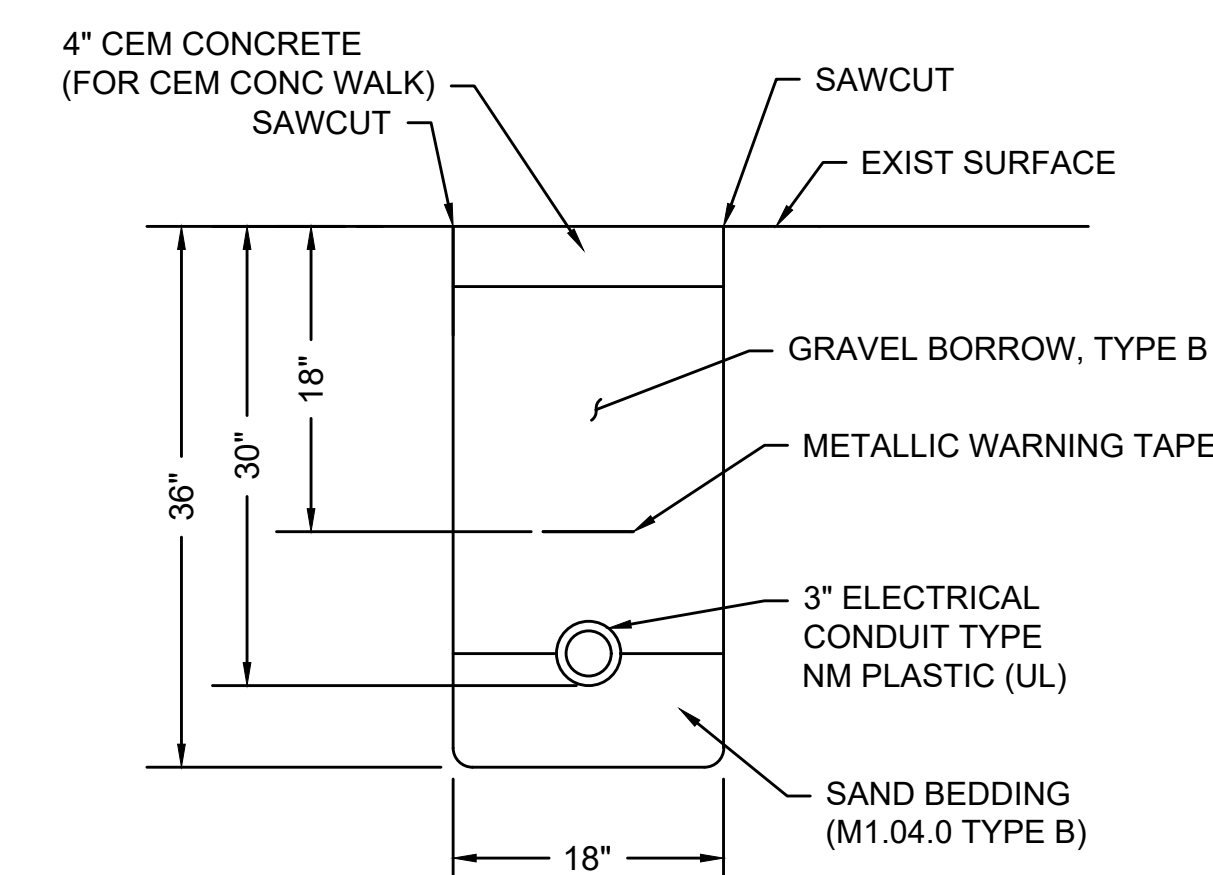
**CONDUIT IN GRASS**

SCALE: N.T.S.



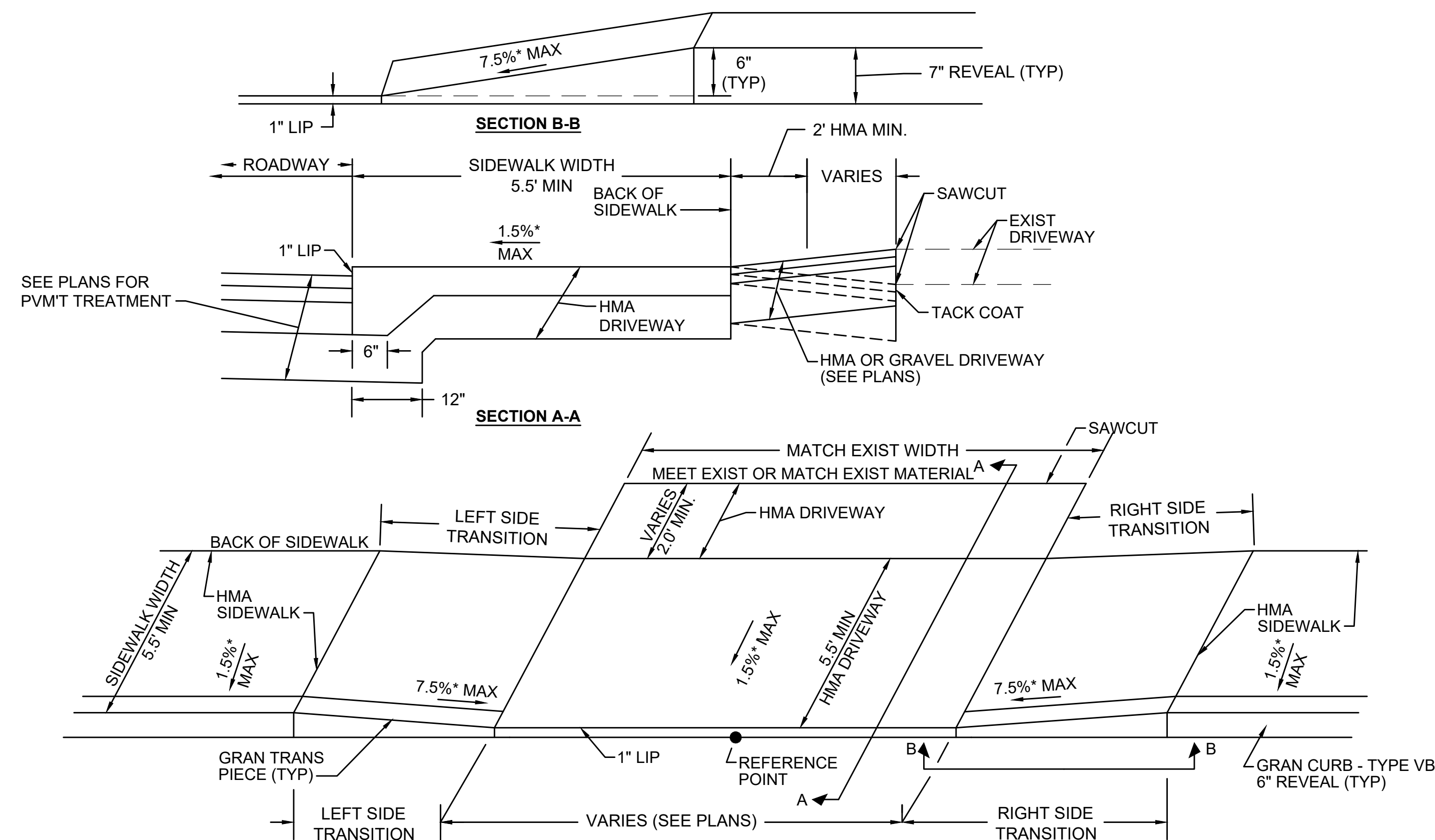
**CONDUIT CROSSING ROADWAY/DRIVEWAY**

SCALE: N.T.S.



**CONDUIT IN SIDEWALK**

SCALE: N.T.S. DWG: TRENCH-03 DATE: MARCH 2013



**HMA DRIVEWAY IN GRANITE CURB**

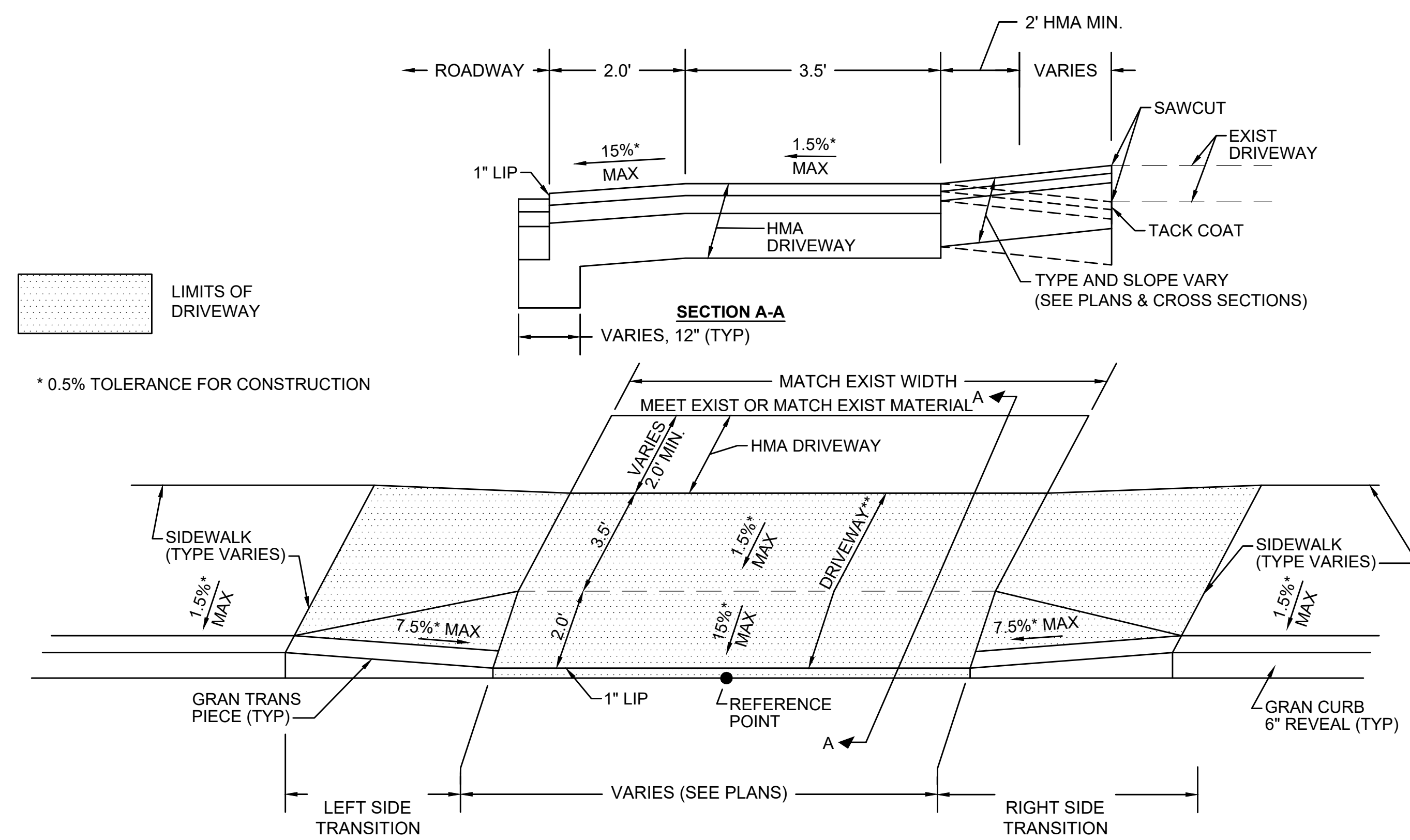
SCALE: NTS

HMA DRIVEWAY IN GRANITE CURB DATA					
NO.	LOCATION (REF POINT)	ROADWAY GUTTER	OPENING ELEV	LEFT SIDE	RIGHT SIDE
				TRANS	TRANS
1	STA 210+05.97, 12.5' RT ALGN - MILLSTONE RD CONST BASELINE	1.45%	59.04	15'-0"	6'-6"
2	STA 211+64.34, 12.5' RT ALGN - MILLSTONE RD CONST BASELINE	2.97%	62.03	6'-6"	14'-0"
3	STA 212+72.13, 12.5' RT ALGN - MILLSTONE RD CONST BASELINE	5.97%	66.53	15'-0"	6'-6"
4	STA 215+34.97, 12.5' RT ALGN - MILLSTONE RD CONST BASELINE	2.57%	80.42	14'-0"	6'-6"
5	STA 216+02.10, 12.5' RT ALGN - MILLSTONE RD CONST BASELINE	0.55%	81.44	9'-0"	6'-6"
6	STA 216+98.65, 12.5' RT ALGN - MILLSTONE RD CONST BASELINE	1.37%	82.09	7'-8"	6'-6"
7	STA 218+23.01, 12.5' RT ALGN - MILLSTONE RD CONST BASELINE	3.57%	85.35	11'-0"	6'-6"
8	STA 218+92.46, 12.5' RT ALGN - MILLSTONE RD CONST BASELINE	0.94%	86.94	11'-0"	6'-6"
9	STA 220+33.24, 12.5' RT ALGN - MILLSTONE RD CONST BASELINE	0.42%	87.58	9'-0"	6'-6"
11	STA 222+19.63, 12.5' RT ALGN - MILLSTONE RD CONST BASELINE	1.73%	89.34	7'-8"	6'-6"
12	STA 223+26.45, 12.5' RT ALGN - MILLSTONE RD CONST BASELINE	2.86%	92.22	11'-0"	6'-6"
13	STA 223+61.17, 12.5' RT ALGN - MILLSTONE RD CONST BASELINE	1.97%	93.05	11'-0"	6'-6"
52	STA 225+49.60, 12.5' RT ALGN - MILLSTONE RD CONST BASELINE	0.67%	94.22	7'-8"	6'-6"

HMA DRIVEWAY IN GRANITE CURB DATA					
NO.	LOCATION (REF POINT)	ROADWAY GUTTER	OPENING ELEV	LEFT SIDE	RIGHT SIDE
				TRANS	TRANS
15	STA 229+31.51, 12.5' RT ALGN - MILLSTONE RD CONST BASELINE	0.91%	102.88	7'-8"	6'-6"
16	STA 229+66.23, 12.5' RT ALGN - MILLSTONE RD CONST BASELINE	1.09%	103.70	14'-0"	6'-6"
17	STA 231+16.41, 12.5' RT ALGN - MILLSTONE RD CONST BASELINE	4.51%	107.97	14'-0"	6'-6"
53	STA 232+34.92, 12.5' RT ALGN - MILLSTONE RD CONST BASELINE	6.29%	114.21	15'-0"	6'-6"
49	STA 233+26.67, 12.5' RT ALGN - MILLSTONE RD CONST BASELINE	3.23%	119.04	15'-0"	6'-6"
51	STA 235+39.95, 12.5' RT ALGN - MILLSTONE RD CONST BASELINE	1.19%	120.43	9'-0"	6'-6"
18	STA 238+79.61, 12.5' RT ALGN - MILLSTONE RD CONST BASELINE	-1.29%	115.48	6'-6"	7'-8"
19	STA 239+71.00, 12.5' RT ALGN - MILLSTONE RD CONST BASELINE	-1.85%	114.63	6'-6"	9'-0"
22	STA 261+54.66, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	2.48%	100.81	6'-6"	11'-0"
23	STA 262+64.90, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	3.92%	104.61	6'-6"	14'-0"
24	STA 264+02.82, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	5.16%	111.09	6'-6"	15'-0"
25	STA 264+56.13, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	4.54%	113.61	6'-6"	15'-0"
61	STA 273+76.26, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	0.91%	120.5	9'-0"	6'-6"
62	STA 274+22.08, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	1.70%	119.8	9'-0"	6'-6"

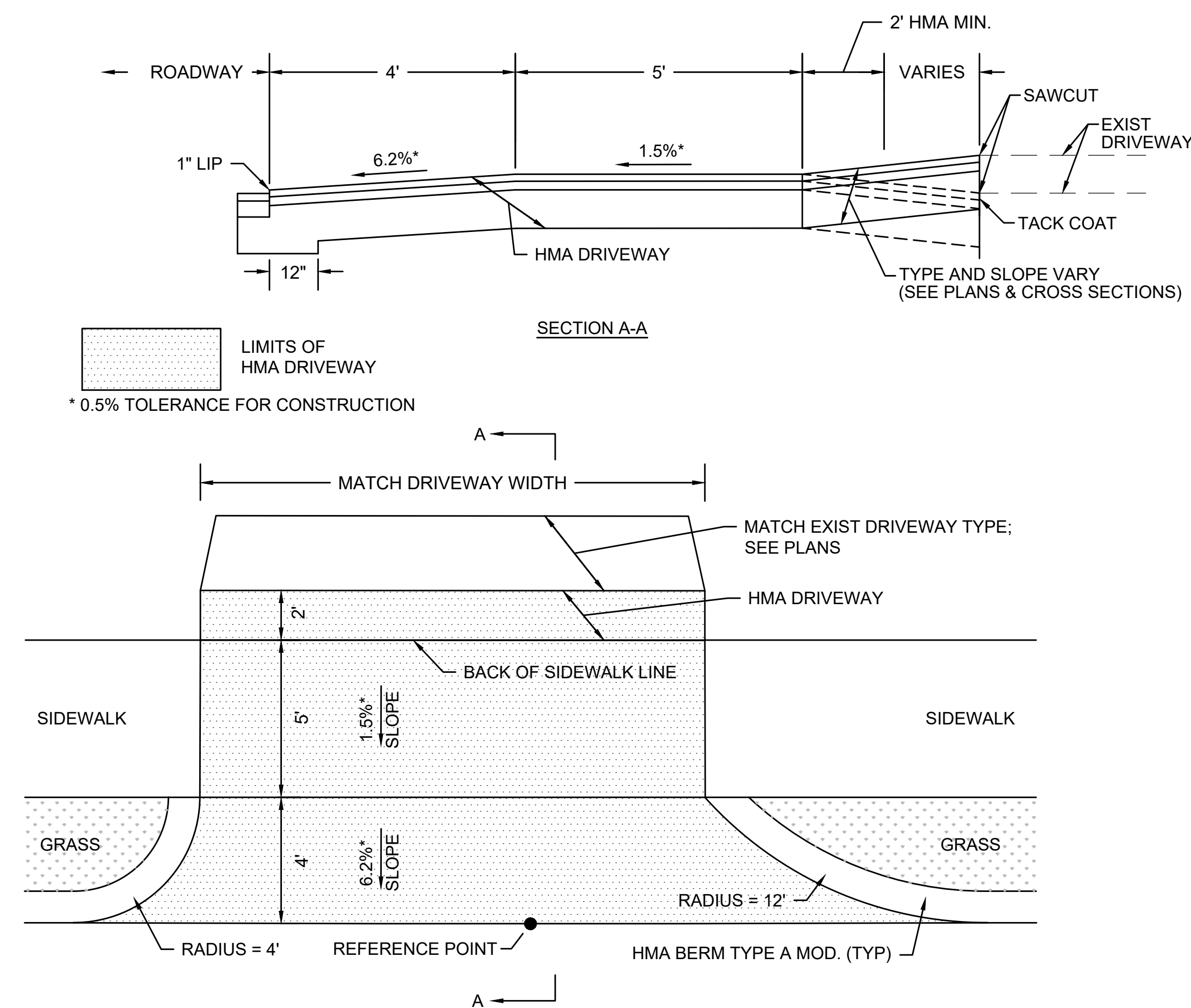
HMA DRIVEWAY IN GRANITE CURB DATA					
NO.	LOCATION (REF POINT)	ROADWAY GUTTER	OPENING ELEV	LEFT SIDE	RIGHT SIDE
				TRANS	TRANS
63	STA 274+88.69, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	1.71%	118.7	9'-0"	6'-6"
64	STA 275+54.69, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	0.55%	117.9	7'-8"	6'-6"
27	STA 278+25.89, -12.5' RT ALGN - MILLSTONE RD CONST BASELINE	0.30%	116.99	6'-6"	9'-0"
28	STA 295+63.64, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	-1.71%	112.51	9'-0"	6'-6"
29	STA 295+97.98, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	-0.47%	112.21	7'-8"	6'-6"
72	STA 299+55.89, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	0.26%	110.5	7'-8"	6'-6"
35	STA 304+65.45, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	0.11%	112.34	9'-0"	6'-6"
38	STA 306+84.80, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	-0.68%	113.70	7'-8"	6'-6"
40	STA 309+12.96, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	-0.85%	112.51	9'-0"	6'-6"
41	STA 310+07.82, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	-0.76%	111.93	6'-6"	7'-8"
42	STA 311+83.96, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	-0.02%	111.30	7'-8"	6'-6"
43	STA 315+25.70, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	0.36%	111.84	6'-6"	7'-8"
44	STA 315+72.88, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	0.03%	111.93	6'-6"	7'-8"
45	STA 317+12.61, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	-1.17%	110.79	9'-0"	6'-6"
46	STA 317+68.30, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	-0.44%	110.30	9'-0"	6'-6"
73	STA 320+86.33, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	0.18%	110.3	7'-8"	6'-6"
78	STA 262+12.77, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	3.00%	102.5	6'-6"	11'-0"





**HMA DRIVEWAY W/ GRADE BREAK**

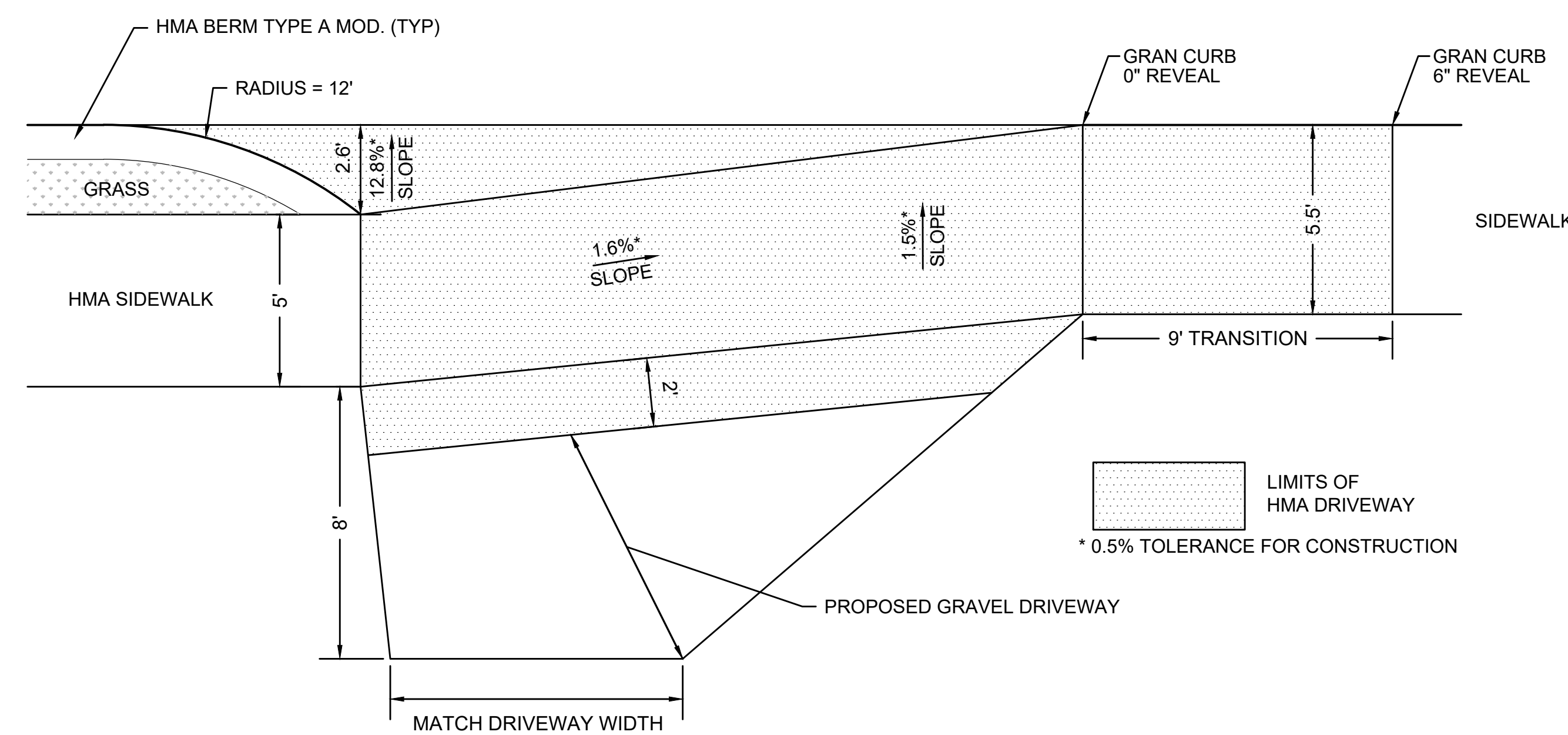
SCALE: N.T.S.



**HMA DRIVEWAY WITH GRASS STRIP**

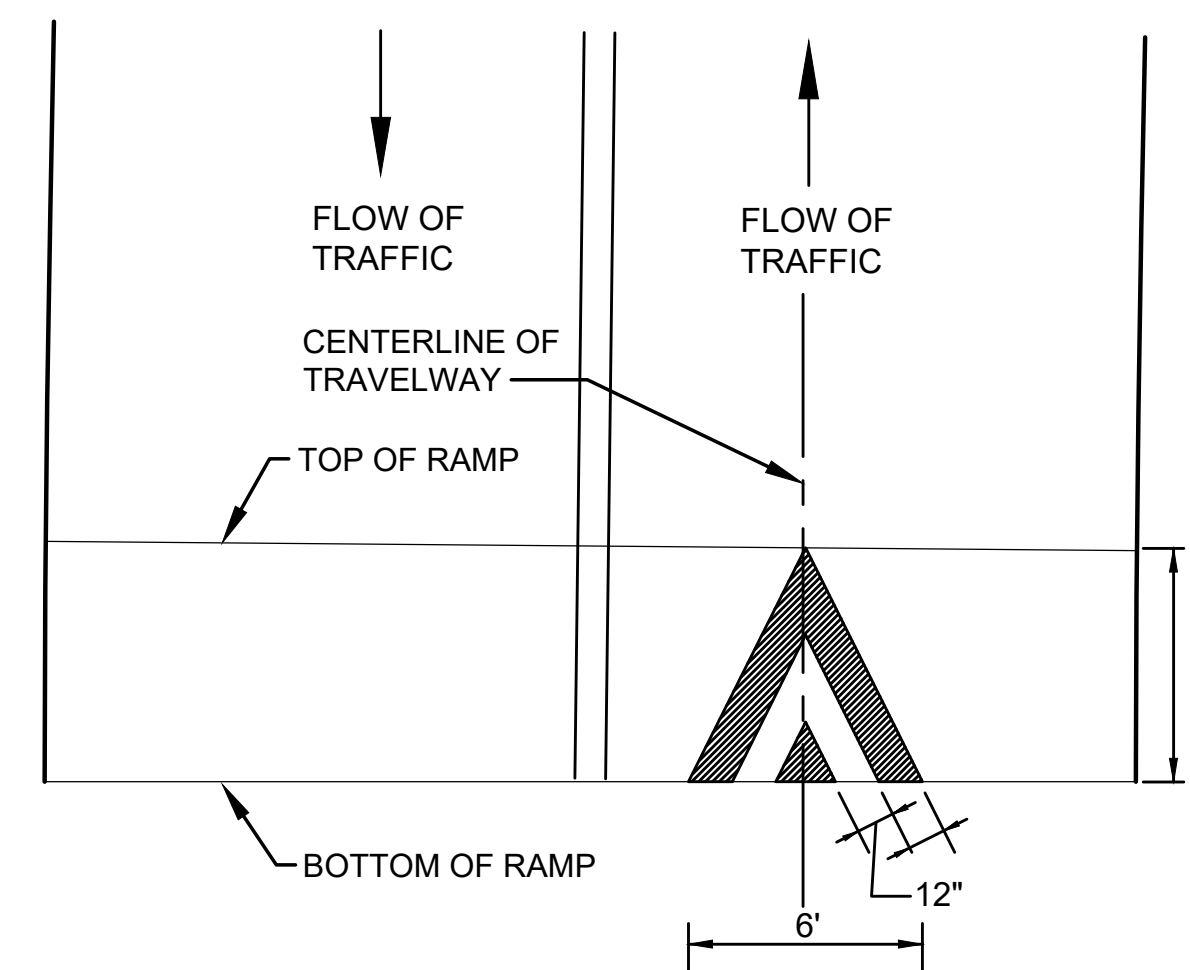
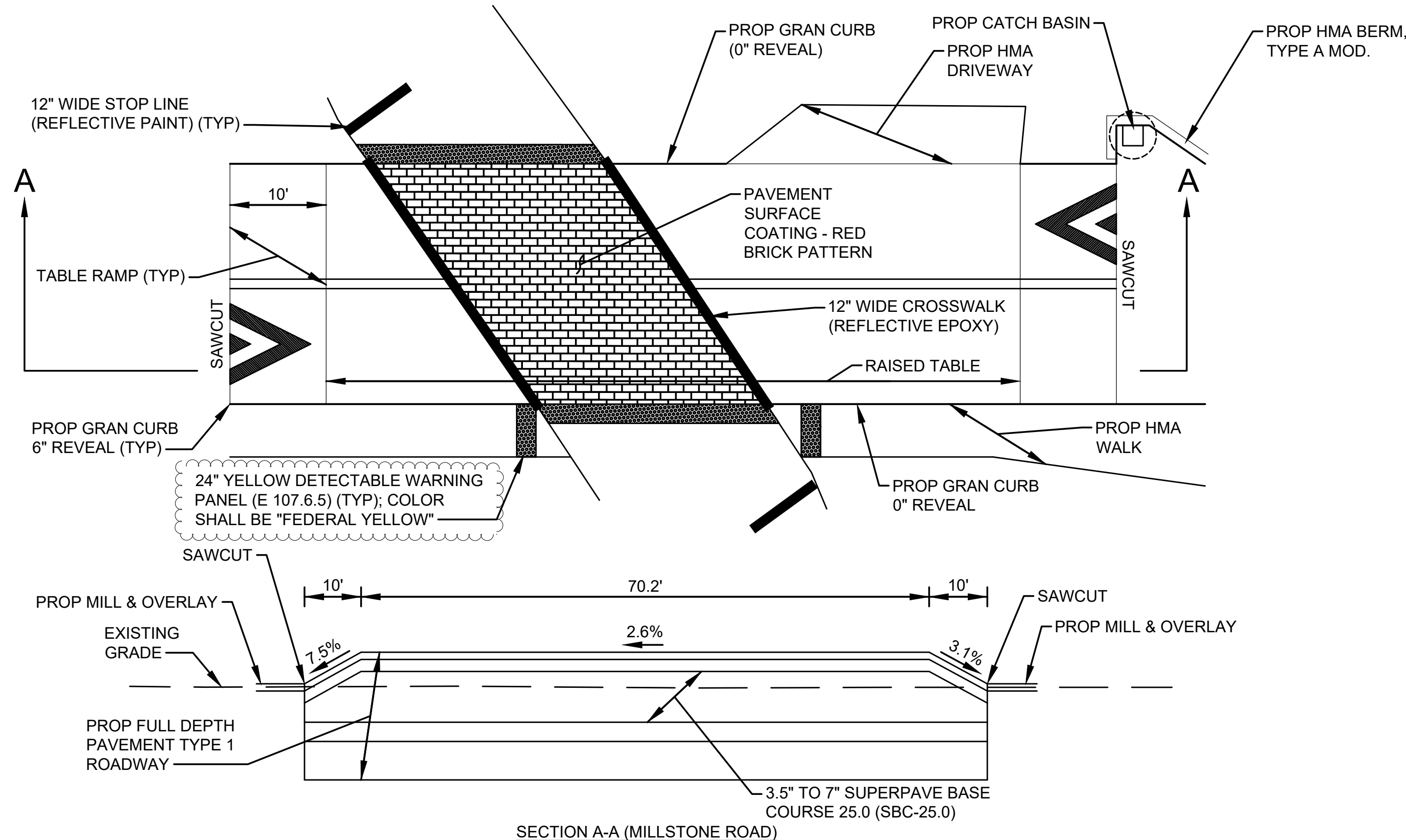
SCALE: N.T.S.

HMA DRIVEWAY W/ GRADE BREAK DATA					
NO.	LOCATION (REF POINT)	ROADWAY GUTTER	OPENING ELEV	LEFT SIDE TRANS	RIGHT SIDE TRANS
10	STA 220+84.86, 12.5' RT ALGN - MILLSTONE RD CONST BASELINE	0.50%	87.94	7'-8"	6'-6"
50	STA 234+59.28, 12.5' RT ALGN - MILLSTONE RD CONST BASELINE	0.54%	119.04	7'-8"	6'-6"
26	STA 266+22.80, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	-0.02%	115.76	6'-6"	7'-8"
30	STA 301+32.22, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	-0.90%	109.93	6'-6"	7'-8"
31	STA 302+41.15, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	2.16%	110.90	6'-6"	9'-0"
32	STA 302+84.52, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	3.91%	112.08	6'-6"	11'-0"
33	STA 303+44.79, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	-0.48%	113.23	7'-8"	6'-6"
34	STA 303+93.74, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	-0.60%	112.73	6'-6"	7'-8"
36	STA 305+04.50, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	1.33%	112.89	6'-6"	14'-0"
37	STA 305+56.92, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	1.30%	113.39	6'-6"	7'-8"
39	STA 308+38.25, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	-1.06%	113.09	6'-6"	7'-8"
47	STA 321+42.83, -12.5' LT ALGN - MILLSTONE RD CONST BASELINE	-1.33%	109.73	7'-8"	6'-6"
	STA 322+45.92, -12.5' LT				



**HMA DRIVEWAY AT STATION 205+80 RT**

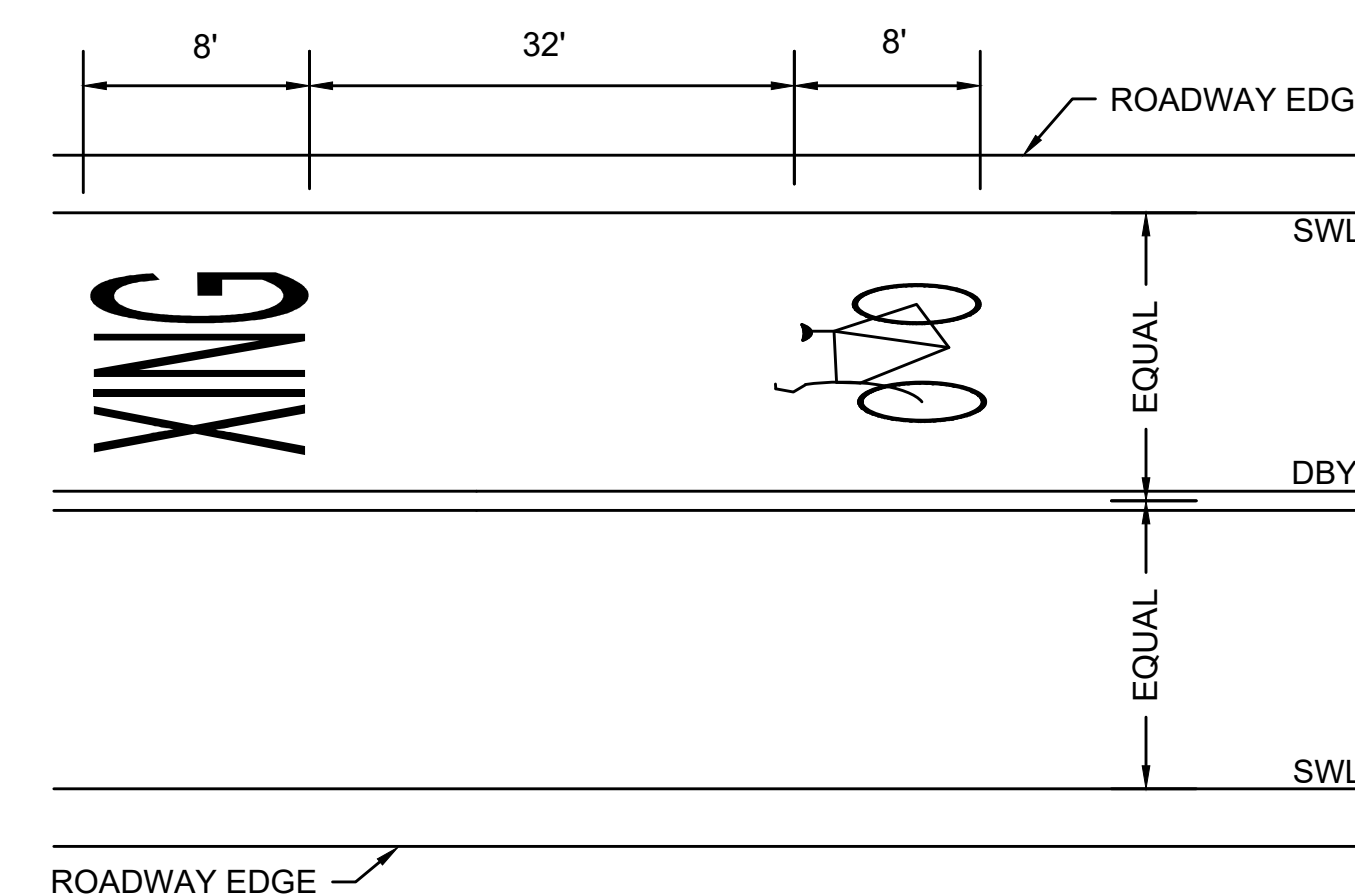
SCALE: N.T.S.



- NOTES:  
1. RAMP MARKINGS SHALL BE REFLECTIVE EPOXY.  
2. SEE TRAFFIC PLANS FOR RAMP MARKING LAYOUT.  
3. SEE FIGURE 3B-29 IN THE MUTCD FOR MORE DETAIL.

**SPEED TABLE PAVEMENT MARKINGS**

SCALE: N.T.S.



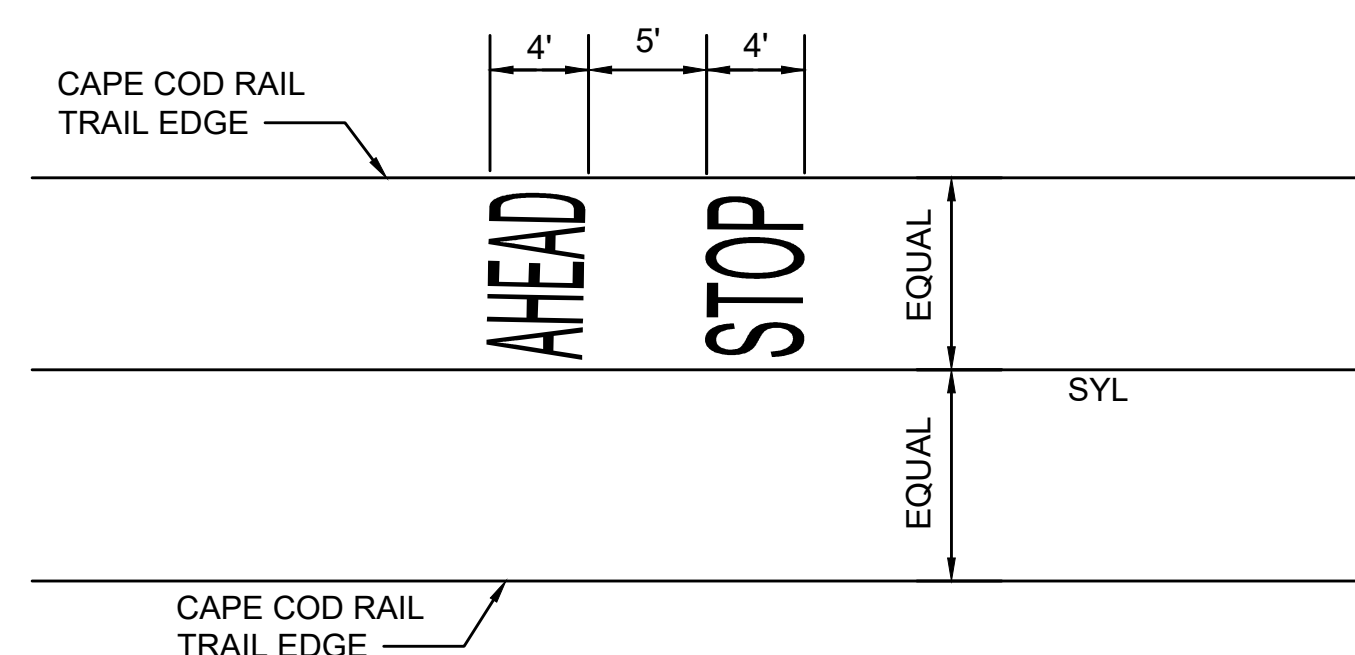
- NOTES:  
1. BICYCLE AND 'XING' MARKINGS SHALL BE REFLECTIVE THERMOPLASTIC.  
2. SWL AND DBYL MARKINGS SHALL BE REFLECTIVE EPOXY.

**ROADWAY PAVEMENT MARKINGS**

SCALE: N.T.S.

**CCRT CROSSING - SPEED TABLE**

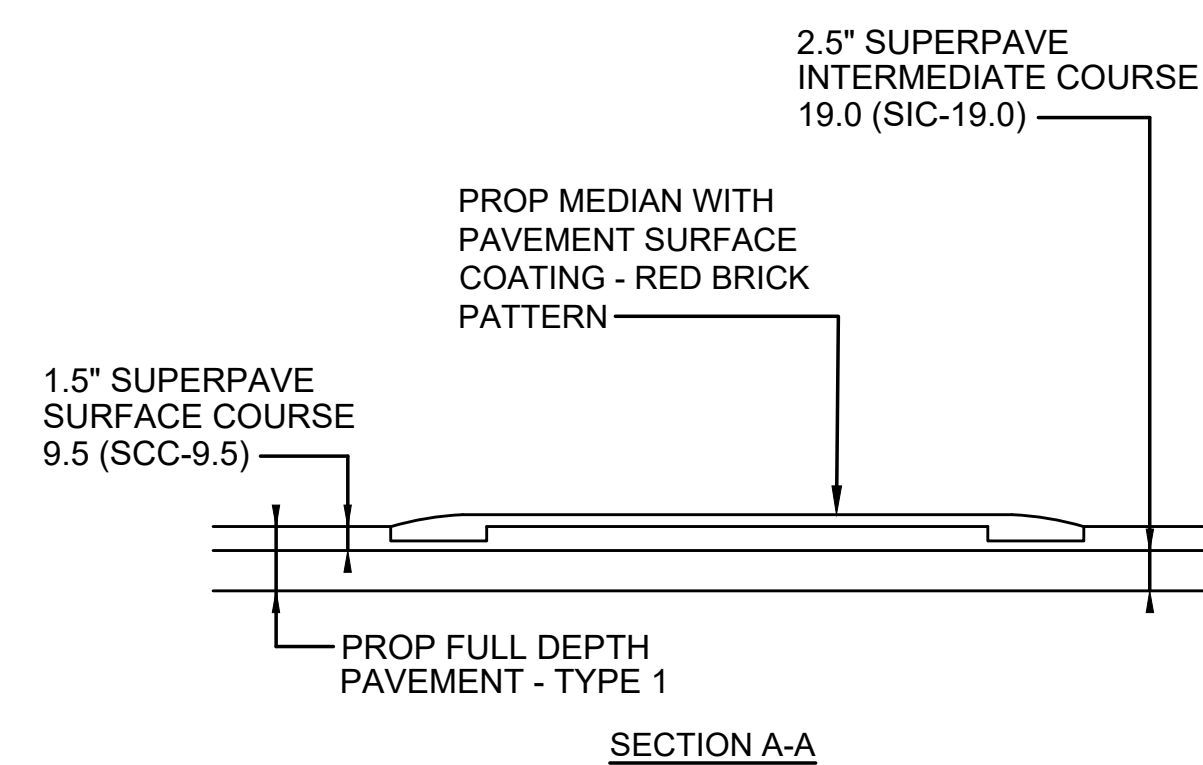
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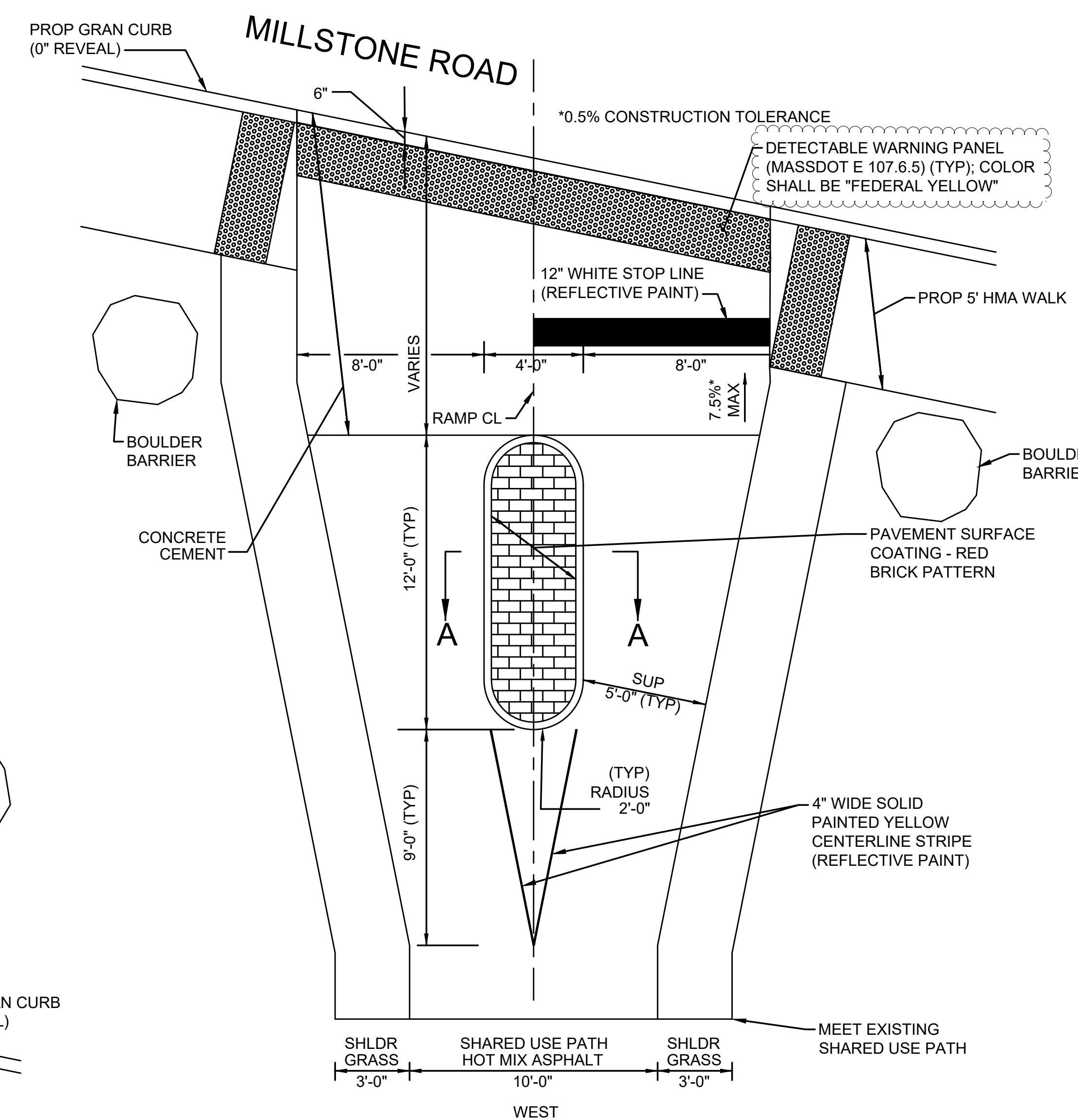
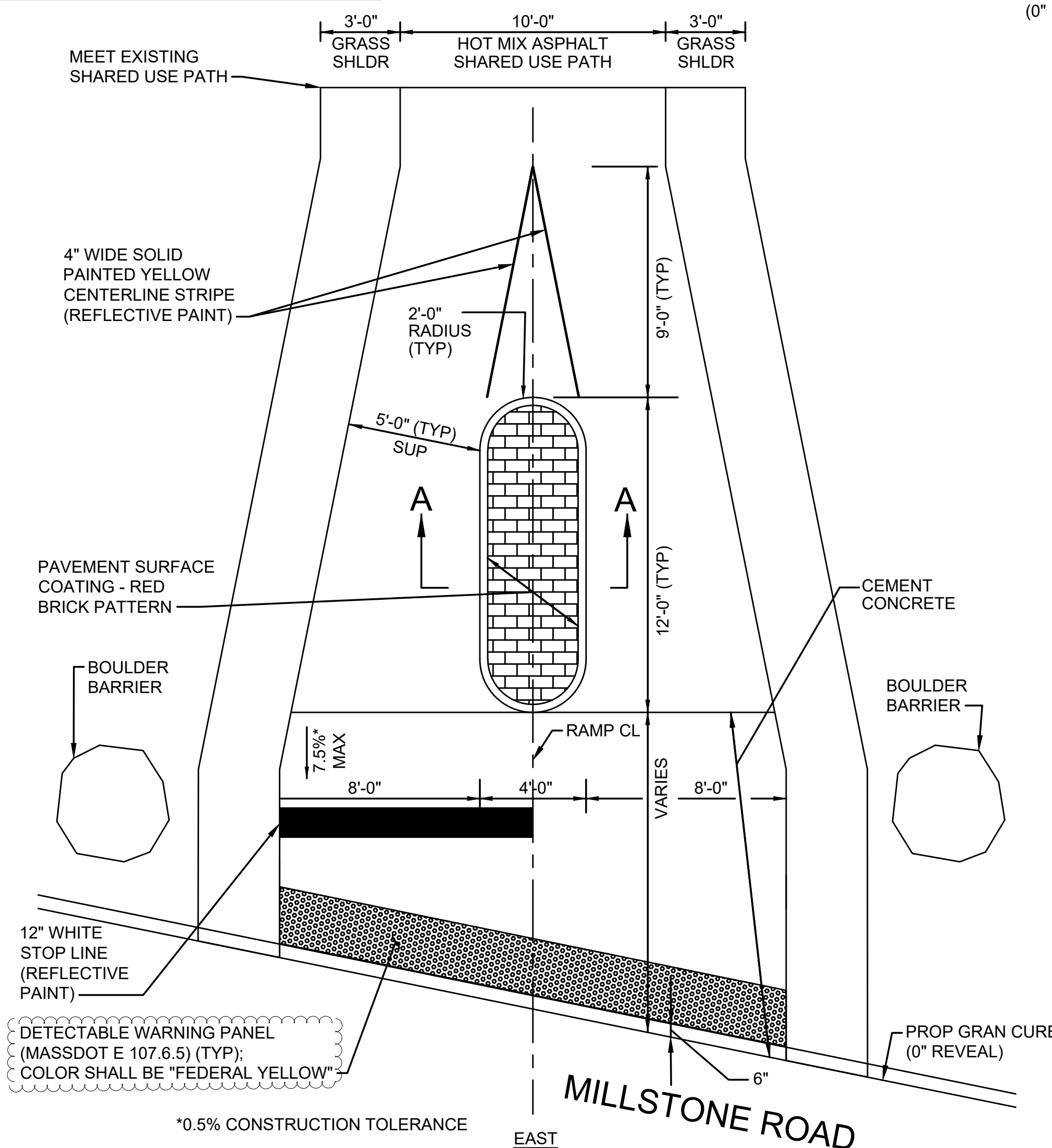
- NOTES:  
1. PAVEMENT MARKINGS AS PER MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD).  
2. PAVEMENT MARKINGS SHALL BE REFLECTIVE PAINT.

**SHARED-USE PATH PAVEMENT MARKINGS**

SCALE: N.T.S.



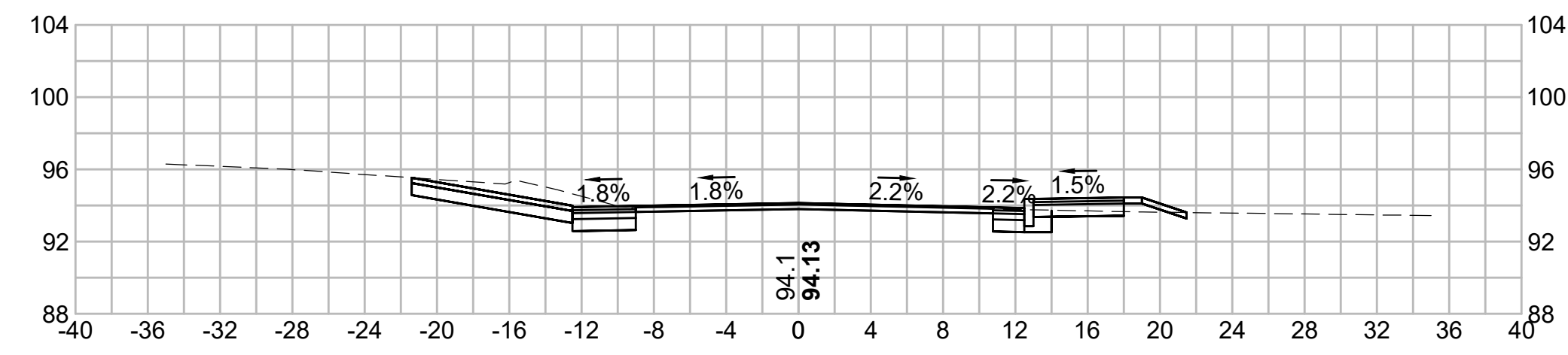
NOTE:  
PAYMENT FOR SUPERPAVE INTERMEDIATE COURSE SHALL BE INCLUDED IN THE UNIT PRICE BID FOR PAVEMENT SURFACE COATING.



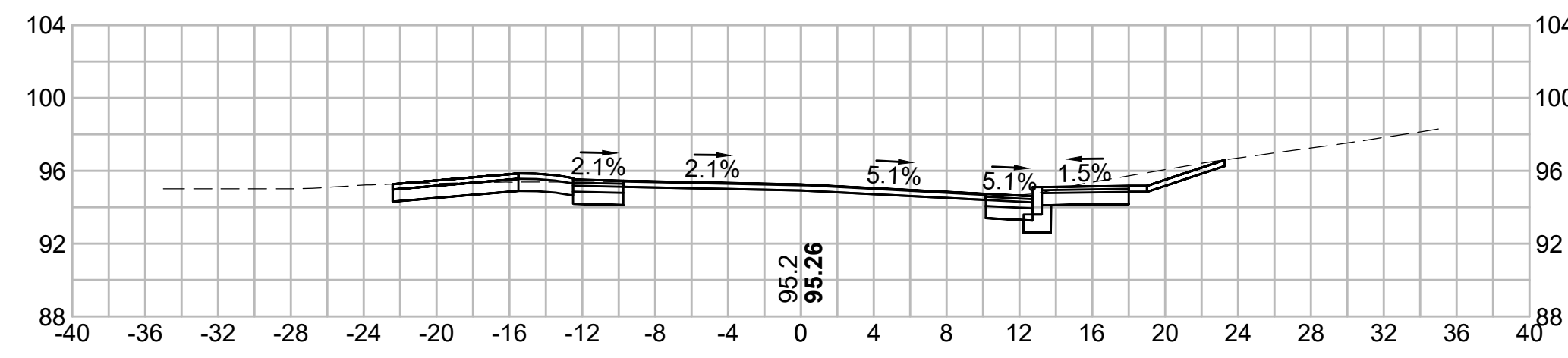
**SPLITTER ISLAND AND SHARED USE PATH PEDESTRIAN CURB RAMPS**

SCALE: N.T.S.

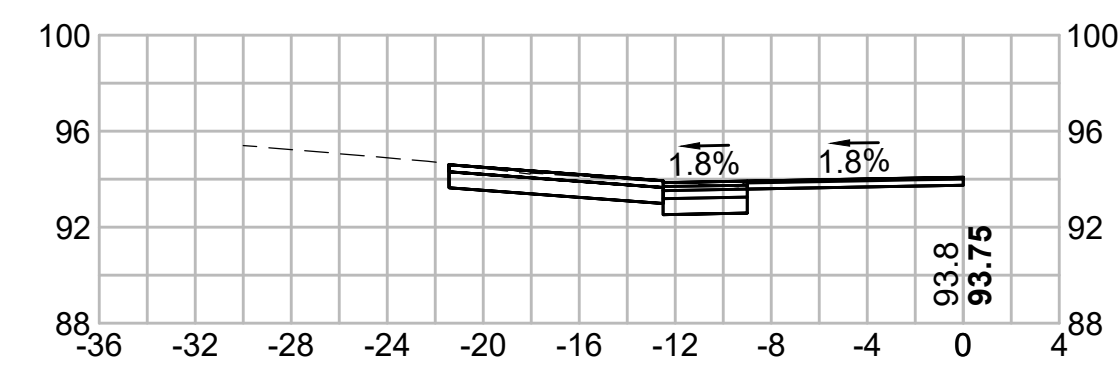
225+00



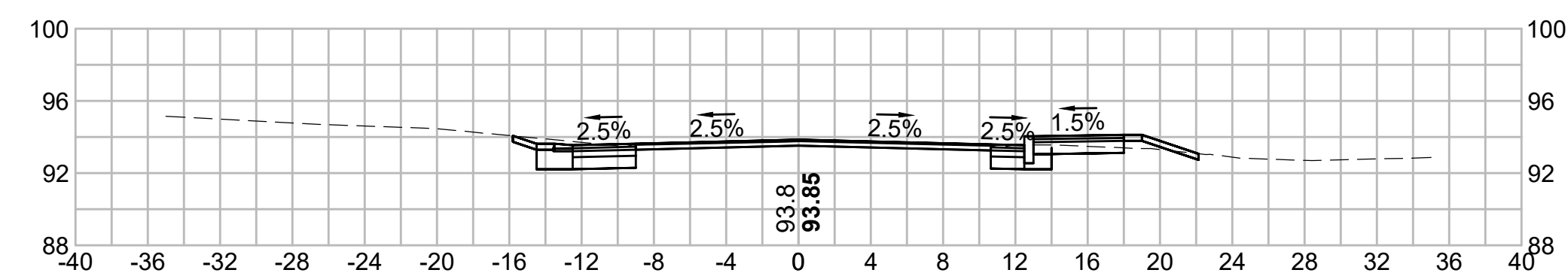
226+00



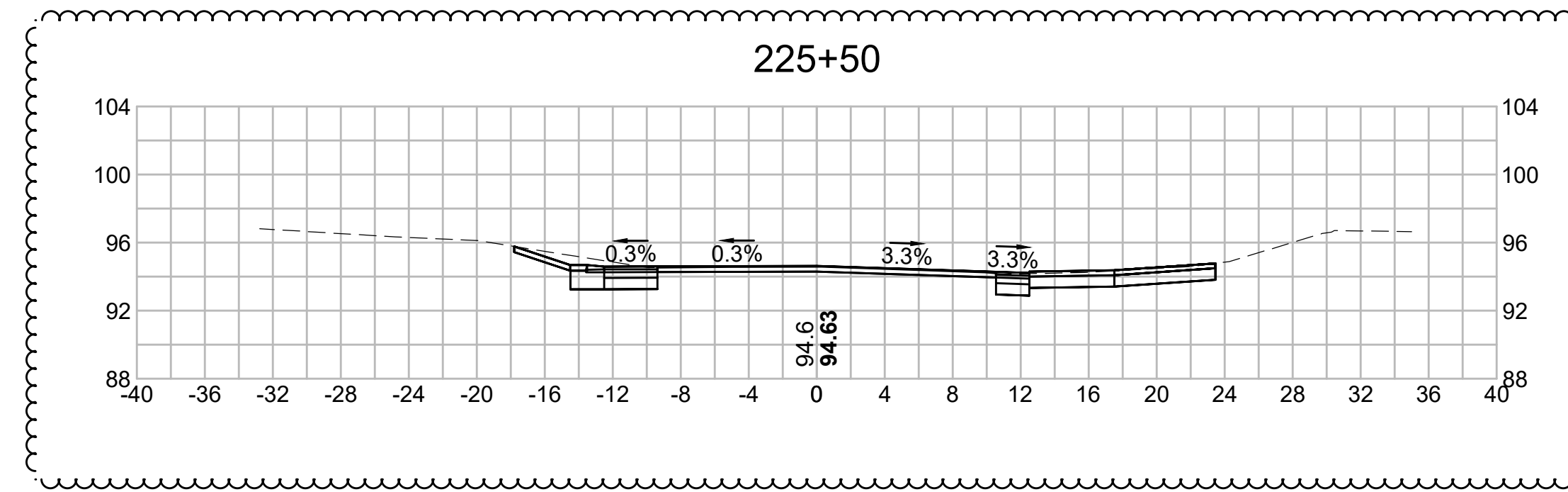
224+91.78



224+50



225+50



224+00

