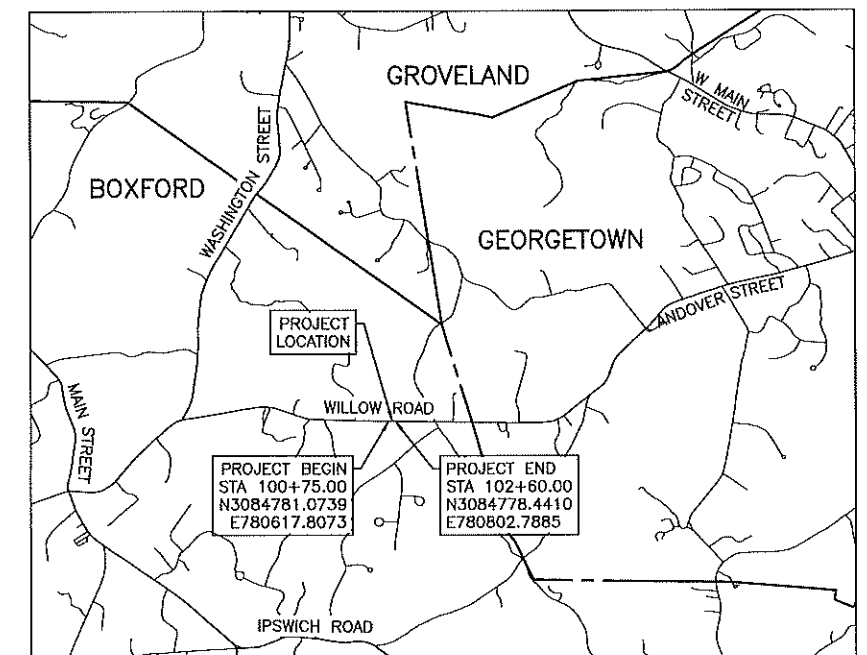
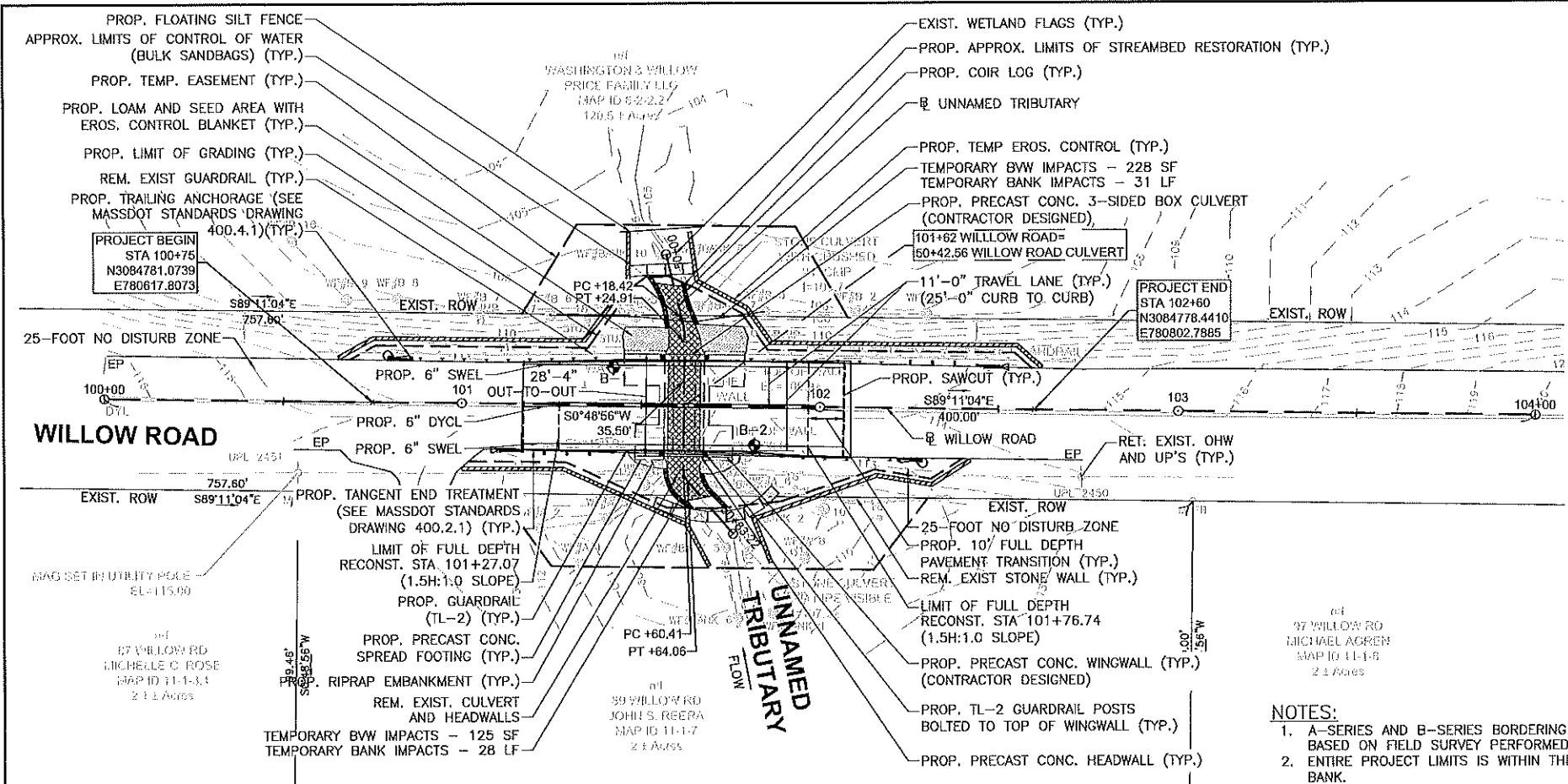
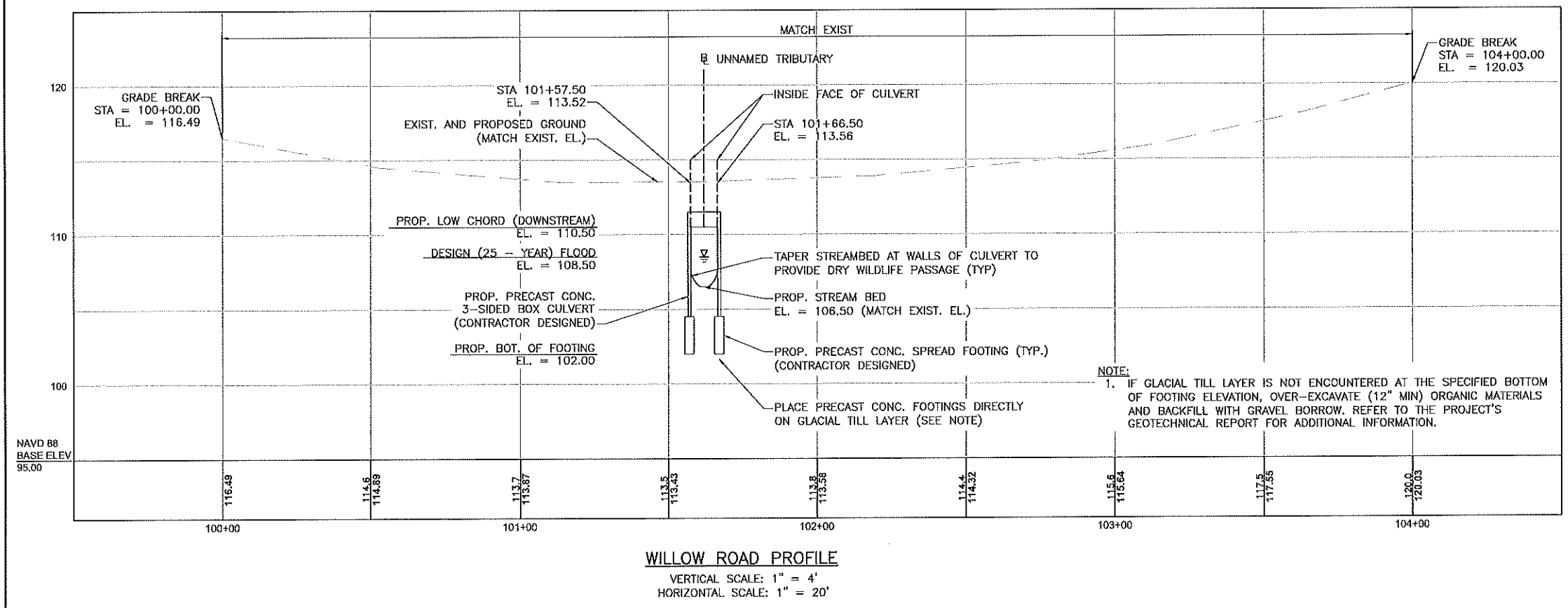


BOXFORD, MA  
WILLOW ROAD  
KEY PLAN AND PROFILE  
SHEET 1 OF 10



- NOTES:**
- A-SERIES AND B-SERIES BORDERING VEGETATIVE WETLANDS FLAGGING ARE SHOWN BASED ON FIELD SURVEY PERFORMED BY BAY COLONY GROUP ON AUGUST 12, 2020.
  - ENTIRE PROJECT LIMITS IS WITHIN THE 100-FOOT BUFFER ZONE TO BVW/INLAND BANK.



**INDEX**

SHEET NO.	DESCRIPTION
1	KEY PLAN AND PROFILE
2	BORING LOGS
3	GRADING PLAN
4	PLAN & ELEVATION
5 - 7	CONSTRUCTION DETAILS
8	CONTROL OF WATER PLAN
9 - 10	TEMPORARY TRAFFIC CONTROL PLAN

DATE	DESCRIPTION	REV #

**TEC**  
The Engineering Corp

146 Dascumb Road  
Andover, MA 01810  
978-794-1792

311 Main Street  
2nd Floor  
Worcester, MA 01608  
508-868-5104

169 Ocean Blvd, Unit 3  
PO Box 249  
Hampton, NH 03842  
603-601-8154

www.TheEngineeringCorp.com

RECOMMENDED FOR APPROVAL

CHIEF ENGINEER \_\_\_\_\_ DATE \_\_\_\_\_

APPROVED

HIGHWAY ADMINISTRATOR \_\_\_\_\_ DATE \_\_\_\_\_

T0898 (TITLE).DWG PLOTTED ON 18-NOV-2020 3:27 PM

BORING B-1

TEST BORING LOG

		Project: Willow Rd. Culvert Replacement Boxford, MA 20.097.NH Date Start: 06-17-20 Date End: 06-17-20		Sheet 1 of 1 Boring No: B-1 Location: See Plan Approx. Surface Elev:								
100 Sheffield Road - Manchester, NH 03103 Ph. (603) 668-6016 - Fax: (603) 668-8641												
GROUNDWATER OBSERVATIONS												
Type	CASING	SAMPLER	Date	Depth	Stabilization Period							
	HSA	SS	06-17-20	7'	26'							
Size	2-1/4" ID	1-3/8" ID										
Hammer	140 lbs.											
Fall	30"											
Depth/Elev.	Cas h/ft	Sample No.	Depth Range	Pen.	Rec.	0-6"	6-12"	12-18"	18-24"	Strata Change	Sample Description	Notes
0		-	0.0-1.2	14							- 14" Asphalt	
		S-1	1.2-2.5	16	9	7/4"	13	13			S-1: Brown, fine to coarse sand, some gravel, little silt	
		S-1A	2.5-3.0	6	4					12	S-1A: Brown, fine to coarse sand, some silt, some gravel (FILL)	
		S-2	4.0-6.0	24	14	7	4	3	2		S-2: Brown, fine to coarse sand, some silt, little gravel (FILL)	
		S-3	6.0-8.0	24	9	2	4	4	2		S-3: Brown, fine to coarse sand, some silt, little gravel (organic roots in sample) (FILL)	
		S-4	8.0-10.0	24	4	2	2	2	3		S-4: Brown, fine to coarse sand, some silt, little gravel (FILL)	
		S-5	10.0-11.0	12	10	6	12				S-5: Dark brown/black, peat, wet	
		S-5A	11.0-12.0	12	8			11	11		S-5A: Brown, fine sand, little silt, trace gravel, wet	(1)
		S-6	14.0-16.0	24	14	10	17	15	21		S-6: Olive/Orange, fine to coarse sand, some silt and gravel	
		S-7	19.0-20.5	18	13	22	34	54			S-7: Gray, silt, little clay	
		S-8	24.0-25.3	16	13	31	47	50/4"			S-8: Gray, fine to coarse sand, some silt and angular gravel	(2)
											Auger Refusal at 26'	
											BORING TERMINATED AT 26 ft	
Driller: R. Marcoux		COHESIVE CONSISTENCY (Blows/Feet)		COHESIONLESS (Blows/Feet)		PROPORTIONS USED						
Helper: J. Donahue		0-2 VERY SOFT		0-4 VERY LOOSE		TRACES 0-10%						
Inspector: T. Young		2-4 SOFT		4-10 LOOSE		LITTLE 10-20%						
		4-8 MEDIUM STIFF		10-30 MEDIUM DENSE		SOME 20-35%						
		8-15 STIFF		30-50 DENSE		AND 35-50%						
		15-30 HARD		50+ VERY DENSE								
NOTES: (1) A large piece of gravel was at the transition from peat to naturally occurring sand. (2) Rock in tip of split-spoon.												
REMARKS: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITION MAY BE GRADUAL. WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS. FLUCTUATIONS IN THE LEVEL OF THE GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.												

EXIST GROUND SURFACE  
EL = 113.0±

GROUNDWATER (6/17/20)  
EL = 106.0±

PROP. BOT. OF FOOTING  
EL = 101.20

EXIST GROUND SURFACE  
EL = 113.1±

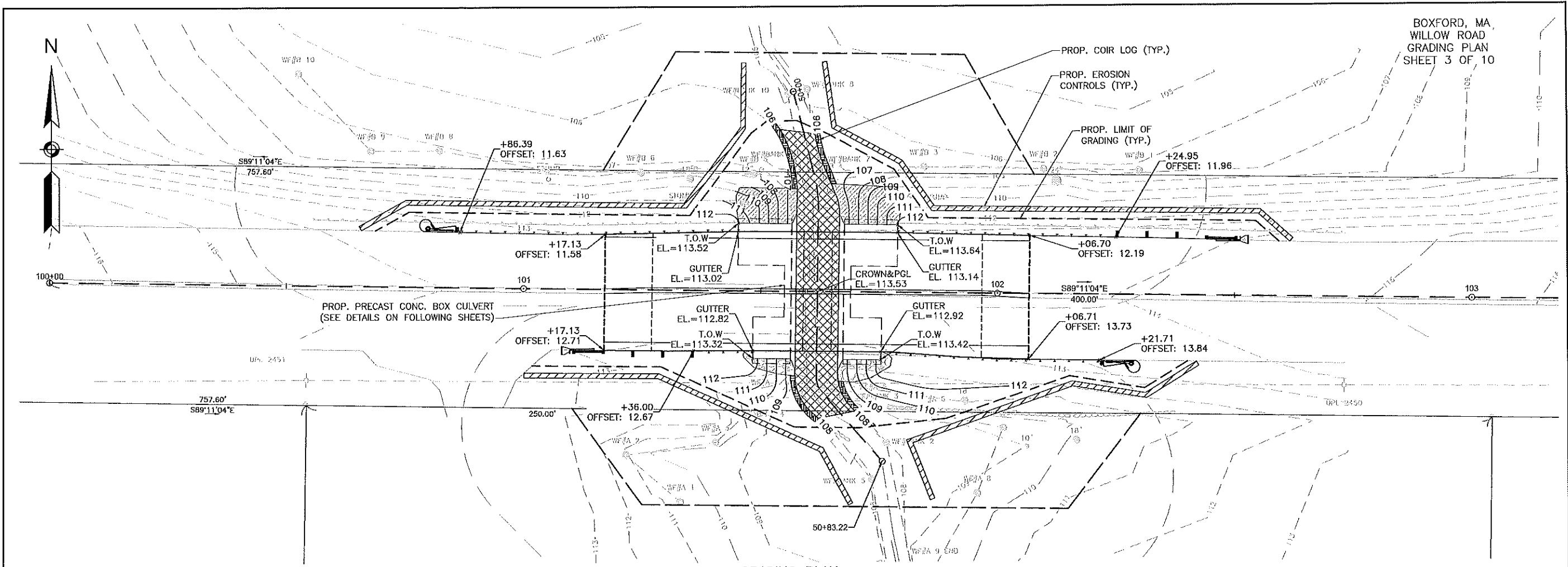
GROUNDWATER (6/17/20)  
EL = 107.6±

PROP. BOT. OF FOOTING  
EL = 102.80

BORING B-2

TEST BORING LOG

		Project: Willow Rd. Culvert Replacement Boxford, MA 20.097.NH Date Start: 06-17-20 Date End: 06-17-20		Sheet 1 of 1 Boring No: B-2 Location: See Plan Approx. Surface Elev:								
100 Sheffield Road - Manchester, NH 03103 Ph. (603) 668-6016 - Fax: (603) 668-8641												
GROUNDWATER OBSERVATIONS												
Type	CASING	SAMPLER	Date	Depth	Stabilization Period							
	HSA	SS	06-17-20	5.5'	27.5'							
Size	2-1/4" ID	1-3/8" ID										
Hammer	140 lbs.											
Fall	30"											
Depth/Elev.	Cas h/ft	Sample No.	Depth Range	Pen.	Rec.	0-6"	6-12"	12-18"	18-24"	Strata Change	Sample Description	Notes
0		-	0.0-1.2	14							- 14" Asphalt	
		S-1	1.2-3.0	22	8	21/4"	31	17	30		S-1: Brown/Orange, fine to medium sand, some silt and gravel (FILL)	
		S-2	4.0-6.0	24	10	7	17	13	6		S-2: Brown/Orange, fine to medium sand, some silt and gravel (FILL)	
		S-3	6.0-7.0	12	7	7	11				S-3: Brown/Orange, fine to medium sand, some silt and gravel, wet (FILL)	
		S-3A	7.0-8.0	12	8			14	5		S-3A: Dark brown/black, peat, wet	
		S-4	8.0-9.5	18	9	1	2	10			S-4: Dark brown/black, peat, wet	
		S-4A	9.5-10.0	6	2	21	25	31	15		S-4A: Olive/Orange (mottled), fine sand, little silt, little gravel, wet	
		S-5	10.0-12.0	24	13				29		S-5: Olive/Orange (mottled), fine sand, little silt, little gravel, wet	
		S-6	14.0-16.0	24	2	27	25	23	25		S-6: Brown, fine sand, little silt, wet	
		S-7	19.0-21.0	24	14	22	26	21	37		S-7: Gray, fine to coarse sand, some silt and angular gravel	
		S-8	24.0-26.0	24	12	15	15	16	26		S-8: Gray, fine to coarse sand, some silt and angular gravel	
											Auger Refusal at 27.5'	
											BORING TERMINATED AT 27.5 ft	
Driller: R. Marcoux		COHESIVE CONSISTENCY (Blows/Feet)		COHESIONLESS (Blows/Feet)		PROPORTIONS USED						
Helper: J. Donahue		0-2 VERY SOFT		0-4 VERY LOOSE		TRACE 0-10%						
Inspector: T. Young		2-4 SOFT		4-10 LOOSE		LITTLE 10-20%						
		4-8 MEDIUM STIFF		10-30 MEDIUM DENSE		SOME 20-35%						
		8-15 STIFF		30-50 DENSE		AND 35-50%						
		15-30 HARD		50+ VERY DENSE								
NOTES:												
REMARKS: THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES. TRANSITION MAY BE GRADUAL. WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS. FLUCTUATIONS IN THE LEVEL OF THE GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.												



**GRADING PLAN**  
SCALE: 1" = 10'

**GENERAL NOTES**

**DESIGN:**  
IN ACCORDANCE WITH THE 2017 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS WITH CURRENT INTERIM SPECIFICATIONS THROUGH 2019 FOR HL-93 LOADING.

**BENCHMARKS:**

MAG NAIL SET 1' UP	500	501	502
IN POLE 180/82	N: 3084761.976	N: 3084804.870	N: 3084792.046
EL = 115.00 (NAVD88)	E: 780674.338	E: 780247.102	E: 780914.956
	EL: 112.470	EL: 122.830	EL: 117.958

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988.

**SCALES:**  
SCALES NOTED ON THE PLANS ARE NOT APPLICABLE TO REDUCED SIZE PRINTS. DIVIDE SCALES BY TWO FOR HALF-SIZE PRINTS (A3).

**UNSUITABLE MATERIAL:**  
ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

**REINFORCEMENT:**  
REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M 31 GRADE 60 EPOXY COATED, UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS
1. NONE	21"	26"
2. 12" OF CONCRETE BELOW BARS	29"	36"
3. COATED BARS, COVER<3db, OR CLEAR SPACING<6db	31"	39"
4. COATED BARS, ALL OTHER CASES	25"	31"
5. CONDITION 2. AND 3.	35"	44"
6. CONDITION 2. AND 4.	34"	43"

IF THE ABOVE BARS ARE SPACED 6" OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS.

**PRECAST ELEMENTS:**  
THE FABRICATOR IS RESPONSIBLE FOR THE DESIGN AND INSTALLATION OF LIFT HOOKS FOR ALL PRECAST ELEMENTS. UNDER NO CIRCUMSTANCES WILL THE REBAR ELEMENTS SHOWN ON THE PLANS BE USED TO LIFT THE PRECAST ELEMENTS. FOR ADDITIONAL REQUIREMENTS, REFER TO THE "PRECAST CONCRETE ELEMENTS" PORTION OF ITEM 995.1 IN THE SPECIAL PROVISIONS.

**PRECAST CONCRETE:**  
5000 PSI, 3/4 IN, 685 HP: CULVERT, HEADWALL, AND FOOTINGS.

**TRAFFIC:**  
THE BRIDGE WILL BE CLOSED TO VEHICULAR TRAFFIC DURING ALL PHASES OF DEMOLITION AND CONSTRUCTION. VEHICULAR TRAFFIC WILL BE DETOURED AS SHOWN ON THE PLANS.

**UTILITIES:**  
DURING CONSTRUCTION, THE CONTRACTOR SHALL LOCATE AND PROTECT FROM DAMAGE ALL UTILITIES THAT ARE TO REMAIN. ALL EXISTING UTILITY POLES AND OVERHEAD WIRES SHALL BE LEFT IN PLACE DURING CONSTRUCTION.

**COIR LOGS:**  
WHILE GRADING IS TAKING PLACE, NO COIR LOGS WILL BE PLACED. UPON COMPLETION OF GRADING, COIR LOGS SHALL BE PLACED AS SHOWN.

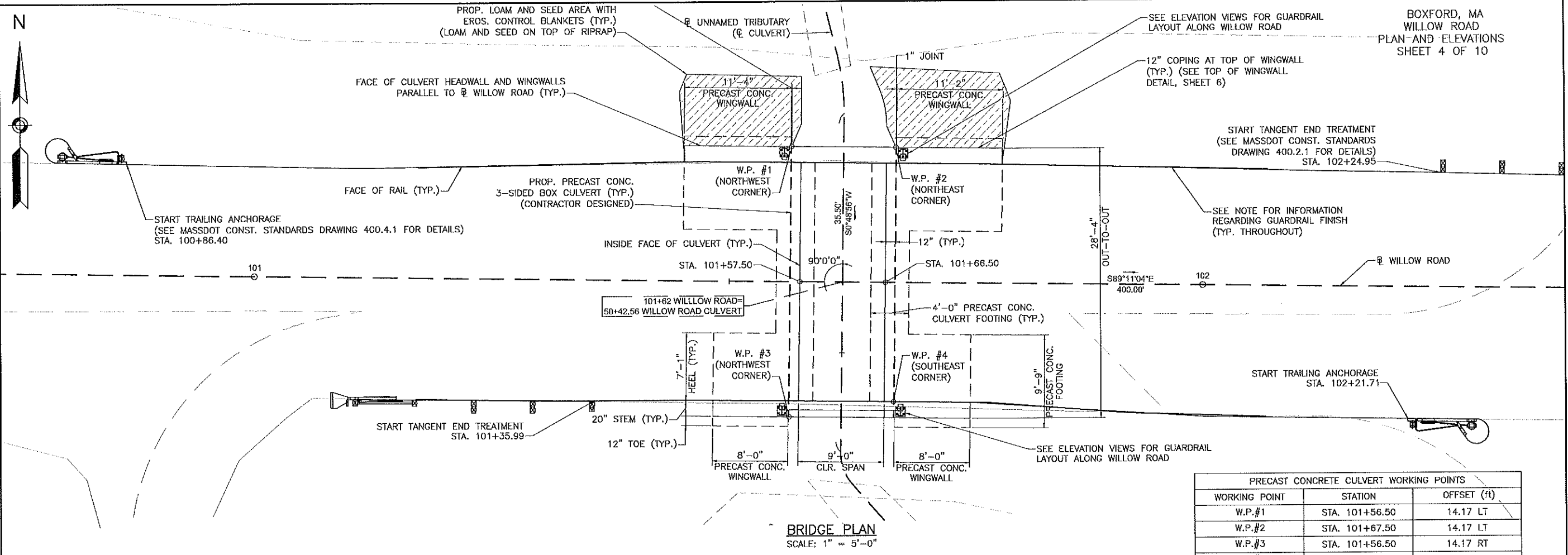
**CONTROL OF WATER SYSTEM:**  
CONTROL OF WATER SYSTEM SHALL BE DESIGNED BY THE CONTRACTOR AND SUBMITTED TO THE ENGINEER FOR APPROVAL, PER ITEM 991.1. CONTROL OF WATER SYSTEM SHALL BE DESIGNED USING THE 2-YEAR DESIGN FLOOD EVENT ELEVATION OF 108.0. APPROXIMATE LIMITS SHOWN ON THIS PLAN ARE CONCEPTUAL AND THE FINAL LOCATION SHALL BE DETERMINED BY THE CONTRACTOR.

**PAVEMENT MARKINGS:**  
ALL PAVEMENT MARKINGS SHALL BE THERMOPLASTIC AND SHALL SMOOTHLY TRANSITION INTO THE EXISTING PAVEMENT MARKINGS AT THE PROJECT LIMITS. A MINOR (NEGLIGIBLE) VARIATION IN THE SPECIFIED LANE WIDTHS IS PERMISSIBLE IN ORDER TO MAKE A SMOOTH TRANSITION FROM PROPOSED TO EXISTING PAVEMENT MARKINGS.

**HYDRAULIC DESIGN DATA**

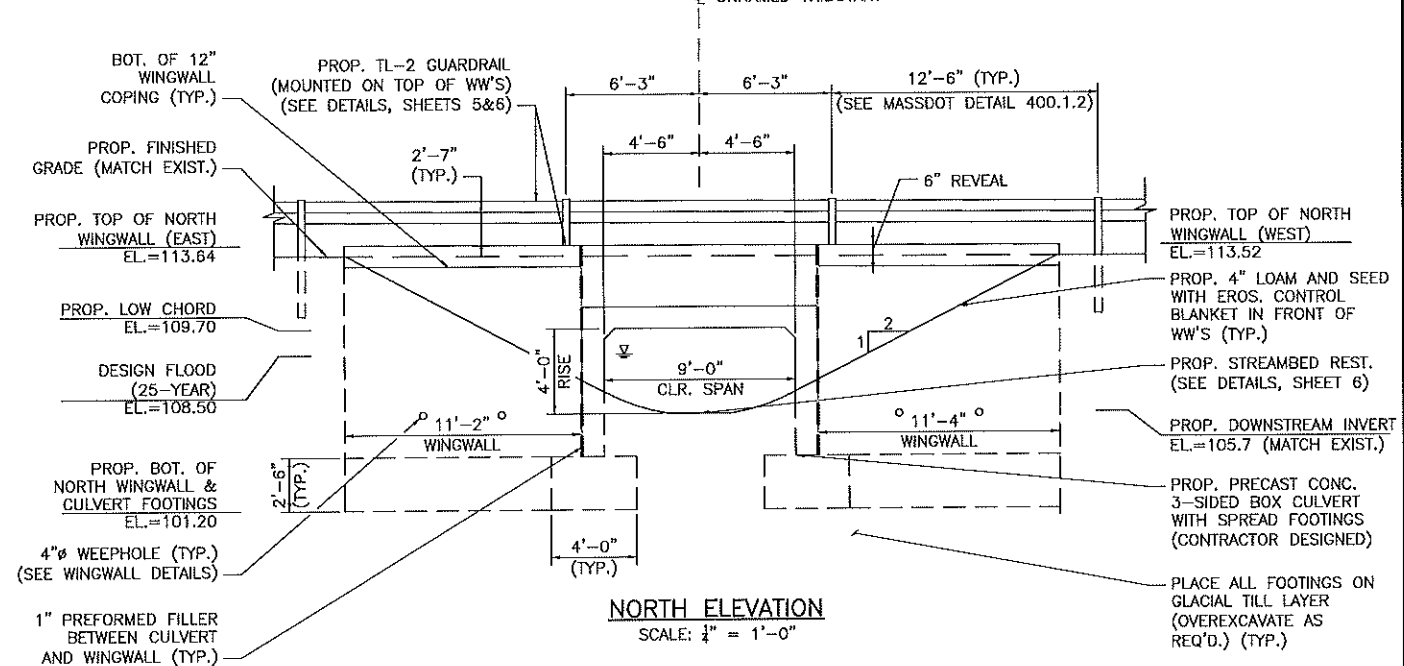
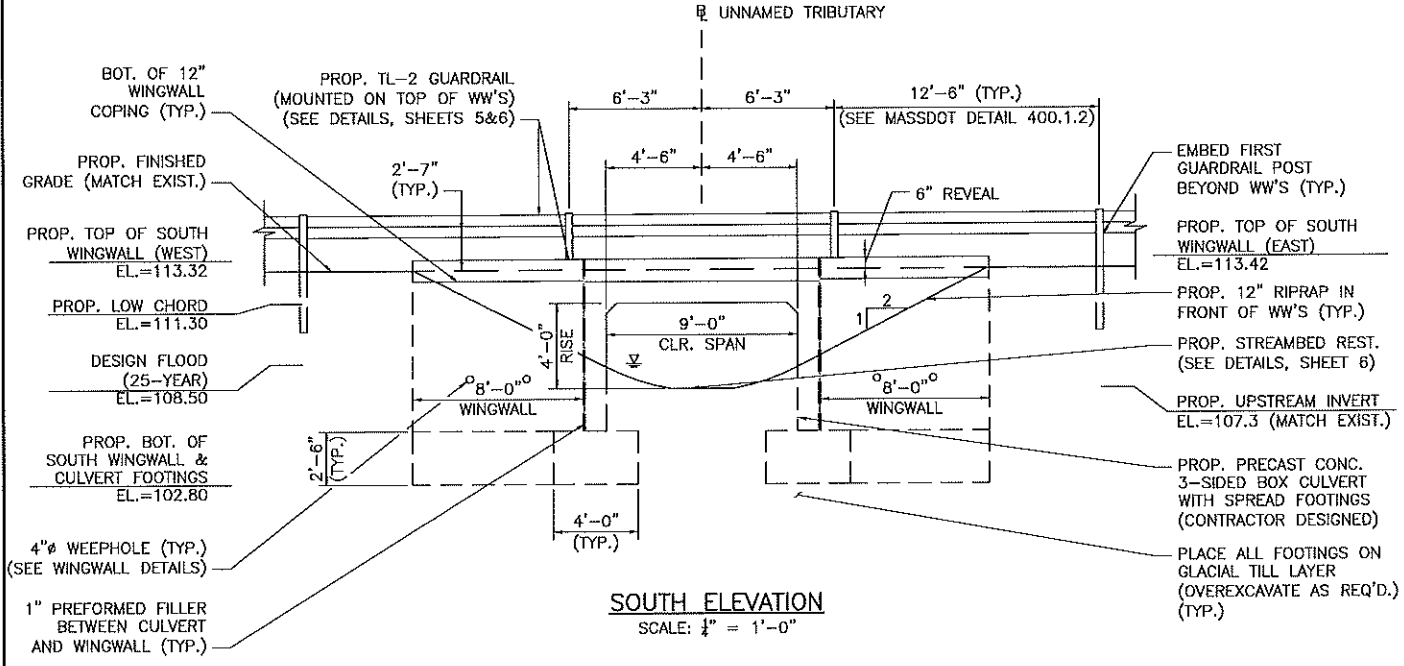
DRAINAGE AREA:	0.19 SQUARE MILES
DESIGN FLOOD DISCHARGE:	31 CUBIC FEET PER SECOND
DESIGN FLOOD FREQUENCY:	25 YEARS
DESIGN FLOOD VELOCITY:	4.8 FEET PER SECOND
DESIGN FLOOD ELEVATION:	108.50 FEET
LOWER CHORD ELEVATION:	109.70 FEET

**PAINTED GUARDRAIL NOTES:**  
ALL GUARDRAIL ELEMENTS AND END TREATMENTS SHALL BE PAINTED TO RESEMBLE CORTEN (WEATHERING) STEEL. REFER TO SPECIAL PROVISIONS (NO. 620.12, 627.1, AND 627.82) FOR ADDITIONAL INFORMATION. THE CONTRACTOR SHALL COORDINATE FINAL PAINT COLOR WITH THE TOWN OF BOXFORD PRIOR TO FABRICATION.



PRECAST CONCRETE CULVERT WORKING POINTS		
WORKING POINT	STATION	OFFSET (ft)
W.P.#1	STA. 101+56.50	14.17 LT
W.P.#2	STA. 101+67.50	14.17 LT
W.P.#3	STA. 101+56.50	14.17 RT
W.P.#4	STA. 101+67.50	14.17 RT

**NOTE:**  
 1. CULVERT FOOTING DIMENSIONS SHOWN ON THIS SHEET ARE CONCEPTUAL AND SHALL BE DESIGNED BY THE CONTRACTOR. REFER TO "PRECAST CONCRETE CULVERT NOTES" ON SHEET 5 FOR ADDITIONAL INFORMATION.  
 2. ALL GUARDRAIL ELEMENTS AND END TREATMENTS SHALL BE PAINTED TO RESEMBLE CORTEN STEEL. REFER TO SPECIAL PROVISIONS (NO. 620.12, 627.1, AND 627.82) FOR ADDITIONAL INFORMATION. THE CONTRACTOR SHALL COORDINATE FINAL PAINT COLOR WITH THE TOWN OF BOXFORD PRIOR TO FABRICATION.



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**TRANSVERSE SECTION NOTES:**

- EXISTING CULVERT AND HEADWALLS NOT SHOWN FOR CLARITY. CONTRACTOR IS RESPONSIBLE FOR DEMOLITION OF ALL EXISTING CULVERT INFRASTRUCTURE.
- THE PROPOSED ROADWAY ELEVATIONS AND CROSS SLOPES ARE INTENDED TO MATCH THE EXISTING CONDITIONS. CONTRACTOR SHALL SMOOTHLY TRANSITION ALL PROPOSED ELEMENTS INTO THE EXISTING APPROACHES AND EMBANKMENT SLOPES.

**PAVEMENT NOTES:**

**PROPOSED FULL DEPTH RECONSTRUCTION:**

SURFACE: 1 1/2" SUPERPAVE SURFACE COURSE 12.5 (SSC - 12.5) OVER 2 1/2" SUPERPAVE INTERMEDIATE COURSE 19.0 (SIC - 19.0)

SUBBASE: 4" DENSE GRADED CRUSHED STONE OVER 8" GRAVEL BORROW, TYPE B

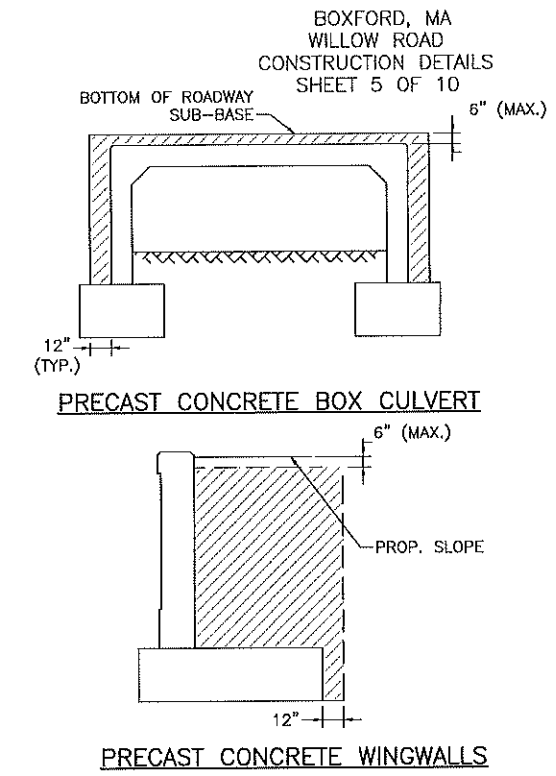
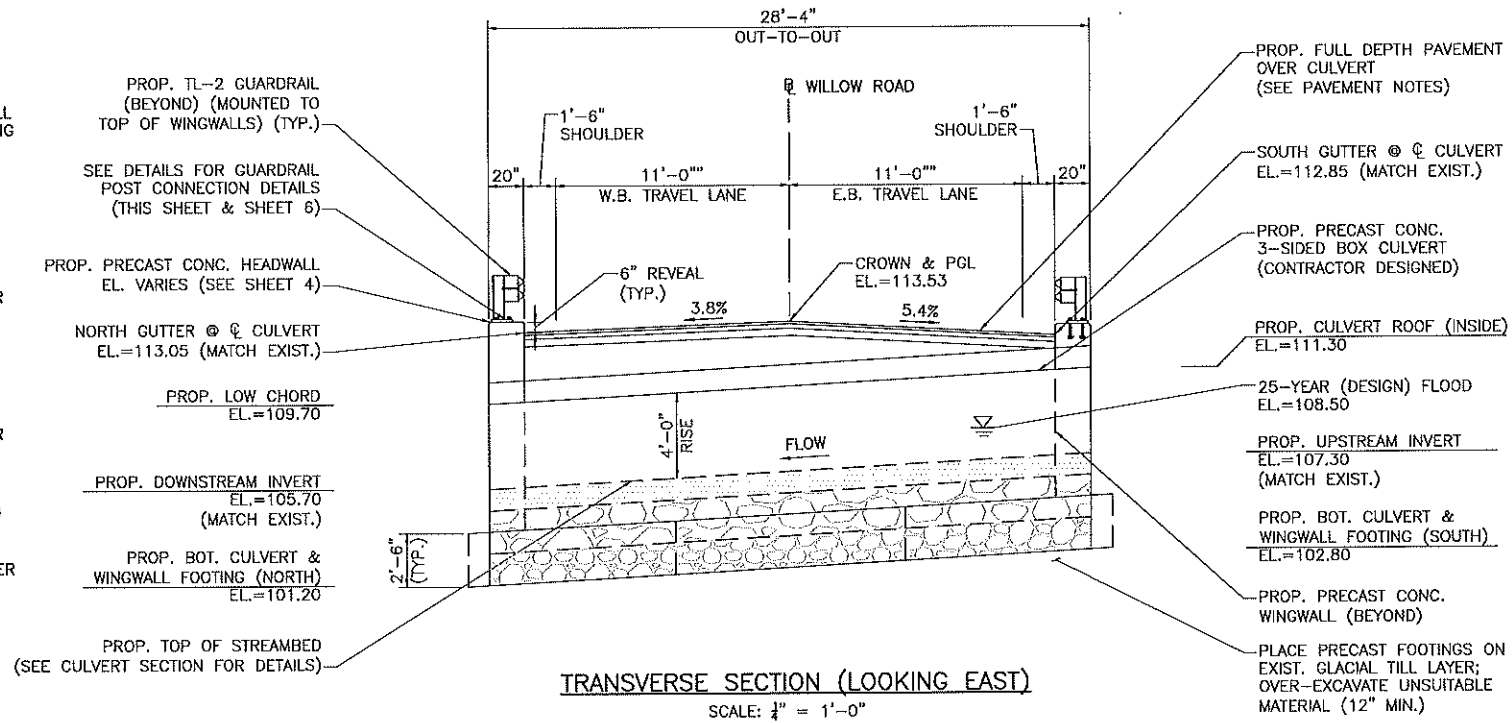
**PROPOSED FULL DEPTH RECONSTRUCTION (OVER CULVERT):**

SURFACE: 1 1/2" SUPERPAVE SURFACE COURSE 12.5 (SSC - 12.5) OVER 2 1/2" SUPERPAVE INTERMEDIATE COURSE 19.0 (SIC - 19.0)

SUBBASE: 4" DENSE GRADED CRUSHED STONE OVER VARIABLE DEPTH GRAVEL BORROW, TYPE B (UP TO 1'-7"±)

**PROPOSED PAVEMENT MILLING TRANSITION:**

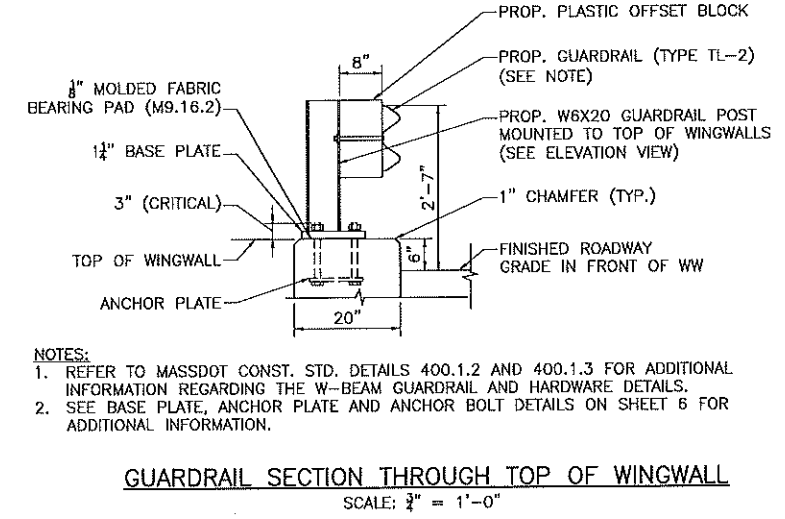
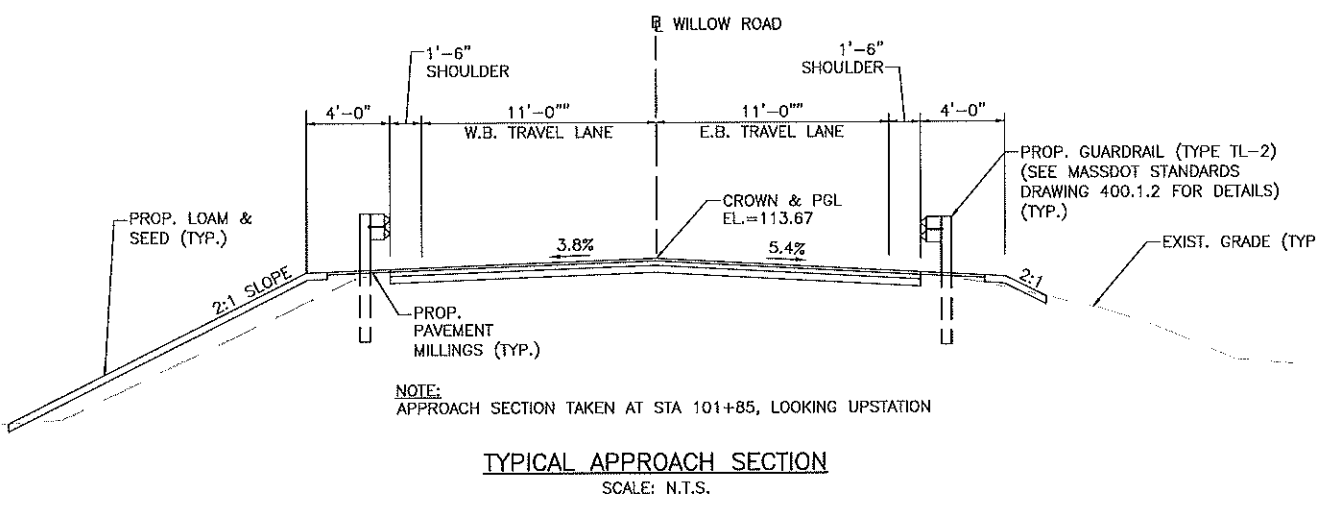
SURFACE: 1 1/2" SUPERPAVE SURFACE COURSE 12.5 (SSC - 12.5) OVER 2 1/2" SUPERPAVE INTERMEDIATE COURSE 19.0 (SIC - 19.0)



- NOTES:**
- HATCHED AREAS INDICATE THE LIMIT OF GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES.
  - THE BACKFILL PLACED AROUND THE STRUCTURE SHALL BE DEPOSITED ON BOTH SIDES TO APPROXIMATELY THE SAME ELEVATION AT THE SAME TIME.

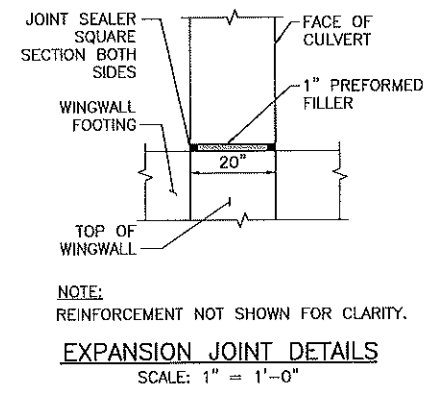
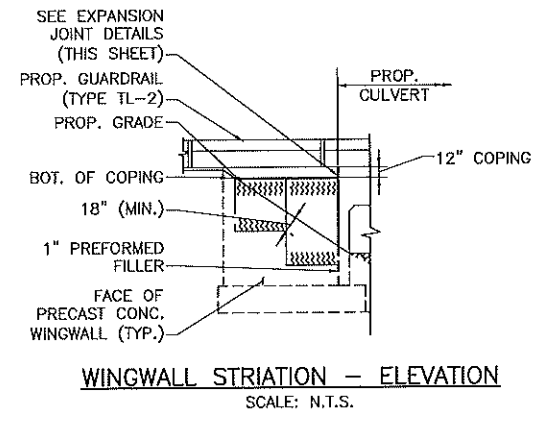
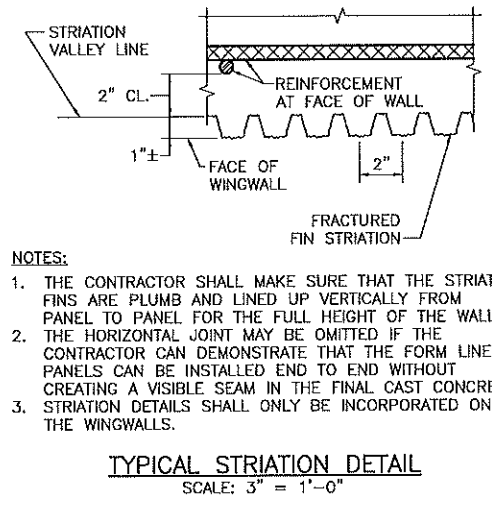
**LIMITS OF GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES**  
SCALE: 1/4" = 1'-0"

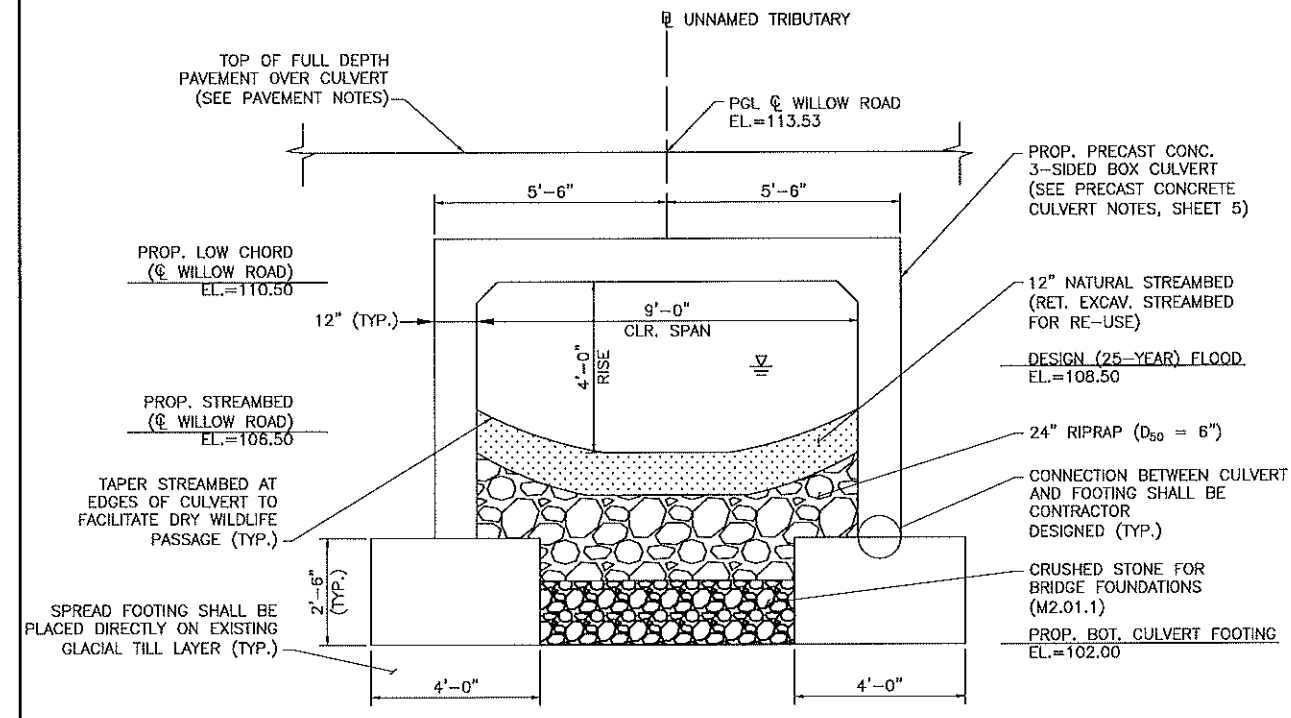
- HANDRAIL AND GUARDRAIL NOTES:**
- ALL STEEL CONNECTING BOLTS AND FASTENERS FOR HANDRAIL POSTS, RAILINGS, NUTS AND WASHERS SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M232.
  - GUARDRAIL BASE PLATES SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M270 GRADE 50.
  - ANCHOR BOLTS SHALL BE SET WITH TEMPLATES. THE NUT SECURING THE POST BASE PLATE TO THE CONCRETE SHALL BE TIGHTENED TO A SNUG FIT AND GIVEN AN ADDITIONAL 1/8 TURN AFTER STEEL IS IN PLACE.
  - POST FLANGE WELD DOES NOT REQUIRE MAGNETIC PARTICLE TESTING. WELD SHALL BE BACK-GOUGED ON BACK SIDE EXCEPT AT WEB. WELD IS THE SAME ON BOTH FLANGES.
  - W-BEAM DETAILS, EXCEPT ATTACHMENT TO WINGWALLS, SHALL BE STANDARD RELEVANT TO MASSDOT CONSTRUCTION STANDARDS.
  - ALL GUARDRAIL ELEMENTS AND END TREATMENTS SHALL BE PAINTED TO RESEMBLE CORTEN STEEL. REFER TO SPECIAL PROVISIONS (NO. 620.12, 627.1, AND 627.82) FOR ADDITIONAL INFORMATION. THE CONTRACTOR SHALL COORDINATE FINAL PAINT COLOR WITH THE TOWN OF BOXFORD PRIOR TO FABRICATION.



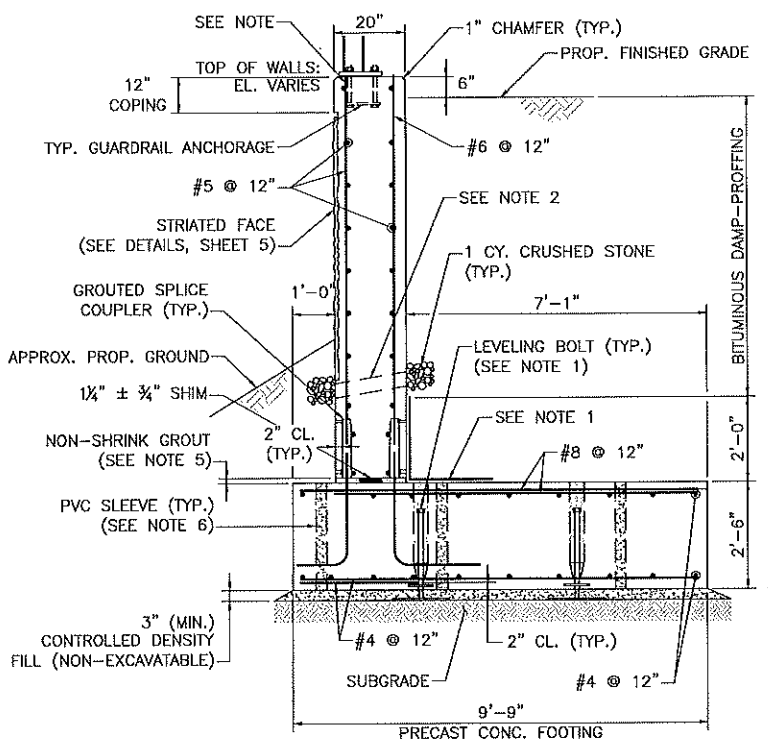
**PRECAST CONCRETE CULVERT NOTES:**

- CONTRACTOR SHALL SUBMIT PRECAST CONCRETE 3-SIDED BOX CULVERT AND FOOTING DESIGN CALCULATIONS AND SHOP DRAWINGS SEALED BY A PROFESSIONAL ENGINEER REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS FOR APPROVAL PRIOR TO FABRICATION. PRESCRIBED HYDRAULIC OPENING (4'X9') SHALL BE MAINTAINED.
- IF CLOSURE POURS ARE REQUIRED AS PART OF THE FOOTING OR CULVERT DESIGN, HIGH EARLY STRENGTH CONCRETE SHALL BE UTILIZED IN ORDER TO EXPEDITE BACKFILLING OPERATIONS. ACTUAL FOOTING DIMENSIONS SHALL BE DETERMINED BY THE CONTRACTOR. ALL OTHER CULVERT AND FOOTING CONCRETE SHALL BE 5000PSI, 3/4", 685 HP CEMENT CONCRETE.
- THE CONTRACTOR SHALL APPROVE ALL ELEVATIONS AND DIMENSIONS OF THE SHOP DRAWINGS PRIOR TO FABRICATION. SHOP DRAWINGS AND CALCULATIONS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW AND APPROVAL PRIOR TO FABRICATION.
- REINFORCEMENT SHALL BE PLACED WITH A MINIMUM OF 1 1/2" COVER. TRANSVERSE REINFORCEMENT SHALL BE PLACED NORMAL TO THE C OF WILLOW ROAD.
- ALL CULVERT REINFORCEMENT SHOWN IS CONCEPTUAL FOR BIDDING PURPOSES. THE CONTRACTOR SHALL SUBMIT DESIGN CALCULATIONS AS PART OF THE SHOP DRAWINGS.
- DESIGN SHALL BE IN ACCORDANCE WITH THE 2017 AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS WITH CURRENT INTERIM SPECIFICATIONS THROUGH 2019 AND THE MASSDOT LRFD BRIDGE MANUAL PART 1 CHAPTER 3 FOR HL-93 LOADING.
- A FACTORED BEARING RESISTANCE OF 5.0 KSF SHALL BE USED IN THE DESIGN OF THE CULVERT (IF PLACED DIRECTLY ON THE GLACIAL TILL LAYER, AS SPECIFIED IN THE GEOTECHNICAL REPORT). THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE SUBGRADE PREPARATION SUCH THAT THE DESIGN BEARING CAPACITY SHALL BE ACHIEVED. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF THIS BEARING CAPACITY CANNOT BE MET.
- THE CONTRACTOR SHALL BE MADE AWARE OF THE OVERHEAD WIRES ABOVE THE SOUTH GUTTERLINE. CONTRACTOR SHALL UTILIZE CONSTRUCTION TECHNIQUES TO WORK BENEATH THESE WIRES.

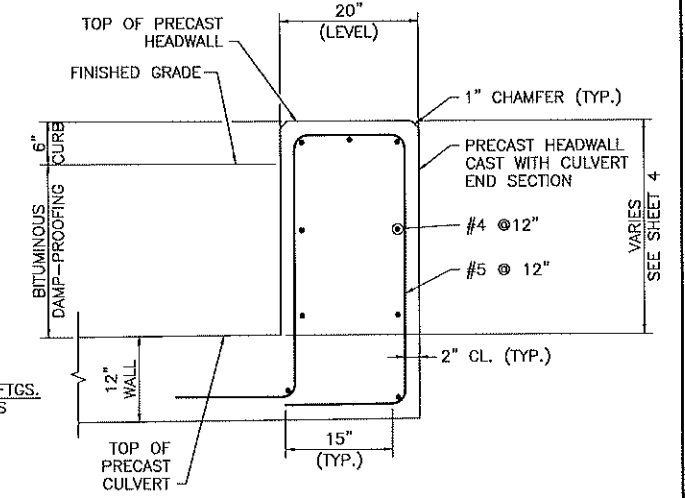




TYPICAL CULVERT SECTION (AT WILLOW ROAD)  
SCALE: 1/2" = 1'-0"

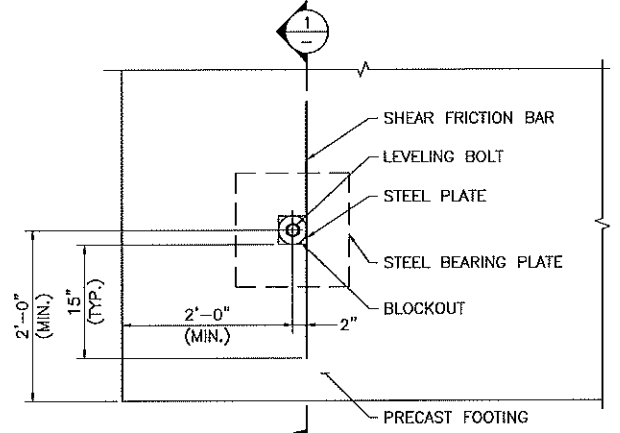


TYPICAL WINGWALL SECTION  
SCALE: 1/2" = 1'-0"



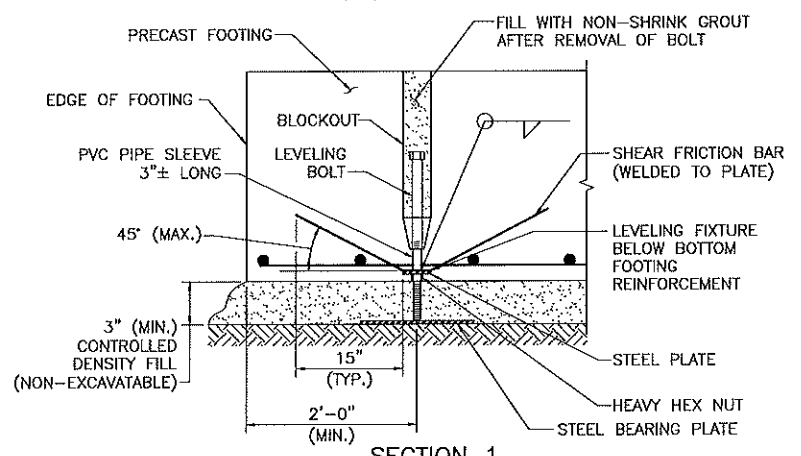
TYPICAL SECTION THROUGH PRECAST HEADWALL  
SCALE: 1" = 1'-0"

- WINGWALL CONSTRUCTION NOTES:**
- MEMBRANE WATERPROOFING OR OTHER WATERPROOFING PROTECTIVE COURSE, MIN. 2" THICK AS SPECIFIED IN MASSDOT STANDARD SPECIFICATIONS.
  - 4" Ø WEEP HOLES AT THIRD POINTS OF WALL LENGTHS (JUST ABOVE PROTECTIVE COURSE). PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF WEEP HOLE.
  - ALL WINGWALL CONCRETE SHALL BE 5000 PSI, 3/4" IN, 685 HP CEMENT CONCRETE.
  - THE FACTORED BEARING PRESSURE = 3.75 KSF, PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH 1 LOAD COMBINATION. FACTORED BEARING RESISTANCE = 5.0 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.
  - PRE-BED PRECAST ELEMENT WITH NON-SHRINK GROUT WITH THICKNESS MORE THAN SHIM STACK.
  - THE CONTRACTOR SHALL DETERMINE THE SIZE AND SPACING OF THE GROUT PORTS BASED ON THE CDF'S FLOW PROPERTIES AND THE SIZE OF THE FOOTING.

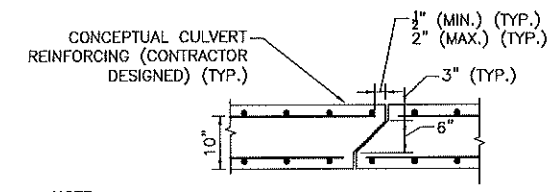


PLAN  
SCALE: 1" = 1'-0"

- LEVELING BOLT ASSEMBLY NOTES:**
- THE LEVELING BOLT ASSEMBLY SHOWN IS SCHEMATIC. DESIGN OF THE LEVELING BOLT ASSEMBLY SHALL BE PERFORMED BY THE CONTRACTOR AND SUBMITTED WITH THE ASSEMBLY PLAN TO THE ENGINEER FOR APPROVAL.
  - BOLT SHALL BE REMOVED AFTER THE CONTROLLED DENSITY FILL (NON-EXCAVATABLE) HAS SET.
  - STEEL PLATES SHALL BE AASHTO M 270 GRADE 36 UNCOATED STEEL.
  - BOLTS SHALL BE H.S. AASHTO M 164 AND UNCOATED.
  - REINFORCEMENT SHALL BE WELDABLE LOW-ALLOY ASTM A 706 BARS.
  - GREASE OF OIL NUT AND BOLT THREADS TO FACILITATE LEVELING AND REMOVAL.

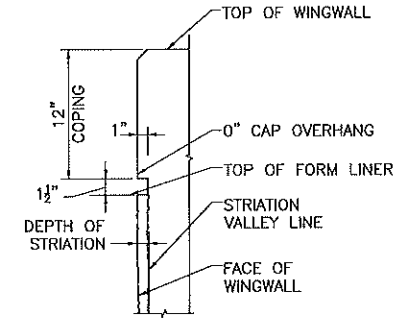


SECTION 1  
SCALE: 1" = 1'-0"  
LEVELING BOLT ASSEMBLY

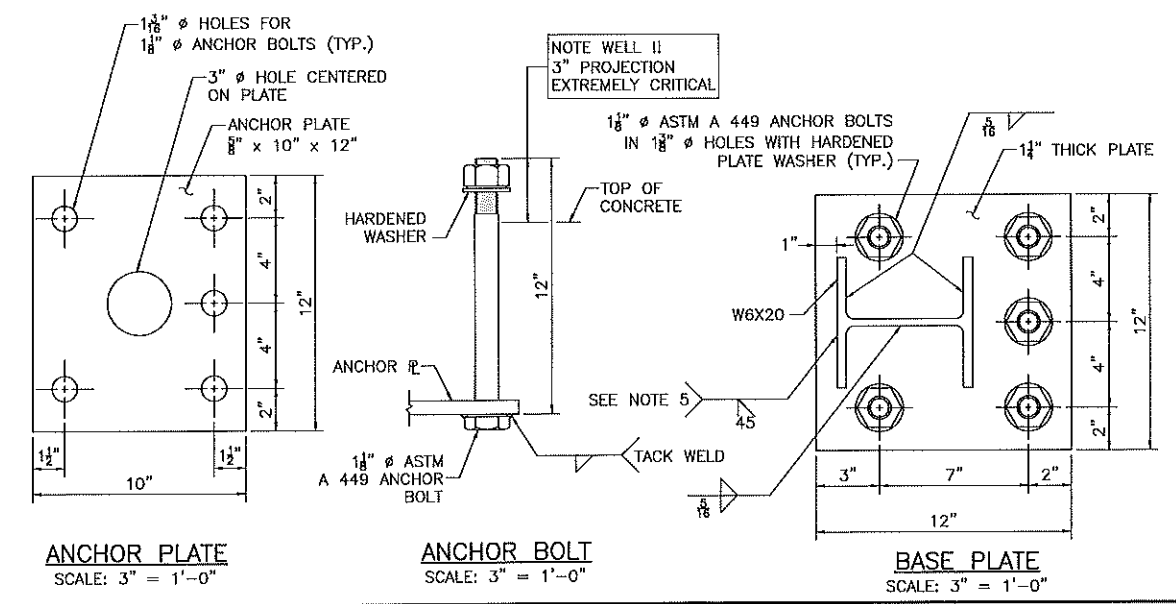


NOTE: JOINT DIMENSIONS ARE CONCEPTUAL AND SHALL BE CONFIRMED BY THE PRECASTER.

CULVERT JOINT DETAIL  
SCALE: 1/2" = 1'-0"



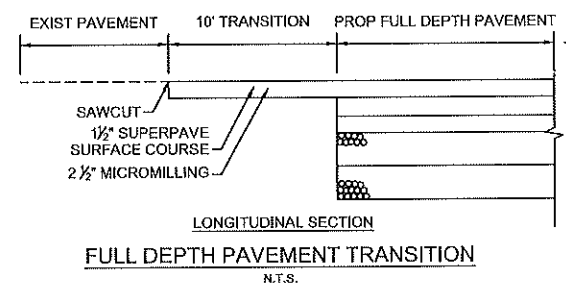
TOP OF WINGWALL DETAIL  
SCALE: N.T.S.



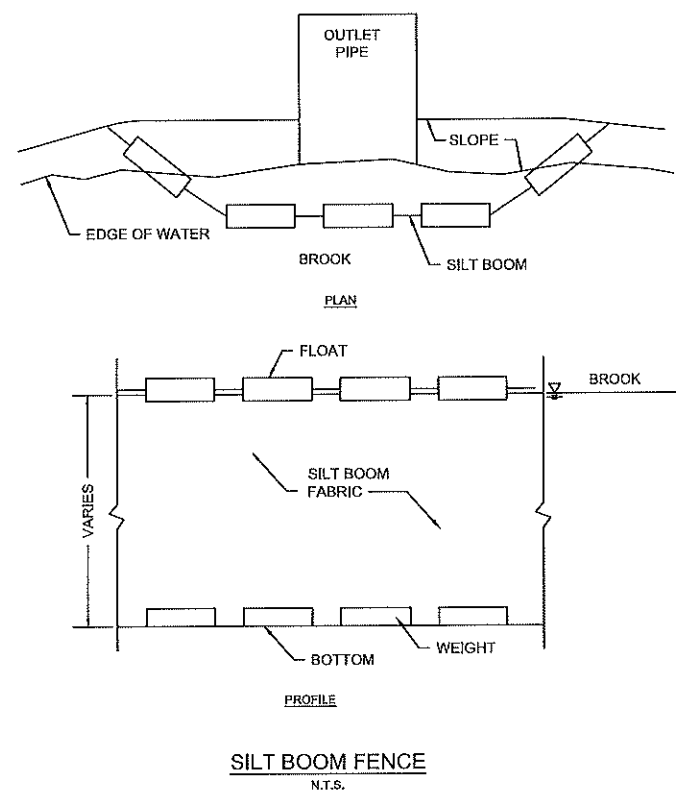
ANCHOR PLATE  
SCALE: 3" = 1'-0"

ANCHOR BOLT  
SCALE: 3" = 1'-0"

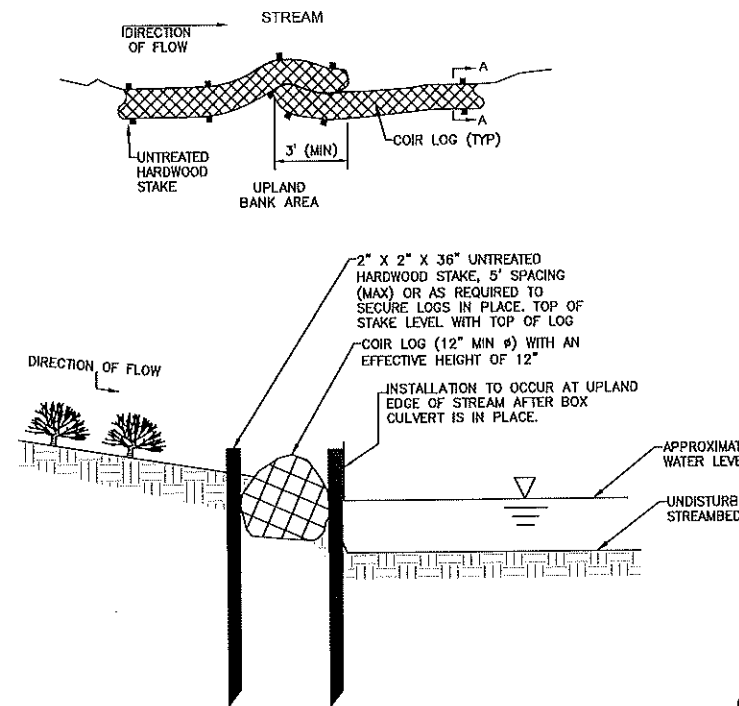
BASE PLATE  
SCALE: 3" = 1'-0"



LONGITUDINAL SECTION  
FULL DEPTH PAVEMENT TRANSITION  
N.T.S.



SILT BOOM FENCE  
N.T.S.



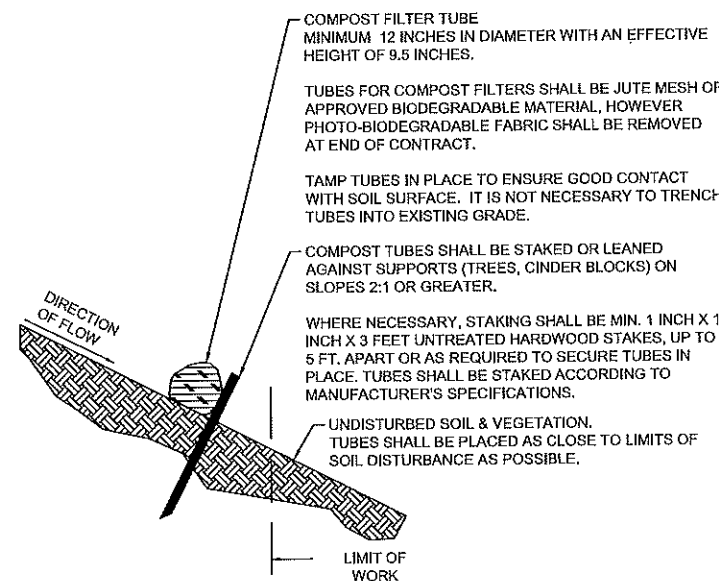
COIR LOG  
N.T.S.

NOTES:

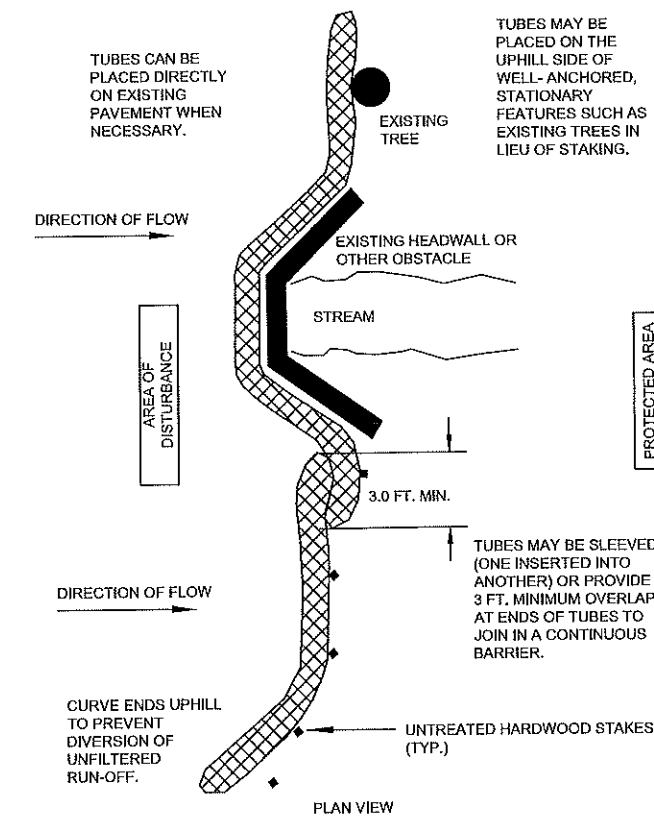
1. PROVIDE A MINIMUM TUBE DIAMETER OF 12" FOR SLOPES UP TO 50 FEET IN LENGTH WITH A SLOPE RATIO OF 3H:1V OR STEEPER. LONGER SLOPES OF 3H:1V MAY REQUIRE LARGER TUBE DIAMETER OR ADDITIONAL COURSING OF FILTER TUBES TO CREATE A FILTER BERM. REFER TO MANUFACTURER'S RECOMMENDATIONS FOR SITUATIONS WITH LONGER OR STEEPER SLOPES.
2. INSTALL LOGS ALONG CONTOURS AND AT EDGE OF STREAM.
3. CONFIGURE LOGS AROUND EXISTING SITE FEATURES TO MINIMIZE SITE DISTURBANCE AND MAXIMIZE CAPTURE AREA OF STORMWATER RUN-OFF.
4. TUBES FOR COIR LOGS SHALL BE JUTE MESH OR APPROVED BIODEGRADABLE MATERIAL. ADDITIONAL LOGS SHALL BE USED AT THE DIRECTION OF THE ENGINEER.
5. TAMP COIR LOGS IN PLACE TO ENSURE GOOD CONTACT WITH SOIL SURFACE. IT IS NOT NECESSARY TO TRENCH LOGS INTO EXISTING GRADE.
6. WHEN STAKING IS NOT POSSIBLE, SUCH AS WHEN TUBES MUST BE PLACED ON A ROCKY SURFACE, HEAVY CONCRETE OR CINDER BLOCKS CAN BE USED BEHIND LOGS UP TO 5 FT. APART OR AS REQUIRED TO SECURE TUBES IN PLACE. DO NOT PUNCTURE LOGS WITH STAKES.
7. PROVIDE A 3' MINIMUM OVERLAP AT ENDS OF LOGS TO JOIN IN A CONTINUOUS BARRIER AND MINIMIZE UNIMPEDED FLOW. STAKE JOINING LOGS SNUGLY AGAINST EACH OTHER TO PREVENT UNFILTERED FLOW BETWEEN THEM.
8. SECURE ENDS OF LOGS WITH STAKES SPACED 18" APART. DO NOT PUNCTURE LOGS WITH STAKES.
9. UPON COMPLETION OF PROJECT, ALL LOGS SHALL STAY IN PLACE AND NATURALLY BIODEGRADE OVERTIME.

NOTES:

1. PROVIDE A MINIMUM TUBE DIAMETER OF 12 INCHES FOR SLOPES UP TO 50 FEET IN LENGTH WITH A SLOPE RATIO OF 3H:1V OR STEEPER. LONGER SLOPES OF 3H:1V MAY REQUIRE LARGER TUBE DIAMETER OR ADDITIONAL COURSING OF FILTER TUBES TO CREATE A FILTER BERM. REFER TO MANUFACTURER'S RECOMMENDATIONS FOR SITUATIONS WITH LONGER OR STEEPER SLOPES.
2. INSTALL TUBES ALONG CONTOURS AND PERPENDICULAR TO SHEET OR CONCENTRATED FLOW.
3. TUBE LOCATION MAY BE SHIFTED TO ADJUST TO LANDSCAPE FEATURES, BUT SHALL PROTECT UNDISTURBED AREA AND VEGETATION TO MAXIMUM EXTENT POSSIBLE.
4. DO NOT INSTALL IN PERENNIAL, EPHEMERAL OR INTERMITTENT STREAMS.
5. ADDITIONAL TUBES SHALL BE USED AT THE DIRECTION OF THE ENGINEER.
6. ADDITIONAL STAKING SHALL BE USED AT THE DIRECTION OF THE ENGINEER.

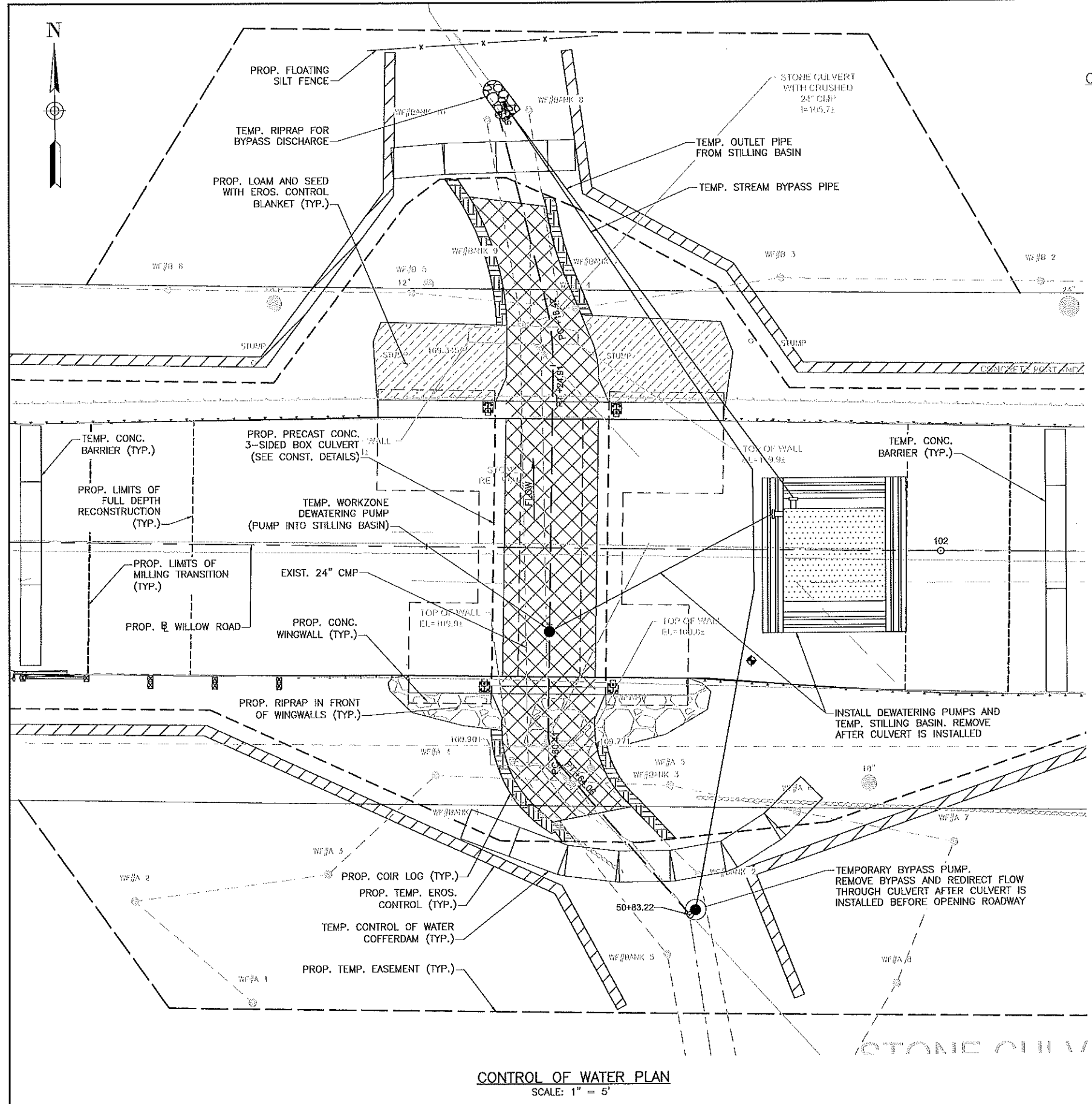


COMPOST FILTER TUBE  
N.T.S.



COMPOST FILTER TUBE  
N.T.S.

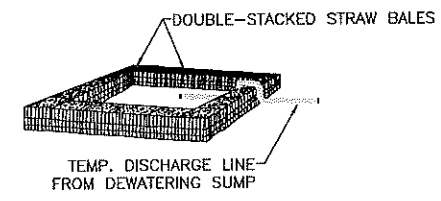
10988\_C.O.W. PLAN.DWG Plored on 15-Nov-2020 3:28 PM



**CONTROL OF WATER PLAN**  
SCALE: 1" = 5'

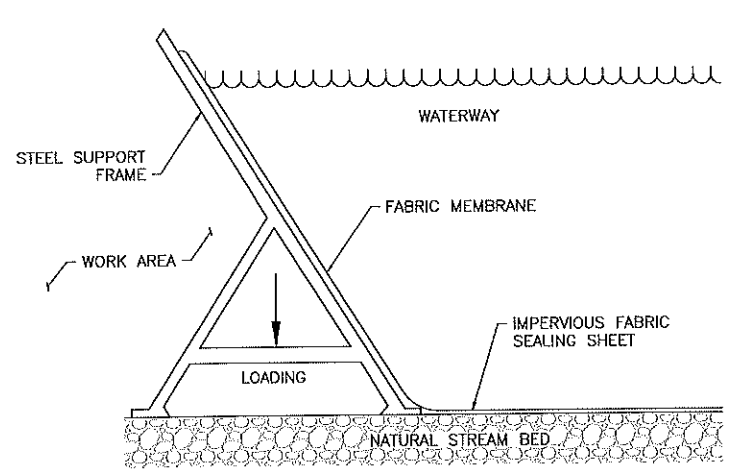
**CONTROL OF WATER NOTES**

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN OF THE CONTROL OF WATER (C.O.W.) SYSTEM AND SHALL SUBMIT A C.O.W. PLAN TO THE ENGINEER FOR APPROVAL. THE C.O.W. SYSTEM SHOWN IS CONCEPTUAL ONLY. THE C.O.W. SYSTEM SHALL BE DESIGNED TO WITHSTAND THE 2-YEAR FLOOD ELEVATION OF 108.0 (NAVD).
2. WILLOW ROAD SHALL BE CLOSED TO VEHICULAR AND PEDESTRIAN TRAFFIC AT THE BRIDGE CROSSING PRIOR TO BEGINNING EXCAVATION. DETOUR SIGNAGE WILL BE INSTALLED IN ACCORDANCE WITH THE MUTCD AND THE TEMPORARY TRAFFIC CONTROL PLANS INCLUDED IN THESE CONSTRUCTION DRAWINGS.
3. C.O.W. SYSTEM SHALL BE INSPECTED DAILY FOR WATER LEAKS OR EROSION AND REPAIRS PROCEDURES SHALL BE IMPLEMENTED ACCORDINGLY.
4. THE CONSTRUCTION SEQUENCE WITH REGARDS TO THE C.O.W. SYSTEM SHALL BE AS FOLLOWS:
  - 4.1. CLOSE THE ROADWAY TO VEHICULAR AND PEDESTRIAN TRAFFIC AT THE BRIDGE CROSSING.
  - 4.2. INSTALL EROSION CONTROLS: TEMPORARY EROSION CONTROL AROUND PROJECT LIMITS TO PROTECT THE UNNAMED TRIBUTARY FROM WORK ZONE SEDIMENT; FLOATING SILT FENCE IN THE UNNAMED TRIBUTARY DOWNSTREAM OF THE PROJECT LIMITS TO TRAP ANY FLOATING DEBRIS/SILT THAT MAY ENTER THE TRIBUTARY.
  - 4.3. INSTALL C.O.W. COFFERDAMS, BYPASS PUMPS, DEWATERING PUMPS, AND TEMPORARY STILLING BASIN.
  - 4.4. PLACE TEMPORARY RIPRAP AT OUTLET FOR BYPASS DISCHARGE.
  - 4.5. DEWATER THE WORK AREA PRIOR TO (AND THROUGHOUT) EXCAVATION TO FACILITATE INSTALLING THE CULVERT, AND WINGWALLS IN THE DRY CONDITION. ALL DEWATERING FLOW SHALL PASS THROUGH THE STILLING BASIN TO REMOVE SEDIMENT PRIOR TO DEPOSITING BACK INTO THE STREAM.
  - 4.6. INSTALL THE THREE-SIDED BOX CULVERT AND WINGWALLS. RESTORE THE STREAMBED IN ACCORDANCE WITH THESE PLANS. INSTALL RIPRAP EMBANKMENT AND LOAM AND SEED WITH EROSION CONTROL BLANKET IN FRONT OF THE WINGWALLS. INSTALL COIR LOGS ALONG UPLAND SIDES OF STREAMBED.
  - 4.7. REDIRECT STREAM FLOW THROUGH THE CULVERT.
  - 4.8. REMOVE THE C.O.W. COFFERDAMS BYPASS PUMPS AND TEMPORARY STILLING BASIN.



NOTES:  
DISCHARGE TO SEDIMENTATION BASIN (AS SHOWN) OR TO SILTATION/ DEWATERING BAG SUCH AS FLOGARD DEWATERING BAG MODEL SC-DW1215Z, OR APPROVED EQUAL BY BOXFORD CONSERVATION COMMISSION. SYSTEM SHOWN IS CONCEPTUAL ONLY AND IS TO BE DESIGNED BY CONTRACTOR.

**TEMPORARY STILLING AREA**  
SCALE: N.T.S.



**TEMPORARY COATED FABRIC STEEL FRAME COFFERDAM**  
SCALE: N.T.S.

NOTES:  
THE STEEL FRAME COFFERDAM SHOWN ABOVE IS FOR CONCEPTUAL ONLY. THE CONTRACTOR SHALL DETERMINE THE APPROPRIATE SYSTEM FOR CONTROLLING THE WATER (I.E. BULK SANDBAGS). THE CONTRACTOR SHALL SUBMIT THEIR PROPOSED CONTROL OF WATER DESIGN TO THE ENGINEER FOR REVIEW AND APPROVAL.

2-YEAR  
(CONSTRUCTION)  
RETURN FLOOD  
EL. 108.0