

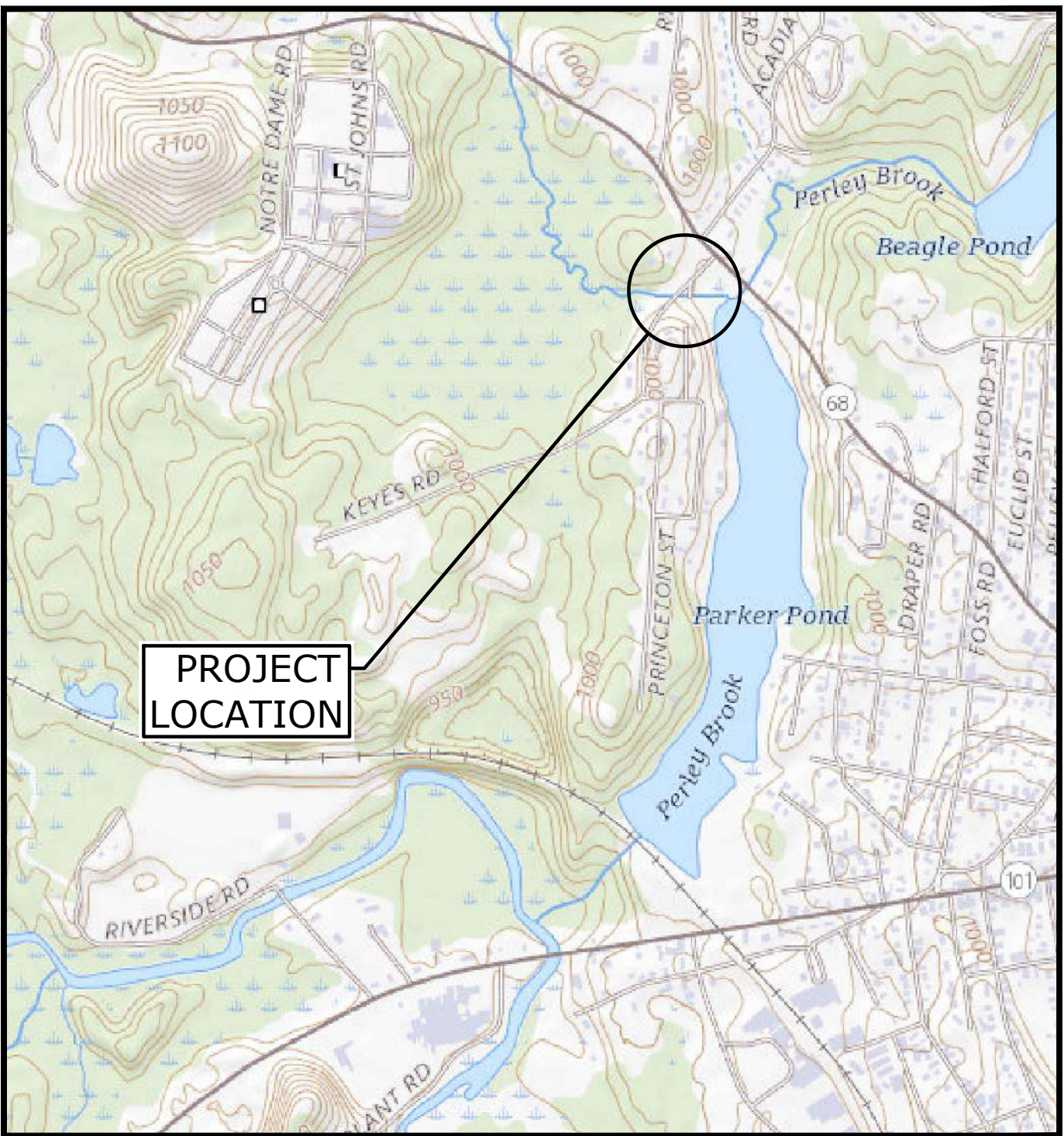
CITY OF GARDNER, MASSACHUSETTS

KEYES ROAD OVER WILDER BROOK CULVERT REPLACEMENT

PROJECT NO: G0384-T060
MASSDOT BRIDGE NO. G-01-025, BIN NO. CD5

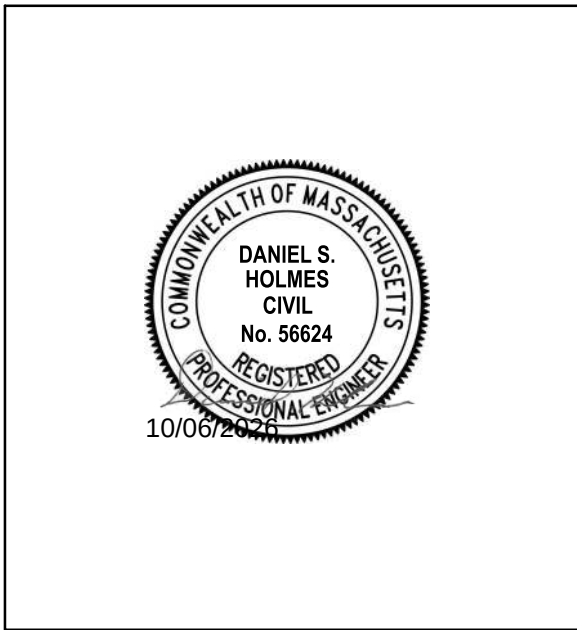
OCTOBER 2026

LIST OF DRAWINGS	
SHEET NO.	SHEET TITLE
1	COVER
2	BRIDGE KEY PLAN, PROFILES, LOCUS, & INDEX
3	GENERAL NOTES, LEGEND, AND ABBREVIATIONS (SHEET 1 OF 2)
4	GENERAL NOTES, LEGEND, AND ABBREVIATIONS (SHEET 2 OF 2)
5	EXISTING CONDITIONS AND DEMOLITION PLAN
6	SITE PLAN
7	CONSTRUCTION DETAILS (SHEET 1 OF 4)
8	CONSTRUCTION DETAILS (SHEET 2 OF 4)
8A	CONSTRUCTION DETAILS (SHEET 3 OF 4)
9	CONSTRUCTION DETAILS (SHEET 4 OF 4)
10	TEMPORARY TRAFFIC CONTROL PLAN
11	BORING LOGS & BORING NOTES
12	GENERAL BRIDGE PLAN AND ELEVATION
13	POTENTIAL CONSTRUCTION STAGE 1 PLAN & SECTION
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20	CT-TL2 BRIDGE RAILING
21	TOP OF PRECAST HIGHWAY GUARDRAIL TRANSITION FOR CT-TL2 RAILING
22	PRECAST GUARDRAIL TRANSITION AND CT-TL2 BRIDGE RAILING DETAILS
23	GUARDRAIL TRANSITION TO BRIDGE RAIL (FACE OF CURB)
24	GUARDRAIL APPROACH GEOMETRY

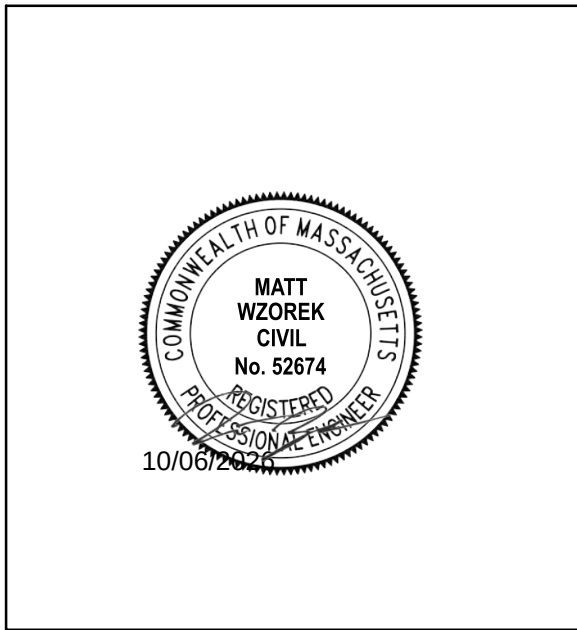


LOCATION MAP
SCALE: 1" = 1000'

PREPARED BY:
Tighe & Bond



DANIEL S. HOLMES, PE, LEED AP



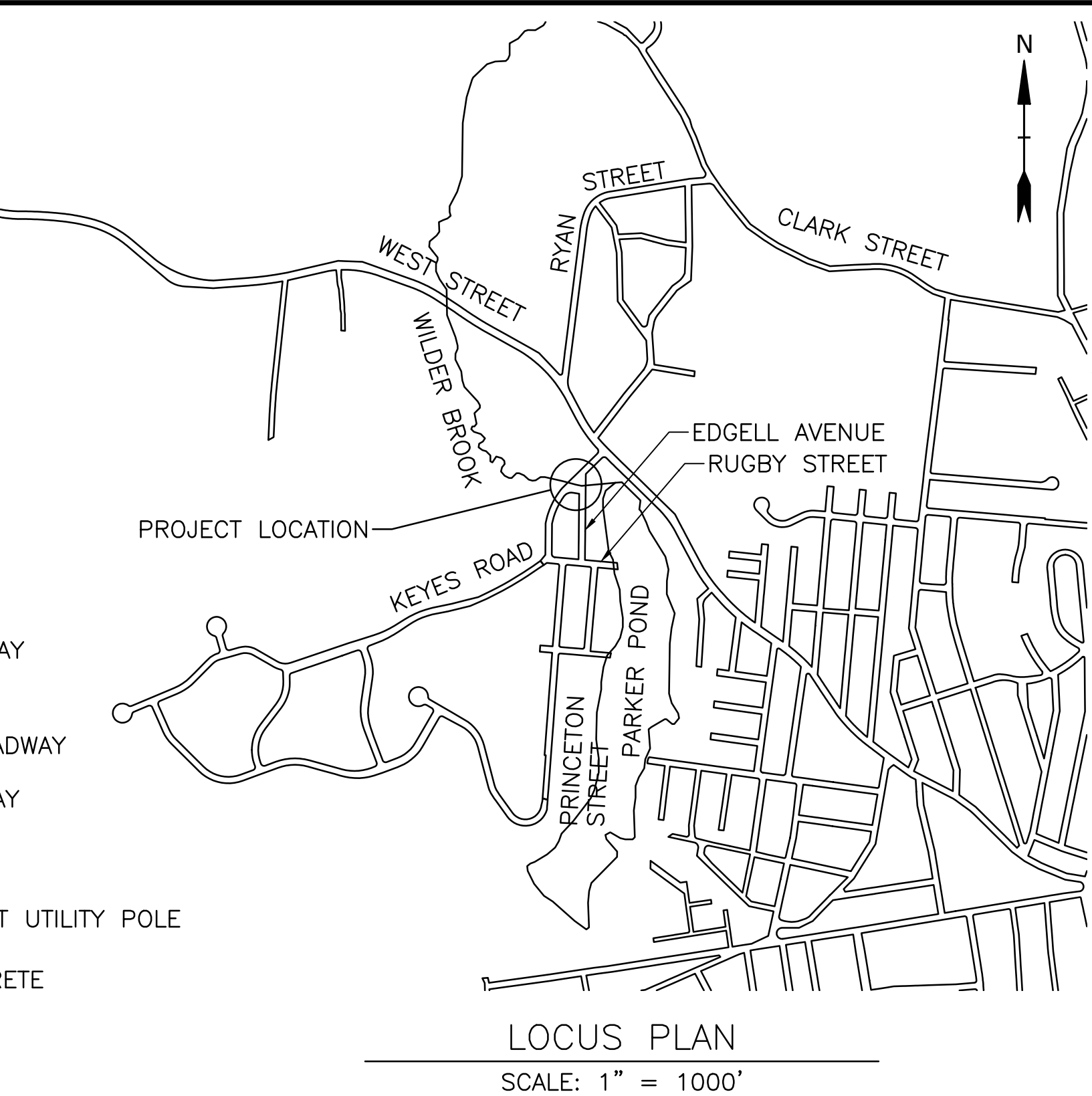
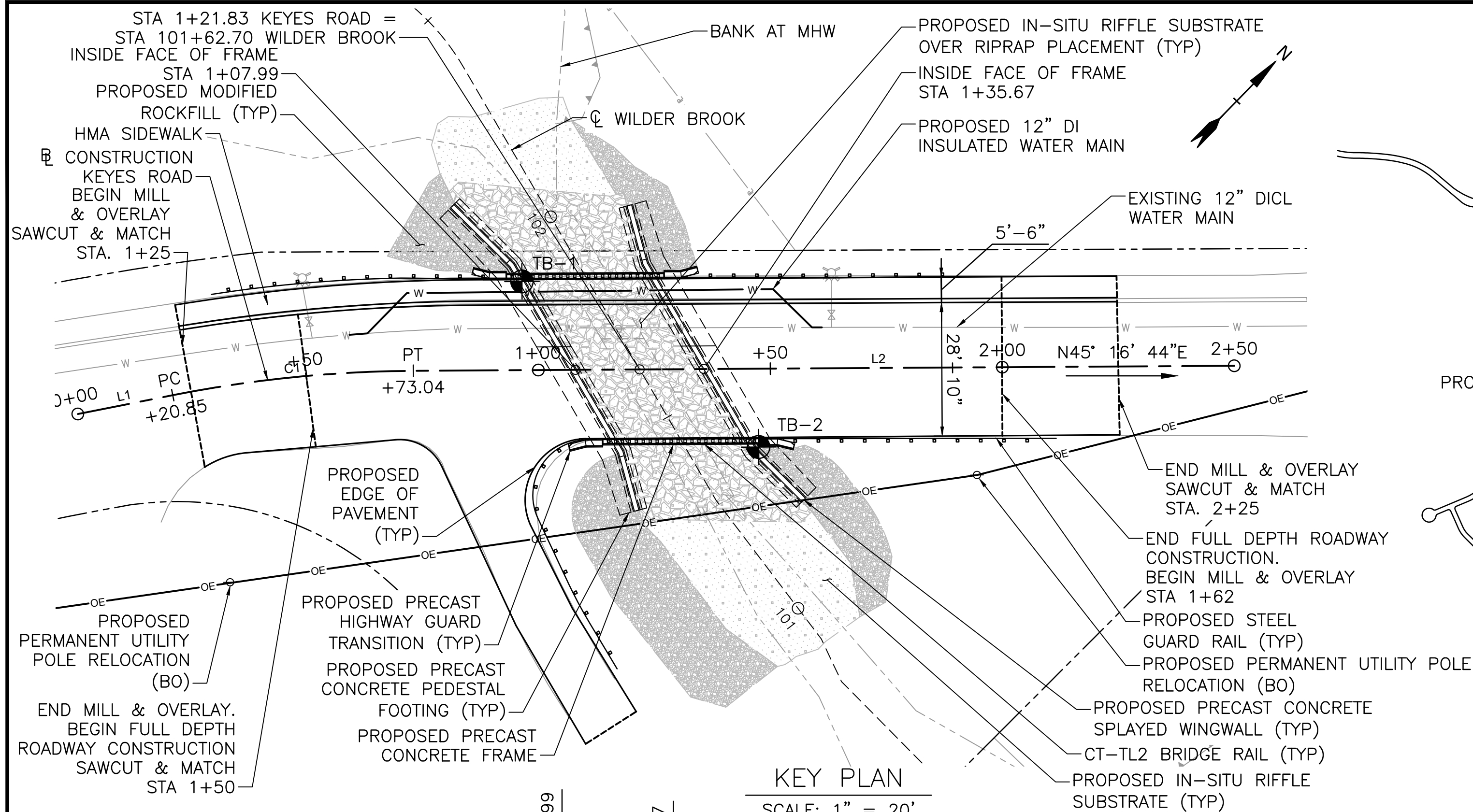
MATTHEW P. WZOREK, PE, MCPPO

PREPARED FOR:
CITY OF GARDNER
MICHAEL J. NICHOLSON, MAYOR

DEPARTMENT OF COMMUNITY
DEVELOPMENT AND PLANNING
JASON STEVENS, DIRECTOR

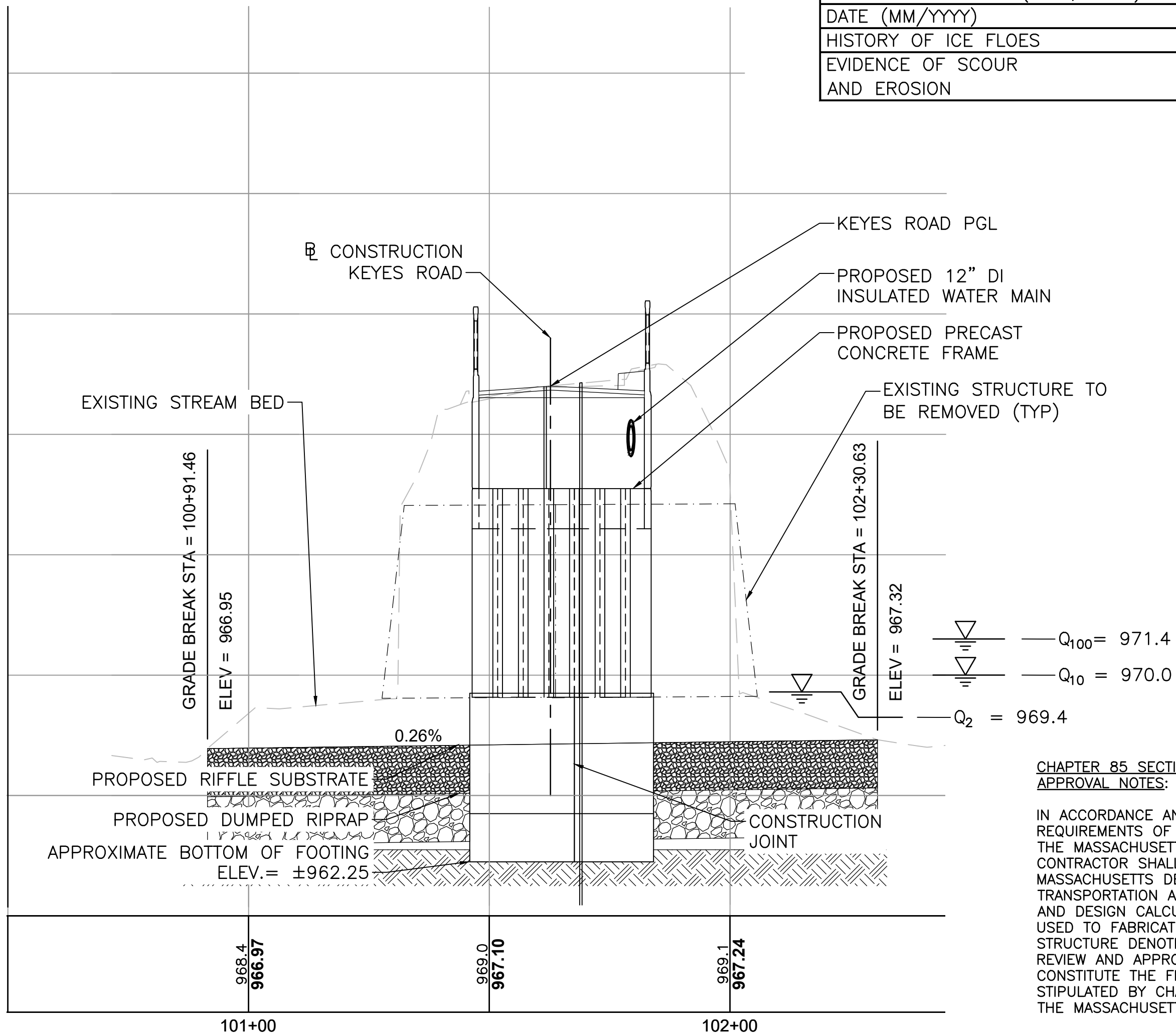
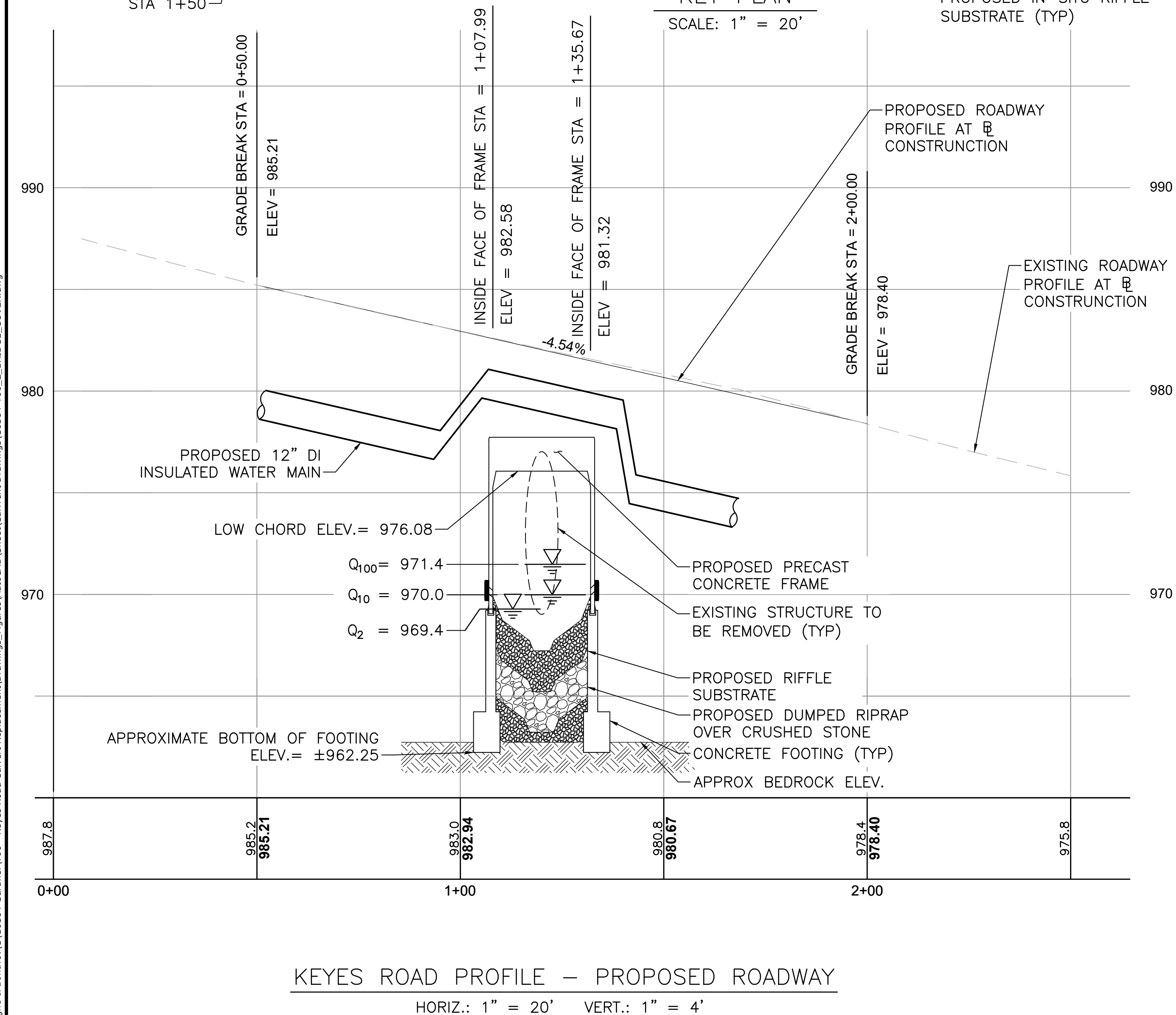
**FOR CONSTRUCTION
COMPLETE SET 25 SHEETS**

Last Saved: 2/9/2023
Printed On: Feb 09, 2023, 1:13pm By: SSsk
Title & Path: G:\G0384-Gardner\160 - Keyes Road Culvert Replacement\Drawings\Figures\AutoCAD\Sheet\Current Drawings\G0384-T60_2_BRIDGE_COVER.dwg



SEISMIC DESIGN CRITERIA	
DESIGN RETURN PERIOD:	1,000
DESIGN SPECTRA	
As	0.106
SDs	0.229
SD1	0.096
SITE CLASS	D
SEISMIC DESIGN CATEGORY (SDC)	A

HYDRAULIC DESIGN DATA	
DRAINAGE AREA (SQ. MILES)	3.0
DESIGN FLOOD DISCHARGE (C.F.S.)	100
DESIGN FLOOD FREQUENCY (YEARS)	10
DESIGN FLOOD VELOCITY (F.P.S.)	2.5
DESIGN FLOOD ELEVATION (FEET, NAVD)	970.0
BASE (100-YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S.)	200
BASE FLOOD ELEVATION (FEET, NAVD)	975.3
DESIGN AND CHECK SCOUR DATA	
DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	25
DESIGN FLOOD ABUTMENT SCOUR DEPTH (FEET)	0.0
DESIGN FLOOD PIER SCOUR DEPTH (FEET)	N/A
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
CHECK FLOOD ABUTMENT SCOUR DEPTH (FEET)	0.0
CHECK FLOOD PIER SCOUR DEPTH (FEET)	N/A
FLOOD OF RECORD	
DISCHARGE (C.F.S.)	UNKNOWN
FREQUENCY (IF KNOWN, YEARS)	N/A
MAXIMUM ELEVATION (FEET, NAVD)	N/A
DATE (MM/YYYY)	N/A
HISTORY OF ICE FLOES	UNKNOWN
EVIDENCE OF SCOUR AND EROSION	N/A

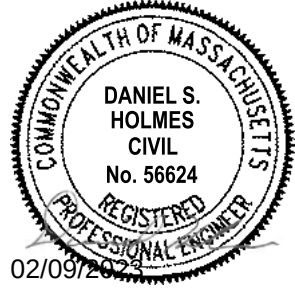


CHAPTER 85 SECTION 35 REVIEW AND APPROVAL NOTES:

IN ACCORDANCE AND COMPLIANCE WITH THE REQUIREMENTS OF CHAPTER 85 SECTION 35 OF THE MASSACHUSETTS GENERAL LAWS, THE CONTRACTOR SHALL SUBMIT TO THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION ALL CONSTRUCTION DRAWINGS AND DESIGN CALCULATIONS THAT SHALL BE USED TO FABRICATE AND CONSTRUCT THE STRUCTURE DENOTED ON THESE PLANS FOR REVIEW AND APPROVAL. THIS APPROVAL SHALL CONSTITUTE THE FINAL APPROVAL AS STIPULATED BY CHAPTER 85 SECTION 35 OF THE MASSACHUSETTS GENERAL LAWS.

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING
3/17/2023
STATE BRIDGE ENGINEER

Tighe&Bond



Keyes Road Over Wilder Brook Culvert Replacement

City of Gardner

Gardner, Massachusetts

MassDOT Bridge No. G-01-025, BIN CD5

MARK	DATE	DESCRIPTION
PROJECT NO:	G0384-060	
DATE:	FEBRUARY 2023	
FILE:	G0384-T60_2_BRIDGE_COVER.dwg	
DRAWN BY:	SDS, RMC	
DESIGNED/CHECKED BY:	AGB, MPW, AML, JRI	
APPROVED BY:	DSH	

BRIDGE KEY PLAN, PROFILES, LOCUS, & INDEX

SCALE: AS SHOWN

SHEET 2
SHEET 2 OF 25

Last Saved: 8/17/2023 1:13pm By: SSak
Plotted On: 8/09/2023 1:13pm By: SSak
Title & Content: G0384-GardnerT60 - Keyes Road Culvert Replacement Drawings - Figures(AutoCAD,Sheet)Current Drawings\G0384-T60_3-4_GEN_NOTES.dwg

BASE PLAN NOTES

- THE EXISTING CONDITIONS INFORMATION SHOWN ON THE DRAWINGS IS BASED ON SURVEY DRAWINGS PROVIDED BY WSP USA INC. TITLED "EXISTING CONDITIONS PLAN, KEYES ROAD OVER WILDER BROOK, GARDNER, MA" AND DATED NOVEMBER 16, 2021.
- UTILITY LOCATIONS SHOWN WERE PLOTTED FROM INFORMATION SUPPLIED BY RESPECTIVE UTILITY COMPANIES AND DATA OBTAINED FROM FIELD SURVEYS AND AS BUILT DRAWINGS. THE ACCURACY AND COMPLETENESS OF SUBSURFACE INFORMATION SHOWN ON THESE DRAWINGS IS NOT GUARANTEED.
- THE HORIZONTAL COORDINATE SYSTEM IS THE NORTH AMERICAN DATUM OF 1983, MASSACHUSETTS STATE PLANE, MAINLAND ZONE, US FEET. VERTICAL DATUM IS THE NORTH AMERICAN VERTICAL DATUM OF 1988.
- THE EXISTING CONDITIONS SHOWN ARE APPROXIMATE. CONTRACTOR TO FIELD VERIFY EXISTING CONDITIONS.

GENERAL NOTES

- NOTIFY DIGSAFE AT 1-888-344-7233 AND OTHER UTILITY OWNERS IN THE AREA NOT ON THE DIGSAFE LIST AT LEAST 72 HOURS PRIOR TO ANY DIGGING, TRENCHING, ROCK REMOVAL, DEMOLITION, BORING, BACKFILLING, GRADING, LANDSCAPING, OR ANY OTHER EARTH MOVING OPERATIONS.
- LOCATIONS OF EXISTING UTILITIES ARE APPROXIMATE. IN ADDITION, SOME UTILITIES MAY NOT BE SHOWN. DETERMINE THE EXACT LOCATION OF UTILITIES BY TEST PIT OR OTHER METHODS, AS NECESSARY TO PREVENT DAMAGE TO UTILITIES AND/OR INTERRUPTIONS IN UTILITY SERVICE OR CONSTRUCTION OPERATIONS. PERFORM TEST PIT EXCAVATIONS AND OTHER INVESTIGATIONS TO LOCATE UTILITIES, AND PROVIDE THIS INFORMATION TO THE ENGINEER, PRIOR TO CONSTRUCTING THE PROPOSED IMPROVEMENTS. LOCATE ALL EXISTING UTILITIES TO BE CROSSED BY HAND EXCAVATION.
- NOT ALL OF THE UTILITY SERVICES TO BUILDINGS ARE SHOWN. THE CONTRACTOR SHALL ANTICIPATE THAT EACH PROPERTY HAS SERVICE CONNECTIONS FOR THE VARIOUS UTILITIES.
- TIGHE & BOND ASSUMES NO RESPONSIBILITY FOR ANY ISSUES, LEGAL OR OTHERWISE, RESULTING FROM CHANGES MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM TIGHE & BOND.
- NOTIFY THE ENGINEER OF ANY UTILITIES IDENTIFIED DURING CONSTRUCTION THAT ARE NOT SHOWN ON THE DRAWINGS OR THAT DIFFER IN SIZE OR MATERIAL.
- THE CONTRACTOR IS RESPONSIBLE FOR SITE SAFETY; COORDINATION WITH THE OWNER, ALL SUBCONTRACTORS, WITH OTHER CONTRACTORS WORKING WITHIN THE LIMITS OF WORK, AND THE MEANS AND METHODS OF CONSTRUCTING THE PROPOSED WORK.
- OBTAIN, PAY FOR AND COMPLY WITH PERMITS, NOTICES AND FEES NECESSARY TO COMPLETE THE WORK. ARRANGE AND PAY FOR NECESSARY INSPECTIONS AND APPROVALS FROM THE JURISDICTIONAL AUTHORITIES.
- SHORE UTILITY TRENCHES WHERE FIELD CONDITIONS DICTATE AND/OR WHERE REQUIRED BY LOCAL, STATE AND FEDERAL HEALTH AND SAFETY CODES.
- FIELD VERIFY ALL EXISTING CONDITIONS PRIOR TO CONSTRUCTION. IF FIELD CONDITIONS ARE OBSERVED THAT VARY SIGNIFICANTLY FROM THOSE SHOWN ON THE DRAWINGS, IMMEDIATELY NOTIFY THE ENGINEER IN WRITING FOR RESOLUTION OF THE CONFLICTING INFORMATION.
- PROTECT AND MAINTAIN ALL UTILITIES IN THE AREAS UNDER CONSTRUCTION DURING THE WORK. LEAVE ALL PIPES AND STRUCTURES WITHIN THE LIMITS OF THE CONTRACT IN A CLEAN AND OPERABLE CONDITION AT THE COMPLETION OF THE WORK. TAKE ALL NECESSARY PRECAUTIONS TO PREVENT SAND AND SILT FROM DISTURBED AREAS FROM ENTERING THE DRAINAGE SYSTEM.
- NOTIFY THE ENGINEER IN WRITING OF ANY CONFLICT, ERROR, AMBIGUITY, OR DISCREPANCY WITH THE PLANS OR BETWEEN THE PLANS AND ANY APPLICABLE LAW, REGULATION, CODE, STANDARD SPECIFICATION, OR MANUFACTURER'S INSTRUCTIONS.
- THE CONTRACTOR IS RESPONSIBLE FOR SUPPORT OF EXISTING UTILITIES AND REPAIR OR REPLACEMENT COSTS OF UTILITIES DAMAGED DURING CONSTRUCTION, WHETHER ABOVE OR BELOW GRADE. REPLACE DAMAGED UTILITIES IMMEDIATELY AT NO ADDITIONAL COST TO THE OWNER AND AT NO COST TO THE PROPERTY OWNER.
- TAKE NECESSARY MEASURES AND PROVIDE CONTINUOUS BARRIERS OF SUFFICIENT TYPE, SIZE, AND STRENGTH TO PREVENT ACCESS TO ALL WORK AND STAGING AREAS AT THE COMPLETION OF EACH DAYS WORK.
- NO OPEN TRENCHES WILL BE ALLOWED OVER NIGHT. THE USE OF ROAD PLATES TO PROTECT THE EXCAVATION WILL BE CONSIDERED UPON REQUEST, BUT BACKFILLING IS PREFERRED.
- THE CONTRACTOR IS RESPONSIBLE FOR ALL NECESSARY TRAFFIC CONTROL/SAFETY DEVICES TO ENSURE SAFE VEHICULAR AND PEDESTRIAN ACCESS THROUGH THE WORK AREA, OR FOR SAFELY IMPLEMENTING DETOURS AROUND THE WORK AREA. PERFORM TRAFFIC CONTROL IN ACCORDANCE WITH THE CONTRACTOR'S APPROVED TRAFFIC CONTROL PLAN.
- MAINTAIN EMERGENCY ACCESS TO ALL PROPERTIES WITHIN THE PROJECT AREA AT ALL TIMES DURING CONSTRUCTION.

- WHEN WORKING IN THE ROAD, PROVIDE THE OWNER AND LOCAL FIRE/POLICE/SCHOOL AUTHORITIES A DETAILED PLAN OF APPROACH INDICATING METHODS OF PROPOSED TRAFFIC ROUTING ON A DAILY BASIS. PROVIDE COORDINATION TO ENSURE COMMUNICATION AND COORDINATION BETWEEN THE OWNER, CONTRACTOR AND LOCAL FIRE/POLICE/SCHOOL AUTHORITIES THROUGHOUT THE CONSTRUCTION PERIOD.
- REMOVE AND DISPOSE OF ALL CONSTRUCTION-RELATED WASTE MATERIALS AND DEBRIS IN STRICT ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL LAWS.
- THE TERM "DEMOLISH" USED ON THE DRAWINGS MEANS TO REMOVE AND DISPOSE OF IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL REQUIREMENTS.
- THE TERM "ABANDON" USED ON THE DRAWINGS MEANS TO LEAVE IN PLACE AND TAKE APPROPRIATE MEASURES TO DECOMMISSION AS SPECIFIED OR NOTED ON THE DRAWINGS.
- ALL PROPOSED WORK MAY BE ADJUSTED IN THE FIELD BY THE ENGINEER TO MEET EXISTING CONDITIONS.

DESIGN LOADS AND SPECIFICATIONS:

- | | |
|-----------------------|---|
| 1. DESIGN LOADING: | HL-93 |
| 2. DESIGN METHOD: | LOAD AND RESISTANCE FACTOR DESIGN (LRFD) |
| 3. SPECIFICATIONS: | AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH ED., 2020 AS AMENDED MASSDOT LRFD BRIDGE MANUAL, 2013, AS AMENDED BY SUPPLEMENTS THE MASSACHUSETTS HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES DATED 2022 |
| 4. FOUNDATION DATA: | PRECAST GUARD TRANSITION:
TRANSITION BASE ON CONTROLLED DENSITY FILL (NON EXCAVATABLE) ON COMPACTED GRAVEL BORROW OR UNDISTURBED SOIL. |
| 5. REINFORCING STEEL: | AASHTO M31 (ASTM A 615) GRADE 60 EPOXY COATED BARS: RIGID FRAME, WINGWALLS, HEADWALLS, AND PRECAST GUARD TRANSITIONS. |
| 6. CONCRETE: | PRECAST RIGID FRAME, HEADWALLS, WINGWALLS, AND GUARD TRANSITIONS:
5000 PSI, $\frac{3}{4}$ ", 685 HP CEMENT CONCRETE
CAST-IN-PLACE PEDESTAL FOOTINGS:
4000 PSI, $\frac{3}{4}$ ", 585 HP CEMENT CONCRETE
CT-TL2 BARRIER:
5000 PSI, $\frac{3}{8}$ ", 710 HP CEMENT CONCRETE |

CULVERT REMOVAL NOTES:

- THE CONTRACTOR'S METHOD FOR REMOVAL OF THE EXISTING CULVERT SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW AND ACCEPTANCE PRIOR TO THE COMMENCEMENT OF ANY REMOVAL OPERATIONS.
- REMOVAL OF EXISTING CULVERT STRUCTURE SHALL INCLUDE THE COMPLETE REMOVAL OF THE PIPE AND STONE HEADWALLS. REFER TO SHEET 5 FOR DEMOLITION PLAN.
- PRIOR TO REMOVAL OF EXISTING CULVERT, THE CONTRACTOR SHALL VERIFY THAT EXISTING UTILITIES HAVE BEEN RELOCATED OR A TEMPORARY BYPASS HAS BEEN INSTALLED.

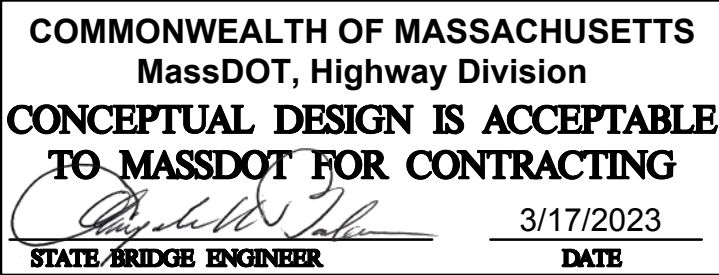
FOUNDATION NOTES:

- FOUNDATION MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.
- CONCRETE SHALL NOT BE PLACED IN WATER OR ON FROZEN GROUND.
- BOTTOM OF FOUNDATION ELEVATIONS PROVIDED ON DRAWINGS SHALL BE CONSIDERED MINIMUM DEPTHS. CONTRACTOR SHALL REMOVE UNSUITABLE MATERIAL AS REQUIRED.
- ALL FINISHED EXCAVATIONS SHALL BE VERIFIED AND APPROVED BY THE ENGINEER PRIOR TO PRECAST SECTION DELIVERY.
- ALL EXCAVATIONS FOR FOOTINGS FOUNDED ON SOIL SHALL BE FINISHED BY HAND FOR THE LAST 6". ALL FINISHED EXCAVATIONS SHALL BE INSPECTED BY THE ENGINEER PRIOR TO ANY CONCRETE PLACEMENT.
- ALL BACKFILL UNDER OR ADJACENT TO ANY PORTION OF THE STRUCTURE SHALL BE PLACED IN ACCORDANCE WITH MASSDOT STANDARD SPECIFICATIONS, SUPPLEMENTAL SPECIFICATIONS, AND SPECIAL PROVISIONS.
- REVIEW BEDROCK CONDITIONS BELOW BRIDGE FOOTINGS WITH ENGINEER PRIOR TO INSTALLATION.
- ANY UNSUITABLE MATERIALS SUCH AS BOULDERS, ROOTS, ORGANIC SOILS, OR SILT/CLAY ENCOUNTERED WITHIN THE FOUNDATION BEARING ZONE, DEFINED BY A 1H:1V PLAN EXTENDING DOWNWARD AND OUTWARD FROM 1 FOOT BEYOND THE EDGE OF FOOTING, SHALL BE REMOVED AND REPLACED WITH CRUSHED STONE, AS DIRECTED BY THE ENGINEER.

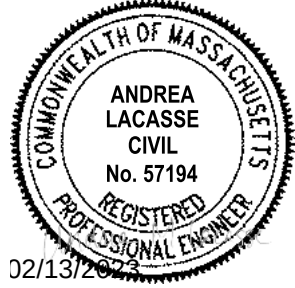
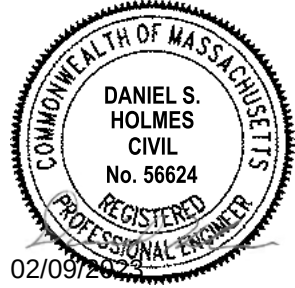
GEOTECHNICAL DESIGN PARAMETERS:

- MINIMUM EMBEDMENT FOR FROST PROTECTION FOR FOOTINGS FOUNDED ON SOIL = 4 FEET BELOW ADJACENT GROUND SURFACE.
- MAXIMUM ALLOWABLE SETTLEMENT = 0.75 INCHES TOTAL, 0.5 INCH DIFFERENTIAL
- FOOTING UNDER PRECAST RIGID FRAME:
 - THE FACTORED BEARING PRESSURE = 17.42 KSF PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATIONS.
 - FACTORED BEARING RESISTANCE = 19.80 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.
- FOOTING UNDER PRECAST WINGWALLS:
 - THE FACTORED BEARING PRESSURE = 8.93 KSF PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATIONS.
 - FACTORED BEARING RESISTANCE = 19.80 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.
- MINIMUM LATERAL EARTH PRESSURES FOR RESTRAINED RIGID FRAME WALLS:
 - STATIC =
 - 48 POUNDS PER SQUARE FOOT PER FOOT (PSF/FT) AS AN EQUIVALENT FLUID PRESSURE (ABOVE GROUNDWATER)
 - 23 POUNDS PER SQUARE FOOT PER FOOT (PSF/FT) AS AN EQUIVALENT FLUID PRESSURE (BELOW GROUNDWATER)
 - SURCHARGE = 0.5 TIMES THE VERTICAL SURCHARGE LOAD UNIFORMLY DISTRIBUTED OVER THE HEIGHT OF THE WALL. THE MINIMUM VERTICAL SURCHARGE SHALL BE AN AASHTO HL-93 VEHICULAR LOAD.
 - SEISMIC =
 - 35 POUNDS PER SQUARE FOOT PER FOOT (PSF/FT) AS AN EQUIVALENT FLUID PRESSURE (ABOVE GROUNDWATER)
 - 79 POUNDS PER SQUARE FOOT PER FOOT (PSF/FT) AS AN EQUIVALENT FLUID PRESSURE (BELOW GROUNDWATER)
- MINIMUM LATERAL EARTH PRESSURES FOR UNRESTRAINED WING WALLS:
 - STATIC =
 - 48 PSF/FT AS AN EQUIVALENT FLUID PRESSURE, 200 PSF/FT MINIMUM (ABOVE GROUNDWATER)
 - 23 PSF/FT AS AN EQUIVALENT FLUID PRESSURE, 200 PSF/FT MINIMUM (BELOW GROUNDWATER)
 - SURCHARGE = 0.31 TIMES THE VERTICAL SURCHARGE LOAD UNIFORMLY DISTRIBUTED OVER THE HEIGHT OF THE WALL. THE MINIMUM VERTICAL SURCHARGE SHALL BE AN AASHTO HL-93 VEHICULAR LOAD. THE DESIGN SHALL ACCOUNT FOR SLOPING GROUND SURFACE ABOVE THE WALLS.
 - SEISMIC =
 - 35 POUNDS PER SQUARE FOOT PER FOOT (PSF/FT) AS AN EQUIVALENT FLUID PRESSURE (ABOVE GROUNDWATER)
 - 79 POUNDS PER SQUARE FOOT PER FOOT (PSF/FT) AS AN EQUIVALENT FLUID PRESSURE (BELOW GROUNDWATER)

- MINIMUM BACKFILL UNIT WEIGHT = 120 POUNDS PER CUBIC FOOT (PCF)
- MAXIMUM BACKFILL ANGLE OF INTERNAL FRICTION = 37 DEGREES
- MAXIMUM COEFFICIENT OF FRICTION FOR CAST-IN-PLACE CONCRETE ON CLEAN, SOUND BEDROCK = 0.70 (DELTA = 35 DEGREES)



Tighe&Bond



Keyes Road
Over Wilder
Brook
Culvert
Replacement

City of Gardner

Gardner,
Massachusetts

MassDOT Bridge No.
G-01-025, BIN CD5

MARK	DATE	DESCRIPTION
PROJECT NO:		G0384-060
DATE:		FEBRUARY 2023
FILE:		G0384-T60_3-4_GEN_NOTES.dwg
DRAWN BY:		SDS, RMC
DESIGNED/CHECKED BY:		AGB, MPW, AML, JRI
APPROVED BY:		DSH

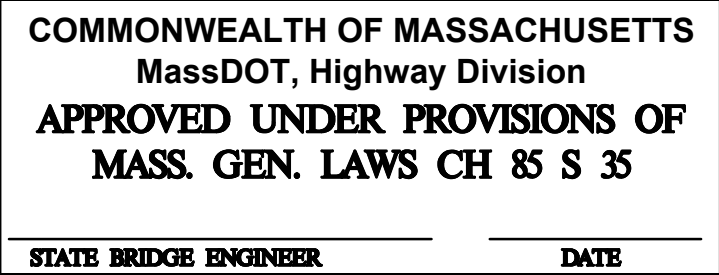
GENERAL NOTES, LEGEND,
AND ABBREVIATIONS
(SHEET 1 OF 2)

SCALE: NO SCALE

SHEET 3
SHEET 3 OF 25

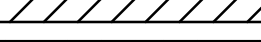
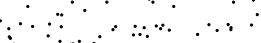
PRECAST CONCRETE BRIDGE STRUCTURE NOTES

1. ITEM 995.01, BRIDGE STRUCTURE, SHALL INCLUDE THE PRECAST CONCRETE RIGID FRAME, CORBELS, CURBS/HEADWALLS, WINGWALLS, AND PEDESTAL FOOTINGS USED TO SUPPORT THE RIGID FRAME AND WINGWALLS. JOINT MATERIALS, MEMBRANE, AND ANY OTHER MATERIALS OR ITEMS REQUIRED FOR INSTALLATION OF THE PRECAST CONCRETE BRIDGE STRUCTURE SHALL BE SUBSIDIARY.
2. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS, DESIGN CALCULATIONS, AND LOAD RATING CALCULATIONS, SEALED AND SIGNED BY A CURRENTLY REGISTERED MASSACHUSETTS PROFESSIONAL ENGINEER TO THE ENGINEER FOR REVIEW AND ACCEPTANCE TO ENSURE CONFORMANCE WITH THE CONTRACT DOCUMENTS AND THEN TO MASSDOT FOR REVIEW AND APPROVAL. DESIGN SHALL ENCOMPASS THE RIGID FRAME AND FOUNDATIONS, WINGWALLS AND FOUNDATIONS, CONNECTION OF HEADWALLS TO RIGID FRAME, AND CORBELS. SHOP DRAWINGS AND CALCULATIONS SHALL BE SUBMITTED PRIOR TO FABRICATION FOR ALL PRECAST CONCRETE ELEMENTS. SHOP DRAWINGS SHALL SHOW JOINT DETAILS AND REINFORCEMENT SIZE AND LOCATION.
3. FINAL SHOP DRAWINGS AND COMPUTATIONS DETAILING THE PROPOSED RIGID FRAME DESIGN SHALL BE SEALED AND SIGNED BY A PROFESSIONAL ENGINEER REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS FOR FINAL CHAPTER 85 SECTION 35 REVIEW AND APPROVAL. ALL FINAL SHOP DRAWINGS AND DESIGN CALCULATIONS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW AND MASSDOT FOR FINAL REVIEW AND APPROVAL. FINAL CHAPTER 85 APPROVAL IS REQUIRED PRIOR TO FABRICATION FOR ALL PRECAST ELEMENTS. PROVIDE CHAPTER 85 FINAL APPROVAL STAMP TO ALL DRAWING SHEETS PRIOR TO SUBMISSION TO MASSACHUSETTS DEPARTMENT OF TRANSPORTATION AS SHOWN BELOW.



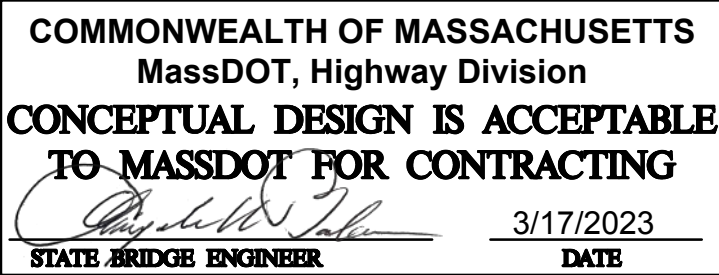
4. CHANGES OR MODIFICATIONS DURING THE FABRICATION PROCESS MUST BE SUBMITTED TO THE ENGINEER FOR ACCEPTANCE AND THEN TO MASSDOT FOR APPROVAL AND INCORPORATED INTO THE FINAL AS-BUILT DRAWINGS.
5. DIMENSIONS SHOWN FOR THE PRECAST CONCRETE ELEMENTS ARE APPROXIMATE AND BASED ON CONCEPTUAL DESIGN. NO ADJUSTMENTS TO QUANTITIES OR PAYMENTS WILL BE MADE AS A RESULT OF PROVIDING PRECAST UNITS SIZED DIFFERENTLY THAN SHOWN ON THE PLANS. CONTRACTOR TO ADJUST OVERALL BRIDGE GEOMETRY AS NEEDED IF PRECAST ELEMENT SIZES SELECTED BY CONTRACTOR DIFFER. SEE ALSO SPECIAL PROVISIONS SECTION 995.
6. THE QUALITY OF MATERIALS, THE PROCESS OF MANUFACTURE, AND THE FINISHED PRECAST UNITS SHALL BE SUBJECT TO INSPECTION AND APPROVAL BY THE ENGINEER.
7. JOINTS BETWEEN ABUTTING PRECAST UNITS SHALL BE MECHANICALLY CONNECTED, WATERTIGHT, GROUTED, AND MEMBRANED. SEE JOINT DETAILS ON SHEET 14.
8. WATERPROOF MEMBRANE SHALL BE PROVIDED OVER THE STRUCTURE ACROSS THE ENTIRE ROADWAY WIDTH.
9. SHEET MEMBRANE SHALL BE 2’ WIDE WITH PROTECTION BOARD (SUBSIDIARY) AND PLACED CENTERED OVER ALL HORIZONTAL AND VERTICAL EXPANSION AND CONSTRUCTION JOINTS.
10. EXPOSED CONCRETE SURFACES SHALL BE TREATED WITH WATER REPELLENT (SILANE/SILOXANE).
11. PRECAST CONCRETE HEADWALL ANCHORAGES, CURBS/HEADWALLS, AND RIGID FRAME SECTIONS SHALL BE DESIGNED TO ACCOUNT FOR ALL EARTH PRESSURE, LIVE LOAD SURCHARGES, AND BRIDGE RAILING LIVE LOAD AS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR NCHRP 350 TL-2 TEST LEVEL.
12. WEEP HOLES SHALL BE PLACED 1’-0” (TYP.) ABOVE THE TOP OF THE PEDESTAL FOOTING AND ONE (1) WEEP SHALL BE PROVIDED ON BOTH SIDES OF EACH RIGID FRAME OR WINGWALL UNIT OR 10’-0” (MAX.) SPACING ALONG FOOTING.
13. FOOTINGS SHALL HAVE A KEYWAY WITH THE SPECIFIED DIMENSIONS. GROUT SHALL BE PLACED AROUND THE BOTTOM OF THE RIGID FRAME OR WINGWALL AND TO THE TOP OF THE KEYWAY.
14. TOP SURFACES OF FOOTING UNITS SHALL BE SET UNIFORMLY TRUE & LEVEL TO A TOLERANCE OF +/- 1/8”.

15. DEWATERING IS REQUIRED AT EACH FOUNDATION LOCATION TO CONTROL THE WATER INFLOW AND ADEQUATELY DEWATER THE FOOTING EXCAVATION. SUMP PUMPING AREAS AROUND THE ENTIRE PERIMETER SHALL BE REQUIRED TO ADEQUATELY CONTROL THE GROUNDWATER WITHIN THE EXCAVATION AREAS. DEWATERING SHALL BE CONTINUOUS UNTIL THE PRECAST CONCRETE RIGID FRAME AND WINGWALLS ARE BACKFILLED EVENLY ON BOTH SIDES TO THE ELEVATIONS OF THE SURROUNDING WATER TABLE, UNLESS OTHERWISE DIRECTED.
16. ANY PROPOSED DEWATERING SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW AND ACCEPTANCE.
17. THE CONTRACTOR SHALL SUBMIT DRAWINGS AND DESIGN CALCULATIONS, SEALED AND SIGNED BY A CURRENTLY REGISTERED MASSACHUSETTS PROFESSIONAL ENGINEER TO THE ENGINEER FOR REVIEW AND ACCEPTANCE OF THE PROPOSED SHORING AND SUPPORT OF EXCAVATION. SHOP DRAWINGS AND CALCULATIONS SHALL BE SUBMITTED PRIOR TO FABRICATION AND INSTALLATION FOR ALL SHORING AND SUPPORT OF EXCAVATION ELEMENTS.
18. WATER PUMPED FROM DEWATERING LOCATIONS SHALL BE FILTERED ADEQUATELY TO REMOVE FINE MATERIALS PRIOR TO RETURNING THE WATER TO THE RIVER/BROOK. ACTUAL LOCATION OF SEDIMENTATION BASIN TO BE DETERMINED BY CONTRACTOR AND APPROVED BY THE ENGINEER PRIOR TO INSTALLATION.
19. ANY FOUNDATION MATERIALS WEAKENED AS A RESULT OF INSUFFICIENT CARE WHILE MAINTAINING A DEWATERED CONDITION SHALL BE REMOVED AND REPLACED WITH GRAVEL BORROW (M1.03.0 TYPE A) OR CRUSHED STONE AT NO EXPENSE TO THE OWNER.
20. REINFORCEMENT OF THE PRECAST UNITS SHALL HAVE A 2” MINIMUM CLEAR COVER IN THE TOP FACE OF TOP SLAB, INSIDE FACE OF SIDEWALLS, AND HEADWALLS. ALL OTHER REINFORCEMENT IN THE PRECAST UNITS SHALL HAVE A 1½” MINIMUM CLEAR COVER. ANY CAST-IN-PLACE CONCRETE SHALL MEET AASHTO COVER REQUIREMENTS.
21. A CORROSION INHIBITOR CONCRETE ADDITIVE SHALL BE INCLUDED AS PART OF THE CONCRETE MIX FOR CONCRETE CURBS/HEADWALLS.
22. DATE TO BE PLACED ON THE INSIDE NORTHEAST FACE AND INSIDE SOUTHWEST FACE HIGHWAY GUARDRAIL TRANSITIONS. CONTRACTOR SHALL FURNISH A SHEET SHOWING SIZE AND CHARACTER OF NUMERALS. THE DATE USED SHALL BE THE LATEST YEAR OF CONTRACT COMPLETION AS OF THE DATE THE FIRST HIGHWAY GUARDRAIL TRANSITION IS CONSTRUCTED. BOTH HIGHWAY GUARDRAIL TRANSITIONS SHALL FEATURE THE SAME DATE.
23. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 3/4”, UNLESS OTHERWISE NOTED.
24. SHEAR KEYS SHALL BE 3” HIGH BY ONE-THIRD THE WIDTH OF THE CONCRETE ELEMENT, CENTERED, WITH 3” MIN. CLEAR ON EACH SIDE.
25. APPLY PAVEMENT JOINT ADHESIVE ALONG ALL LONGITUDINAL JOINTS BETWEEN PAVEMENT PASSES AND ALONG BRIDGE CURB LINES AND EXPANSION JOINT ARMORING PRIOR TO PLACING ALL PAVEMENT COURSES.
26. FACES OF PRECAST CONCRETE TO BE BACKFILLED AGAINST SHALL BE COATED WITH DAMP-PROOFING IN ACCORDANCE WITH THE SPECIFICATIONS.

EXISTING	PROPOSED	DESCRIPTION
		MAIL BOX
		CONCRETE POST
		BOULDER
		BENCHMARK
X WF ##-##		WETLAND FLAG
		SIGN AND POST
		GATE VALVE
		HYDRANT
		UTILITY POLE
		OVERHEAD UTILITY
		WATER MAIN
		INTERMEDIATE CONTOURS
		INDEX CONTOURS
		PROPERTY LINE OR APPROXIMATE PROPERTY LINE
		EDGE OF PAVEMENT
		CENTERLINE
		CURB
		GUARDRAIL
		LIMITS OF WORK
		EROSION CONTROL BARRIER
		COFFER DAM
		MEAN HIGH WATER/BANK
		BORDER OF VEGETATED WETLAND
		30-FOOT NO DISTURBANCE ZONE
		100-FOOT BUFFER ZONE
		200-FOOT RIVERFRONT AREA
		BORDERING LAND SUBJECT TO FLOODING
		DEMOLISH
		MODIFIED ROCKFILL SURFACE RESTORATION
		DUMPED RIPRAP BANK RESTORATION AND STABILIZATION
		BANK RESTORATION AND STABILIZATION

ABBREVIATIONS

ADJ	ADJUST
BIT	BITUMINOUS
BL	BASELINE
BLSF	BORDERING LAND SUBJECT TO FLOODING
BO	BY OTHERS
BOT	BOTTOM
CCW	CEMENT CONCRETE WALK
CL	CENTERLINE
CMP	CORROGATED METAL PIPE
CONC	CONCRETE
CY	CUBIC YARD
DIA	DIAMETER
E	EAST
EL/ELEV	ELEVATION
EOP	EDGE OF PAVEMENT
EW	EACH WAY
EXIST	EXISTING
HMA	HOT MIX ASPHALT
LT	LEFT
MAX	MAXIMUM
MIN	MINIMUM
MSE	MECHANICALLY STABILIZED EARTH
N	NORTH
NTS	NOT TO SCALE
N/A	NOT APPLICABLE
OC	ON CENTER
OH	OVERHEAD
PC	POINT OF CURVATURE
PGL	PROPOSED GRADE LINE
PI	POINT OF INTERSECTION
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PT	POINT OF TANGENCY
RET UP	RETAIN UTILITY POLE
ROW	RIGHT OF WAY
RT	RIGHT
R&D	REMOVE AND DISPOSE
R&R	REMOVE AND RESET
S	SOUTH
SF	SQUARE FOOT
SOE	SUPPORT OF EXCAVATION
TYP	TYPICAL
UP	UTILITY POLE



Tighe&Bond



Keyes Road
Over Wilder
Brook
Culvert
Replacement

City of Gardner

Gardner,
Massachusetts

MassDOT Bridge No.
G-01-025, BIN CD5

MARK	DATE	DESCRIPTION
PROJECT NO: G0384-060		
DATE: FEBRUARY 2023		
FILE: G0384-T60_3-4_GEN_NOTES.dwg		
DRAWN BY: SDS, RMC		
DESIGNED/CHECKED BY: AGB, MPW, AML, JRI		
APPROVED BY: DSH		

GENERAL NOTES, LEGEND,
AND ABBREVIATIONS
(SHEET 2 OF 2)

SCALE: NO SCALE

SHEET 4
SHEET 4 OF 25

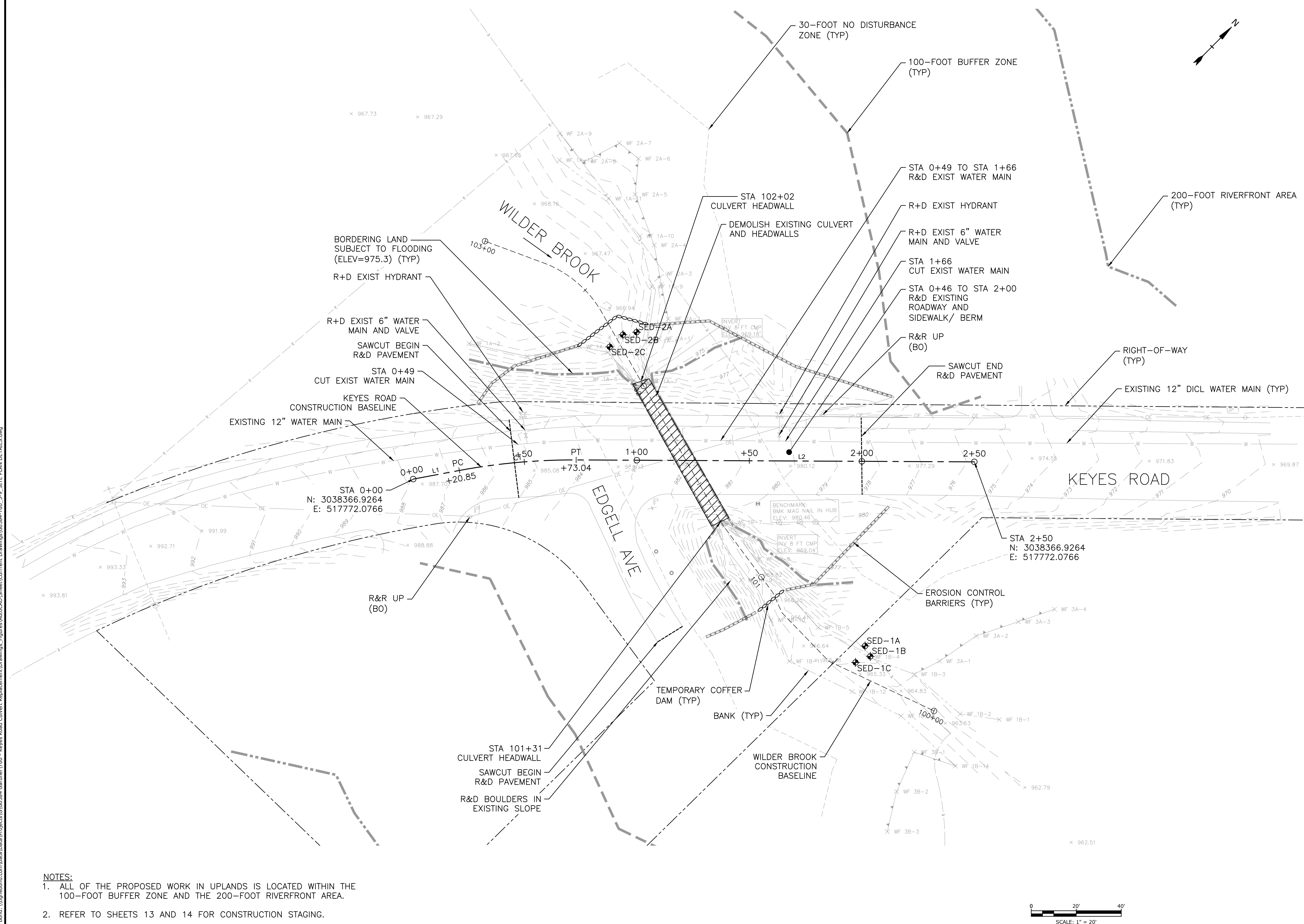
MassDOT Bridge No.
G-01-025, BIN CD5

[illegible]

MARK	DATE	DESCRIPTION
PROJECT NO:		G0384-060
DATE:		FEBRUARY 2023
FILE:	G0384-T60_5-9_SITE PLAN DETAILS.dwg	
DRAWN BY:		SDS, RMC
DESIGNED/CHECKED BY: AGB, MPW, AML, JRI		
APPROVED BY:		DSH

SCALE: 1" = 20'

SHEET 5
SHEET 5 OF 25



NOTES:

1. ALL OF THE PROPOSED WORK IN UPLANDS IS LOCATED WITHIN THE 100-FOOT BUFFER ZONE AND THE 200-FOOT RIVERFRONT AREA.
2. REFER TO SHEETS 13 AND 14 FOR CONSTRUCTION STAGING.

Last Saved: 10/6/2026 10:00:06 AM By: JPrzelecinzy
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Page 8 of 8

EROSION CONTROL NOTES:

- ALL EROSION CONTROL MEASURES SHOWN, SPECIFIED AND REQUIRED BY THE ENGINEER SHALL BE INSTALLED PRIOR TO ANY CONSTRUCTION OR IMMEDIATELY UPON REQUEST. MAINTAIN ALL SUCH CONTROL MEASURES UNTIL FINAL SURFACE TREATMENTS ARE IN PLACE AND/OR UNTIL PERMANENT VEGETATION IS ESTABLISHED.
- MAINTAIN AN ADDITIONAL SUPPLY OF EROSION CONTROL MEASURES THROUGHOUT THE CONSTRUCTION PERIOD.
- PRIOR TO STARTING WORK, CLEARLY STAKE WORK LIMIT LINE(S). DO NOT DISTURB VEGETATION AND TOPSOIL BEYOND THE NEW LIMIT LINE. COORDINATE WITH THE ENGINEER THE LOCATIONS FOR THE TEMPORARY STOCKPILING OF TOPSOIL DURING CONSTRUCTION.
- SIDE SLOPES, AND DISTURBED VEGETATED AREAS, SHALL BE A MAXIMUM GRADE OF 2:1 COMPACTED, STABILIZED, LOAMED AND SEEDED AS SHOWN ON DRAWINGS. SIDE SLOPES SHALL BE IMMEDIATELY FINE GRADED AND SEEDED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.
- SILT TRAPPED AT BARRIERS SHALL BE REMOVED AND DISPOSED OF IN UPLAND AREAS OUTSIDE BUFFER ZONES. MATERIALS DEPOSITED IN ANY TEMPORARY SETTLING BASIN SHALL BE REMOVED AT THE COMPLETION OF THE PROJECT. ALL DISTURBED AREAS SHALL BE RESTORED.
- INSTALL EROSION CONTROLS AT THE EDGE OF NEW WORK. EROSION CONTROLS SHALL ACT AS LIMIT OF WORK LINE TO HELP ENSURE THAT EQUIPMENT DOES NOT DISTURB ADJACENT PROPERTIES.
- ADDITIONAL EROSION CONTROLS MAY BE REQUIRED TO LIMIT SEDIMENTS FROM DISCHARGING TO ADJACENT PROPERTIES OR WATERWAYS.
- PROPERLY STABILIZE AND PROTECT TEMPORARY STOCKPILES OF MATERIALS RELATED TO THE CONSTRUCTION ACTIVITIES TO LIMIT MOVEMENT OF MATERIAL ONTO ADJACENT PARCELS, OR INTO THE STREAM.
- STABILIZE THE AREAS OF CONSTRUCTION ACTIVITIES AT THE CLOSE OF EACH CONSTRUCTION DAY. CHECK EROSION CONTROLS AT THIS TIME AND MAINTAIN OR REINFORCE IF NECESSARY
- PROTECT NEW WORK FROM FLOODING. PROPERLY SLOPE GRADING IN THE AREAS SURROUNDING ALL EXCAVATIONS TO LIMIT WATER FROM RUNNING INTO THE EXCAVATED AREA OR TO ADJACENT PROPERTIES. UPON COMPLETION OF THE WORK, RESTORE ALL AREAS IN A SATISFACTORY MANNER.
- ALL SILT–LADEN WATER MUST BE SETTLED OR FILTERED TO REMOVE ALL SEDIMENTS PRIOR TO RELEASE TO AN UPLAND AREA, IN A SEDIMENTATION OR FILTER BAG LOCATED DOWN GRADIENT.
- DEWATER AS NECESSARY TO KEEP CONSTRUCTION AREAS FREE OF WATER, DISCHARGE WATER FROM DEWATERING TO APPROPRIATE UPLAND LOCATION AND WITHOUT SEDIMENT (SEE DEWATERING REQUIREMENTS).
- AT THE END OF EACH WORK DAY, ANY SEDIMENTS TRACKED ONTO PUBLIC RIGHTS–OF–WAY BEYOND THE PROJECT LIMITS SHALL BE SWEPT.

IN–SITU WETLAND RESTORATION NOTES:

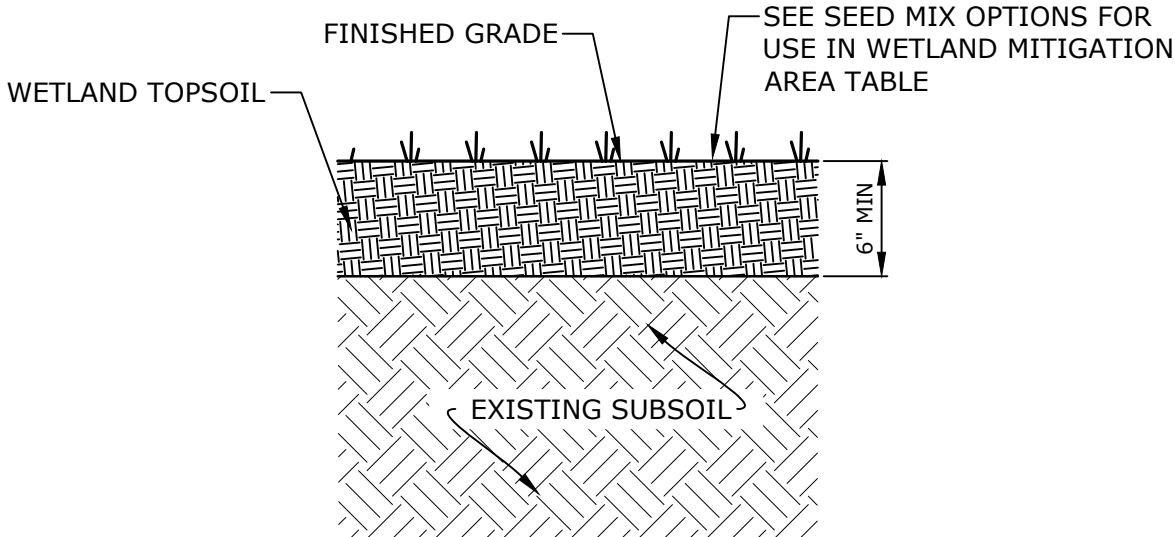
- STABILIZATION OF DISTURBED AREAS OR NEW SOIL SHALL BE IMPLEMENTED WITHIN 14 DAYS AFTER GRADING OR CONSTRUCTION ACTIVITIES HAVE TEMPORARILY OR PERMANENTLY CEASED. APPROPRIATE VEGETATIVE SOIL STABILIZATION IS TO BE USED TO MINIMIZE EROSION. TEMPORARY OR PERMANENT VEGETATIVE COVER IS TO BE ESTABLISHED IN ACCORDANCE WITH THE PROJECT PLANS AND SPECIFICATIONS, USING HYDRO–SEEDING, BROADCASTING, OR OTHER APPROVED TECHNIQUES.
- TREES AND SHRUBS SHOULD BE PLANTED FIRST AND THEN SEEDING WITH THE SPECIFIED SEED MIX (TABLE 2–3).
- TREES AND SHRUB SPECIES PLANTING SUBSTITUTIONS MAY BE REQUIRED BASED ON THE AVAILABILITY OF NATIVE MATERIAL. SUBSTITUTIONS SHALL BE APPROVED BY A WETLAND SCIENTIST OR ENGINEER OVERSEEING THE RESTORATION.
- MAINTAIN VEGETATED SURFACES, INCLUDING WATER, AND RE–SEEDING UNTIL ESTABLISHED CONDITIONS ARE MET AND UNTIL THE END OF THE CONTRACTUAL MAINTENANCE PERIOD.
- SEED MIX SPECIFIED IN TABLE 2–3 SHALL BE APPLIED BASED ON THE APPLICATION RATE SPECIFIED BY THE SUPPLIER.
- THE IN–SITU WETLAND RESTORATION AREAS SHALL BE MULCHED WITH STRAW FOLLOWING SEEDING.
- AREAS WHERE WETLAND TOPSOIL IS SIGNIFICANTLY DISTURBED OR REMOVED ENTIRELY, REPLACE WITH WETLAND SOIL AS SPECIFIED IN INLAND WETLAND REPLACEMENT PLAN NOTE 2 TO MATCH EXISTING GRADE

TABLE 2-3 Seed Mix ¹ for Application to Bank and Wetland Restoration Areas and for Wetland Replacement		
Common Name	Botanical Name ²	Indicator Status ¹
Fox Sedge	<i>Carex vulpinoidea</i>	OBL
Blunt Broom Sedge	<i>Carex scoparia</i>	FACW
Lurid Sedge	<i>Carex lurida</i>	OBL
Hop Sedge	<i>Carex lupulina</i>	OBL
Fowl Bluegrass	<i>Poa palustris</i>	FACW
Beggar Ticks	<i>Bidens frondosa</i>	FACW
Green Bulrush	<i>Scirpus atrovirens</i>	OBL
Swamp Milkweed	<i>Asclepias incarnata</i>	OBL
Fringed Sedge	<i>Carex crinita</i>	OBL
New York Ironweed	<i>Vernonia noveboracensis</i>	FACW
Soft Rush	<i>Juncus effusus</i>	OBL
Starved/Calico Aster	<i>Aster lateriflorus</i> (<i>Symphotrichum lateriflorum</i>)	FAC
Blue Flag	<i>Iris versicolor</i>	OBL
American Mannagrass	<i>Glyceria grandis</i>	OBL
Square Stemmed Monkey Flower	<i>Mimulus ringens</i>	OBL
Spotted Joe Pye Weed	<i>Eupatorium maculatum</i> (<i>Eutrochium maculatum</i>)	OBL

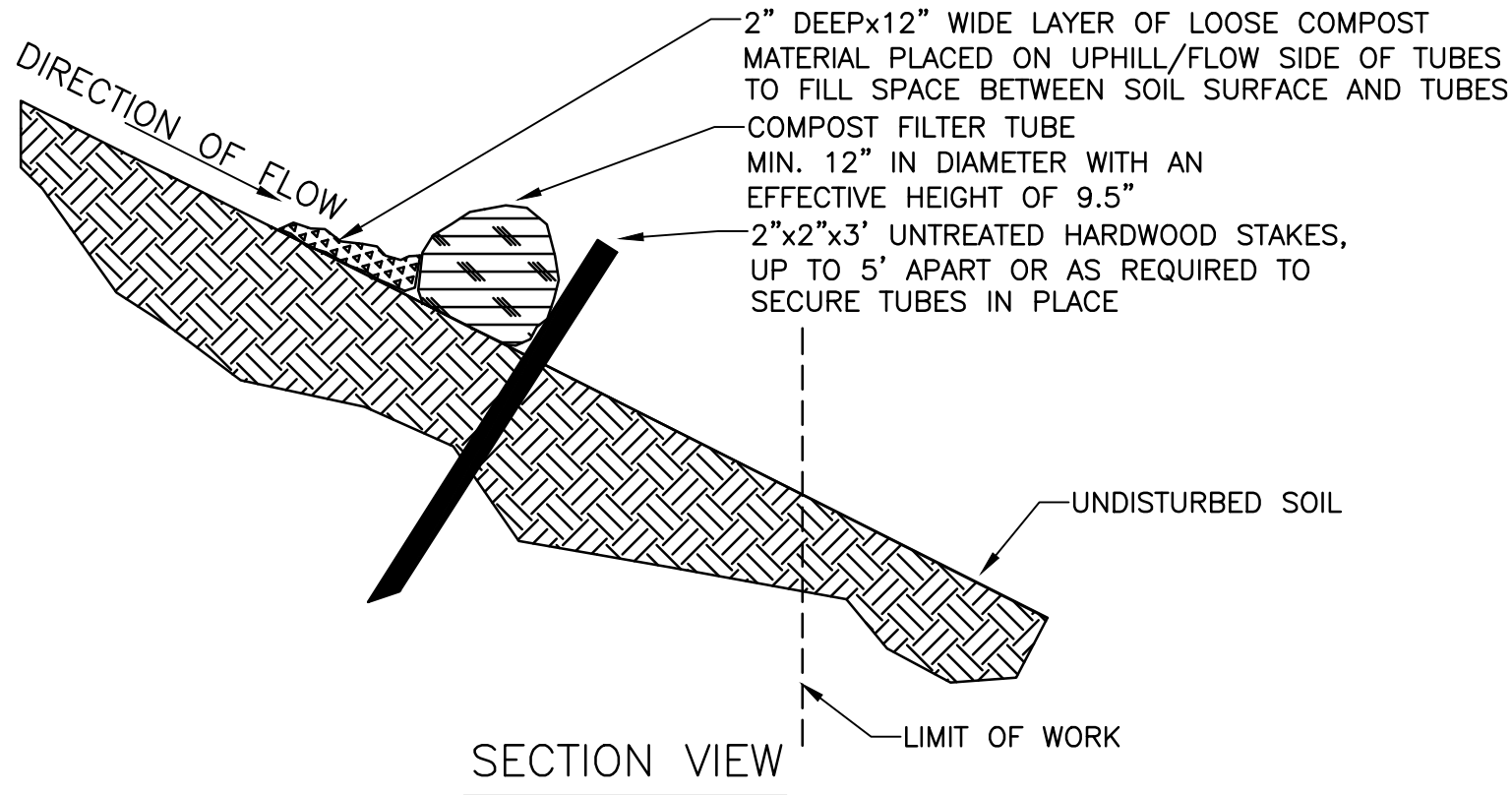
¹ New England Wetmix (Wetland Seed Mix) Species Composition (New England Wetland Plants, Inc.)
² This list was adapted from the New England Wetland Plants, Inc. information sheet as of October 10, 2020.
³ Indicator status is based on the USDA NRCS Plants Database.

TABLE 2-4 Native Shrubs (tubelings or live stakes) for Bank Restoration ¹			
Common Name	Botanical Name	Indicator Status ²	On center Spacing
Silky Dogwood	<i>Cornus amomum</i>	FACW	1'-2'
Winterberry	<i>Ilex verticillata</i>	FACW	1'-2'
Pussy Willow	<i>Salix discolor</i>	FACW	1'-2'
Bebb Willow	<i>Salix bebbiana</i>	FACW	1'-2'
Black Willow	<i>Salix nigra</i>	OBL	1'-2'

¹ Shrubs to be selected from the species listed in this table based on the availability of native nursery stock at the time of installation.
² Indicator status is based on the USDA NRCS Plants Database.



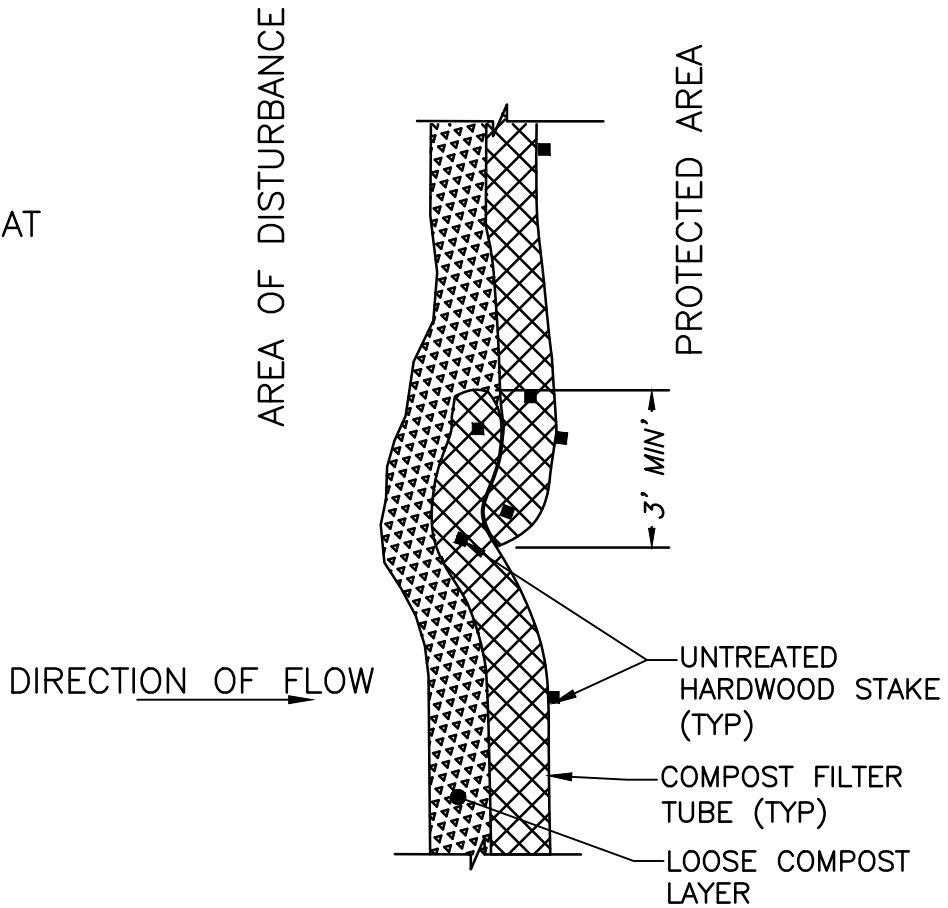
WETLAND TOPSOIL FOR INLAND WETLAND REPLACEMENT AREA
NO SCALE



SECTION VIEW

NOTES:

- PROVIDE 3’ MINIMUM OVERLAP AT ENDS OF TUBES TO JOIN IN A CONTINUOUS BARRIER AND MINIMIZE UNIMPEDED FLOW.
- STAKE JOINING TUBES SNUGLY AGAINST EACH OTHER TO PREVENT UNFILTERED FLOW BETWEEN THEM.
- SECURE ENDS OF TUBES WITH STAKES SPACED 18” APART THROUGH TOPS OF TUBES.

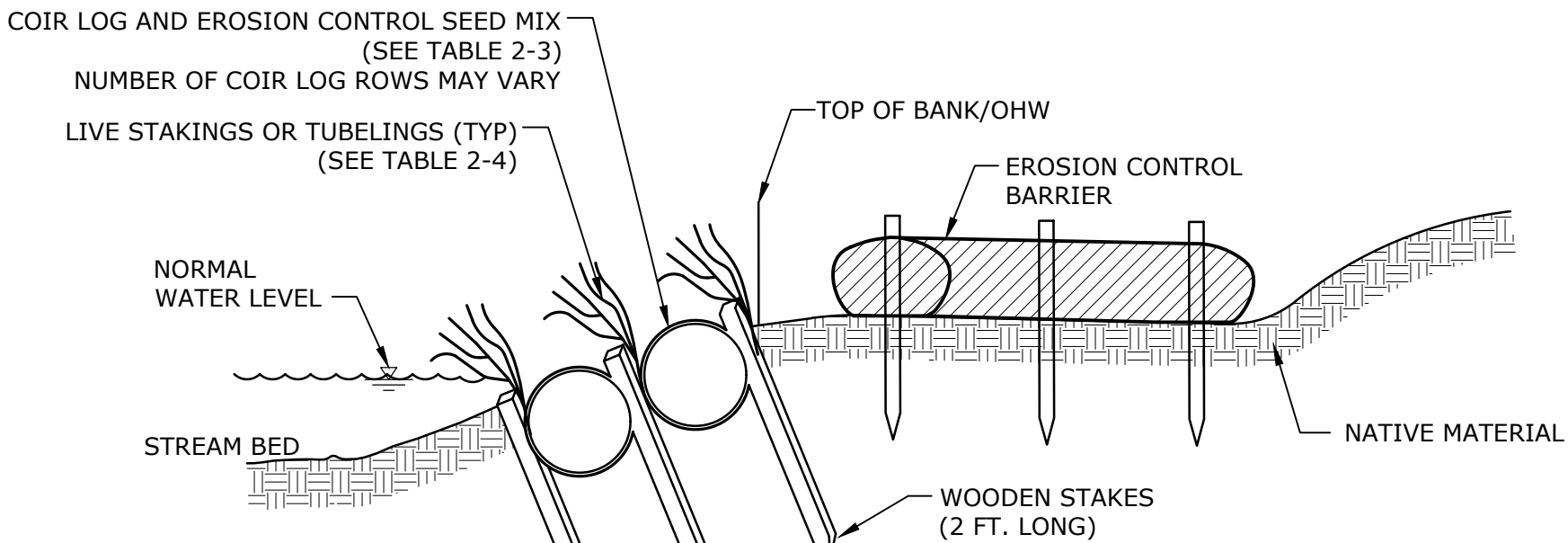


PLAN VIEW – JOINT DETAIL

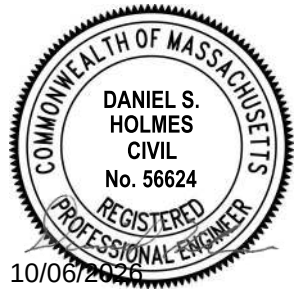
COMPOST FILTER TUBE NOTES:

- PROVIDE A MINIMUM TUBE DIAMETER OF 12” FOR SLOPES UP TO 50’ 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 SITUATION WITH LONGER SLOPES OR STEEPER SLOPES.
- INSTALL TUBES ALONG CONTOURS AND PERPENDICULAR TO SHEET OR CONCENTRATED FLOW.
- DO NOT INSTALL IN PERENNIAL, EPHEMERAL OR INTERMITTENT STREAMS.
- CONFIGURE TUBES AROUND EXISTING SITE FEATURES TO MINIMIZE SITE DISTURBANCE AND MAXIMIZE CAPTURE AREA OF STORMWATER RUN–OFF.
- TUBES FOR COMPOST FILTERS SHALL BE JUTE MESH OR APPROVED BIODEGRADABLE MATERIAL. ADDITIONAL TUBES SHALL BE USED AT THE DIRECTION OF THE ENGINEER.
- TAMP TUBES IN PLACE TO ENSURE GOOD CONTACT WITH SOIL SURFACE. IT IS NOT NECESSARY TO TRENCH TUBES INTO EXISTING GRADE.
- WHEN STAKING IS NOT POSSIBLE, SUCH AS WHEN TUBES MUST BE PLACED ON PAVEMENT, HEAVY CONCRETE OR CINDER BLOCKS CAN BE USED BEHIND TUBES UP TO 5’ APART OR AS REQUIRED TO SECURE TUBES IN PLACE.
- PROVIDE 3’ MINIMUM OVERLAP AT ENDS OF TUBES TO JOIN IN A CONTINUOUS BARRIER AND MINIMIZE UNIMPEDED FLOW.
- STAKE JOINING TUBES SNUGLY AGAINST EACH OTHER TO PREVENT UNFILTERED FLOW BETWEEN THEM.
- SECURE ENDS OF TUBES WITH STAKES SPACED 18” APART THROUGH TOPS OF TUBES.

COMPOST FILTER TUBES
NO SCALE



COIR LOG BANK STABILIZATION
NO SCALE



Keyes Road
Over Wilder
Brook
Culvert
Replacement

City of Gardner

Gardner,
Massachusetts

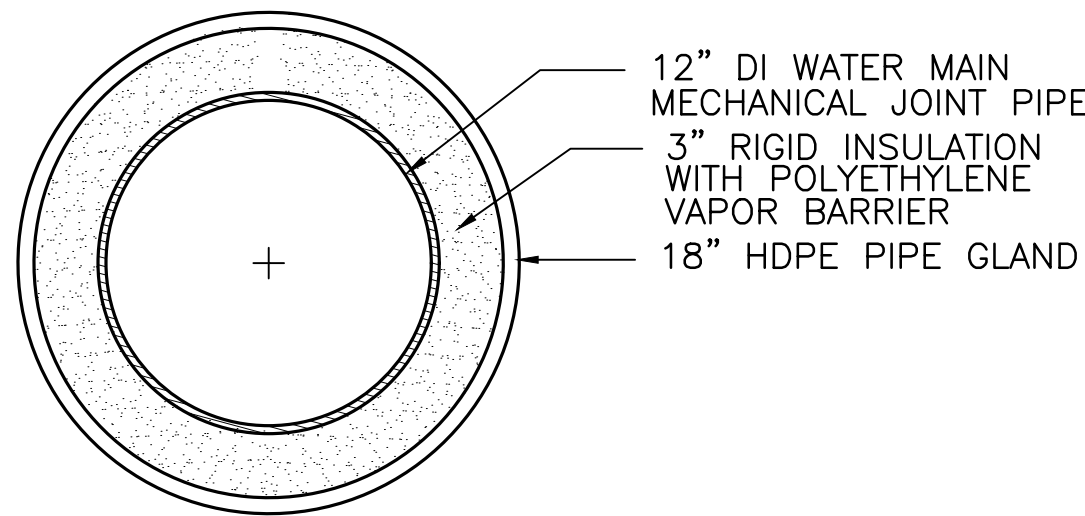
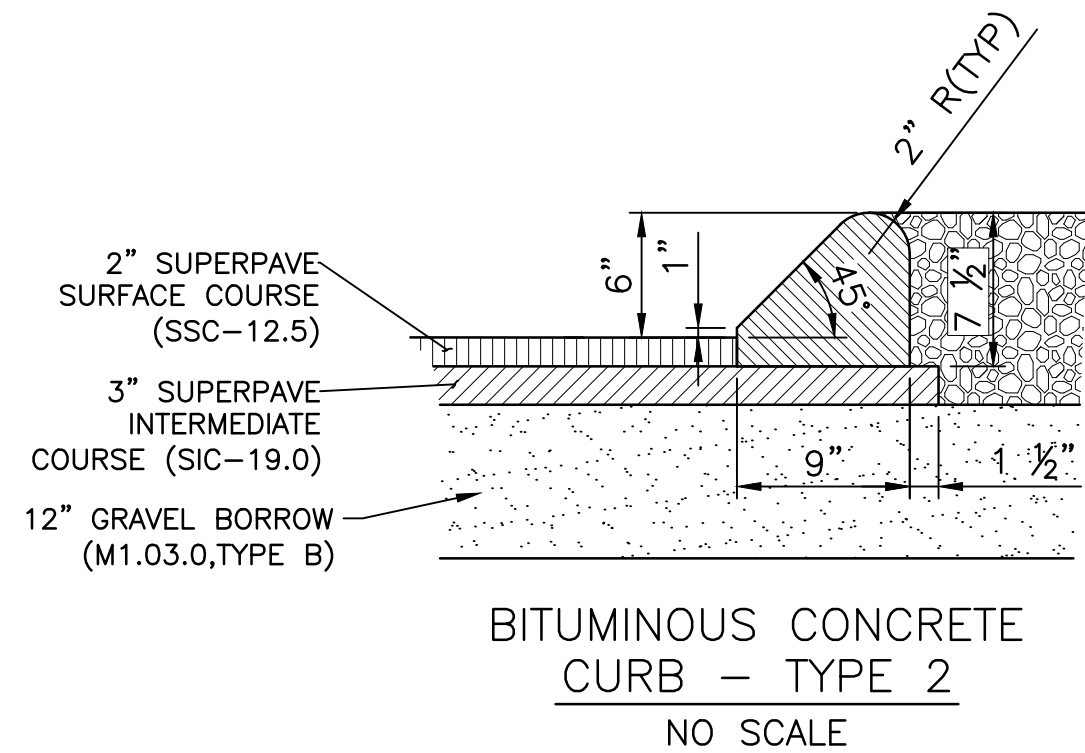
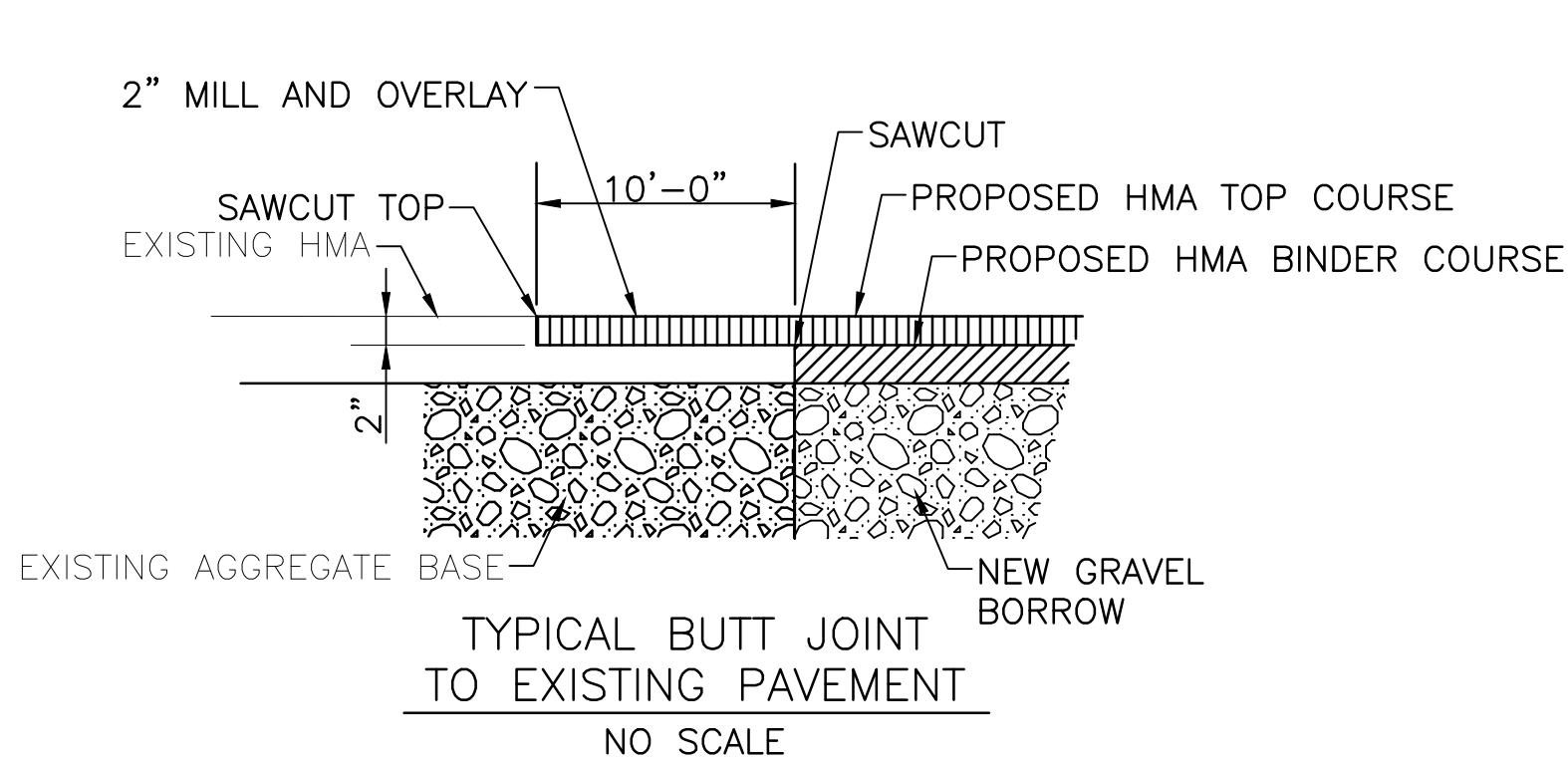
MassDOT Bridge No.
G-01-025, BIN CD5

MARK	DATE	DESCRIPTION
PROJECT NO:	G0384-060	
DATE:	FEBRUARY 2023	
FILE:	G0384-T60_5-9_SITE PLAN DETAILS.dwg	
DRAWN BY:	SDS, RMC	
DESIGNED/CHECKED BY:	AGB, MPW, AML, JRI	
APPROVED BY:	DSH	

CONSTRUCTION DETAILS

SCALE: NO SCALE

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Figure: AutoCAD Sheet (Current Drawings) G0384-T60-5-9-Site Plan Details.dwg



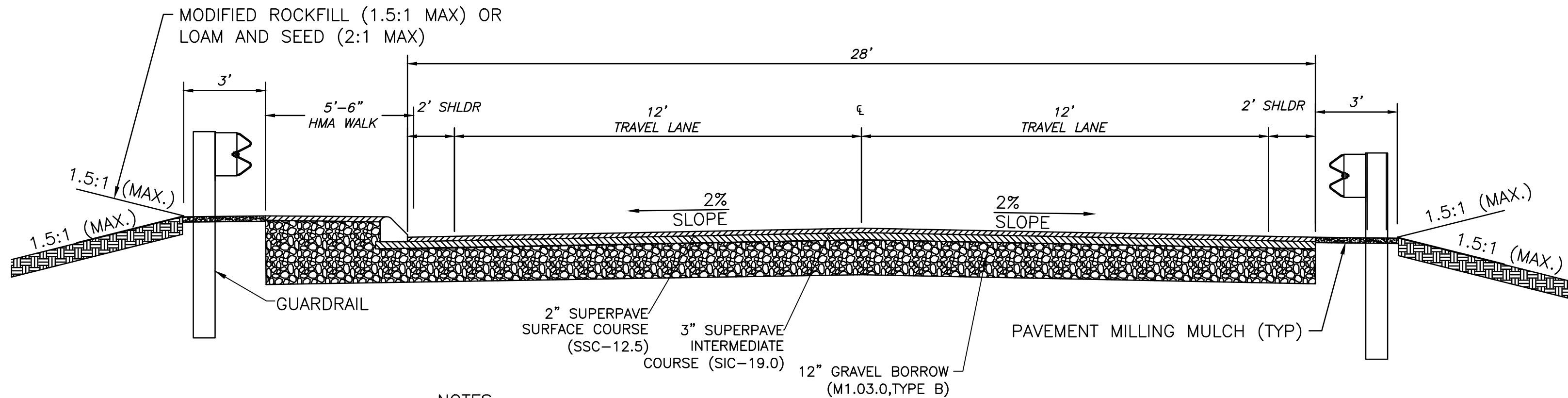
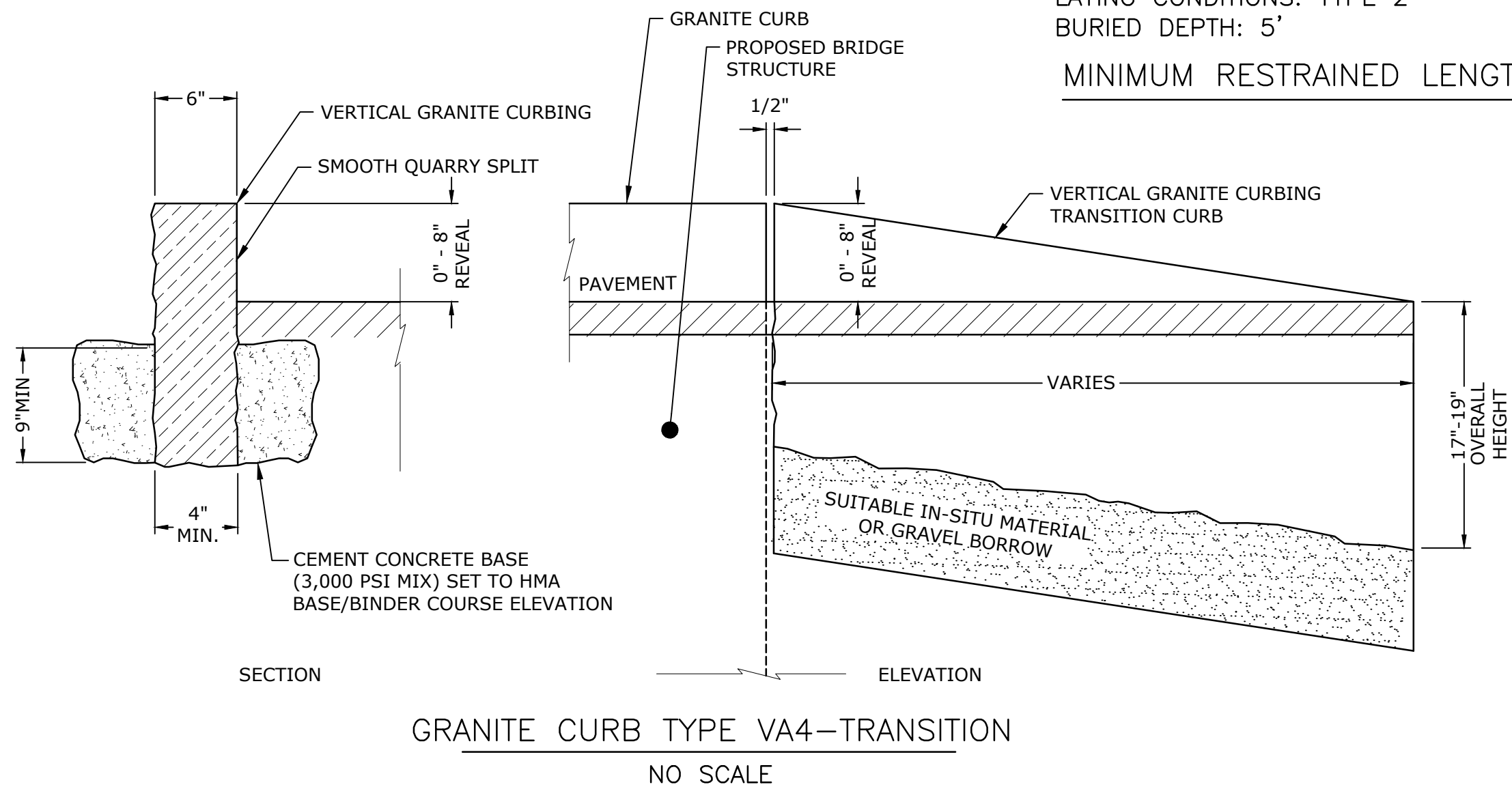
- NOTES:
1. INSULATED WATER MAIN IS REQUIRED WHERE THE WATER MAIN HAS LESS THAN 5' OF COVER.
 2. WATER MAIN BENDS LOCATED IN AREAS WITH LESS THAN 5' OF COVER SHALL BE INSULATED.

SIZE (IN.)	FITTING	*MINIMUM RESTRAINED LENGTH, FT. () INDICATES POLYWRAPPED
6"	90° BEND	20
6"	DEAD END / VALVE	50
12"	45° BEND	28 (32)
12"	CAP (DEAD END)	142 (202)
12"	45° VERTICAL UP BEND	28 (32)
12"	45° VERTICAL DOWN BEND	59 (84)

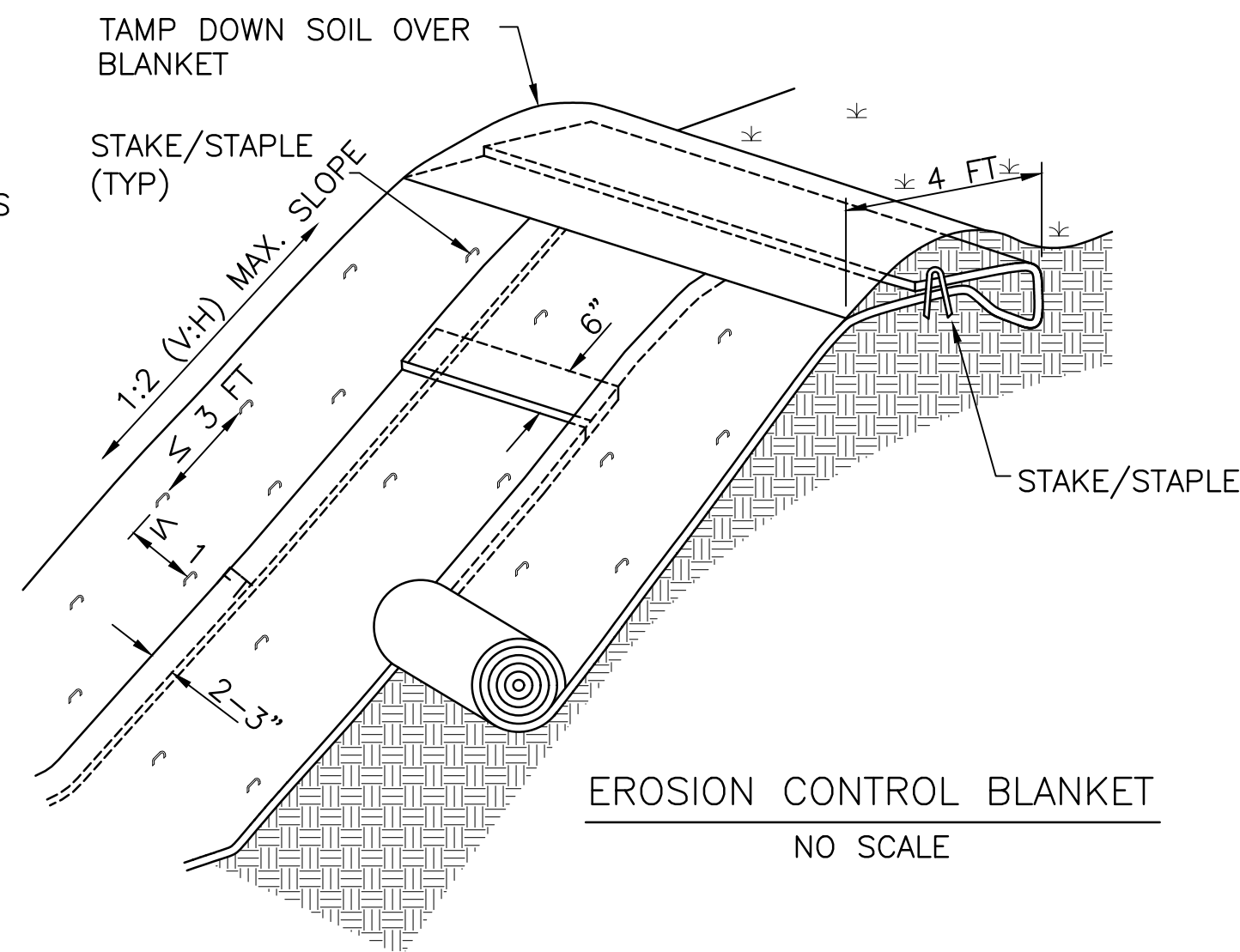
* MINIMUM RESTRAINED LENGTH BASED ON DIPRA, "THRUST RESTRAINT DESIGN FOR DUCTILE IRON PIPE," 7TH EDITION, 2016.

FOLLOWING CONDITIONS APPLY:
SOIL TYPE: SAND SILT
MAX. PRESSURE: 200psi
LAYING CONDITIONS: TYPE 2
BURIED DEPTH: 5'

MINIMUM RESTRAINED LENGTHS FOR DI PIPE

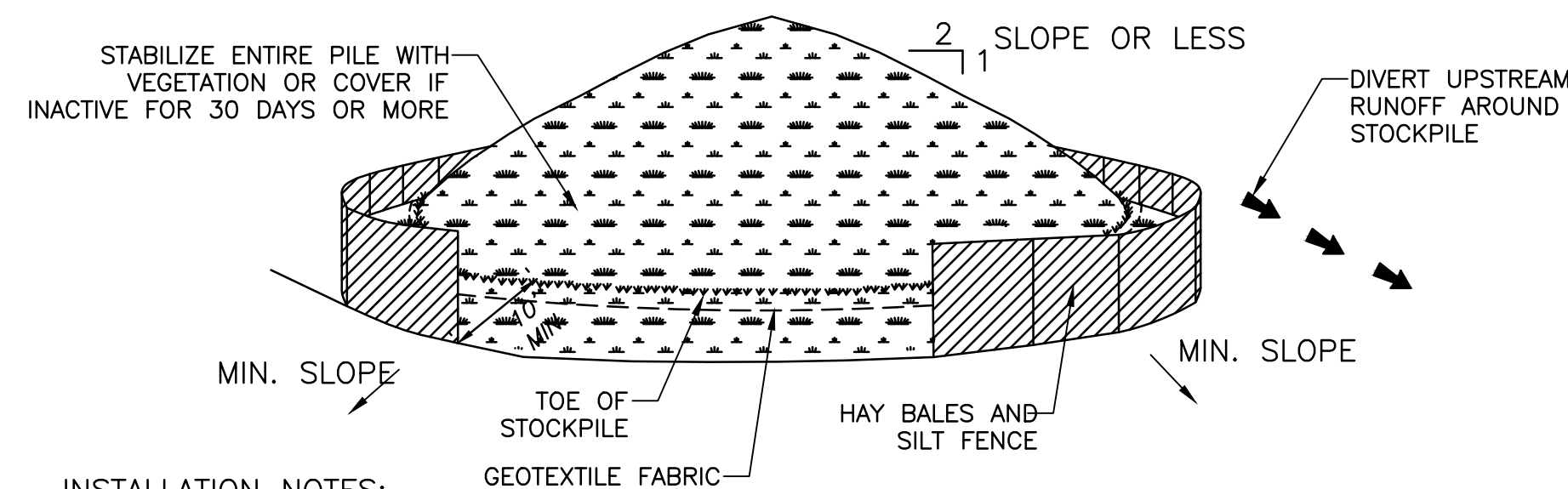


- NOTES:
1. REFER TO STRUCTURAL DRAWINGS FOR BRIDGE RAIL LOCATIONS.



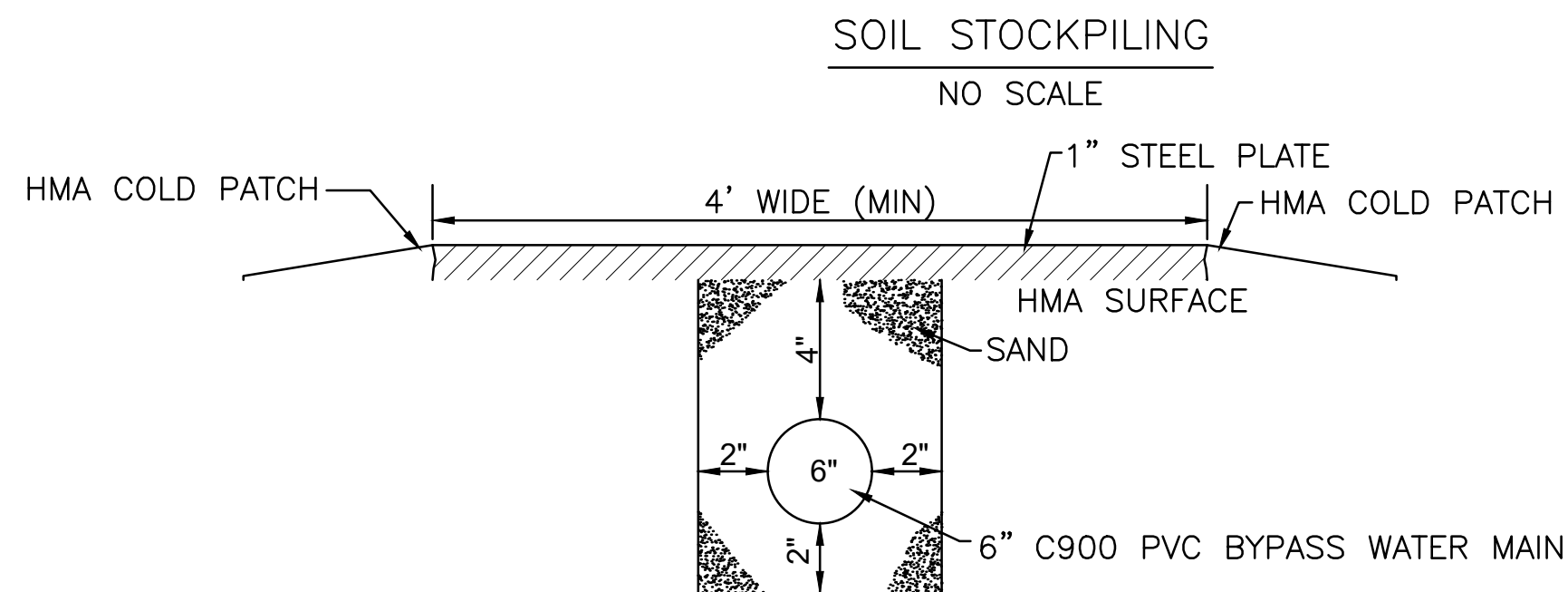
INSTALLATION NOTES:

1. 100% BIODEGRADABLE WEAVE JUTE NET EROSION CONTROL BLANKET OVER 6" LOAM & SEED. DO NOT USE NYLON OR PLASTIC NETTING. IN ALL LOCATIONS WITH A 3:1 SLOPE OR STEEPER. SEED MIX AS SHOWN IN TABLE BELOW.
2. EROSION CONTROL BLANKET SHOULD BE INSTALLED VERTICALLY DOWNSLOPE.
3. STAKES/STAPLES SHOULD BE PLACED NO MORE THAN 3 FT APART VERTICALLY, AND 1 FT APART HORIZONTALLY.
4. SLOPE SURFACE SHOULD BE FREE OF STICKS, ROCKS, AND OTHER OBSTRUCTIONS.
5. BLANKETS SHOULD BE ROLLED OUT LOOSELY AND STAKED/STAPLED TO MAINTAIN DIRECT SOIL CONTACT. DO NOT STRETCH THE BLANKETS.



INSTALLATION NOTES:

1. AREA CHOSEN FOR STOCKPILING OPERATIONS SHALL BE DRY AND STABLE.
2. MAXIMUM SLOPE OF STOCKPILE SHALL BE 2H:1V.
3. UPON COMPLETION OF SOIL STOCKPILING, EACH PILE SHALL BE SURROUNDED WITH EITHER SILT FENCING AND HAYBALES, THEN STABILIZED WITH VEGETATION OR COVERED.

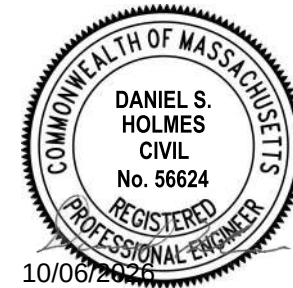


NOTES:

1. TEMPORARY WATER MAIN BYPASS SHALL BE FUNCTIONAL BEFORE REMOVAL OF EXISTING WATER MAIN. CUT AND CAP EXISTING WATER MAIN AS SHOWN ON THE PLANS AND COORDINATE ANY TEMPORARY WATER MAIN SHUT-DOWNS WITH THE CITY PRIOR TO COMMENCING WORK.
2. CONTRACTOR TO PROVIDE TEMPORARY INSULATION TO THE BYPASS WHEN TEMPERATURES ARE BELOW 50°F.
3. CONTRACTOR TO PROVIDE TEMPORARY SUPPORT FOR WATER MAIN BYPASS.
4. SUBMIT TEMPORARY WATER MAIN BYPASS PLAN WHICH SHALL INCLUDE LOCATION, DURATION, AND CONSTRUCTION PHASING.
5. PIPING TO BE 6" C900 PVC WITH A MINIMUM WORKING PRESSURE OF 200 PSI HAVING PREVIOUSLY BEEN USED ONLY FOR LIKE WORK.
6. ALL PIPING OR HOSES CROSSING SIDEWALKS SHALL HAVE COLD PATCH RAMPS.
7. CONTRACTOR SHALL PROVIDE FULL-TIME ON-CALL BYPASS WATCH.
8. BYPASS WATER MAIN PIPE JOINTS SHALL BE SANDBAGGED AS DIRECTED BY THE ENGINEER.

TEMPORARY WATER MAIN BYPASS SECTION

Tighe&Bond



Keyes Road Over Wilder Brook Culvert Replacement

City of Gardner

Gardner, Massachusetts

MassDOT Bridge No. G-01-025, BIN CD5

MARK	DATE	DESCRIPTION
PROJECT NO:	G0384-060	
DATE:	FEBRUARY 2023	
FILE:	G0384-T60_5-9_SITE PLAN DETAILS.dwg	
DRAWN BY:	SDS, RMC	
DESIGNED/CHECKED BY:	AGB, MPW, AML, JRI	
APPROVED BY:	DSH	

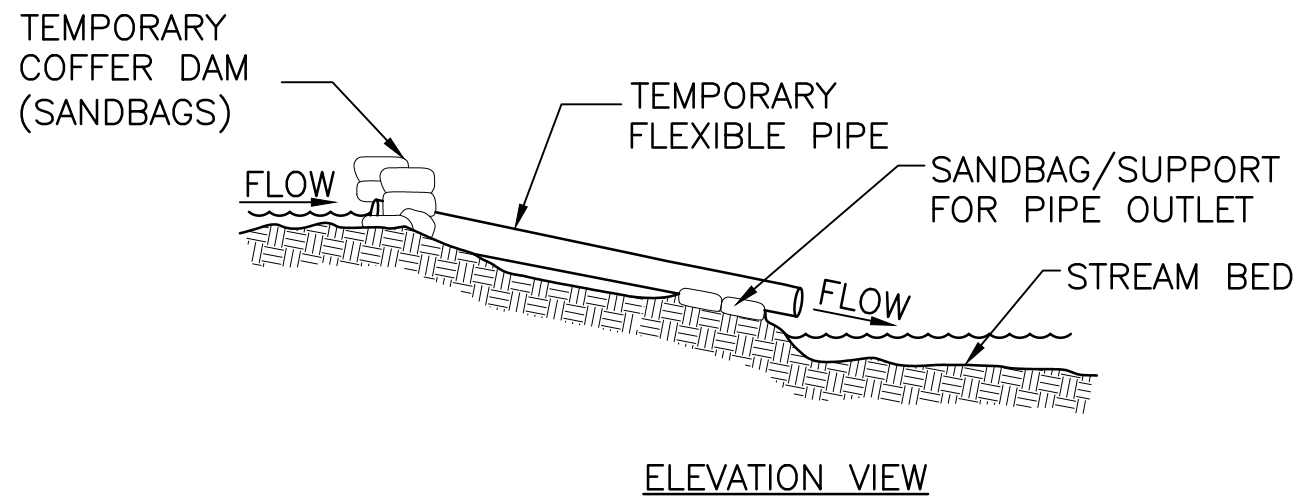
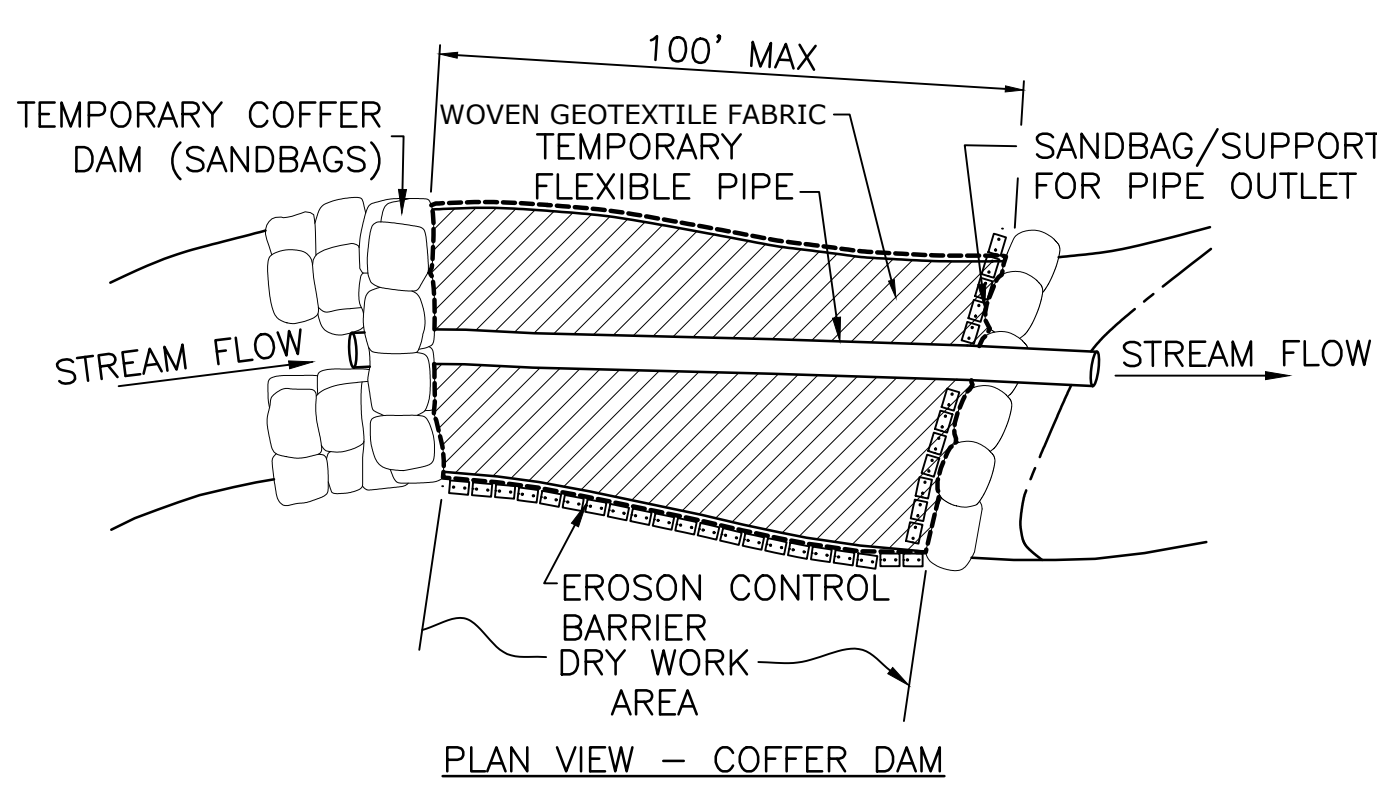
CONSTRUCTION DETAILS

SCALE: NO SCALE

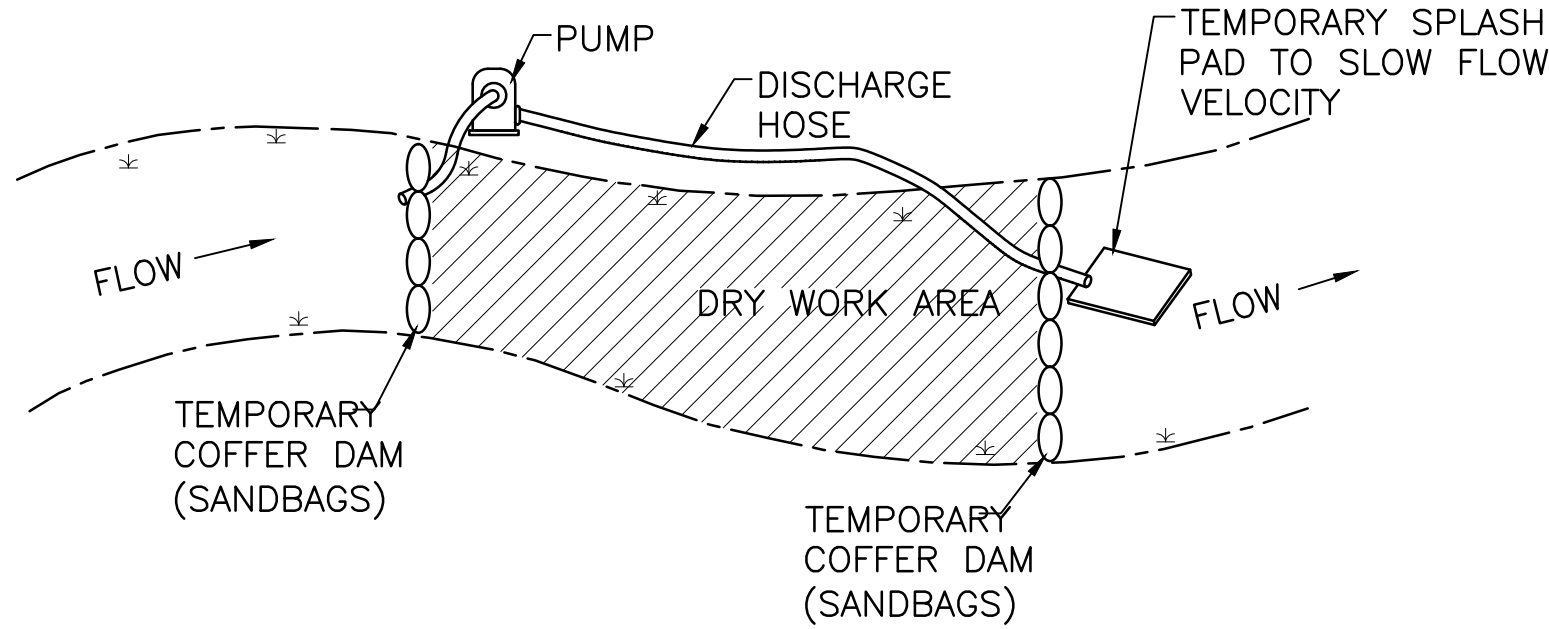
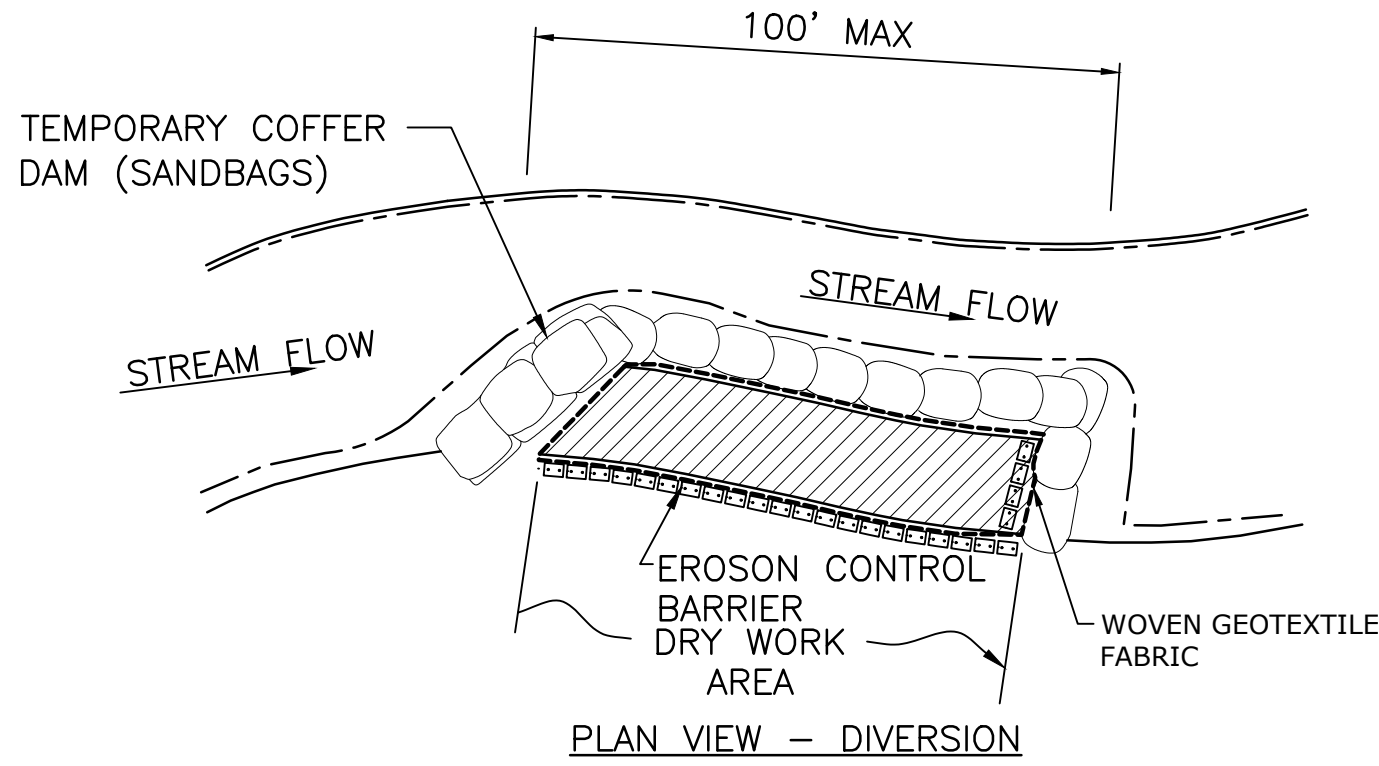
SHEET 8
SHEET 8 OF 25



Last Saved: 10/6/2026 10:00:06 AM By: JPrzeleczny
Title & Content: Keys Road Culvert Replacement Drawings
Figure: AutoCAD Sheet
Current Drawings: G0384-T60_5-9_SITE PLAN DETAILS.dwg



STREAM BYPASS DETAIL (PIPE)
NO SCALE



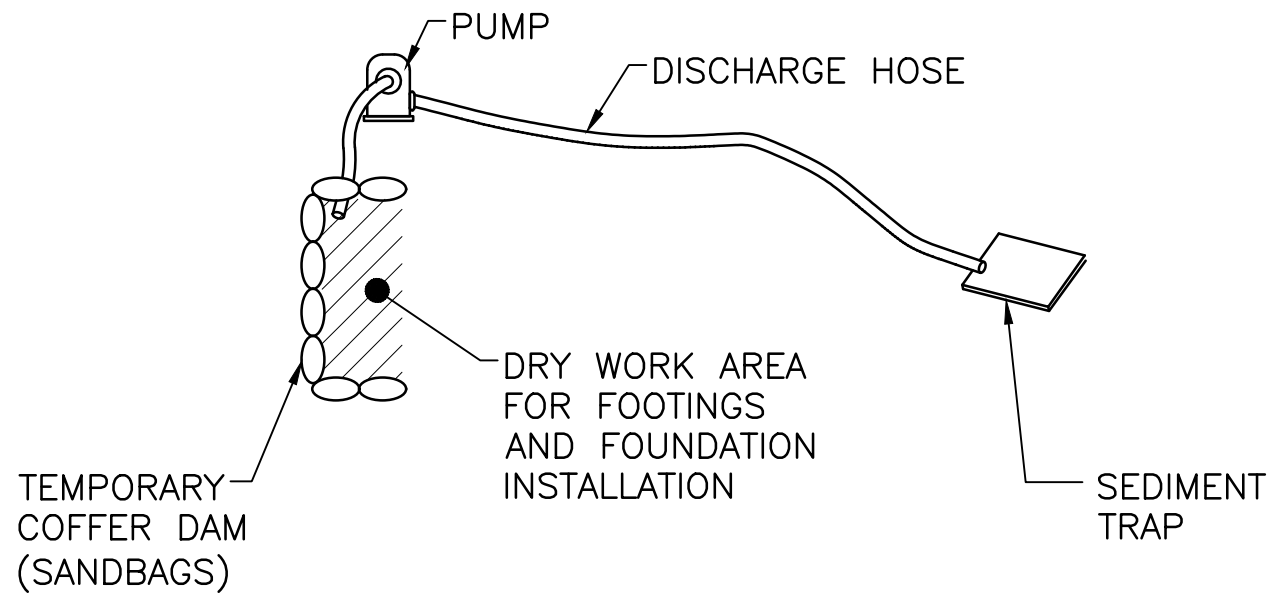
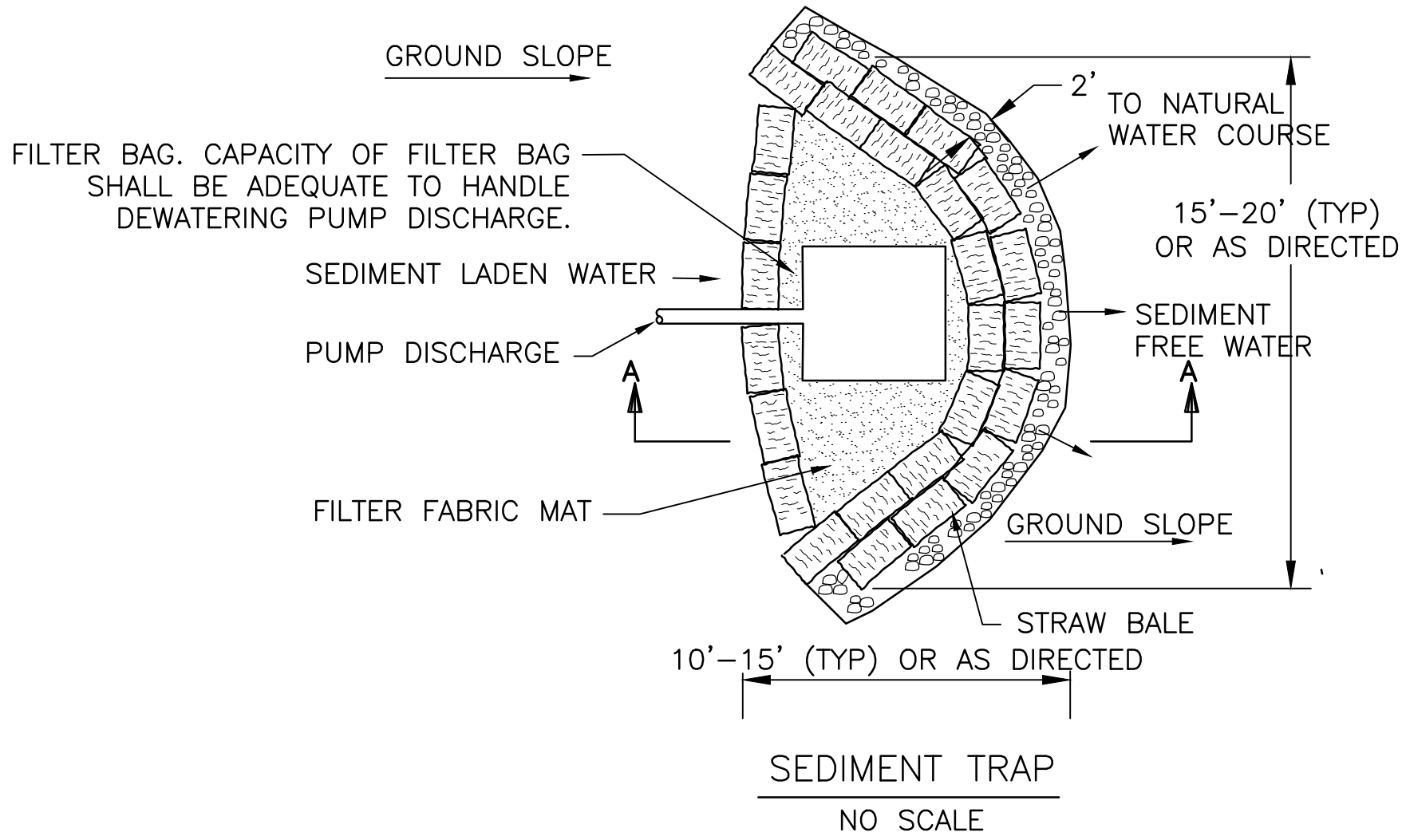
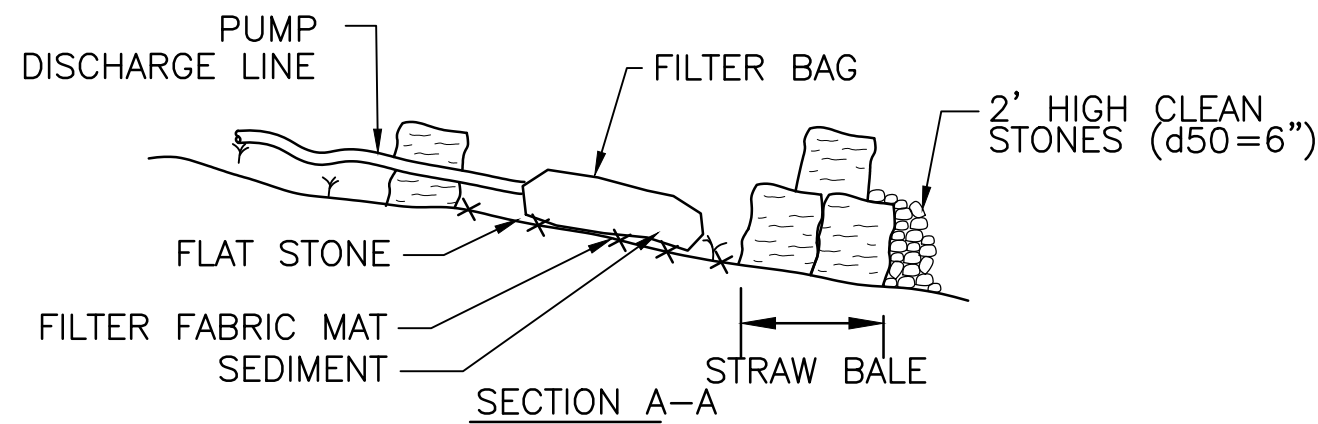
STREAM BYPASS DETAIL (PUMPED)
NO SCALE

WATER CONTROL SEQUENCING:

1. INSTALL A TEMPORARY COFFER DAM UPSTREAM OF THE EXISTING CULVERT PRIOR TO REMOVAL OF THE EXISTING CULVERT. PROVIDE BYPASS FLUME PIPE OR PUMP. SIZE AND PROVIDE A FLUME PIPE OR PUMP WITH ADEQUATE CAPACITY TO ACCOMMODATE STREAM FLOWS AS INDICATED IN THE WATER CONTROL NOTES. SUBMIT AN EMERGENCY CONTINGENCY PLAN FOR A STORM EVENT GREATER THAN THE 2-YEAR STORM.
2. REMOVE AND DISPOSE EXISTING CULVERT, EXCAVATE FOR BRIDGE FOOTINGS, INSTALL BRIDGE FOOTINGS, AND INSTALL THE PROPOSED STREAM BED AND BANK RESTORATION. AT NO POINT SHOULD THE STREAM FLOW OVER NEWLY EXCAVATED EARTH OR OVER AREAS THAT DO NOT HAVE THE FINISHED SURFACE TREATMENT.
3. ABUTMENTS AND THE SUPERSTRUCTURE SHALL THEN BE INSTALLED AND STREAM DIVERSION MAY BE REMOVED AFTER ALL SURFACES HAVE BEEN PROTECTED AGAINST EROSION.
4. STREAM DIVERSION MAY BE USED TO WORK AT INDIVIDUAL ABUTMENTS AND THE FLUME PIPE MAY BE REMOVED, IF THE STREAMBED AREA EXPOSED TO FLOWS HAS BEEN STABILIZED.

WATER CONTROL NOTES:

1. THE ISOLATED WORK AREA WITHIN THE COFFER DAMS MAY BE DEWATERED AS NEEDED TO PERFORM WORK IN THE DRY. ALL WORK MUST BE PERFORMED IN THE DRY. ANY DEWATERING ACTIVITIES SHALL BE PERFORMED USING A DISCHARGE HOSE, FILTER BAG, AND SEDIMENT TRAP (SHOWN ON THIS SHEET).
2. PRIOR TO BEGINNING ANY CONSTRUCTION IN THE STREAM, SUBMIT TO THE OWNER A WORK SEQUENCE INDICATING ANTICIPATED COFFER DAM LOCATIONS, OR ALTERNATE SYSTEM. WORK SHALL ONLY BE PERFORMED DURING LOW FLOW CONDITIONS.
3. THE COFFER DAM WORK MAY BE MODIFIED TO ADDRESS THE CONTRACTOR'S SEQUENCE OF CONSTRUCTION, WITH THE APPROVAL OF THE OWNER.
4. TEMPORARY COFFER DAMS (SAND BAG, JERSEY BARRIER, WATER FILLED BARRIER OR EQUIVALENT; USE OF UNCONSOLIDATED MATERIALS STRICTLY PROHIBITED) WILL BE INSTALLED TO MAINTAIN A DRY WORK AREA DURING CONSTRUCTION ACTIVITIES AND TO LIMIT SEDIMENTATION AS A RESULT OF THE PROPOSED WORK. THE WORK AREA LOCATED WITHIN THE COFFER DAMS SHALL BE DEWATERED. THE COFFER DAMS WILL BE LOCATED WITHIN THE STREAM TO ALLOW INSTALLATION OF BRIDGE FOOTINGS AND FOUNDATIONS AND IN OTHER LOCATIONS WHERE DEWATERING NEAR THE STREAM IS REQUIRED.
5. WATER CONTROLS SHOULD BE DESIGNED FOR A 2-YEAR STORM (PEAK FLOW 58 CFS). PRIOR TO COMMENCING WORK THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER DRAWINGS AND CALCULATIONS, STAMPED BY A PROFESSIONAL ENGINEER IN THE STATE OF MASSACHUSETTS, INDICATING THE CONTRACTOR'S METHOD FOR CONTROL OF WATER. THE SUBMITTAL SHALL INCLUDE PROPOSED IMPACT AREAS, RESTORATION METHODS, FLOW RATES, DEWATERING METHODS AND A DETAILED SCHEDULE FOR THE CONTROL OF WATER.
6. AN EXCAVATION SUPPORT SYSTEM MAY BE USED FOR THE CONSTRUCTION OF THE BRIDGE ABUTMENT AND WING WALL FOOTINGS TO PREVENT IMPACTING EXISTING UTILITIES. THE EXCAVATION SUPPORT SYSTEM SHALL CONFORM TO THE PROVISIONS OF SECTION 950.1. THE DESIGN OF THE PROPOSED SUPPORT OF EXCAVATION SYSTEM SHALL BE PERFORMED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF MASSACHUSETTS. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS AND CALCULATIONS FOR THE PROPOSED SUPPORT OF EXCAVATION SYSTEM FOR REVIEW AND APPROVAL BY THE OWNER. COORDINATE DESIGN OF THE PROPOSED SUPPORT OF EXCAVATION WITH SELECTED WATER CONTROL METHODS.



NOTES:

1. DEWATERING EQUIPMENT SHALL REMAIN WITHIN THE PERMANENTLY IMPACTED AREAS.
2. DISCHARGE HOSE SHALL NOT CROSS THE STREAM AT ANY LOCATION

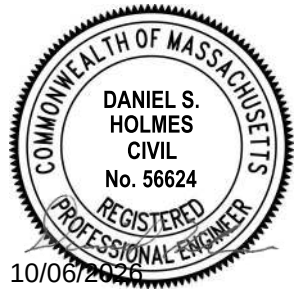
COFFER DAM AND DEWATERING
NO SCALE

DEWATERING REQUIREMENTS

PREPARE A DEWATERING PLAN TO ADDRESS THE FOLLOWING CONCERNS AND ADHERE TO THE FOLLOWING REQUIREMENTS:

1. IF THE WATER TABLE IS INTERCEPTED DURING EXCAVATION, WATER COLLECTED IN THE TRENCH SHALL BE PUMPED OUT SO THAT THE WORK CAN BE PERFORMED "IN THE DRY." PROVIDE ADEQUATELY SIZED DEWATERING EQUIPMENT WITH 100% BACKUP AND SEDIMENTATION/EROSION CONTROL STRUCTURES AS DETAILED ON THE CONTRACT DRAWINGS TO ENSURE CONSTRUCTION "IN THE DRY" AND ADEQUATELY PROTECT ADJACENT WETLAND AREAS AND WATERWAYS.
2. ALL GROUNDWATER REMOVED (PUMPED) FROM THE TRENCH EXCAVATION AND DISCHARGED SHALL BE A "CLEAN DISCHARGE." PROVIDE WHATEVER DEVICES ARE REQUIRED TO ACHIEVE THE "CLEAN DISCHARGE." IF THE OWNER'S REPRESENTATIVE DETERMINES THE PUMPED DISCHARGE IS CLEAN (LESS THAN 50 NTU), THE FLOW CAN BE DIRECTED TO AN UPLAND AREA. IF THE OWNER'S REPRESENTATIVE DETERMINES THAT THE FLOW IS NOT CLEAN, DIRECT THAT FLOW TO ONE OR MORE FILTRATION DEVICES FOR THE PURPOSE OF SUBSTANTIALLY REMOVING SUSPENDED SOLIDS FROM THE WATER. THE FILTRATION DEVICES SHALL BE AS SHOWN ON THE DRAWINGS OR APPROVED ALTERNATES SUGGESTED BY THE CONTRACTOR, OR AS REQUIRED BY THE LOCAL PERMITS.
3. OBTAIN ALL NECESSARY STATE AND LOCAL PERMITS RELATING TO DEWATERING ACTIVITIES.
4. DEWATERING DISCHARGE LOCATIONS ARE TO BE REVIEWED AND APPROVED BY THE OWNER'S REPRESENTATIVE.
5. ANY PROPOSED DEWATERING AND SHORING PROCEDURES SHALL BE SUBMITTED TO THE ENGINEER OF RECORD FOR REVIEW AND ACCEPTANCE. THE DEWATERING/WATER CONTROL AND SHORING/TEMPORARY EARTH SUPPORT SHALL BE DESIGNED AND STAMPED BY A REGISTERED PROFESSIONAL ENGINEER IN THE COMMONWEALTH OF MASSACHUSETTS.

Tighe&Bond



Keyes Road
Over Wilder
Brook
Culvert
Replacement

City of Gardner

Gardner,
Massachusetts

MassDOT Bridge No.
G-01-025, BIN CD5

MARK	DATE	DESCRIPTION
PROJECT NO:	G0384-060	
DATE:	FEBRUARY 2023	
FILE:	G0384-T60_5-9_SITE PLAN DETAILS.dwg	
DRAWN BY:	SDS, RMC	
DESIGNED/CHECKED BY:	AGB, MPW, AML, JRI	
APPROVED BY:	DSH	

CONSTRUCTION DETAILS

SCALE: NO SCALE

SHEET 9
SHEET 9 OF 25

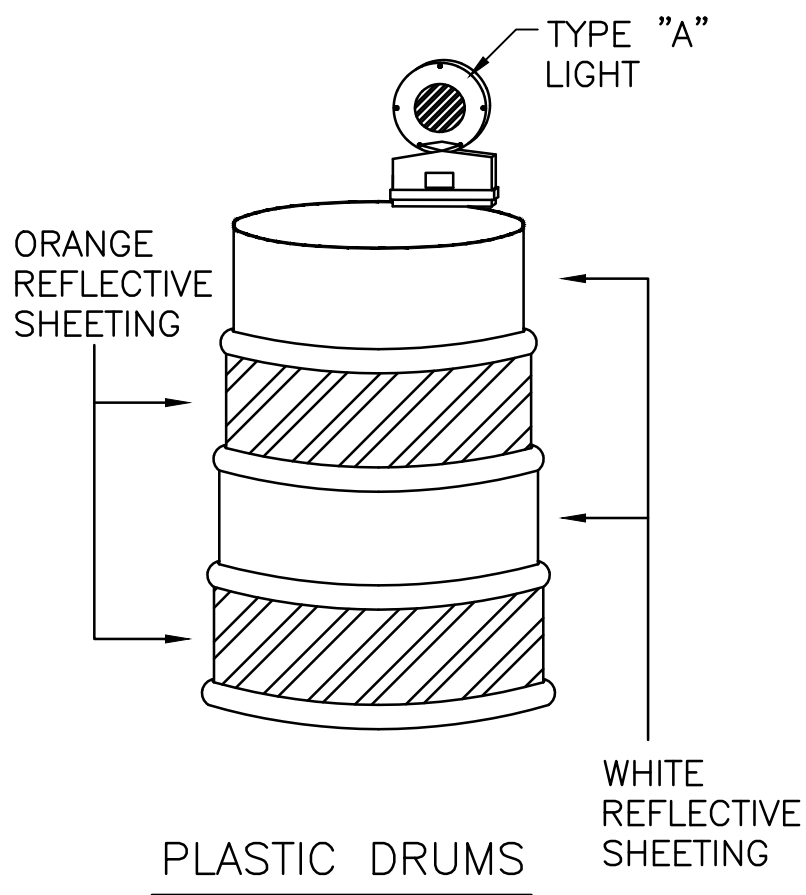
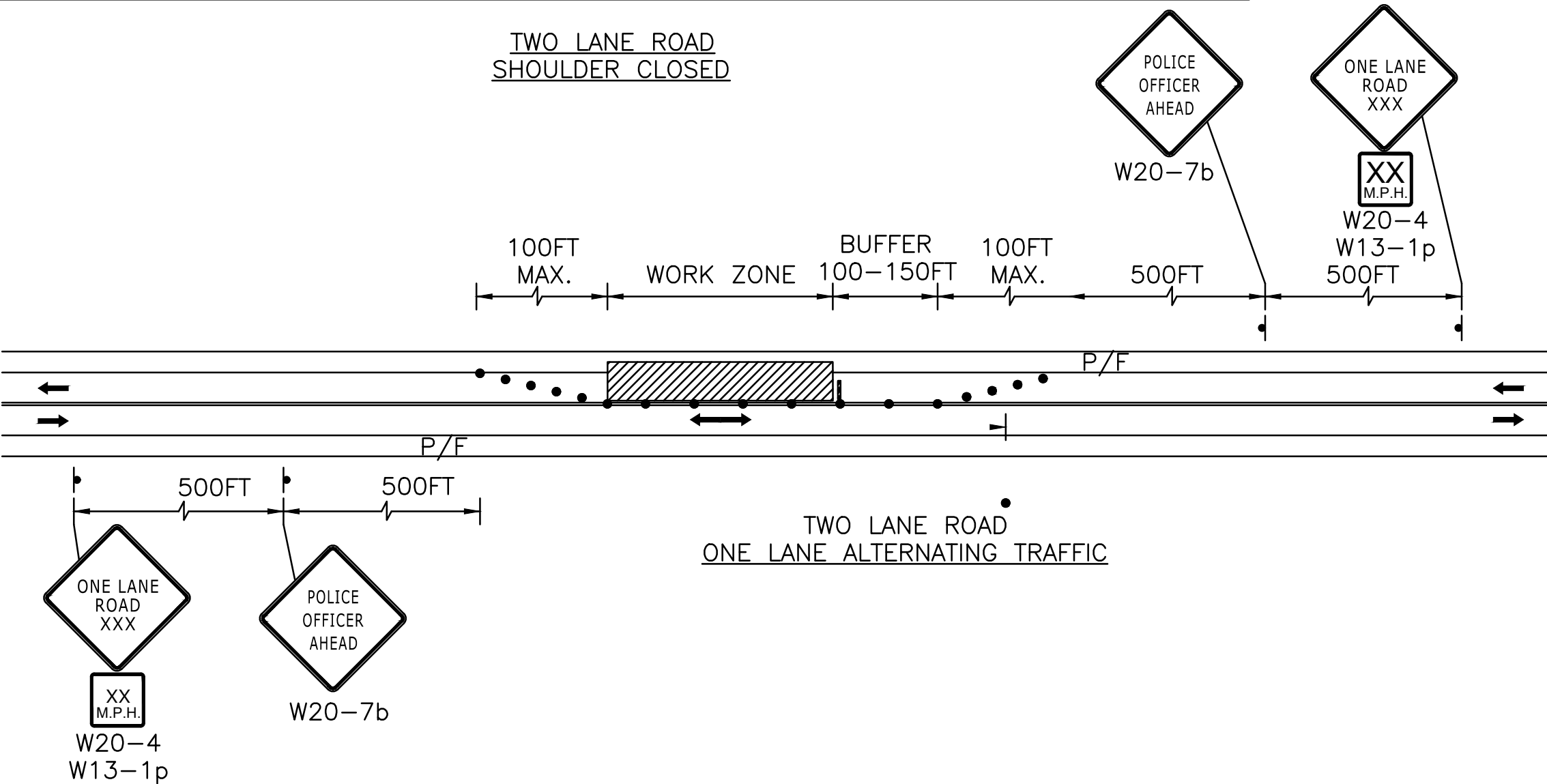
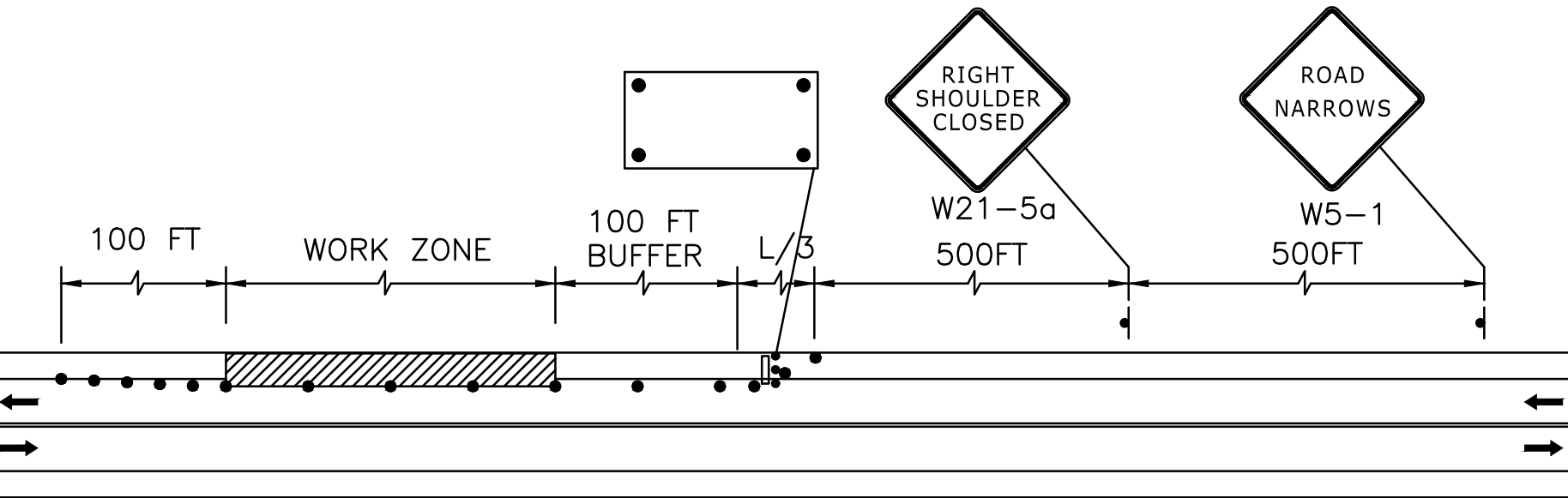
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Tighe & Bond, LLP
C:\Users\jprzenic\OneDrive\Documents\Drawings\G0384-T60_5-9_Site Plan Details.dwg

GENERAL NOTES:

- ALL TEMPORARY TRAFFIC CONTROL WORK SHALL CONFORM TO THE LATEST EDITION OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD) AND ALL REVISIONS, UNLESS SUPERCEDED BY THESE PLANS.
- ALL SIGN LEGENDS, BORDERS, AND MOUNTING SHALL BE IN ACCORDANCE WITH THE MUTCD.
- TEMPORARY CONSTRUCTION SIGNING AND ALL OTHER TRAFFIC CONTROL DEVICES SHALL BE IN PLACE PRIOR TO THE START OF ANY WORK.
- TEMPORARY CONSTRUCTION SIGNING, BARRICADES, AND ALL OTHER NECESSARY WORK ZONE TRAFFIC CONTROL DEVICES SHALL BE REMOVED FROM THE HIGHWAY OR COVERED WHEN THEY ARE NOT REQUIRED FOR CONTROL OF TRAFFIC.
- SIGNS AND SIGN SUPPORTS LOCATED ON OR NEAR THE TRAVELED WAY, CHANNELIZING DEVICES, BARRIERS, AND CRASH ATTENUATORS MUST PASS THE CRITERIA SET FORTH IN NCHRP REPORT 350, "RECOMMENDED PROCEDURES FOR THE SAFETY PERFORMANCE EVALUATION OF HIGHWAY FEATURES" AND/OR "MANUAL FOR ASSESSING SAFETY HARDWARE" (MASH).
- NOTIFY EACH ABUTTER AT LEAST 24 HOURS IN ADVANCE OF THE START OF ANY WORK THAT WILL REQUIRE THE TEMPORARY CLOSURE OF ACCESS, SUCH AS CONDUIT INSTALLATION, EXISTING PAVEMENT EXCAVATION, TEMPORARY DRIVEWAY PAVEMENT PLACEMENT, AND SIMILAR OPERATIONS.
- THE PLASTIC DRUMS OF A TAPER SHALL BE MOUNTED WITH TYPE A LIGHTS.
- THE ADVISORY SPEED LIMIT, IF REQUIRED, SHALL BE DETERMINED BY THE ENGINEER.
- MAXIMUM SPACING OF TRAFFIC DEVICES IN A TAPER (DRUMS OR CONES) IS EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
- MINIMUM LANE WIDTH IS TO BE 11 FEET UNLESS OTHERWISE SHOWN. MINIMUM LANE WIDTH TO BE MEASURED FROM THE EDGE OF DRUMS OR MEDIAN BARRIER.
- ALL SIGNS SHALL BE MOUNTED ON THEIR OWN STANDARD SIGN SUPPORTS.
- SIGN MA-R2-10a AND MA-R2-10e SHALL BE LOCATED AT THE PROJECT LIMITS FOR THE DURATION OF THE WORK. PORTABLE CHANGEABLE MESSAGE SIGNS SHALL BE PROVIDED ON WEST STREET AT BOTH ENDS OF THE PROJECT LIMITS.

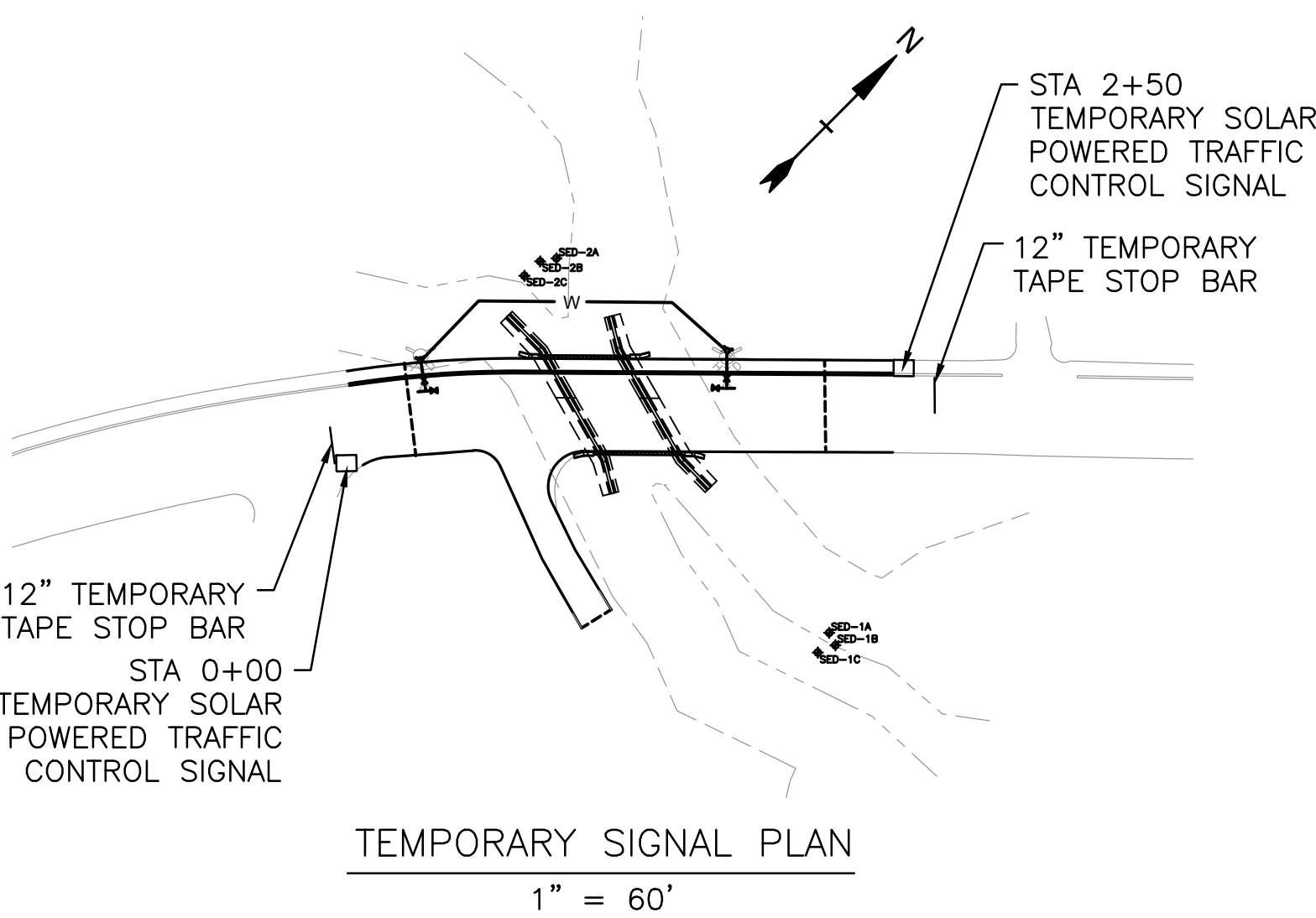
LEGEND

- REFLECTORIZED PLASTIC DRUM OR 36" CONE
- P/F POLICE/FLAGGER DETAIL
- TYPE III BARRICADE
- CHANGEABLE MESSAGE SIGN
- ARROW BOARD
- WORK ZONE
- DIRECTION OF TRAFFIC
- IMPACT ATTENUATOR
- MEDIAN BARRIER
- MEDIAN BARRIER WITH WARNING LIGHTS
- WORK VEHICLE
- TRUCK MOUNTED ATTENUATOR
- TRAFFIC OR PEDESTRIAN SIGNAL
- SIGN



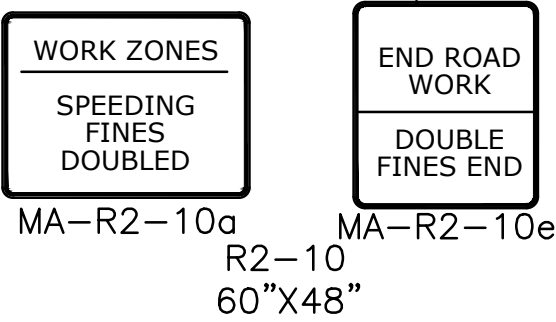
NOTES:

- DRUM DESIGN AND APPLICATION SHALL BE AS PER THE CURRENT EDITION OF THE MUTCD.
- DRUMS SHALL BE APPROXIMATELY 36" IN HEIGHT, HAVING A MINIMUM WALL THICKNESS OF 3/32" AND A MINIMUM DIAMETER OF 18" REGARDLESS OF ORIENTATION.
- DRUM MATERIAL MUST BE APPROVED UV RESISTANT, LOW DENSITY, IMPACT RESISTANT, LINEAR POLYETHYLENE (OR APPROVED EQUIVALENT).
- SHEETING SHALL BE APPROVED ORANGE AND WHITE TYPE IV REFLECTORIZED SHEETING CONFORMING TO M9.30.0.
- ALL DRUMS SHALL BE WELL MAINTAINED INCLUDING REMOVAL OF DUST OR ROAD FILM, SO AS NOT TO REDUCE REFLECTIVE EFFICIENCY. WHEN A DRUM LOSES TARGET VALUE IT SHALL BE REPLACED.
- STORE UNUSED DRUMS IN ONE LOCATION, AWAY FROM ALL TRAFFIC, OR REMOVE FROM SITE ENTIRELY.



NOTES:

- TEMPORARY SIGNALS SHALL BE ADJUSTED FOR VEHICLE DETECTION, TIMING, AND LOCATION DURING CONSTRUCTION.
- SIGNAL LOCATION SHALL BE COORDINATED WITH THE CONSTRUCTION PHASING PLAN.



WORK ZONE LIMIT SIGNS
SEE NOTE 12

FORMULAS FOR DETERMINING TAPER LENGTHS

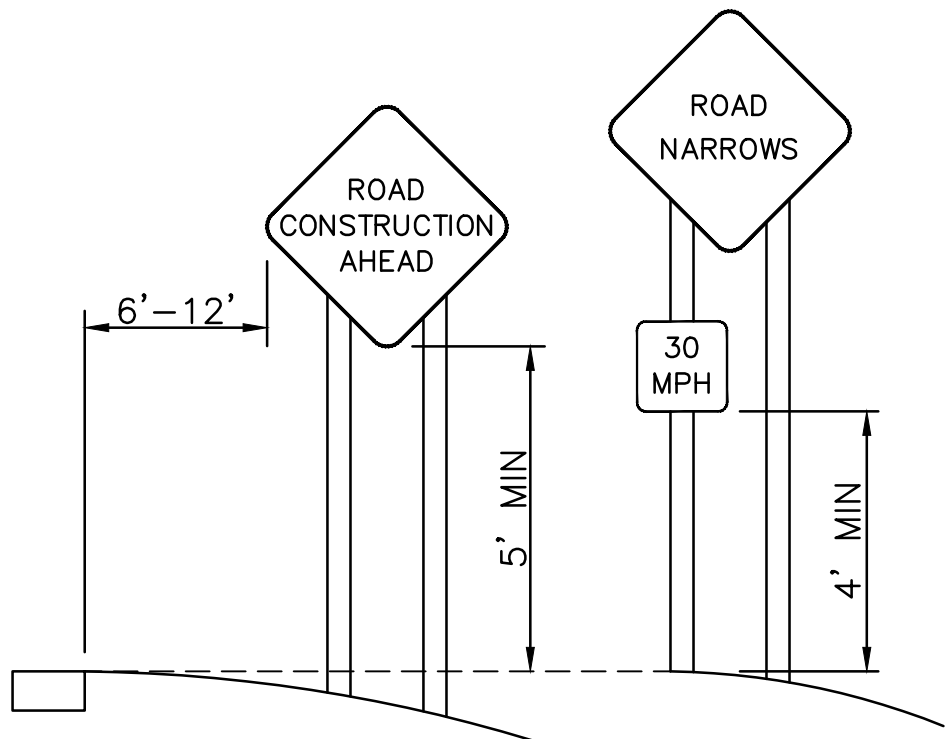
SPEED LIMIT (S)	TAPER LENGTH (L) FEET
40 MPH OR LESS	$L = \frac{WS^2}{60}$
45 MPH OR MORE	$L = WS$

WHERE:

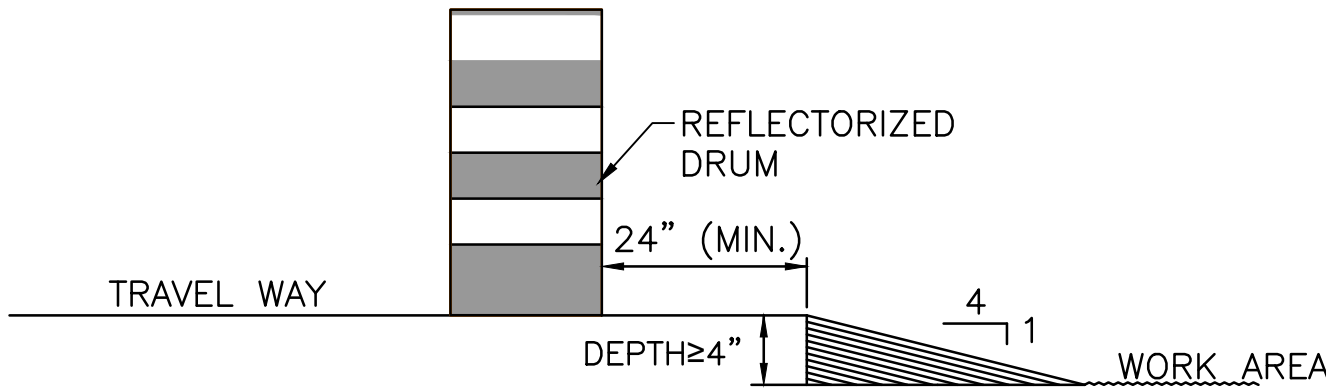
L = TAPER LENGTH IN FEET

W = WIDTH OF OFFSET IN FEET

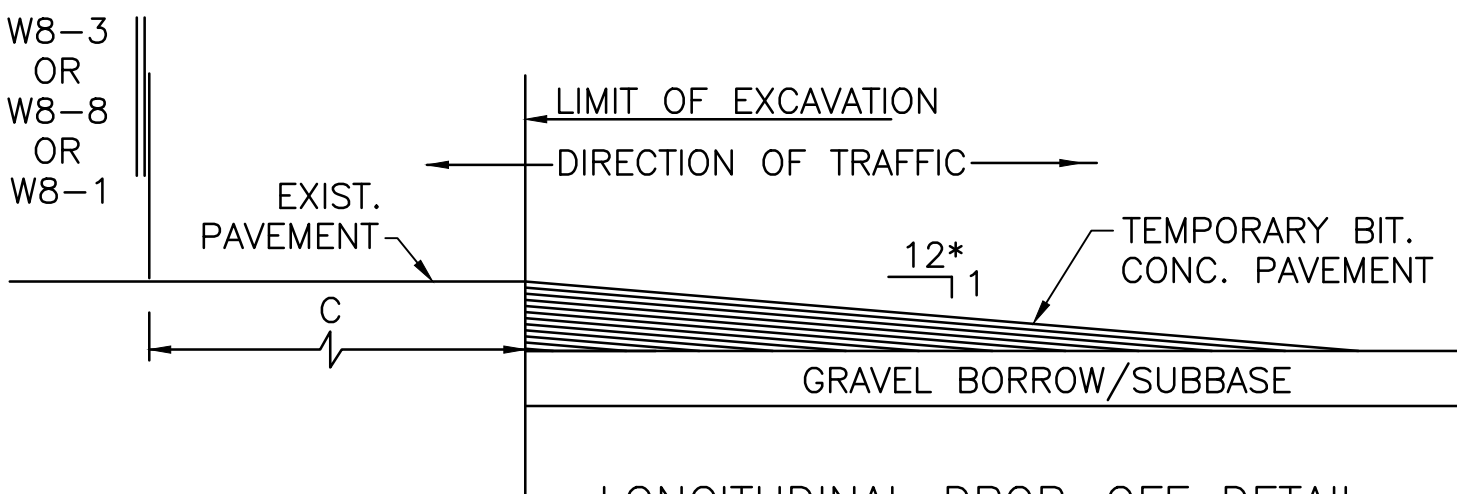
S = POSTED SPEED LIMIT, OR OFF-PEAK 85TH-PERCENTILE SPEED PRIOR TO WORK STARTING, OR THE ANTICIPATED OPERATING SPEED IN MPH



TYPICAL INSTALLATION OF PROJECT SIGNS



LATERAL DROP-OFF DETAIL
NO SCALE

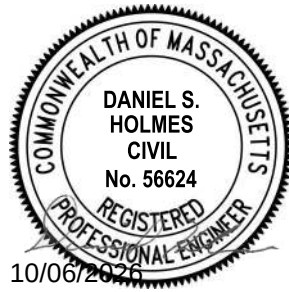


LONGITUDINAL DROP-OFF DETAIL
NO SCALE

* - INCREASE SLOPE RATIO FOR HIGHER SPEEDS

LATERAL AND LONGITUDINAL
DROP-OFF DETAILS

Tighe&Bond



Keyes Road
Over Wilder
Brook
Culvert
Replacement

City of Gardner

Gardner,
Massachusetts

MassDOT Bridge No.
G-01-025, BIN CD5

MARK	DATE	DESCRIPTION

PROJECT NO:	G0384-060
DATE:	FEBRUARY 2023
FILE:	G0384-T60_5-9_Site Plan Details.dwg
DRAWN BY:	SDS, RMC
DESIGNED/CHECKED BY:	AGB, MPW, AML, JRI
APPROVED BY:	DSH

TEMPORARY TRAFFIC
CONTROL PLAN

SCALE: AS SHOWN

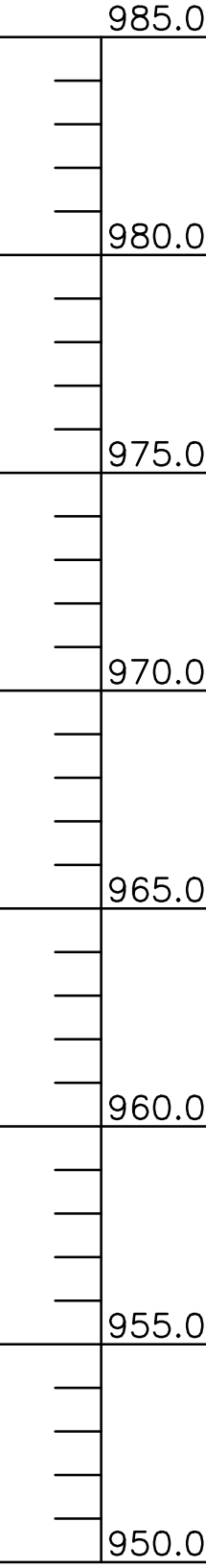
SHEET 10
SHEET 10 OF 25

Last Saved: 5/5/2022 11:11pm By: JSSak
Plotted On: Feb 09, 2023, 1:11pm By: JSSak
Tighe & Bond 21 G:\0384-Gardner\100 - Keyes Road Culvert Replacement\Drawings - Figures\AutoCAD\Sheet\Current Drawings\G0384-T60_10_BORINGS.dwg

BORING NOTES

1. LOCATION OF BORINGS SHOWN ON SHEET 2 THUS: 
2. BORINGS WERE TAKEN FOR PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
3. WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF TAKING BORINGS AND DO NOT NECESSARILY SHOW THE TRUE GROUND WATER LEVEL.
4. FIGURES IN COLUMNS INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE A 1 1/8" I.D. SPLIT SPOON SAMPLER 6" USING A 140 POUND WEIGHT FALLING 30".
5. BORING SAMPLES ARE STORED AT TIGHE & BOND'S OFFICE, 53 SOUTHAMPTON ROAD, WESTFIELD, MA 01085. THE CONTRACTOR MAY EXAMINE THE SOIL AND ROCK SAMPLES BY CONTACTING THE DESIGN ENGINEER.
6. ALL BORINGS WERE DRILLED IN DECEMBER 2021.
7. BORINGS WERE DRILLED BY MARTIN GEO ENVIRONMENTAL LLC.
8. THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988 IS USED THROUGHOUT.
9. THE SURFACE ELEVATION ON EACH BORING LOG IS THE ELEVATION OF THE EXISTING GROUND AT THE TIME THE BORING WAS TAKEN.
10. ENGINEERING JUDGEMENT WAS EXERCISED IN PREPARING THE SUBSURFACE INFORMATION PRESENTED HEREIN. ANALYSIS AND INTERPRETATION OF SUBSURFACE DATA WAS PERFORMED FOR DESIGN AND ESTIMATING PURPOSES. PRESENTATION OF THE INFORMATION IN THE CONTRACT IS INTENDED TO PROVIDE THE CONTRACTOR ACCESS TO THE SAME DATA AVAILABLE TO THE OWNER. THE SUBSURFACE INFORMATION IS PRESENTED IN GOOD FAITH AND IS NOT INTENDED AS A SUBSTITUTE FOR PERSONAL INVESTIGATION, INDEPENDENT INTERPRETATION, INDEPENDENT ANALYSIS OR JUDGEMENT BY THE CONTRACTOR.

ELEVATION
(NAVD 88)



GROUNDWATER 
ON 12/20/21
EL 970.0'

TOP OF FOOTING
EL 964.25'
APPROX. BOTTOM
OF FOOTING
EL 962.25'



Project: Keyes Road Culvert Replacement
Location: Keyes Road over Wilder Brook, Gardner, MA
Client: City of Gardner, MA

Boring No. **TB-1**
Page 1 of 1
File No. G-0384-060
Checked by: D. Gnatek

Drilling Co. Martin GeoEnvironmental, LLC			Casing		Sampler		Groundwater Readings							
Foreman: J. Martin			Type	HSA	Split Spoon	Date	Time	Depth	Casing	Sta. Time				
T&B Rep.: M. Begag			I.D./O.D. 1-1/4"/7-5/8"		1-3/8"/2"	Refer to Note 1								
Date Start: 12/20/21			End: 12/20/21		Hammer Wt. 140#									
Location See Exploration Location Plan			Hammer Fall 30"											
GS. Elev. ±983 (NAVD88)			Rig Make/Model Mobile B-53 w/ autohammer											
Depth (ft.)	Casing Blows Per Ft.	Sample No. Rec. (in)	Sample Depth (ft.)	Blows Per 6"	PID Reading (ppm)	Sample Description	General Stratigraphy	Notes	Well Construction					
5	S-1 / 15	0-2	6-7	-	-	Medium dense, brown, fine to medium SAND, some Silt, little Gravel, dry	0.1' ASPHALT							
										7-10	-	Medium dense, brown, fine to medium SAND, some Silt, some Gravel, dry		
10	S-2 / 11	2-4	6-10	-	-	Medium dense, brown, fine to medium SAND, some Silt, little Gravel, dry								
										10-8	-	Medium dense, brown, fine to medium SAND, little Silt, little Gravel, dry		
15	S-3 / 6	4-6	5-6	-	-	Loose, brown, fine to medium SAND, little Gravel, trace Silt, dry	13'	1	No Well Installed					
										5-5	-	Very dense, brown, fine to coarse SAND and GRAVEL, little Silt, moist		
20	S-4 / 11	10-12	1-2	-	-	WEATHERED BEDROCK	20'	2						
										5-5	-	End of Boring at 20.7' (auger refusal)		
25	S-5 / 12	15-17	8-49	-	-									
										17-15	-			
30	S-6 / 8	20-20.7	111-100/2"	-	-									

Notes:		Proportions Used		Density/Consistency	
1. Groundwater estimated at 13' based on driller observation during boring.		TRACE (TR.) 0 - <10%		VERY LOOSE 0-4 VERY SOFT <2	
2. Auger refusal at 20". Unable to core due to frozen pump on drill rig.		LITTLE (LL.) 10 - <20%		LOOSE 4-10 SOFT 2-4	
3. Borehole backfilled at completion of drilling using cuttings.		SOME (SO.) 20 - <35%		MEDIUM DENSE 10-30 MEDIUM 4-8	
		AND 35 - <50%		DENSE 30-50 STIFF 8-15	
				VERY DENSE >50 VERY STIFF 15-30	
				HARD >30	

BORING TB-1 (1 OF 1)



Project: Keyes Road Culvert Replacement
Location: Keyes Road over Wilder Brook, Gardner, MA
Client: City of Gardner, MA

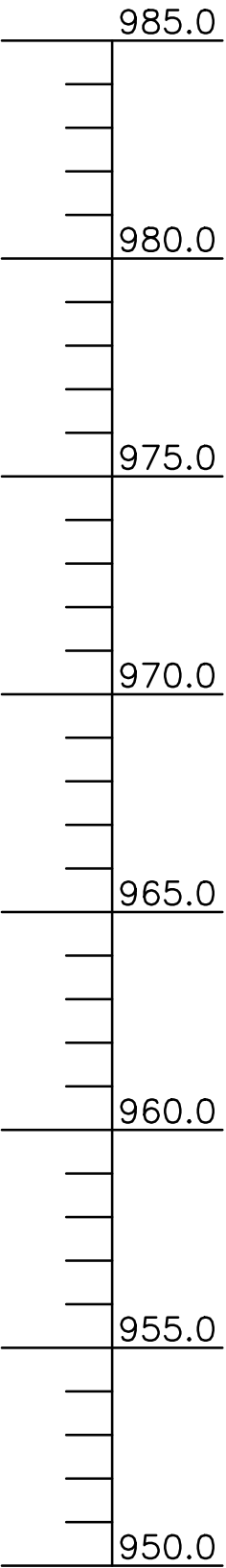
Boring No. **TB-2**
Page 1 of 1
File No. G-0384-060
Checked by: D. Gnatek

Drilling Co. Martin GeoEnvironmental, LLC			Casing		Sampler		Groundwater Readings				
Foreman: J. Martin			Type	HSA	Split Spoon	Date	Time	Depth	Casing	Sta. Time	
T&B Rep.: M. Beggs			I.D./O.D. 1-1/4"/7-5/8"			1-3/8"/2"			Refer to Note 1		
Date Start: 12/20/21			End: 12/20/21			Hammer Wt. 140#					
Location See Exploration Location Plan			Hammer Fall 30"								
GS. Elev. ±989 (NAVD88)			Rig Make/Model Mobile B-53 w/ autohammer								
Depth (ft.)	Casing Blows Per Ft.	Sample No. Rec. (in)	Sample Depth (ft.)	Blows Per 6"	PID Reading (ppm)	Sample Description	General Stratigraphy	Notes	Well Construction		
5		S-1 / 20	0-2	5-17	-	10" Dense, gray/brown, GRAVEL, little fine to coarse SAND, trace Silt, dry, over dense, dark brown, fine to coarse SAND, little Gravel, little Silt, dry					
		S-2 / 9	2-4	6-4	-	Loose, brown, fine to medium SAND, little Gravel, little Silt, dry					
		S-3 / 11	4-6	5-4	-	Loose, brown, fine to coarse SAND, some Gravel, little Silt, dry					
10							EXISTING FILL				
		S-4 / 14	10-12	4-6	-	Medium dense, brown, fine to coarse SAND, some Gravel, trace Silt, moist				No Well Installed	
15											
		S-5 / 12	15-16.9	12-15	-	Medium dense, brown, fine to coarse SAND, some Silt, little Gravel, wet (Weathered Bedrock in spoon tip)					
		S-6 / 1	17-17.1	50/1"	-	WEATHERED BEDROCK					
20		C-1 / 60	17.1-22.1	4-49	-	Moderately hard to gray, slightly to very slightly weathering, moderately to slightly fractured, dark gray, little to medium grained, MICA SCHIST, shallow to steeply dipping fractures REC = 60"/60" = 100% RQD = 28.5"/60" = 47.5%					
25						End of Boring at 22.1'					
30											

Notes:		Proportions Used		Density/Consistency	
1. Groundwater estimated at 10' based on driller observation during boring.		TRACE (TR.) 0 - <10%		VERY LOOSE 0-4 VERY SOFT <2	
2. Auger refusal at 17.1'.		LITTLE (L.) 10 - <20%		LOOSE 4-10 SOFT 2-4	
3. Borehole backfilled with cuttings at completion of drilling.		SOME (SO.) 20 - <35%		MEDIUM DENSE 10-30 MEDIUM 4-6	
		AND 35 - <50%		DENSE 30-50 STIFF 8-15	
				VERY DENSE >50 VERY STIFF 15-30	
				HARD >30	

BORING TB-2 (1 OF 1)

ELEVATION
(NAVD 88)



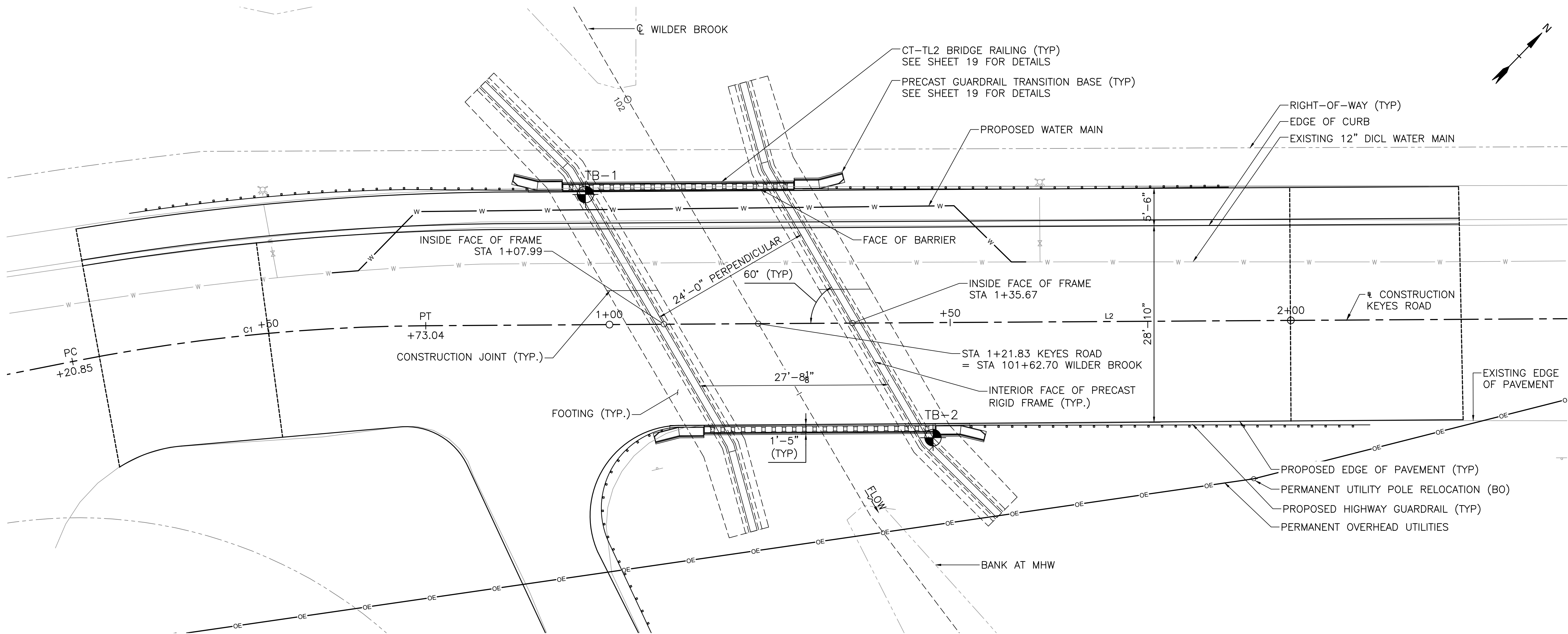
Keyes Road
Over Wilder
Brook
Culvert
Replacement

City of Gardner

Gardner,
Massachusetts

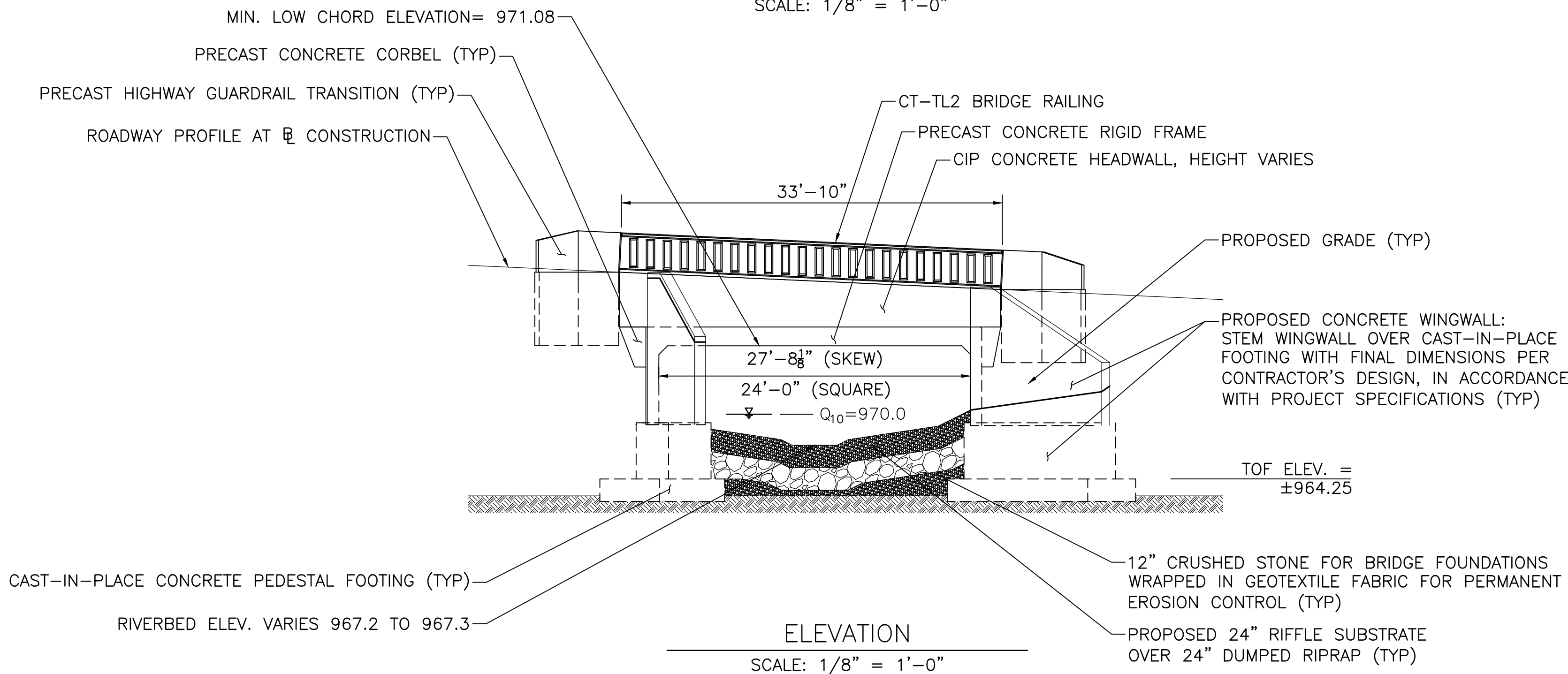
MassDOT Bridge No.
G-01-

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Title & Content: G0384-160 - Keyes Road Culvert Replacement Drawings\G0384-160_11_BRIDGE_PLAN.dwg



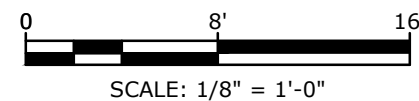
GENERAL BRIDGE PLAN

SCALE: 1/8" = 1'-0"

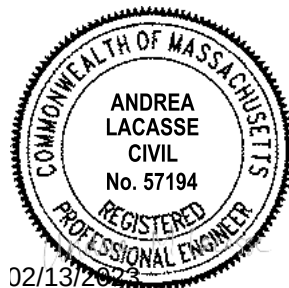


ELEVATION

SCALE: 1/8" = 1'-0"



COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
**CONCEPTUAL DESIGN IS ACCEPTABLE
TO MASSDOT FOR CONTRACTING**
[Signature] 3/17/2023
STATE BRIDGE ENGINEER DATE



**Keyes Road
Over Wilder
Brook
Culvert
Replacement**

City of Gardner

Gardner,
Massachusetts

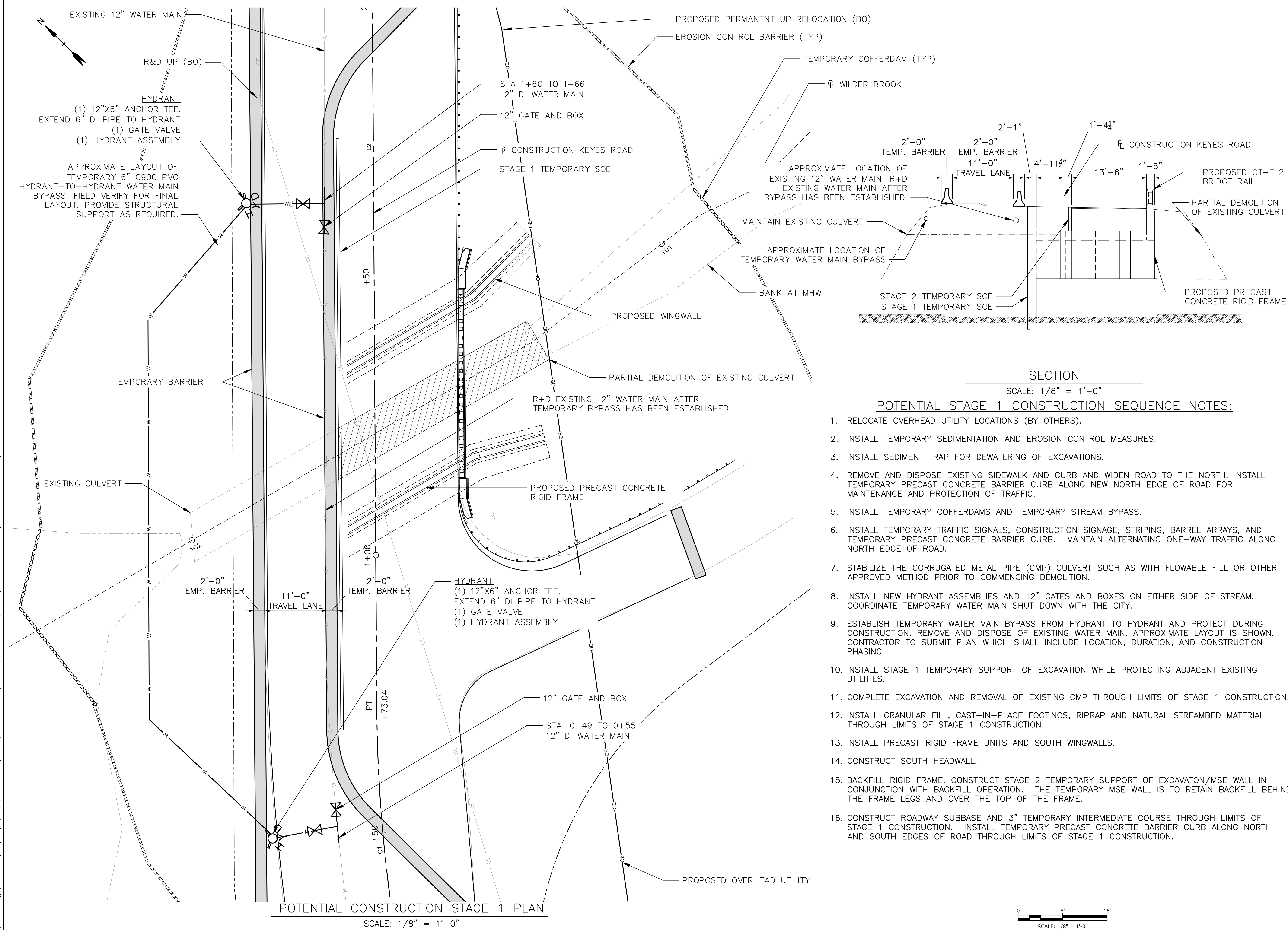
MassDOT Bridge No.
G-01-025, BIN CD5

MARK	DATE	DESCRIPTION
PROJECT NO:	G0384-060	
DATE:	FEBRUARY 2023	
FILE:	G0384-160_11_BRIDGE_PLAN.dwg	
DRAWN BY:	SDS, RMC	
DESIGNED/CHECKED BY:	AGB, MPW, AML, JRI	
APPROVED BY:	DSH	

GENERAL BRIDGE PLAN &
ELEVATION

SCALE: 1/8" = 1'-0"

SHEET 13
SHEET 13 OF 25



MassDOT Bridge No.
G-01-025, BIN CD5

[illegible]

MARK	DATE	DESCRIPTION
PROJECT NO:		G0384-060
DATE:		FEBRUARY 2023
FILE:		G0384-T60_13_STAGE2.dwg
DRAWN BY:		SDS, RMC
DESIGNED/CHECKED BY: AGB, MPW, AML, JRI		
APPROVED BY:		DSH

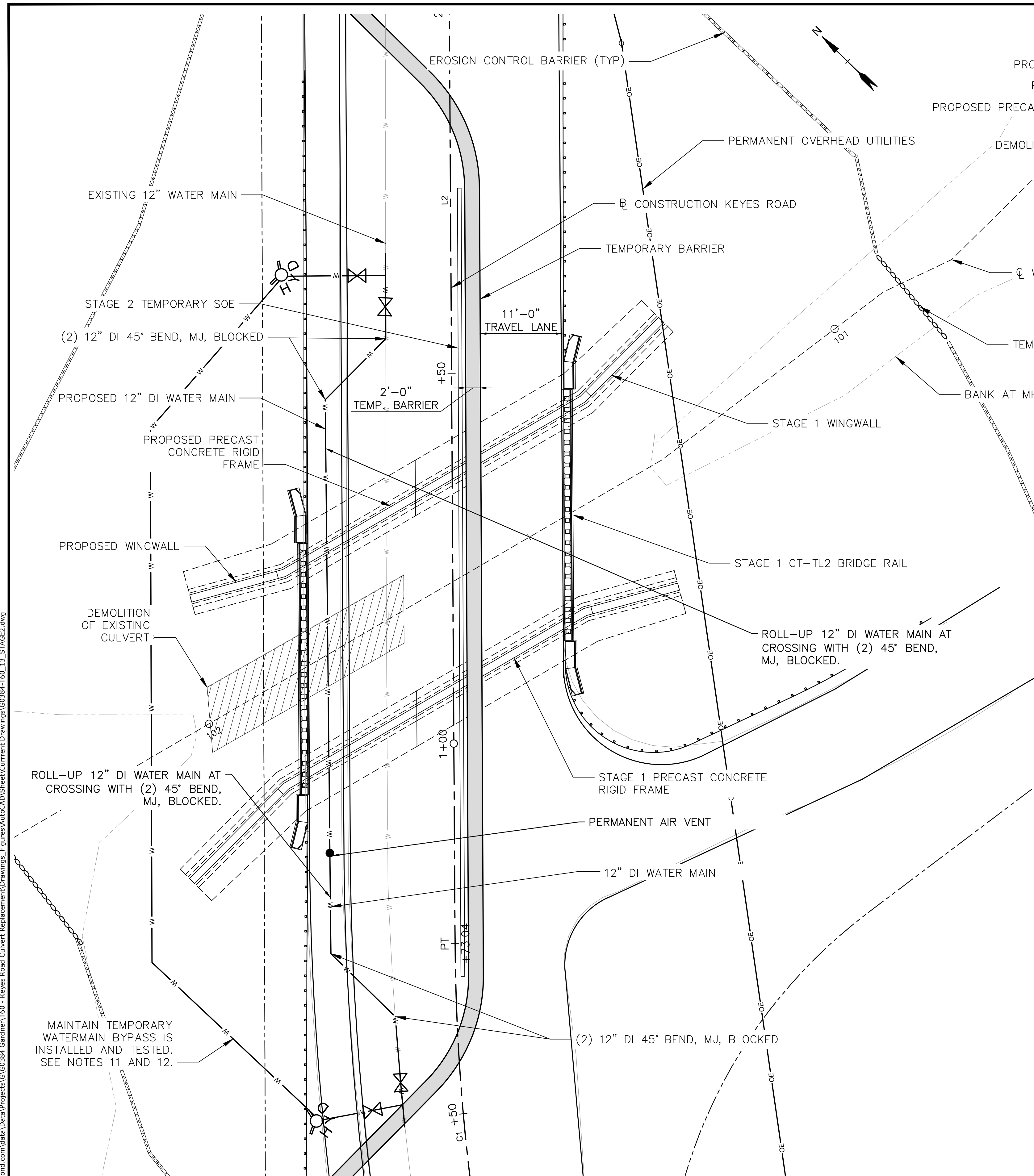
POTENTIAL CONSTRUCTION STAGE 2 PLAN & SECTION

SCALE: $1/8" = 1'-0"$

SECTION

SCALE: 1/8" = 1'-0"

1. RELOCATE SEDIMENT TRAP FOR DEWATERING OF EXCAVATIONS.
2. RELOCATE TEMPORARY PRECAST CONCRETE BARRIER CURB AND BARREL ARRAYS AT PROJECT LIMITS AS REQUIRED TO SHIFT ALTERNATING ONE-WAY TRAFFIC TO NEWLY CONSTRUCTED ROADWAY.
3. RELOCATE TEMPORARY TRAFFIC SIGNALS AND STOP BARS.
4. REMOVE ANY TEMPORARY PRECAST CONCRETE BARRIER CURB THAT IS NO LONGER NEEDED FOR TRAFFIC CONTROL. COMPLETE EXCAVATION AND REMOVAL OF EXISTING CMP THROUGH LIMITS OF STAGE 2 CONSTRUCTION.
5. REMOVE STAGE 1 TEMPORARY SUPPORT OF EXCAVATION.
6. INSTALL GRANULAR FILL, CAST-IN-PLACE FOOTINGS, RIPRAP AND NATURAL STREAMBED MATERIAL THROUGH LIMITS OF STAGE 2 CONSTRUCTION.
7. INSTALL REMAINING PRECAST RIGID FRAME UNITS AND NORTH WINGWALLS.
8. CONSTRUCT NORTH HEADWALL.
9. BACKFILL RIGID FRAME. AT STAGE LINE, CUT AND REMOVE ANY PORTION OF THE TEMPORARY MSE WALL THAT WOULD INTERFERE WITH PAVING OPERATIONS.
10. INSTALL PROPOSED WATER MAIN AS SHOWN AND PERFORM BACTERIAL AND PRESSURE TESTS.
11. COORDINATE DEMOLITION OF TEMPORARY WATER MAIN BYPASS WITH INSTALLATION AND TESTING OF PROPOSED 12" WATER MAIN.
12. CONSTRUCT ROADWAY SUBBASE AND 3" TEMPORARY INTERMEDIATE COURSE THROUGH LIMITS OF STAGE 2 CONSTRUCTION.
13. AFTER 90 DAYS REMOVE ALL TEMPORARY INTERMEDIATE COURSE THROUGH PROJECT LIMITS.
14. CONSTRUCT SIDEWALK, PERMANENT PAVEMENT SECTION, GUARDRAIL, AND PAVEMENT MARKINGS THROUGH PROJECT LIMITS.

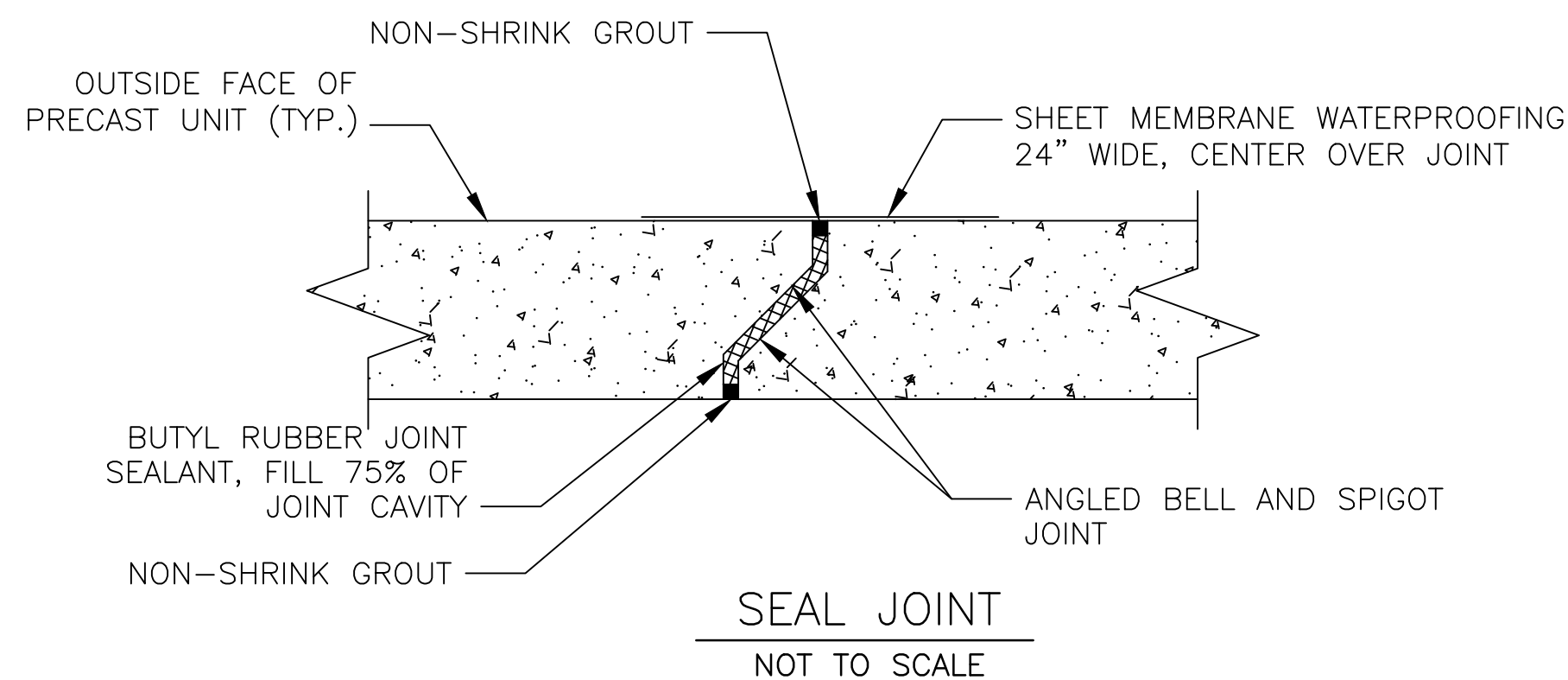
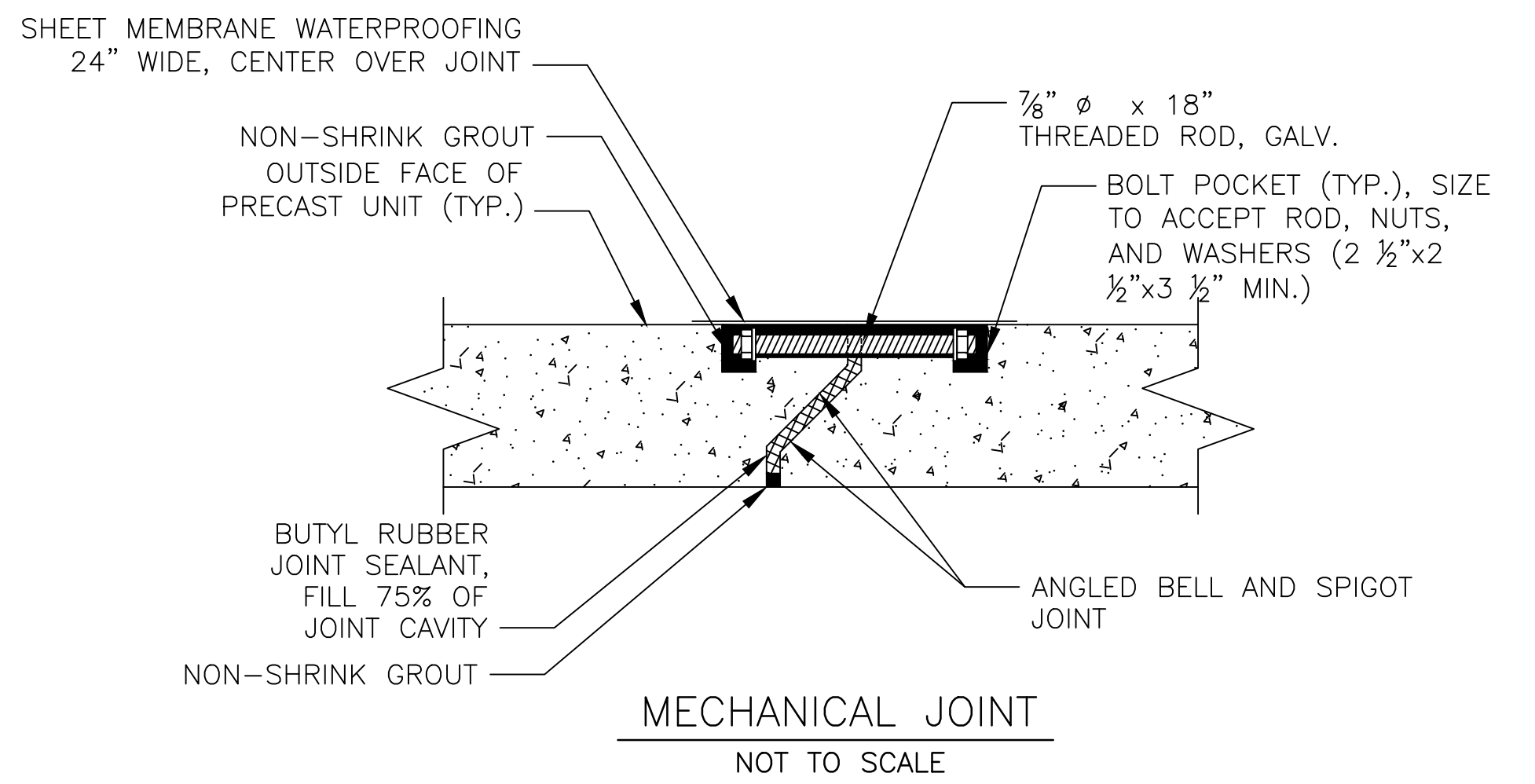
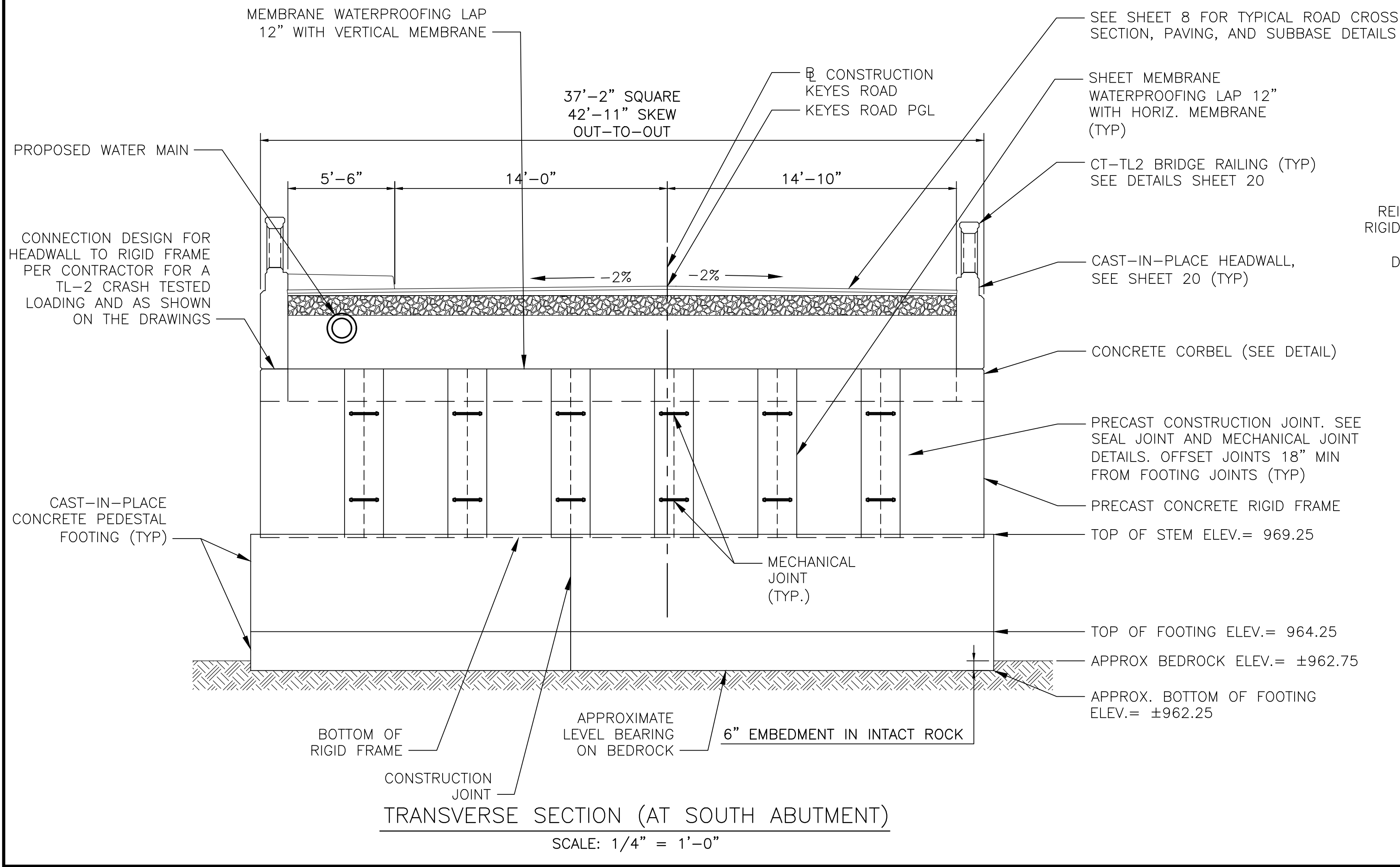
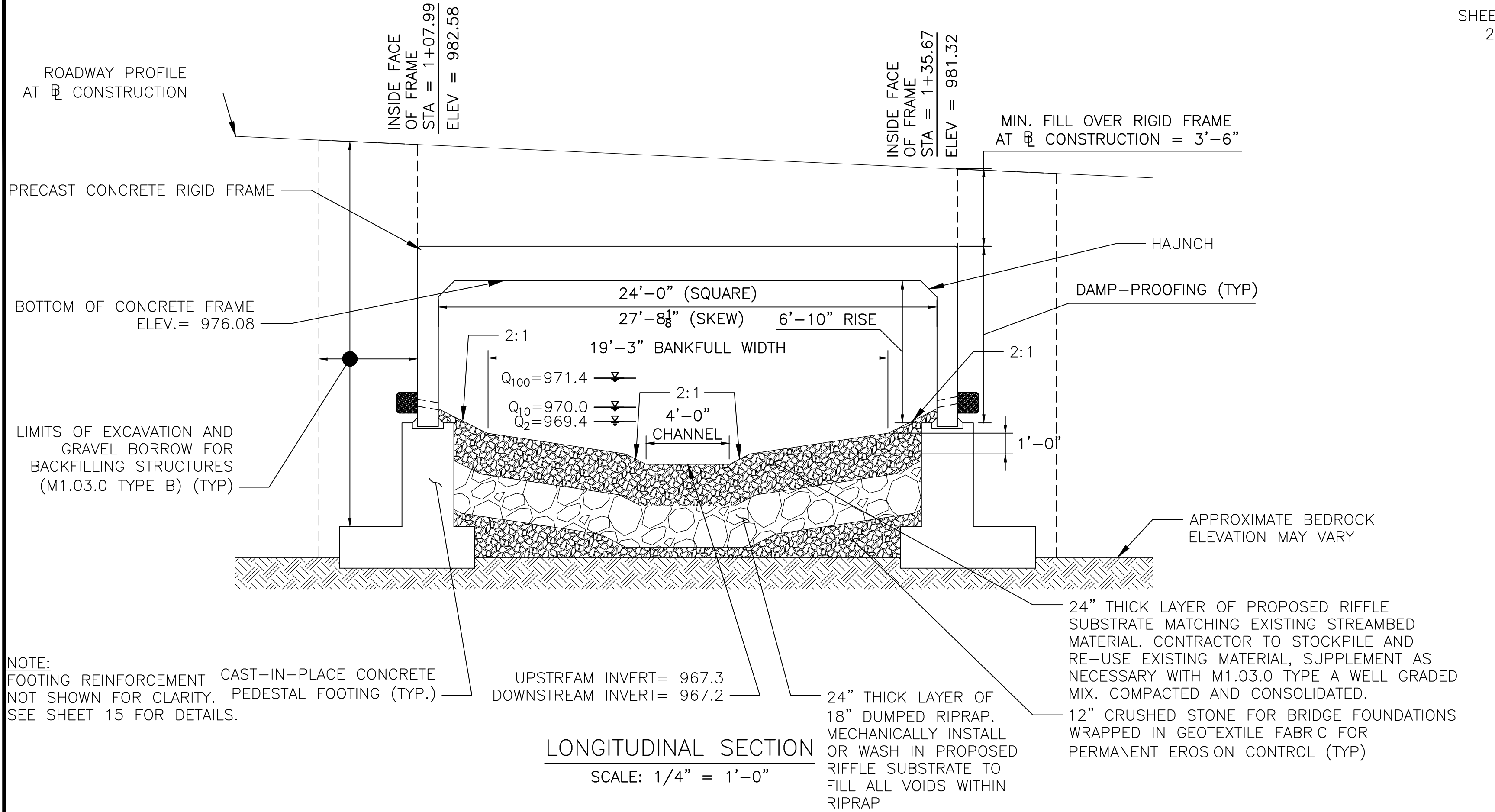


POTENTIAL CONSTRUCTION STAGE 2 PLAN

SCALE: 1/8" = 1'-0"

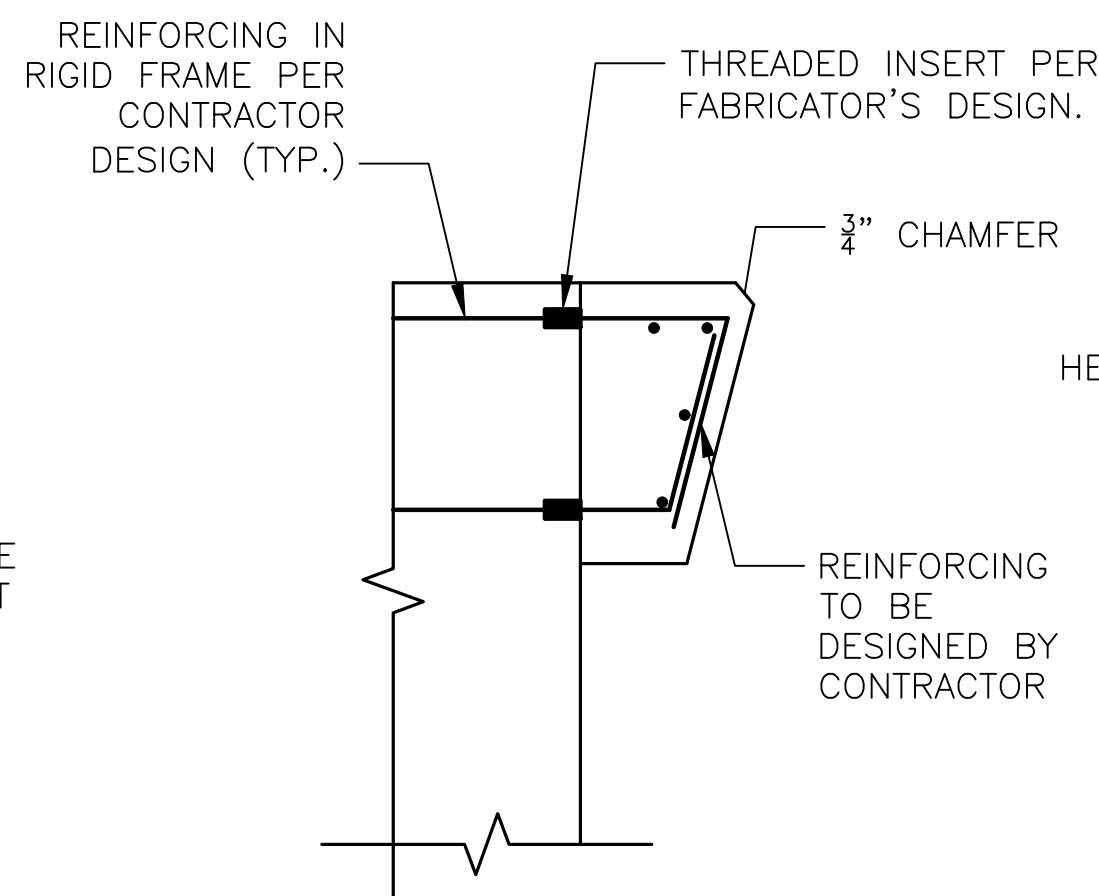


Last Saved: 2/3/2023 1:20pm By: SS&K
Printed On: Feb 09, 2023 1:20pm By: SS&K
Title & Content: G0384-Gardner T60 - Keyes Road Culvert Replacement Drawings
Figures: AutoCAD, Sheet, Current Drawings, G0384-T60_14_BRIDGE_SECTIONS.dwg



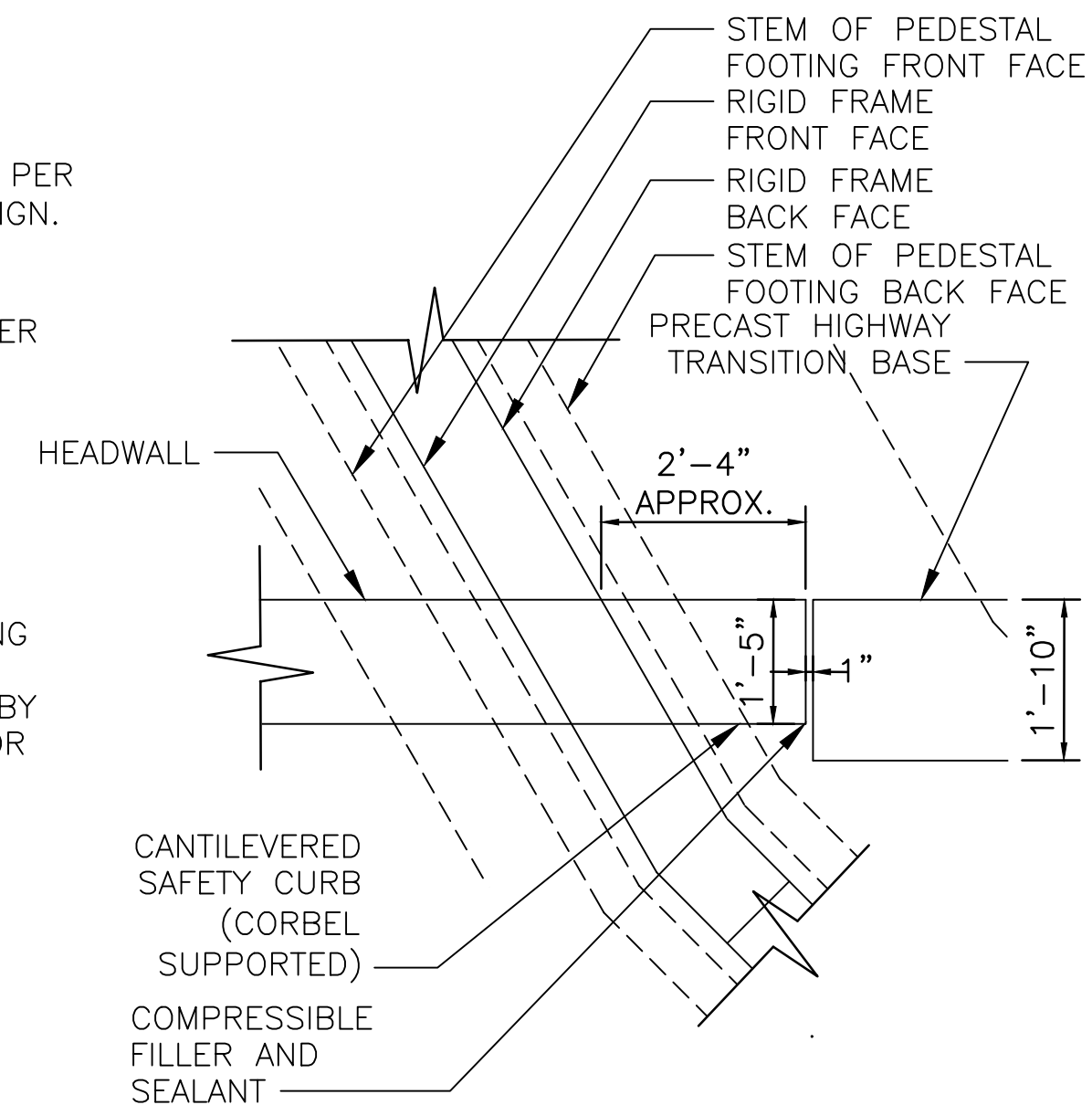
JOINT SEALANT NOTES:

1. PROVIDE BUTYL RUBBER JOINT SEALANT (AASHTO M-198) BETWEEN PRECAST CONCRETE UNITS.
2. PROVIDE A MINIMUM OF 7 MECHANICAL CONNECTORS BETWEEN EACH RIGID FRAME UNITS (3 ON TOP AND 2 ON EACH SIDE) AND 2 MECHANICAL CONNECTORS BETWEEN WINGWALL UNITS.
3. ALL BOLT POCKETS SHALL BE FILLED WITH NON-SHRINK GROUT.
4. SHEET MEMBRANE SHALL BE PLACED IN 2-FOOT WIDE STRIPS, CENTERED OVER THE TOP AND/OR SIDES OF EACH JOINT.



CONCRETE CORBEL NOTES:

1. REINFORCEMENT IS SHOWN FOR SCHEMATIC PURPOSES ONLY.
2. CONTRACTOR IS RESPONSIBLE FOR CORBEL DIMENSIONS, REINFORCING, AND DESIGN.



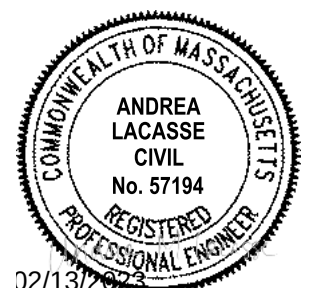
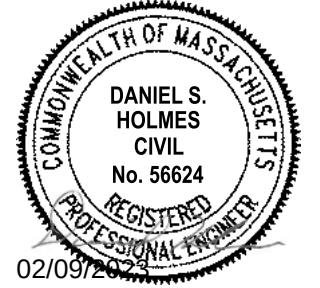
PRECAST CONCRETE CORBEL

NOT TO SCALE

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING
3/17/2023
DATE



Tighe&Bond



**Keyes Road
Over Wilder
Brook
Culvert
Replacement**

City of Gardner

Gardner,
Massachusetts

MassDOT Bridge No.
G-01-025, BIN CD5

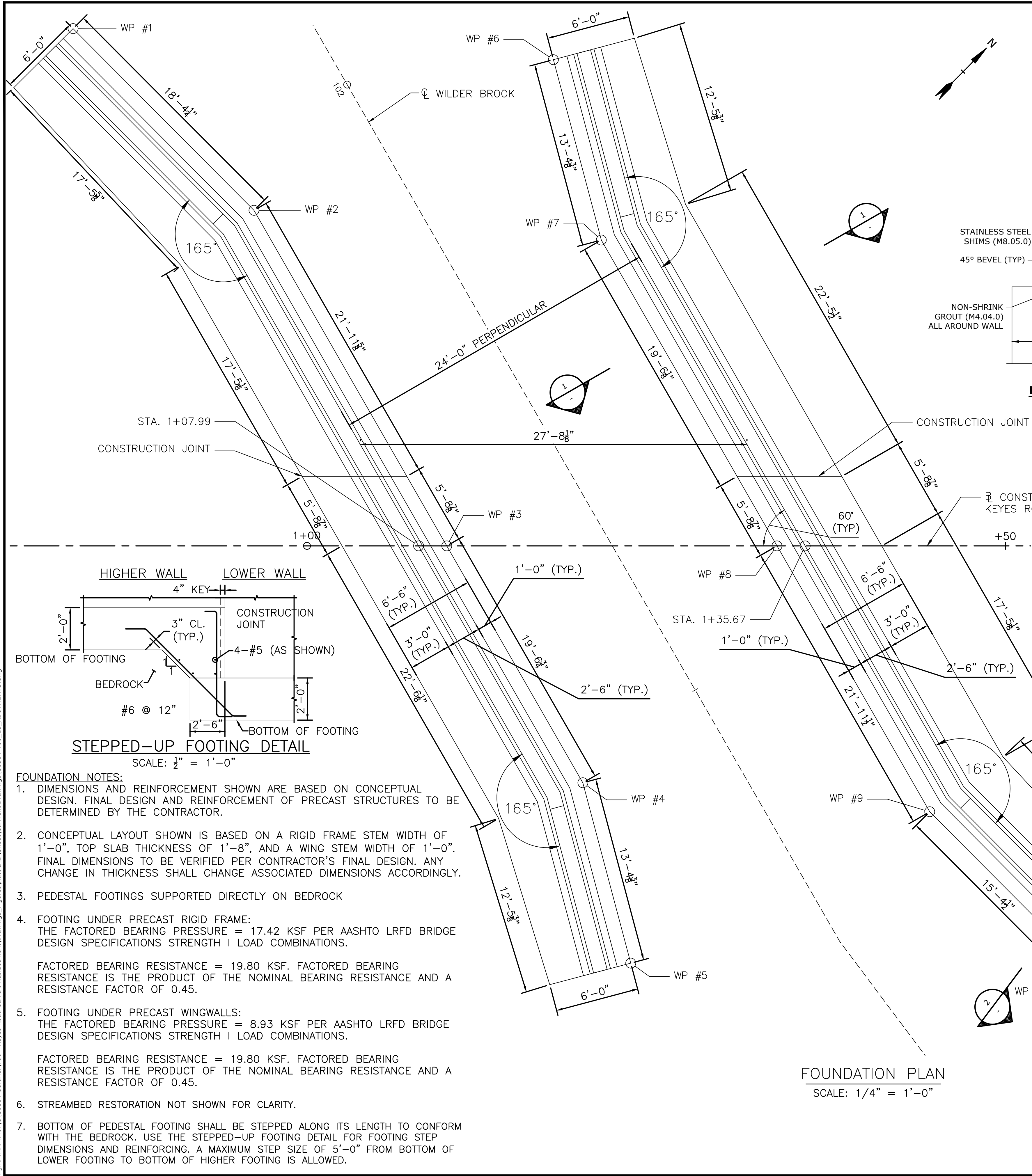
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DATE:	FEBRUARY 2023	
FILE:	G0384-T60_14_BRIDGE_SECTIONS.dwg	
DRAWN BY:	SDS, RMC	
DESIGNED/CHECKED BY:	AGB, MPW, AML, JRI	
APPROVED BY:	DSH	

BRIDGE SECTIONS
& DETAILS

SCALE: AS SHOWN

SHEET 15
SHEET 15 OF 25

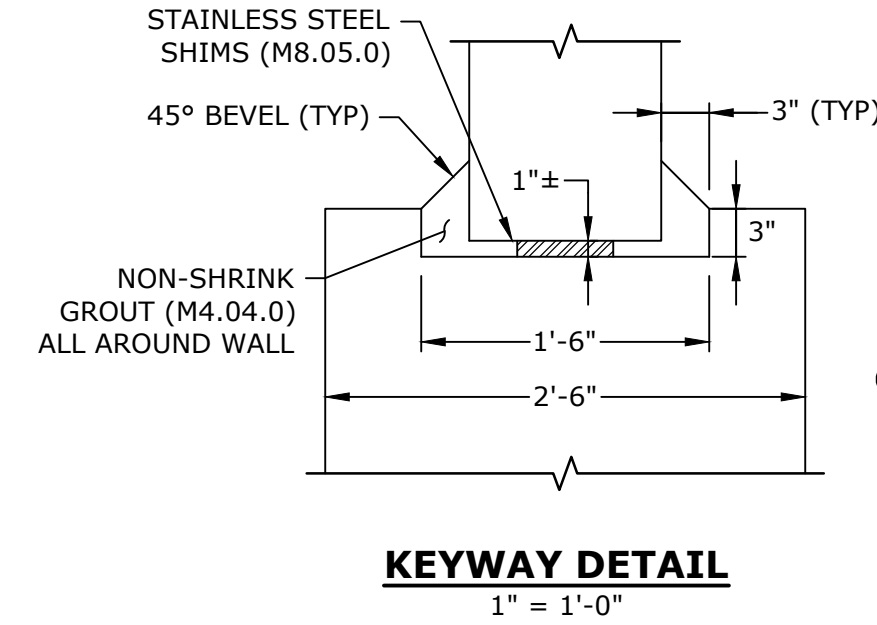
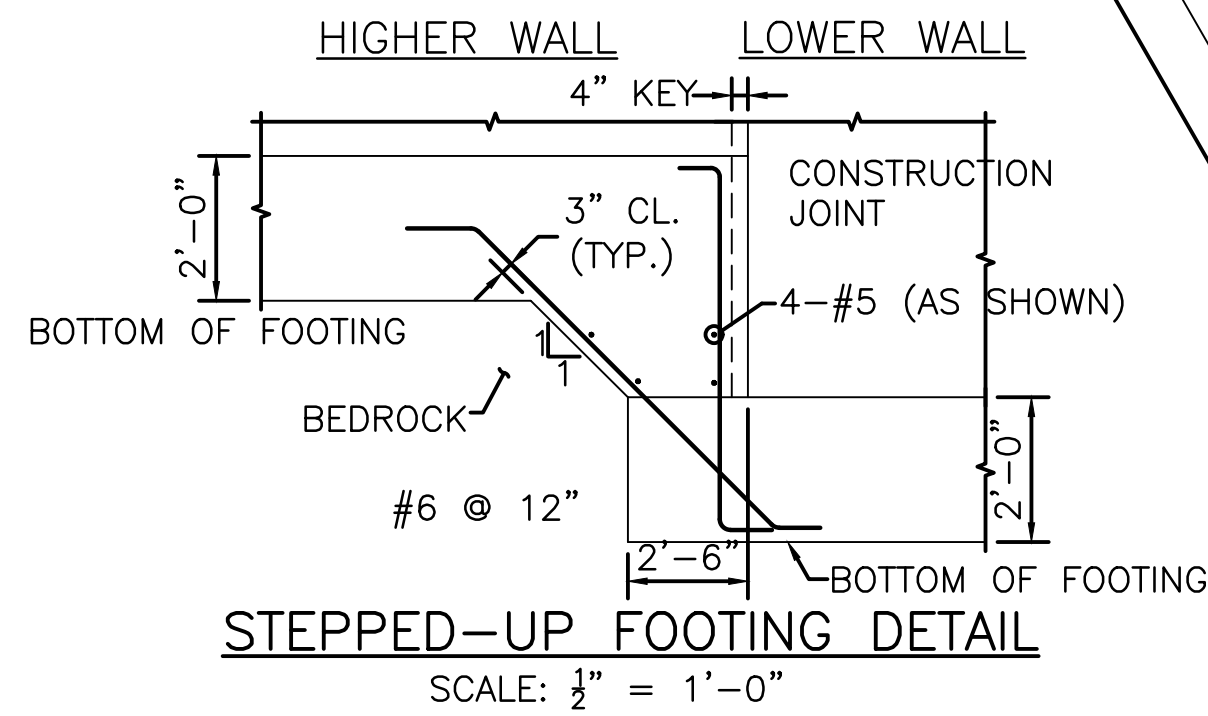
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Plotted On: 09/05/2023 1:21pm By: SSsk
Title & Content: G0384-T60_15_ABUTMENTS.dwg
Project: Keyes Road Culvert Replacement
Drawing: G0384-T60_15_ABUTMENTS.dwg



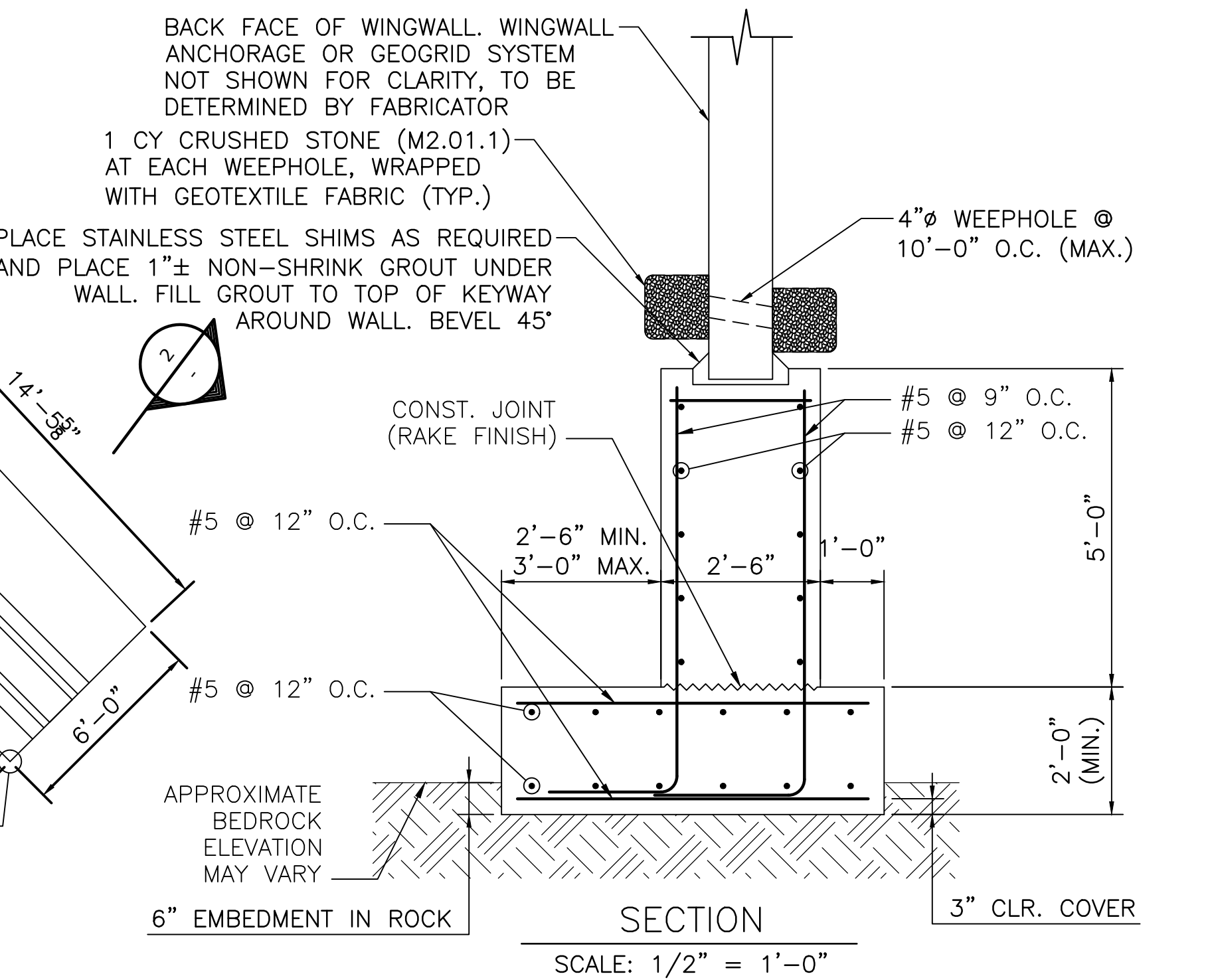
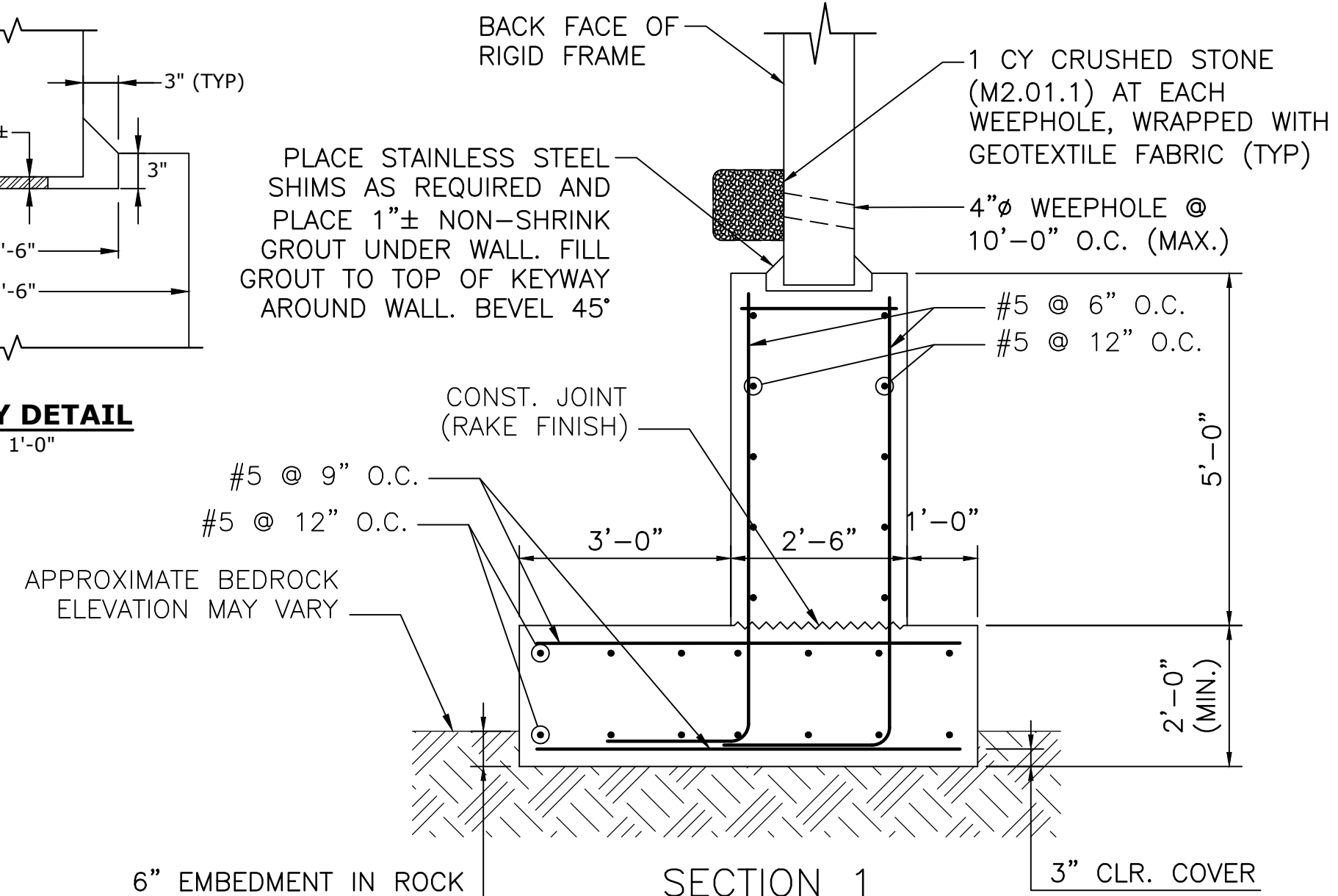
- FOUNDATION NOTES:**
- DIMENSIONS AND REINFORCEMENT SHOWN ARE BASED ON CONCEPTUAL DESIGN. FINAL DESIGN AND REINFORCEMENT OF PRECAST STRUCTURES TO BE DETERMINED BY THE CONTRACTOR.
 - CONCEPTUAL LAYOUT SHOWN IS BASED ON A RIGID FRAME STEM WIDTH OF 1'-0", TOP SLAB THICKNESS OF 1'-8", AND A WING STEM WIDTH OF 1'-0". FINAL DIMENSIONS TO BE VERIFIED PER CONTRACTOR'S FINAL DESIGN. ANY CHANGE IN THICKNESS SHALL CHANGE ASSOCIATED DIMENSIONS ACCORDINGLY.
 - PEDESTAL FOOTINGS SUPPORTED DIRECTLY ON BEDROCK
 - FOOTING UNDER PRECAST RIGID FRAME:
THE FACTORED BEARING PRESSURE = 17.42 KSF PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATIONS.

FACTORED BEARING RESISTANCE = 19.80 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.
 - FOOTING UNDER PRECAST WINGWALLS:
THE FACTORED BEARING PRESSURE = 8.93 KSF PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATIONS.

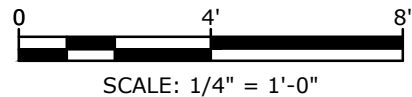
FACTORED BEARING RESISTANCE = 19.80 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.
 - STREAMBED RESTORATION NOT SHOWN FOR CLARITY.
 - BOTTOM OF PEDESTAL FOOTING SHALL BE STEPPED ALONG ITS LENGTH TO CONFORM WITH THE BEDROCK. USE THE STEPPED-UP FOOTING DETAIL FOR FOOTING STEP DIMENSIONS AND REINFORCING. A MAXIMUM STEP SIZE OF 5'-0" FROM BOTTOM OF LOWER FOOTING TO BOTTOM OF HIGHER FOOTING IS ALLOWED.



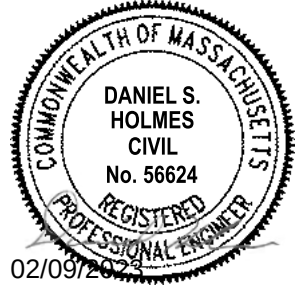
WORKING POINTS				
WORKING POINT	STATION	OFFSET	NORTHING	EASTING
WP #1	0+83.26	LT. 37.04'	3,038,457.65	517,798.44
WP #2	0+96.21	LT. 24.03'	3,038,457.52	517,816.80
WP #3	1+10.01	—	3,038,450.15	517,843.51
WP #4	1+19.75	RT. 16.96'	3,038,444.96	517,862.37
WP #5	1+23.18	RT. 29.88'	3,038,438.19	517,873.89
WP #6	1+17.64	LT. 34.82'	3,038,480.26	517,824.44
WP #7	1+21.07	LT. 21.90'	3,038,473.50	517,835.96
WP #8	1+33.65	—	3,038,466.79	517,860.31
WP #9	1+44.58	RT. 19.04'	3,038,460.95	517,881.48
WP #10	1+55.43	RT. 29.93'	3,038,460.85	517,896.84



COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
**CONCEPTUAL DESIGN IS ACCEPTABLE
TO MASSDOT FOR CONTRACTING**
3/17/2023
DATE



Tighe&Bond



Keyes Road Over Wilder Brook Culvert Replacement

City of Gardner

Gardner,
Massachusetts

MassDOT Bridge No.
G-01-025, BIN CD5

MARK	DATE	DESCRIPTION
PROJECT NO:	G0384-060	
DATE:	FEBRUARY 2023	
FILE:	G0384-T60_15_ABUTMENTS.dwg	
DRAWN BY:	SDS, RMC	
DESIGNED/CHECKED BY:	AGB, MPW, AML, JRI	
APPROVED BY:	DSH	

FOUNDATION PLAN
& DETAILS

SCALE: AS SHOWN

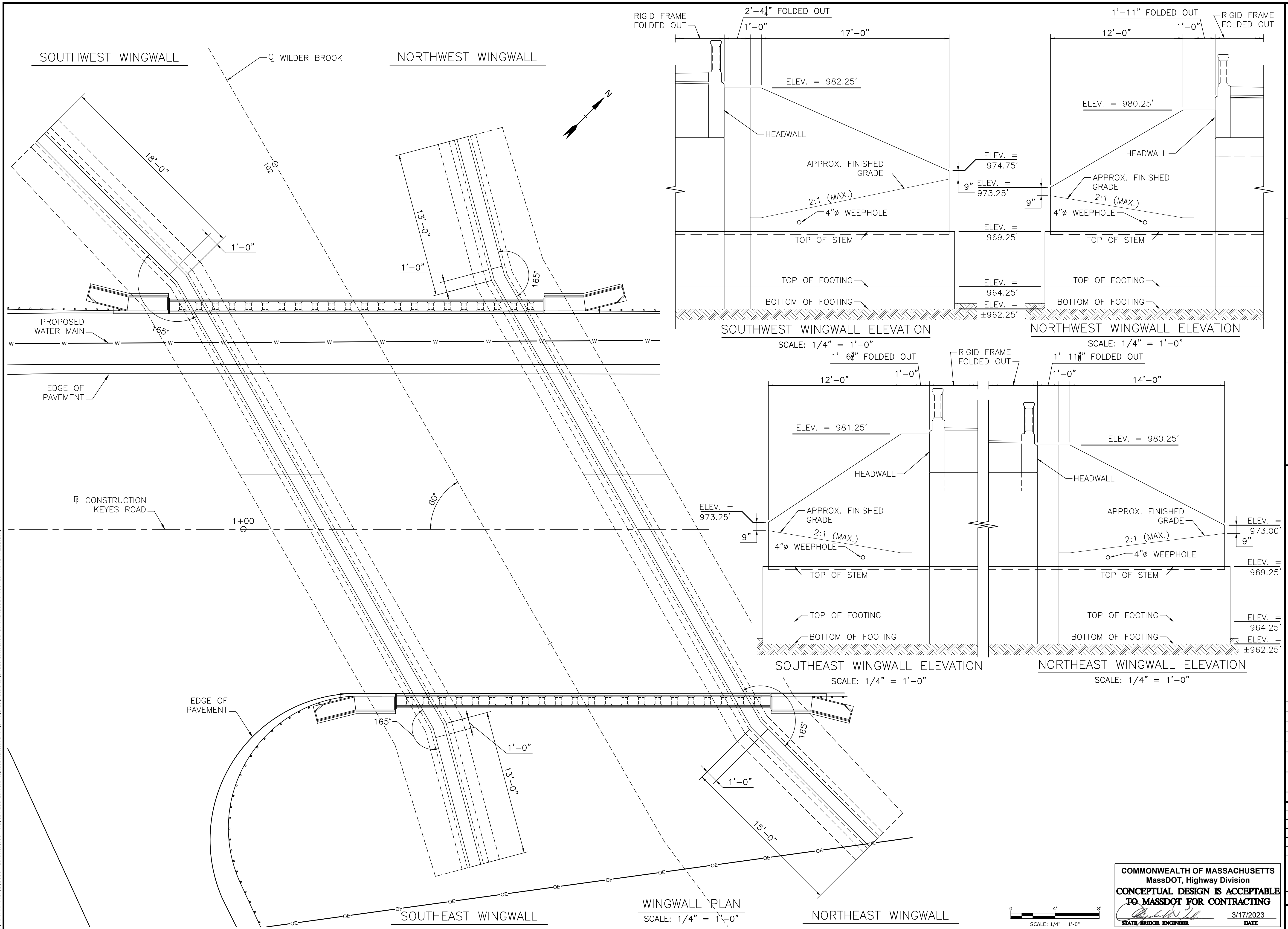
SHEET 16
SHEET 16 OF 25

MassDOT Bridge No.
G-01-025, BIN CD5

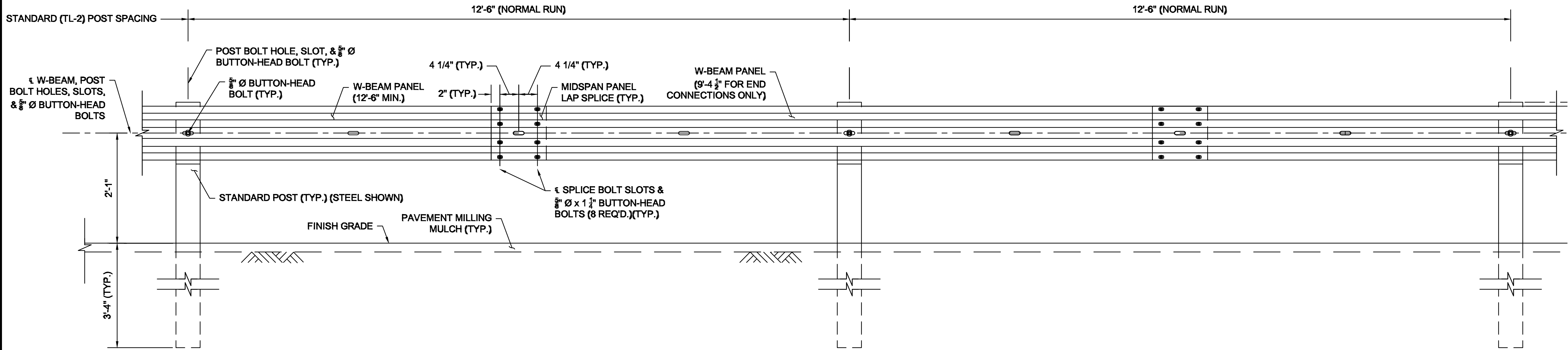
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DATE:	FEBRUARY 2023	
FILE:	G0384-T60_16_WINGWALLS.dwg	
DRAWN BY:	SDS, RMC	
DESIGNED/CHECKED BY:	AGB, MPW, AML, JRI	
APPROVED BY:	DSH	

SCALE: $1/4" = 1'-0"$

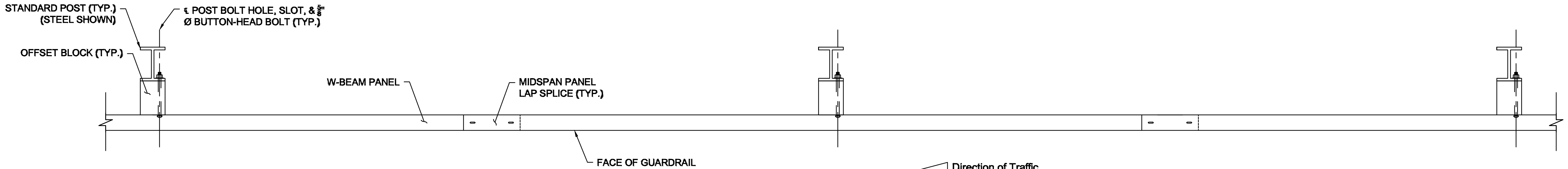
SHEET 17
SHEET 17 OF 25



Last Saved: 6/6/2022
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ELEVATION

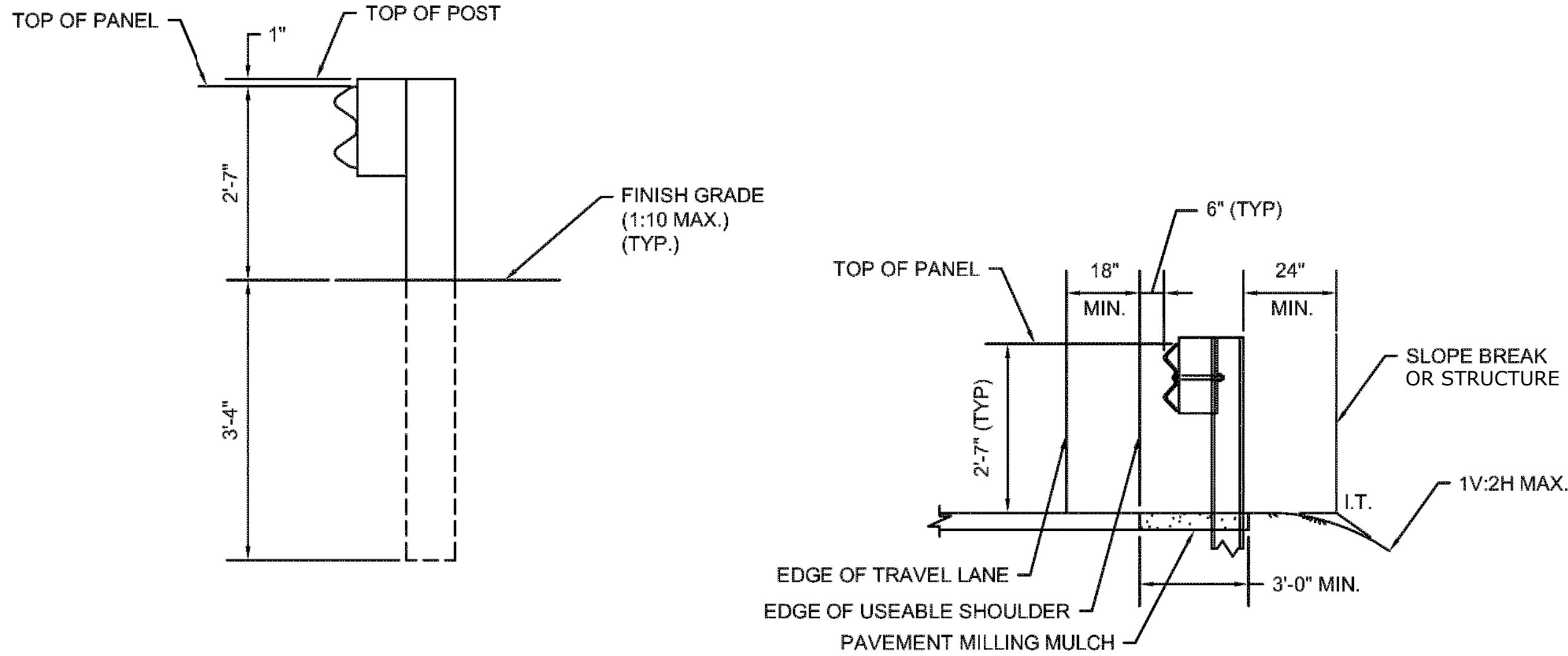


PLAN

NOTES:

1. A 9'-4 1/2" PANEL IS REQUIRED WHEN TRANSITIONING TO TL-3 W-BEAM GUARDRAIL TO MAINTAIN PROPER POST SPACING.

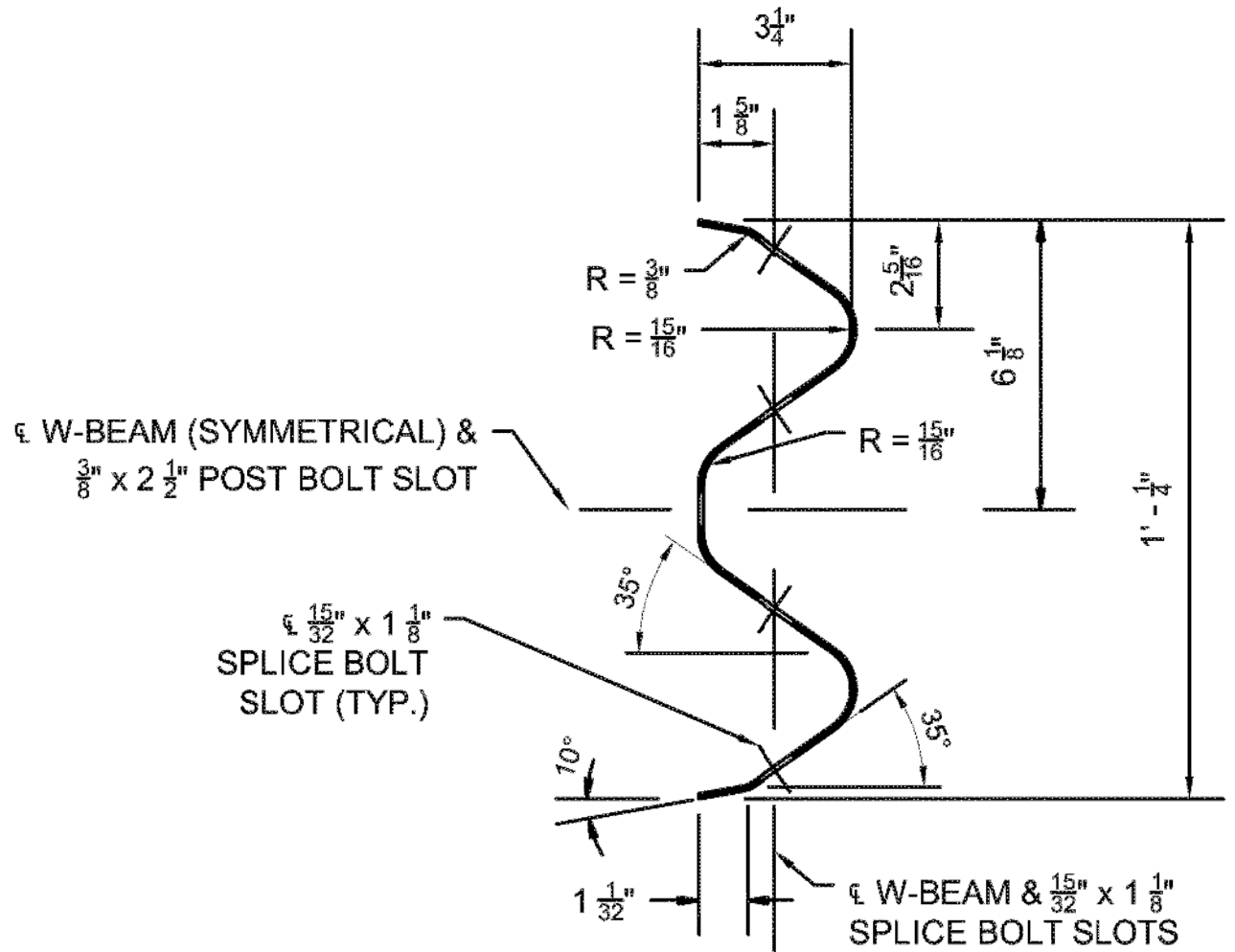
GUARDRAIL, TL2 DETAILS



W-BEAM

FLUSH WITH ROADWAY

GUARDRAIL MOUNTING HEIGHTS & POST DEPTHS

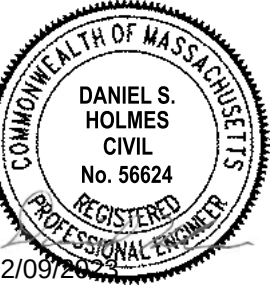


W-BEAM PANEL SECTION

MASSDOT STANDARD DETAILS:
MASSDOT HIGHWAY DIVISION
CONSTRUCTION STANDARD DETAILS
GUARDRAIL, TL2 & W-BEAM PANEL DETAILS

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MassDOT, Highway Division
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3/17/2023
STATE BRIDGE ENGINEER DATE

Tighe&Bond



Keyes Road
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Replacement

City of Gardner

Gardner,
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MassDOT Bridge No.
G-01-025, BIN CD5

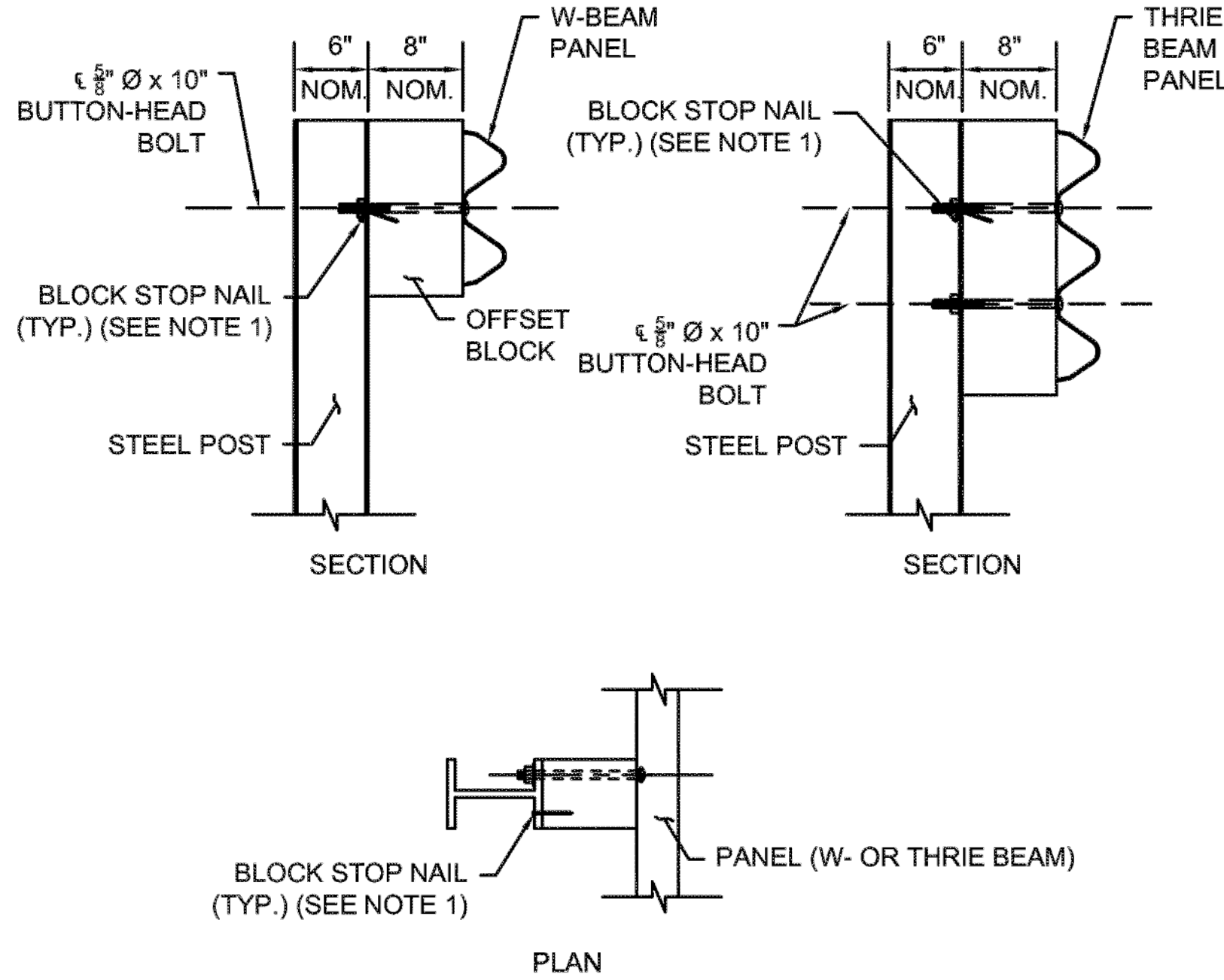
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PROJECT NO:	G0384-060	
DATE:	FEBRUARY 2023	
FILE:	G0384-T60_17-18_GUARDRAIL.dwg	
DRAWN BY:	SDS, RMC	
DESIGNED/CHECKED BY:	AGB, MPW, AML, JRI	
APPROVED BY:	DSH	

HIGHWAY GUARDRAIL
DETAILS (SHEET 1 OF 2)

SCALE: AS SHOWN

SHEET 18
SHEET 18 OF 25

Last Saved: 5/5/2022 11:22pm By: SSak
Plotted On: 05/05/2023 1:22pm By: SSak
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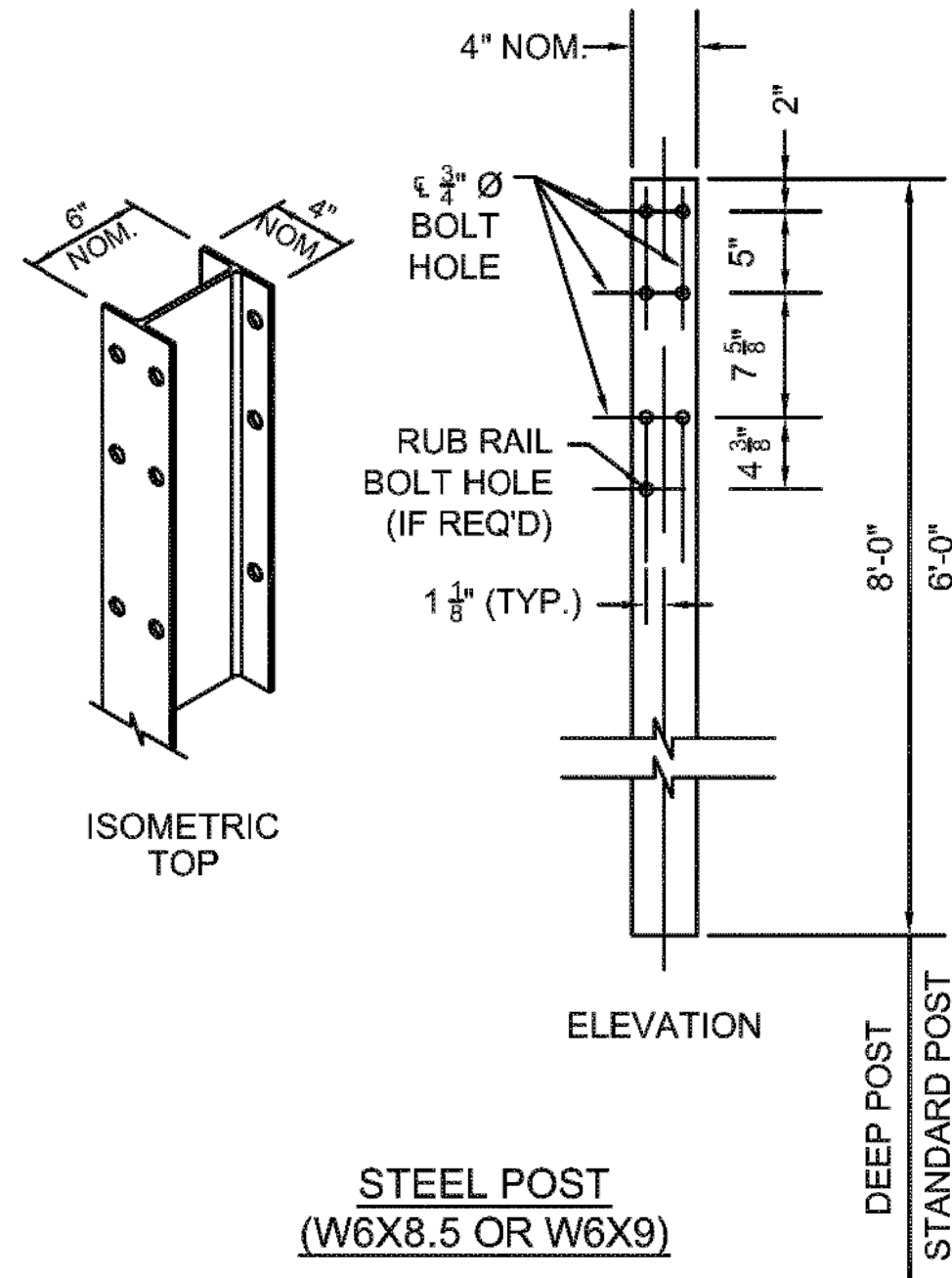


W-BEAM & THRIE BEAM
STEEL POST

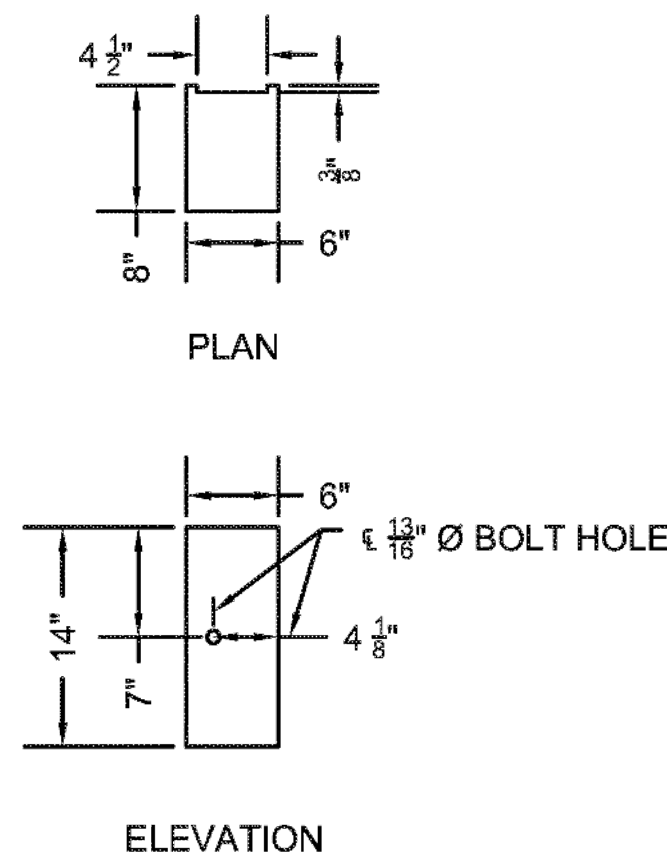
NOTES:

1. DRIVE ONE NAIL PER W BEAM TIMBER OFFSET BLOCK TO PREVENT BLOCK ROTATION. USE ASTM A153 HOT DIP GALVANIZED STEEL 3 1/2" TYPE 16D NAILS. FOR STEEL POSTS, DRIVE THE NAIL THROUGH THE UNUSED FLANGE BOLT HOLE AND BEND THE NAIL SO ITS HEAD CONTACTS THE FLANGE.
2. DEEP STEEL POSTS SHALL ONLY BE USED WHERE INDICATED IN THESE STANDARDS OR THE PLANS.
3. WHERE BACK OF POSTS ARE EXPOSED AND PLACED WITHIN 2'-0" OF A SIDEWALK, SEPARATED BIKE FACILITY OR SHARED-USE PATH, TIMBER POSTS SHALL BE USED. ALTERNATIVELY, STEEL POSTS WITH A TIMBER BACKING, PER 400.5.1, MAY BE SUBSTITUTED AT NO ADDITIONAL COST. WHEN TIMBER POSTS ARE USED, ONE OF THE FOLLOWING SAFETY TREATMENTS IS REQUIRED FOR ALL BOLTS PROTRUDING FROM THE BACK FACE OF THE POST:
 - A. AFTER TIGHTENING THE NUT, TRIM THE PROTRUDING POST BOLT FLUSH WITH THE NUT AND GALVANIZE PER M7.04.11;
 - B. USE 15" POST BOLTS AND COUNTERSINK THE WASHER AND NUT BETWEEN 1" AND 1 1/2" DEEP INTO THE BACK FACE OF THE POST; OR
 - C. USE 15" POST BOLT SLEEVE NUTS AND WASHERS.

END TREATMENTS AND TRANSITIONS, WHERE SPECIFIC MATERIAL TYPES ARE SPECIFIED, ARE EXEMPT FROM THESE REQUIREMENTS.



STEEL POST
(W6X8.5 OR W6X9)



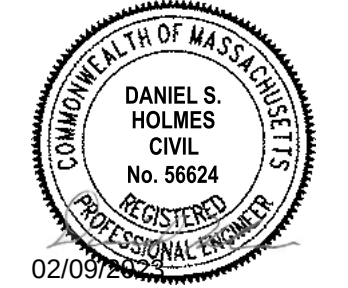
W-BEAM TIMBER OFFSET BLOCK
FOR USE WITH STEEL POSTS
(6"X8" NOMINAL)

POST & OFFSET BLOCK DETAILS

MASSDOT STANDARD DETAILS:
MASSDOT HIGHWAY DIVISION
CONSTRUCTION STANDARD DETAILS
GUARDRAIL, TL2 & W-BEAM PANEL DETAILS

COMMONWEALTH OF MASSACHUSETTS
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3/17/2023
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Tighe&Bond



Keyes Road
Over Wilder
Brook
Culvert
Replacement

City of Gardner

Gardner,
Massachusetts

MassDOT Bridge No.
G-01-025, BIN CD5

MARK	DATE	DESCRIPTION
PROJECT NO:	G0384-060	
DATE:	FEBRUARY 2023	
FILE:	G0384-T60-17-18_GUARDRAIL.dwg	
DRAWN BY:	SDS, RMC	
DESIGNED/CHECKED BY:	AGB, MPW, AML, JRI	
APPROVED BY:	DSH	

HIGHWAY GUARDRAIL
DETAILS (SHEET 2 OF 2)

SCALE: AS SHOWN

SHEET 19
SHEET 19 OF 25

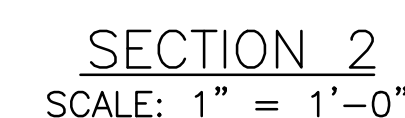
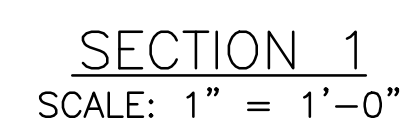
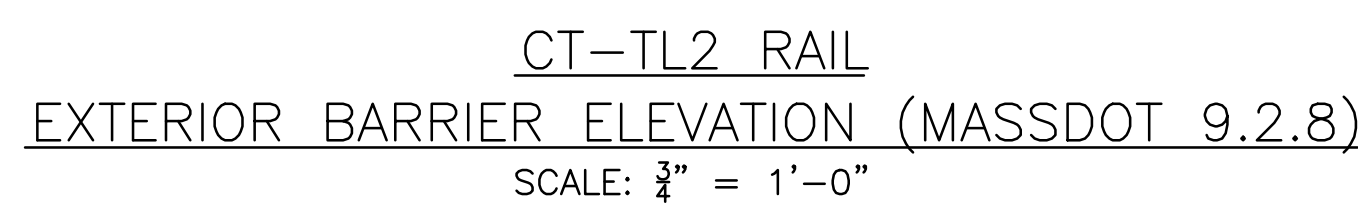
MassDOT Bridge No.
G-01-025, BIN CD5

[illegible]

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DATE:		FEBRUARY 2023
FILE:	G0384-T60_19_BRIDGE_RAILING.dwg	
DRAWN BY:	SDS, RMC	
DESIGNED/CHECKED BY: AGB, MPW, AML, JRI		
APPROVED BY:	DSH	

SCALE: AS SHOWN

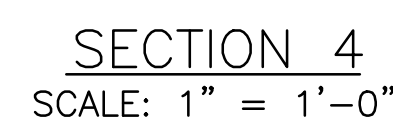
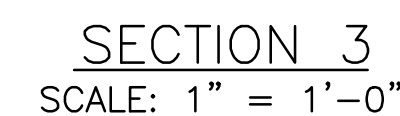
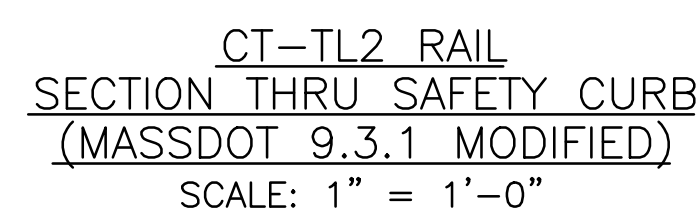
SHEET 20
SHEET 20 OF 25



NOTE:
SEE SECTION THRU CT-TL2 AT SIDEWALK FOR
DIMENSIONS AND REINFORCEMENT NOT SHOWN HERE.

CAST-IN-PLACE HEADWALL DETAILS
(MASSDOT 9.2.14 MODIFIED)
SCALE: 1" = 1'-0"

1. SIZE AND SPACING OF THE TRANSVERSE RIGID FRAME REINFORCEMENT AS PER THE CONTRACTOR'S DESIGN. 9" MAX SPACING SHALL BE PROVIDED TO MATCH HEADWALL REINFORCING.
2. SIZE AND SPACING OF THE ADDITIONAL REINFORCEMENT AS PER THE CONTRACTOR'S DESIGN.
3. USE THE SAME SPACING FOR THE PRIMARY HEADWALL REINFORCEMENT AS THE TRANSVERSE RIGID FRAME REINFORCEMENT. 9" MAX SPACING SHALL BE PROVIDED.
4. CONTRACTOR IS RESPONSIBLE FOR DESIGN OF HEADWALL CONNECTION TO RIGID FRAME INCLUDING FORCES FROM CT-TL2 BARRIER.



CT-TL2 RAIL
HORIZONTAL SECTIONS THROUGH OPTIONAL PILASTERS

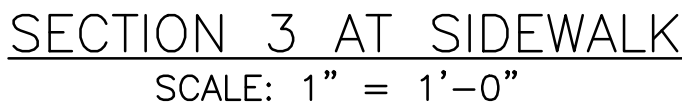
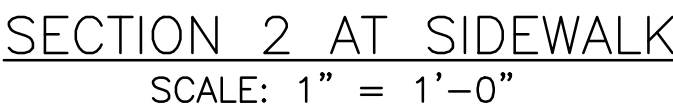
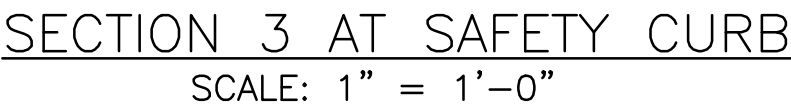
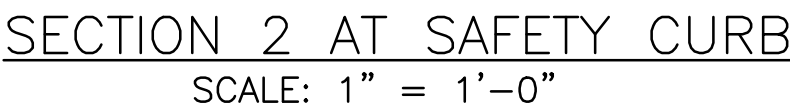
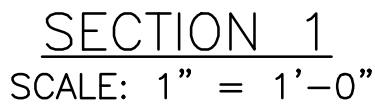
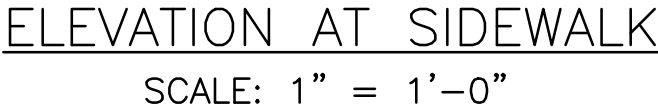
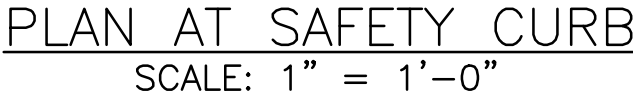
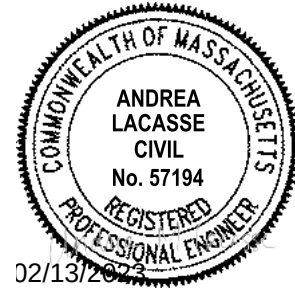
MASSDOT 2013 LRFD BRIDGE MANUAL
PART II CONVENTIONAL CONSTRUCTION
CT-TL2 BRIDGE RAILING

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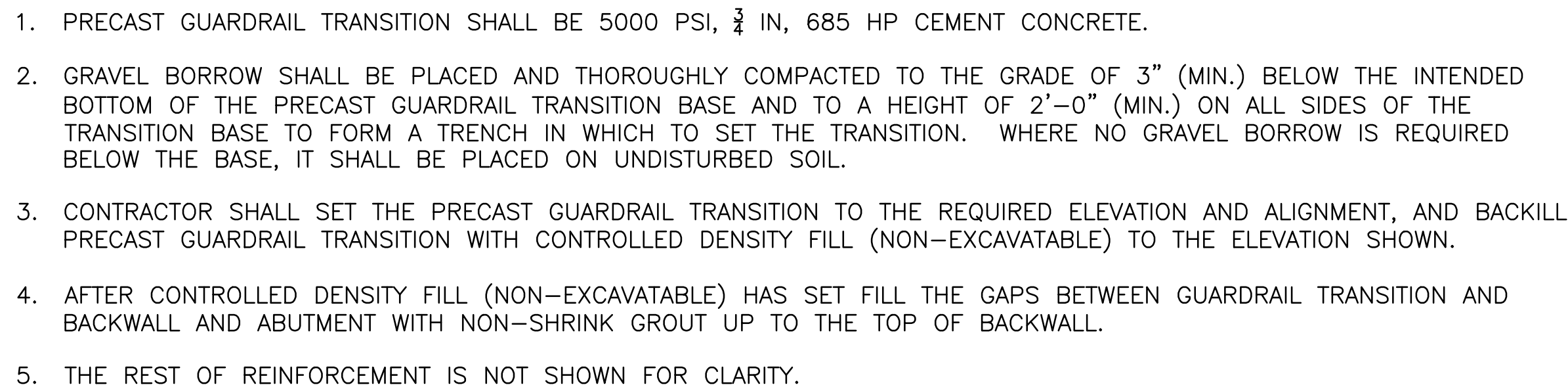
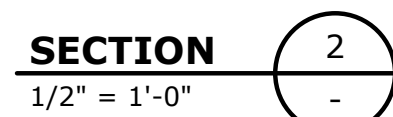
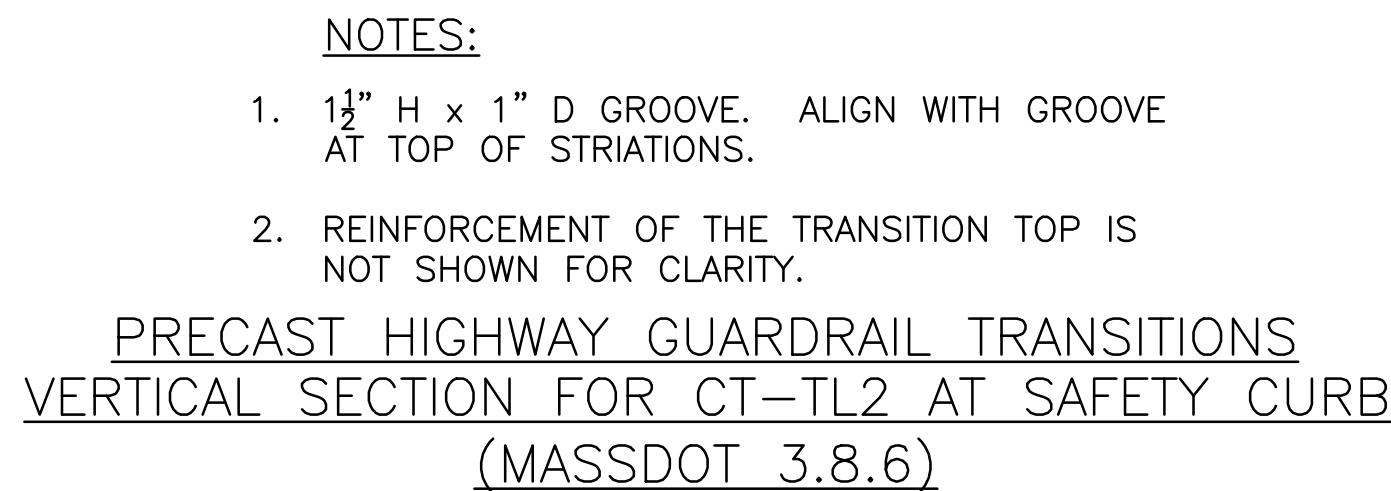
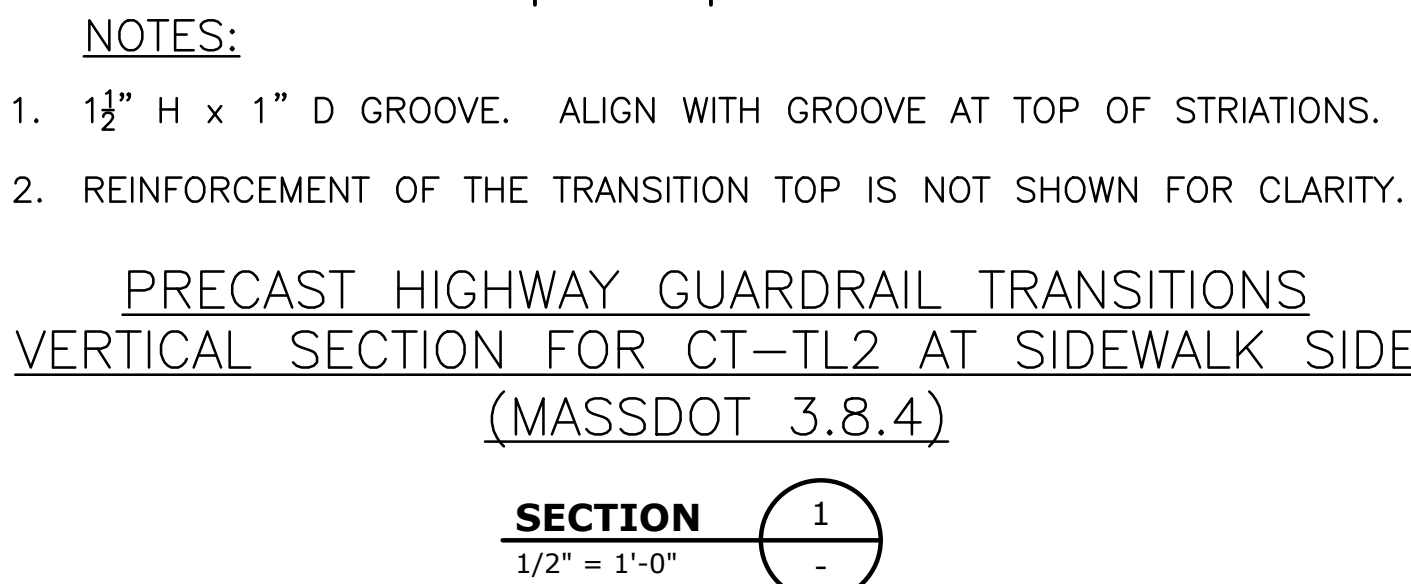
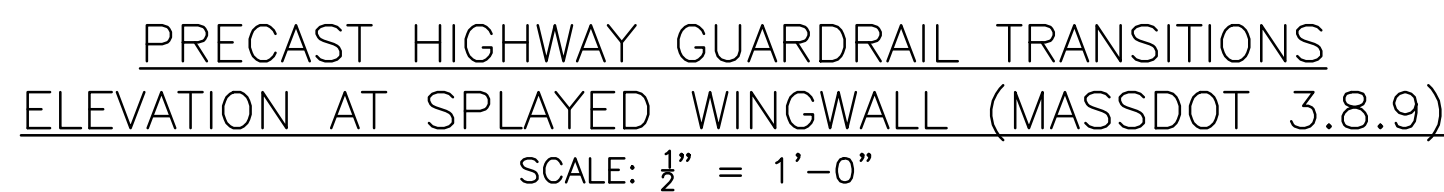
**CONCEPTUAL DESIGN IS ACCEPTABLE
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STATE BRIDGE ENGINEER

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DATE

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SHEET 21
SHEET 21 OF 25



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STATE BRIDGE ENGINEER

3/17/2023

DATE

SCALE: AS SHOW

SHEET 22
SHEET 22 OF 25

MassDOT Bridge No.
G-01-025, BIN CD5

[illegible]

MARK	DATE	DESCRIPTION
PROJECT NO:		G0384-060
DATE:		FEBRUARY 2023
FILE:	G0384-T60_22_GUARD_TRANSITION.d	
DRAWN BY:		SDS, RMC
DESIGNED/CHECKED BY: AGB, MPW, AML, JRI		
APPROVED BY:		DSH

GUARDRAIL TRANSITION TO
BRIDGE RAIL (FACE OF CURE

SCALE:	NO SCALE
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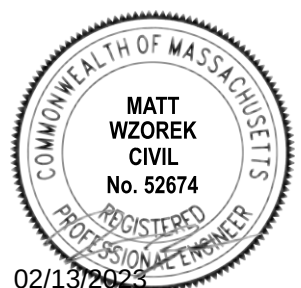
SHEET 23
SHEET 23 OF 25



MASSDOT STANDARD DETAILS:
MASSDOT 2017 CONSTRUCTION STANDARD
DETAILS, 400.3.6

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STATE BRIDGE ENGINEER 3/17/2023
DATE



MassDOT Bridge No.
G-01-025, BIN CD5

[illegible]

MARK	DATE	DESCRIPTION
PROJECT NO:		G0384-060
DATE:		FEBRUARY 2023
FILE:	G0384-T60_23_GUARD_GEOM.dwg	
DRAWN BY:	SDS, RMC	
DESIGNED/CHECKED BY: AGB, MPW, AML, JRI		
APPROVED BY:		DSH

SCALE:	NO SCALE
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SHEET 24
SHEET 24 OF 25



1. INSTALL GUARDRAIL AT STATION AND OFFSET SHOWN IN THE PLANS. THE END OF THE GUARDRAIL SHOWN IN THE PLANS CORRESPONDS WITH THE BEGIN LENGTH OF NEED POINT FOR THE END TREATMENT (SHOWN AT POST 3 IN THESE STANDARDS, BUT MAY VARY BY MANUFACTURER).
2. PROPRIETARY END TREATMENTS MAY VARY IN SIZE AND SHAPE FROM WHAT IS DEPICTED IN THESE STANDARDS. HOWEVER, THE MAXIMUM SLOPES AND MINIMUM OFFSETS DIMENSIONED FROM THE POSTS SHOWN HEREIN SHALL STILL APPLY.
3. END TREATMENT TEST LEVEL AND TYPE (TANGENT OR FLARED) SHALL BE SPECIFIED IN THE PLANS.
4. CONSTRUCT TANGENT AND FLARED END TREATMENTS IN ACCORDANCE WITH THE MANUFACTURER'S UNIQUE DRAWING DETAILS, PROCEDURES, AND SPECIFICATIONS.
5. AT THE DISCRETION OF THE ENGINEER, THE FACE OF THE TANGENT END TREATMENT IMPACT HEAD MAY BE OFFSET UP TO 2'-0" FROM THE PROJECTED FACE OF GUARDRAIL TO MINIMIZE NUISANCE HITS. THE OFFSET SHALL OCCUR OVER THE ENTIRE LENGTH OF THE END TREATMENT UNLESS OTHERWISE SPECIFIED BY THE MANUFACTURER.
6. LATERAL OFFSET OF FLARED END TREATMENT SHALL BE DETERMINED BY THE DESIGN ENGINEER FOLLOWING THE METHODOLOGY FOUND IN THE *ROADSIDE DESIGN GUIDE* AND SHOULD FALL WITHIN THE ALLOWABLE TOLERANCES SPECIFIED BY THE MANUFACTURER. LATERAL OFFSET SHALL BE MEASURED FROM THE EDGE OF TRAVELED WAY TO THE FACE OF THE GUARDRAIL AT POST #3.
7. END TREATMENTS SHALL NOT TERMINATE CURVED W-BEAM SEGMENTS.
8. END TREATMENT IMPACT HEAD DELINEATION SHALL CONFORM TO 601.63.
9. INSTALL GRADING AS SHOWN HEREIN UNDER SEPARATE PAY ITEMS.
10. SEE 400.2.2 FOR APPROACH TERMINAL GEOMETRY FOR GUARDRAIL INSTALLED ADJACENT TO CURB AND DOUBLE FACED GUARDRAIL.
11. MAINTAIN 2'-0" (MIN) OFFSET TO FRONT SLOPE BREAK DOWNSTREAM OF MIDSPAN SPLICE LOCATION AT ALL TIMES. IF, DOWNSTREAM OF THE SPLICE, GRADING CONSTRAINTS INHIBIT THIS MINIMUM OFFSET THEN USE DEEP STEEL POSTS AND TRANSITION TO A SLOPE BREAK CONDITION DESIGN PER THE DETAIL IN 400.1.5 UNTIL THE 2'-0" OFFSET CAN BE MET.

APPROACH GEOMETRY: SINGLE FACED (MASSDOT 400.2.1)

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DATE

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