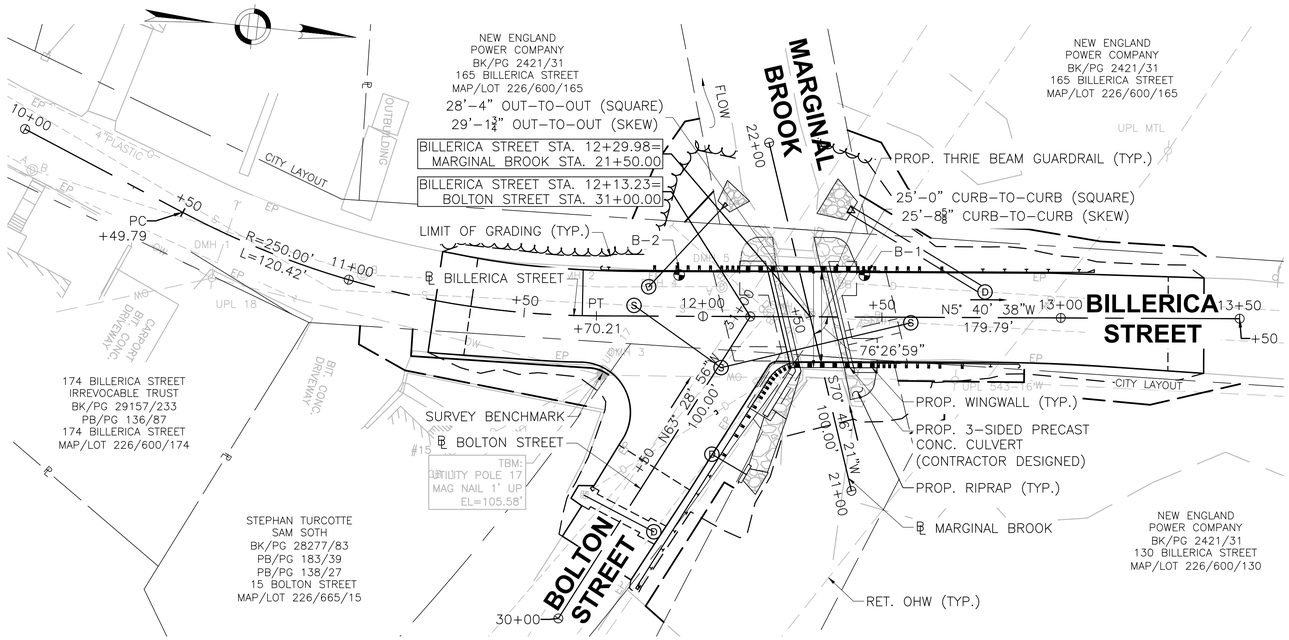
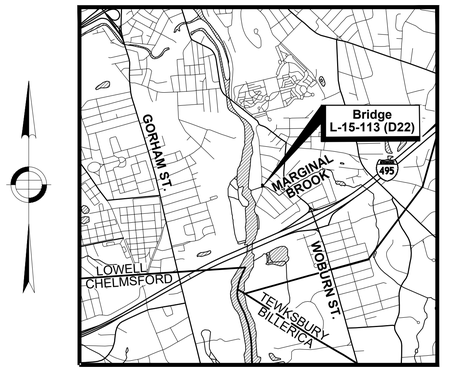


KEY PLAN

SCALE: 1" = 20'



LOCUS MAP

SCALE: 1" = 2000'

LOWELL
BILLERICA STREET

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	1	20
PROJECT FILE NO.	T1625		

KEY PLAN AND PROFILE

INDEX OF DRAWINGS

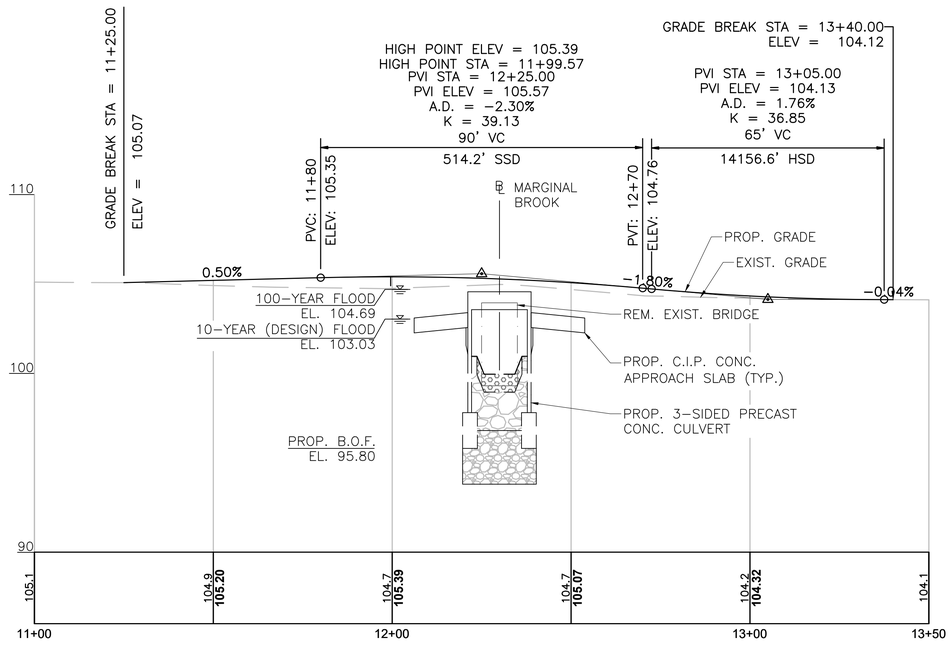
SHEET NO.	DESCRIPTION
1	KEY PLAN AND PROFILE
2	GENERAL NOTES
3	BORING LOGS
4	BRIDGE PLAN
5	BRIDGE ELEVATIONS
6	CONSTRUCTION PLAN
7	CONSTRUCTION PROFILE
8	GRADING PLAN
9	FOUNDATION PLAN
10	CULVERT DETAILS (1 OF 3)
11	CULVERT DETAILS (2 OF 3)
12	CULVERT DETAILS (3 OF 3)
13	TYPICAL SECTIONS AND PAVEMENT NOTES
14	CONSTRUCTION DETAILS
15	CONTROL OF WATER PLAN
16	TRAFFIC MANAGEMENT PLAN
17	CROSS SECTIONS – 1 OF 4
18	CROSS SECTIONS – 2 OF 4
19	CROSS SECTIONS – 3 OF 4
20	CROSS SECTIONS – 4 OF 4

CHAPTER 85 SECTION 35 REVIEW AND APPROVAL

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 DRAWGINS 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.

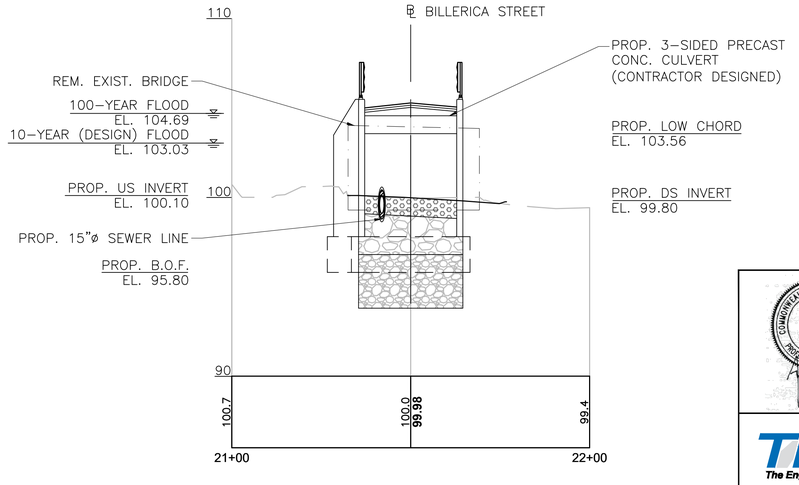
COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

DISTRICT 4 BRIDGE ENGINEER — DATE 1/5/26



BILLERICA STREET PROFILE

HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 4'



MARGINAL BROOK PROFILE

HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 4'

COMMONWEALTH OF MASSACHUSETTS ANDREW J. SPURR CIVIL No. 56540 PROFESSIONAL ENGINEER

TEC The Engineering Corp
282 Merrimack Street, 2nd Floor
Lawrence, MA 01843

JAN. 5, 2026	MGL CH 85 S35 REVIEW SUBMISSION

PROPOSED BRIDGE REPLACEMENT

LOWELL

BILLERICA STREET
OVER MARGINAL BROOK

CITY OF LOWELL
375 MERRIMACK STREET
LOWELL, MA 01852

SHEET 1 OF 20 SHEETS BRIDGE NO. L-15-113 (D22)

T1625_BR1(KEY PLAN).DWG Plotted on 5-Jan-2026 1:18 PM

MGL CH 85 S35 Review Submission 5-January-2026

GENERAL NOTES:

DESIGN:

IN ACCORDANCE WITH THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION, 2020 FOR HL–93 LOADING.

SURVEY BENCHMARKS:

BENCHMARK 1: MTRV MMAG1
N: 3051143.669'
E: 711451.954'
ELEVATION = 104.980'

BENCHMARK 2: TP MAG 2
N: 3051367.619'
E: 711508.144'
ELEVATION = 104.732'

BENCHMARK 3: MTRV MMAG3
N: 3051657.814'
E: 711471.179'
ELEVATION = 104.627'

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

DATE:

TO BE PLACED ON THE EXTERIOR FACE OF EACH HEADWALL. A SHEET SHOWING SIZE AND CHARACTER OF NUMERALS WILL BE FURNISHED. THE DATE USED SHALL BE THE LATEST YEAR OF CONTRACT COMPLETION AS OF THE DATE OF THE FIRST HEADWALL CONSTRUCTED. BOTH HEADWALLS SHALL FEATURE THE SAME DATE.

SURVEY NOTES:

THE HORIZONTAL DATUM FOR THIS SURVEY IS THE MASSACHUSETTS COORDINATE SYSTEM, NAD 1983, MAINLAND ZONE. THE VERTICAL DATUM FOR THIS SURVEY IS THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). SAID DATUMS WERE ESTABLISHED VIA GPS OBSERVATIONS UTILIZING NAD83 (NA2011) EPOCH 2010.00 (MYCS2) AND GEOID 18.

UNDERGROUND UTILITIES SHOWN HEREON ARE COMPILED FROM FIELD LOCATIONS OF STRUCTURES AND FROM AVAILABLE RECORD INFORMATION ON FILE AT THE CITY ENGINEERING OFFICES, CITY D.P.W., MASS HIGHWAY DEPT. AND UTILITY COMPANIES. OTHER UNDERGROUND UTILITIES MAY EXIST. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE LOCATION, SIZE & ELEVATION OF ALL UTILITIES WITHIN THE AREA OF PROPOSED WORK AND TO CONTACT "DIG–SAFE" AT 811 AT LEAST 72 HOURS PRIOR TO ANY EXCAVATION, DEMOLITION OR CONSTRUCTION.

LIMITS OF MEAN HIGH WATER AND BORDERING VEGETATED WETLANDS SHOWN HEREON WERE DELINEATED BY HANCOCK ASSOCIATES ON 5/25/25 AND LOCATED BY FIELD SURVEY.

SURVEY NOTEBOOKS:

SURVEY PREPARED BY HANCOCK ASSOCIATES OF BOSTON, MA DATED JUNE 2025.

SCALES:

SCALES NOTED ON THE PLANS ARE NOT APPLICABLE TO REDUCED SIZE PRINTS. DIVIDE SCALES BY 2 FOR HALF–SIZE PRINTS (A3).

FOUNDATIONS:

FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.

UNSUITABLE MATERIAL:

ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER. CONTRACTOR SHALL EXCAVATE TO 93.80' ELEVATION TO REMOVE ALL UNSUITABLE MATERIAL.

ANCHOR BOLTS:

ALL ANCHOR BOLTS SHALL BE SET BY TEMPLATE BEFORE THE CONCRETE IS PLACED.

CONCRETE:

UNLESS OTHERWISE SPECIFIED, ALL CONCRETE SHALL BE 5000 HP CONCRETE.

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 995.01 IN THE SPECIAL PROVISIONS.

REINFORCEMENT:

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

MODIFICATION CONDITION:	#4 BARS	#5 BARS	#6 BARS
1. NONE	16"	17"	21"
2. 12" OF CONCRETE BELOW BAR	18"	22"	27"
3. EPOXY COATED BARS, COVER < 3db, OR CLEAR SPACING < 6db	21"	26"	31"
4. COATED BARS, ALL OTHER CASES	17"	21"	25"
5. CONDITION 2. AND 3.	23"	29"	35"
6. CONDITION 2. AND 4.	21"	27"	32"

ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS.

TRAFFIC:

THE BRIDGE WILL BE CLOSED TO VEHICULAR TRAFFIC DURING ALL PHASES OF DEMOLITION AND CONSTRUCTION, INCLUDING ACCESS TO BOLTON STREET FROM BILLERICA STREET. VEHICULAR TRAFFIC WILL BE DETOURED AS SHOWN ON THE PLANS.

CONTROL OF WATER SYSTEM:

THE CONTROL OF WATER SYSTEM SHALL BE DESIGNED BY THE CONTRACTOR AND SUBMITTED TO THE ENGINEER FOR REVIEW AND APPROVAL PER ITEM 991.1. APPROXIMATE LIMITS SHOWN ON THIS PLAN ARE CONCEPTUAL AND THE FINAL LOCATION SHALL BE DETERMINED BY THE CONTRACTOR. THE TOP ELEVATION OF THE TEMPORARY WATER CONTROL MEASURE SHALL BE THE CONTRACTOR DETERMINED CONSTRUCTION FLOOD ELEVATION PLUS 1 FOOT OF FREEBOARD.

UTILITIES:

EXISTING 15" SEWER LINE SHALL BE TEMPORARILY RELOCATED (CONTRACTOR DESIGNED) TO MAINTAIN SERVICE DURING CONSTRUCTION. THE EXISTING SEWER MANHOLES AND PIPES SHALL BE REMOVED AND NEW MANHOLES AND PIPES SHALL BE INSTALLED AS SHOWN ON THE PLANS. THE PERMANENT SEWER LINE SHALL BE PLACED THROUGH THE 3–SIDED CULVERT AS SHOWN ON THE PLANS. CONTRACTOR SHALL COORDINATE WITH THE LOWELL WASTEWATER DEPARTMENT FOR TEMPORARY AND PERMANENT RELOCATIONS.

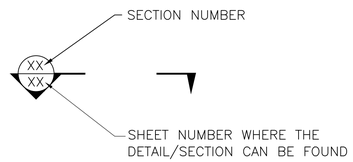
EXISTING DRAIN MANHOLES AND PIPES SHALL BE REMOVED AS SHOWN ON THE PLANS. PROPOSED DRAIN MANHOLES AND PIPES SHALL BE INSTALLED AS SHOWN ON THE PLANS.

EXISTING OVERHEAD WIRES AND UTILITY POLES ARE TO REMAIN IN PLACE AND ACTIVE THROUGHOUT THE DURATION OF CONSTRUCTION. CONTRACTOR SHALL USE CAUTION WHILE WORKING AROUND THE EXISTING UTILITIES SCHEDULED TO REMAIN. CONTRACTOR SHALL UTILIZE LOW HEIGHT HOISTING EQUIPMENT TO SET THE PRECAST ELEMENTS IN ORDER TO STAY UNDERNEATH THE EXISTING OVERHEAD WIRES. THIS SHALL BE DESIGNED AND EXPLAINED IN THE CONTRACTOR'S ERECTION PROCEDURE. CONTRACTOR SHALL COORDINATE WITH RESPECTIVE UTILITY OWNERS REGARDING ANY CLEARANCES, DE–ENERGIZING, ETC. THAT MAY NEED TO BE CONSIDERED IN THE CONTRACTOR'S ERECTION PROCEDURE.

BRIDGE DEMOLITION:

ALL WORK TO REMOVE THE EXISTING STRUCTURE IN ITS ENTIRETY SHALL BE DEEMED INCIDENTAL TO ITEM 140. – BRIDGE EXCAVATION.

SECTION MARK:



LOWELL
BILLERICA STREET

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	2	20
PROJECT FILE NO.	T1625		

GENERAL NOTES

SEISMIC DESIGN CRITERIA	
DESIGN RETURN PERIOD:	1000
DESIGN SPECTRA	
As	0.128
SDs	0.256
SD1	0.098
SITE CLASS	D
SEISMIC DESIGN CATEGORY (SDC)	HIGH A

HYDRAULIC DESIGN DATA	
DRAINAGE AREA (SQ. MILES)	1.3
DESIGN FLOOD DISCHARGE (C.F.S.)	120
DESIGN FLOOD FREQUENCY (YEARS)	10
DESIGN FLOOD VELOCITY (F.P.S.)	4.9
DESIGN FLOOD ELEVATION (FEET, NAVD)	103.03
BASE (100–YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S.)	233
BASE FLOOD ELEVATION (FEET, NAVD)	104.69
DESIGN AND CHECK SCOUR DATA	
DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	25
DESIGN FLOOD ABUTMENT SCOUR DEPTH (FEET)	0
DESIGN FLOOD PIER SCOUR DEPTH (FEET)	N/A
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
CHECK FLOOD ABUTMENT SCOUR DEPTH (FEET)	0
CHECK FLOOD PIER SCOUR DEPTH (FEET)	N/A
FLOOD OF RECORD	
DISCHARGE (C.F.S.)	N/A
FREQUENCY (IF KNOWN, YEARS)	N/A
MAXIMUM ELEVATION (FEET, NAVD)	N/A
DATE (MM/YYYY)	N/A
HISTORY OF ICE FLOES	N/A
EVIDENCE OF SCOUR AND EROSION	N/A

TEMPORARY WATER CONTROL DESIGN DATA *	
DESIGN FLOOD DISCHARGE (C.F.S.)	T.B.D.
DESIGN FLOOD FREQUENCY (YEARS)	T.B.D.
DESIGN FLOOD VELOCITY (F.P.S.)	T.B.D.
DESIGN FLOOD ELEVATION (FEET, NAVD)	T.B.D.

* TO BE DETERMINED BY THE CONTRACTOR.

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE
TO MASSDOT FOR CONTRACTING

_____ 1/5/26
DISTRICT 4 BRIDGE ENGINEER — DATE

BORING 1 (B–1)

TEST BORING LOG

MILLER ENGINEERING & TESTING, INC.
100 Sheffield Road - Manchester, NH 03103
Ph. (603) 668-6016 - Fax: (603) 668-8641

Project: Billerica St. Culvert, Lowell, MA
Project No: 25.077.NH
Date Start: 05-29-25
Date End: 05-29-25
Sheet 1 & 2 **of** 2
Boring No: B-1
Location: See Plan
Approx. Surface Elev: 104'

GROUNDWATER OBSERVATIONS

	CASING	SAMPLER	Date	Depth	Casing At	Stabilization Period
Type	HSA	SS	05-29-25	3'	38.5'	Upon Completion
Size	2-1/4" ID	1-3/8" ID				
Hammer		140 lbs.				
Fall		30"				

EXIST. GROUND SURFACE EL. = 104.0±
OBS. GROUNDWATER (5/29/2025) EL. = 101.0±
PROP. B.O.F. EL. = 95.80

ELEVATION IN FEET: 110, 100, 90, 80, 70, 60, 50, 40, 30

Depth/ Elev.	Cas bl/ft	Sample No.	Depth Range	Pen.	Rec.	BLOWS 0-6"	6-12"	12-18"	18-24"	Strata Change	Sample Description	Notes
0 104		S-1	0.0-0.5	6	5	5					S-1: Dark brown, fine sand, some organic silt (topsoil)	
		S-1A	0.5-2.0	18	10		40	20	11		S-1A: Black, fine to coarse sand, little gravel (milled asphalt) [USCS: SM]	
		S-2	2.0-3.0	12	6	8	11				S-2: Black, fine to coarse sand, little gravel (milled asphalt) [USCS: SM]	
		S-2A	3.0-4.0	12	3			8	6		S-2A: Brown, fine to medium sand, little silt, trace gravel, wet (FILL) [USCS: SM]	
		S-3	4.0-5.0	12	5	3	4				S-3: Black/Brown, fine to coarse sand, little gravel, wet [FILL) [USCS: SM]	
		S-3A	5.0-6.0	12	5			2	3		S-3A: Dark brown, organic silt, wet [USCS: PT]	
6 98		S-4	6.0-8.0	24	9	6	8	8	9		S-4: Brown/Gray, fine sand, some silt, trace gravel, trace roots [USCS: SM]	
		S-5	9.0-11.0	24	9	4	4	5	6		S-5: Brown/Gray, fine to medium sand, little silt, wet (13" of blow-in, in split-spoon) [USCS: SM]	
12 92		S-6	14.0-16.0	24	11	8	10	13	10		S-6: Gray, silt, little caly, wet (3 - 1/6" clay varves in sample) 13" of blow-in, in split-spoon) [USCS: ML]	
18 86		S-7	19.0-21.0	24	9	2	3	2	3		S-7: Gray, silt, trace fine sand, wet (1.5" layer of gray, fine sand in middle of sample) (7" of blow-in, in split-spoon) [USCS: ML]	
24 80		S-8	24.0-26.0	24	10	2	3	4	7		S-8: Gray, fine to medium sand, little silt, trace subangular gravel, wet [USCS: SM]	
30 74		S-9	29.0-31.0	24	5	2	4	14	17		S-9: ray, fine to medium sand, little silt, trace subangular gravel, wet (12" of blow-in, in split-spoon) [USCS: SM]	
36 68		S-10	34.0-36.0	24	5	3	3	8	31		S-10: ray, fine to medium sand, little silt, little subangular gravel, wet (15" of blow-in, in split-spoon) [USCS: SM]	
		S-11	38.5-38.6	1	0	50/1"					S-11: No recovery	
42 62											BORING TERMINATED AT 38.6 ft	
48 56												
54 50												
60 44												
66 38												
72 32												

Driller: R. Marcoux
Helper: J. Donahue
Inspector: Patrick

COHESIVE CONSISTENCY (Blows/Foot)
0-2 VERY SOFT
2-4 SOFT
4-8 MEDIUM STIFF
8-15 STIFF
15-30 HARD

COHESIONLESS (Blows/Foot)
0-4 VERY LOOSE
4-10 LOOSE
10-30 MEDIUM DENSE
30-50 DENSE
50- VERY DENSE

PROPORTIONS USED
TRACE: 0-10%
LITTLE: 10-20%
SOME: 20-35%
AND: 35-50%

NOTES: 42.6211°N; 71.2945°W

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.

BORING 2 (B–2)

TEST BORING LOG

MILLER ENGINEERING & TESTING, INC.
100 Sheffield Road - Manchester, NH 03103
Ph. (603) 668-6016 - Fax: (603) 668-8641

Project: Billerica St. Culvert, Lowell, MA
Project No: 25.077.NH
Date Start: 05-29-25
Date End: 05-29-25
Sheet 1 **of** 1
Boring No: B-2
Location: See Plan
Approx. Surface Elev: 104'

GROUNDWATER OBSERVATIONS

	CASING	SAMPLER	Date	Depth	Casing At	Stabilization Period
Type	HSA	SS	05-29-25	4.5'	31'	Upon Completion
Size	2-1/4" ID	1-3/8" ID				
Hammer		140 lbs.				
Fall		30"				

EXIST. GROUND SURFACE EL. = 104.0±
OBS. GROUNDWATER (5/29/2025) EL. = 99.5±
PROP. B.O.F. EL. = 95.80

Depth/ Elev.	Cas bl/ft	Sample No.	Depth Range	Pen.	Rec.	BLOWS 0-6"	6-12"	12-18"	18-24"	Strata Change	Sample Description	Notes
0 104		S-1	0.0-0.5	6	2	2					S-1: Dark brown, fine sand, some silt (topsoil)	
		S-1A	0.5-2.0	18	6		7	8	6		S-1A: Brown, fine to coarse sand, little gravel, trace silt (FILL) [USCS: SP-SM]	
		S-2	2.0-4.0	24	6	4	2	2	1		S-2: Brown/Orange, fine sand and silt (glass, plastic and ash in sample) (FILL) [USCS: SM]	
		S-3	4.5-6.0	18	14	1/18"					S-3: Dark brown, silt, trace fine sand, wet (FILL) [USCS: ML]	
6 98		S-3A	6.0-6.5	6	5				3		S-3A: Brown, silt, trace fine sand, wet [USCS: ML]	
		S-4	6.5-8.5	24	10	5	7	8	8		S-4: Brown, fine to coarse sand, little silt, wet [USCS: SM]	
		S-5	9.0-11.0	24	5	3	3	4	5		S-5: Brown, fine to medium sand, little silt, trace coarse sand, wet (10" of blow-in, in split-spoon) [USCS: SM]	
12 92		S-6	14.0-16.0	24	12	4	4	3	5		S-6: Brown, fine to coarse sand, little silt, wet (7" of blow-in, in split-spoon) [USCS: SM]	
18 86		S-7	19.5-21.0	18	7	9	8	6			S-7: Gray, fine to coarse sand, trace subangular gravel, wet (13" of blow-in, in split-spoon) [USCS: SM]	
24 80		S-8	24.0-25.5	18	6	48	93	17			S-8: Gray, fine to coarse sand, trace subangular gravel, wet (15" of blow-in, in split-spoon) [USCS: SM]	
		S-8A	25.5-26.0	6	3				14		S-8A: Gray, silt, little subangular gravel, wet [USCS: ML]	
30 74		S-9	29.0-31.0	24	0	14	33	46	45		S-9: No recovery (24" of blow-in, in split-spoon)	
36 68											BORING TERMINATED AT 31 ft	

Driller: R. Marcoux
Helper: J. Donahue
Inspector: Patrick

COHESIVE CONSISTENCY (Blows/Foot)
0-2 VERY SOFT
2-4 SOFT
4-8 MEDIUM STIFF
8-15 STIFF
15-30 HARD

COHESIONLESS (Blows/Foot)
0-4 VERY LOOSE
4-10 LOOSE
10-30 MEDIUM DENSE
30-50 DENSE
50- VERY DENSE

PROPORTIONS USED
TRACE: 0-10%
LITTLE: 10-20%
SOME: 20-35%
AND: 35-50%

NOTES: 42.6208°N; 71.2944°W

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.

BORING NOTES:

1. LOCATION OF BORINGS SHOWN ON THE PLAN THUS: ◕
2. BORINGS ARE TAKEN FOR THE PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF THE 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 $1\frac{3}{8}$" I.D. SPLIT SPOON SAMPLER 6" USING A 140 POUND WEIGHT FALLING 30".
5. BORING SAMPLES ARE STORED BY MILLER ENGINEERING & TESTING, INC., AT 100 SHEFFIELD ROAD, MANCHESTER, NH 03103. THE CONTRACTOR MAY EXAMINE THE SOIL SAMPLES BY CONTACTING MILLER ENGINEERING & TESTING.
6. ALL BORINGS WERE MADE IN MAY 2025 BY MILLER ENGINEERING & TESTING, INC.
7. THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988 IS USED THROUGHOUT.

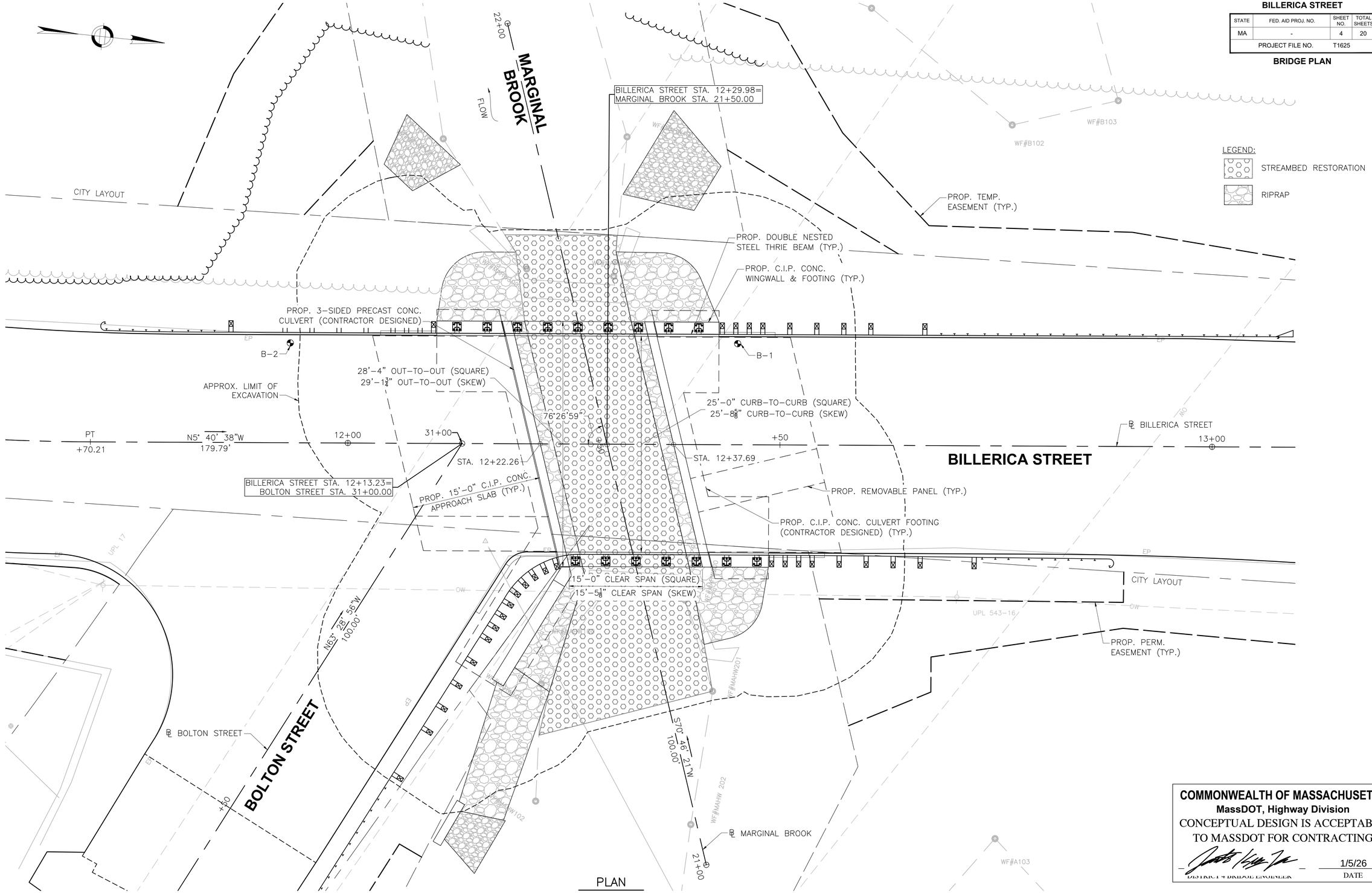
COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

DISTRICT 4 BRIDGE ENGINEER — DATE 1/5/26

LOWELL
BILLERICA STREET

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	20
PROJECT FILE NO.	T1625		

BRIDGE PLAN



PLAN
SCALE: 1" = 5'

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE
TO MASSDOT FOR CONTRACTING

DISTRICT 4 BRIDGE ENGINEER — 1/5/26 DATE

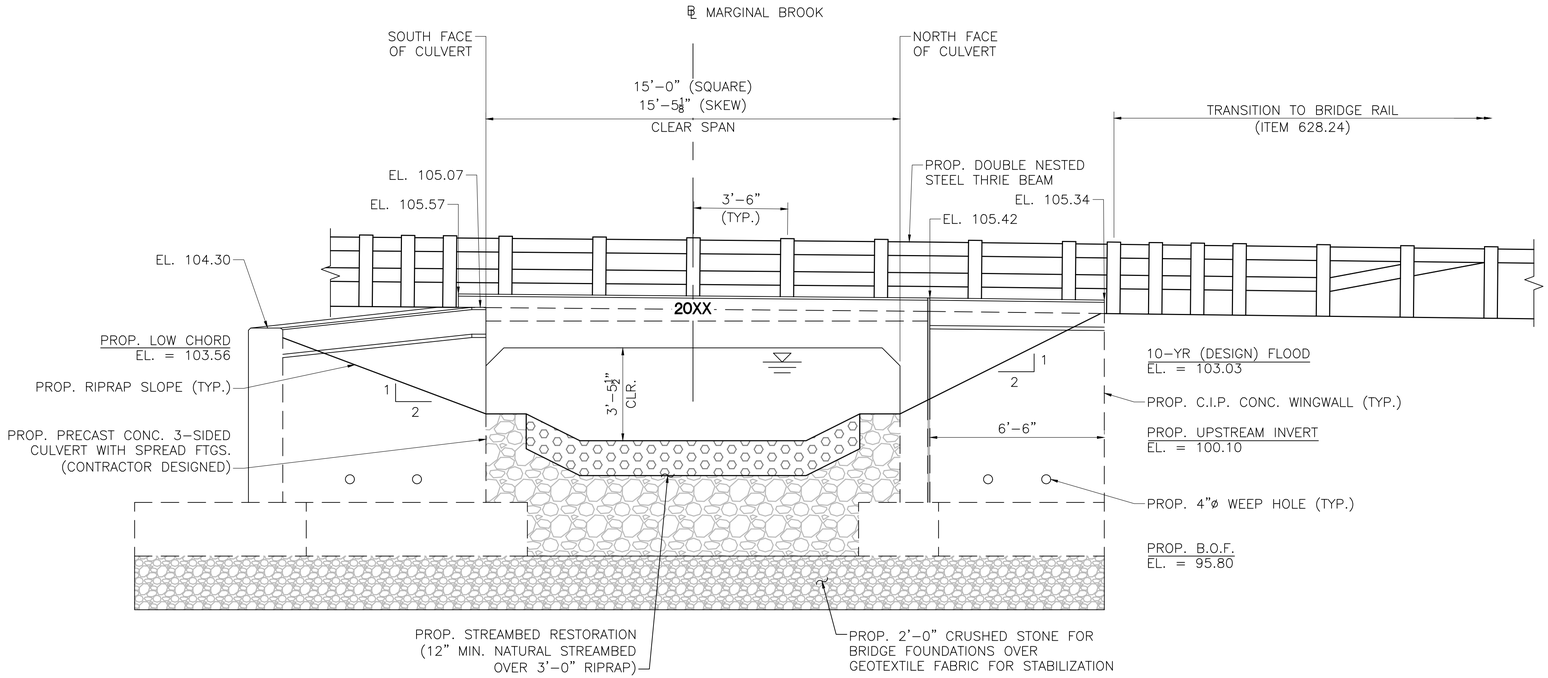
T1625_BR4(PLAN & ELEV).DWG Plotted on 5-Jan-2026 1:18 PM

MGL CH 85 S35 Review Submission 5-January-2026

LOWELL
BILLERICA STREET

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	5	20
PROJECT FILE NO.	T1625		

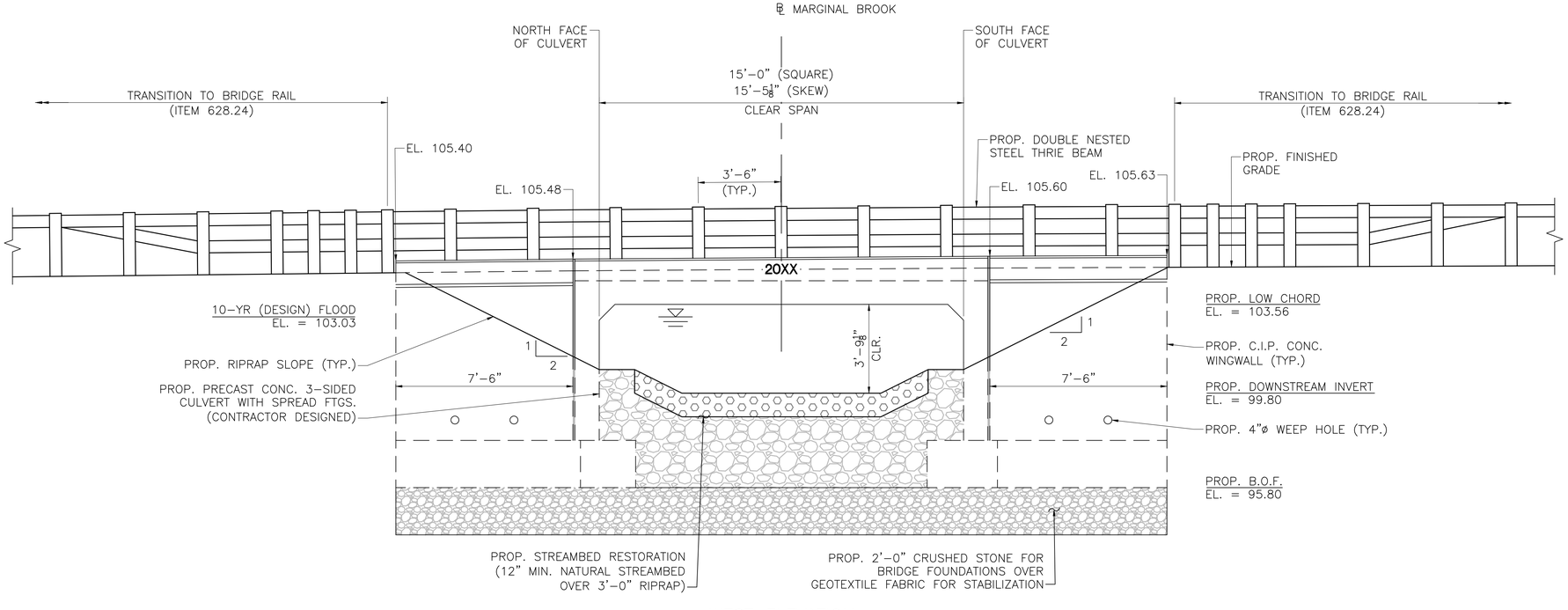
BRIDGE ELEVATIONS



EAST ELEVATION
SCALE: ⅜" = 1'-0"

NOTE:

SEE SHEET 6 FOR GUARDRAIL NOTES.



WEST ELEVATION
SCALE: ⅜" = 1'-0"

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

DISTRICT 4 BRIDGE ENGINEER — 1/5/26 DATE

LOWELL
BILLERICA STREET

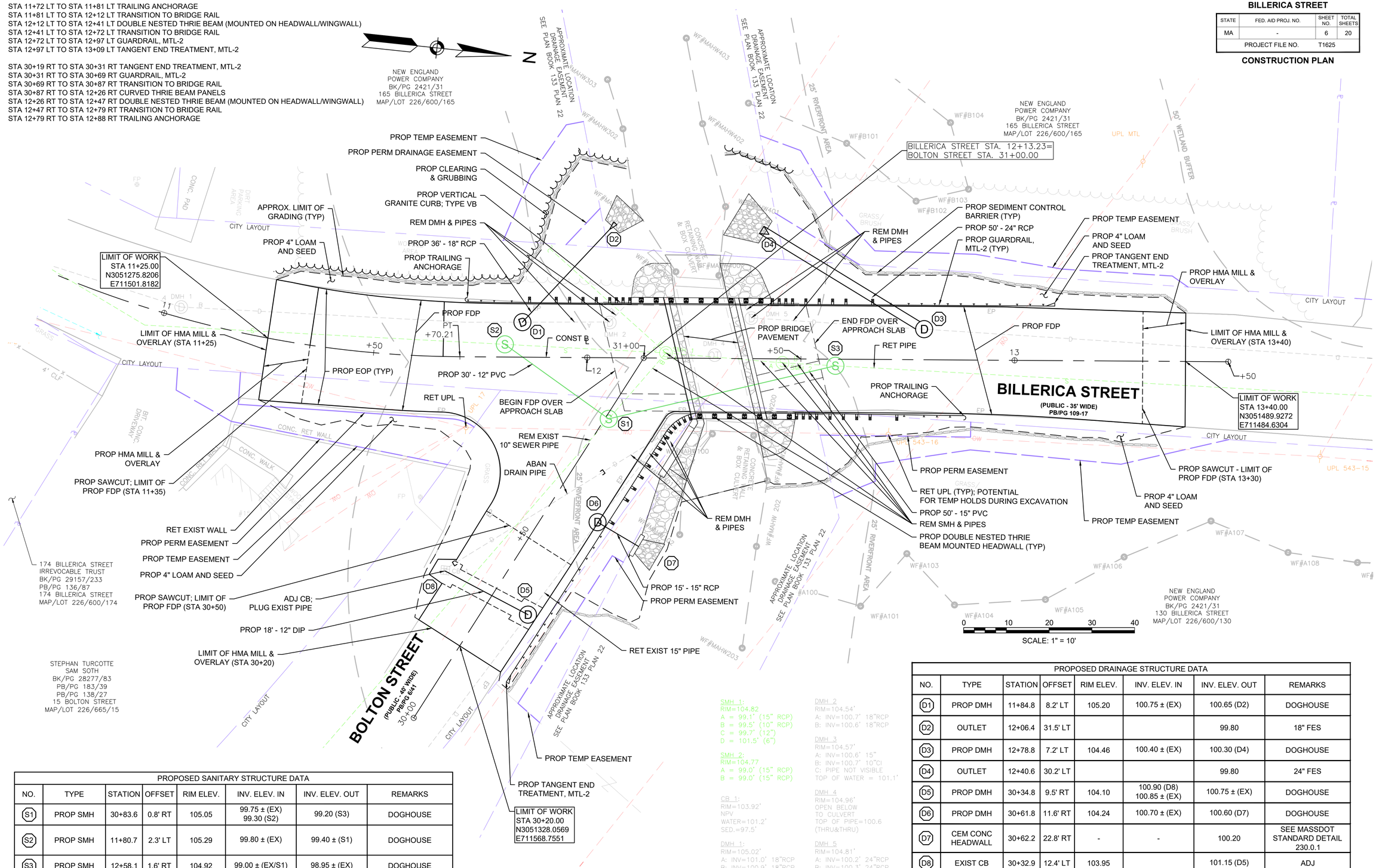
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	6	20
PROJECT FILE NO.	T1625		

CONSTRUCTION PLAN

GUARDRAIL NOTES

STA 11+72 LT TO STA 11+81 LT TRAILING ANCHORAGE
STA 11+81 LT TO STA 12+12 LT TRANSITION TO BRIDGE RAIL
STA 12+12 LT TO STA 12+41 LT DOUBLE NESTED THRIE BEAM (MOUNTED ON HEADWALL/WINGWALL)
STA 12+41 LT TO STA 12+72 LT TRANSITION TO BRIDGE RAIL
STA 12+72 LT TO STA 12+97 LT GUARDRAIL, MTL-2
STA 12+97 LT TO STA 13+09 LT TANGENT END TREATMENT, MTL-2

STA 30+19 RT TO STA 30+31 RT TANGENT END TREATMENT, MTL-2
STA 30+31 RT TO STA 30+69 RT GUARDRAIL, MTL-2
STA 30+69 RT TO STA 30+87 RT TRANSITION TO BRIDGE RAIL
STA 30+87 RT TO STA 12+26 RT CURVED THRIE BEAM PANELS
STA 12+26 RT TO STA 12+47 RT DOUBLE NESTED THRIE BEAM (MOUNTED ON HEADWALL/WINGWALL)
STA 12+47 RT TO STA 12+79 RT TRANSITION TO BRIDGE RAIL
STA 12+79 RT TO STA 12+88 RT TRAILING ANCHORAGE



PROPOSED SANITARY STRUCTURE DATA

NO.	TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
S1	PROP SMH	30+83.6	0.8' RT	105.05	99.75 ± (EX) 99.30 (S2)	99.20 (S3)	DOGHOUSE
S2	PROP SMH	11+80.7	2.3' LT	105.29	99.80 ± (EX)	99.40 ± (S1)	DOGHOUSE
S3	PROP SMH	12+58.1	1.6' RT	104.92	99.00 ± (EX/S1)	98.95 ± (EX)	DOGHOUSE

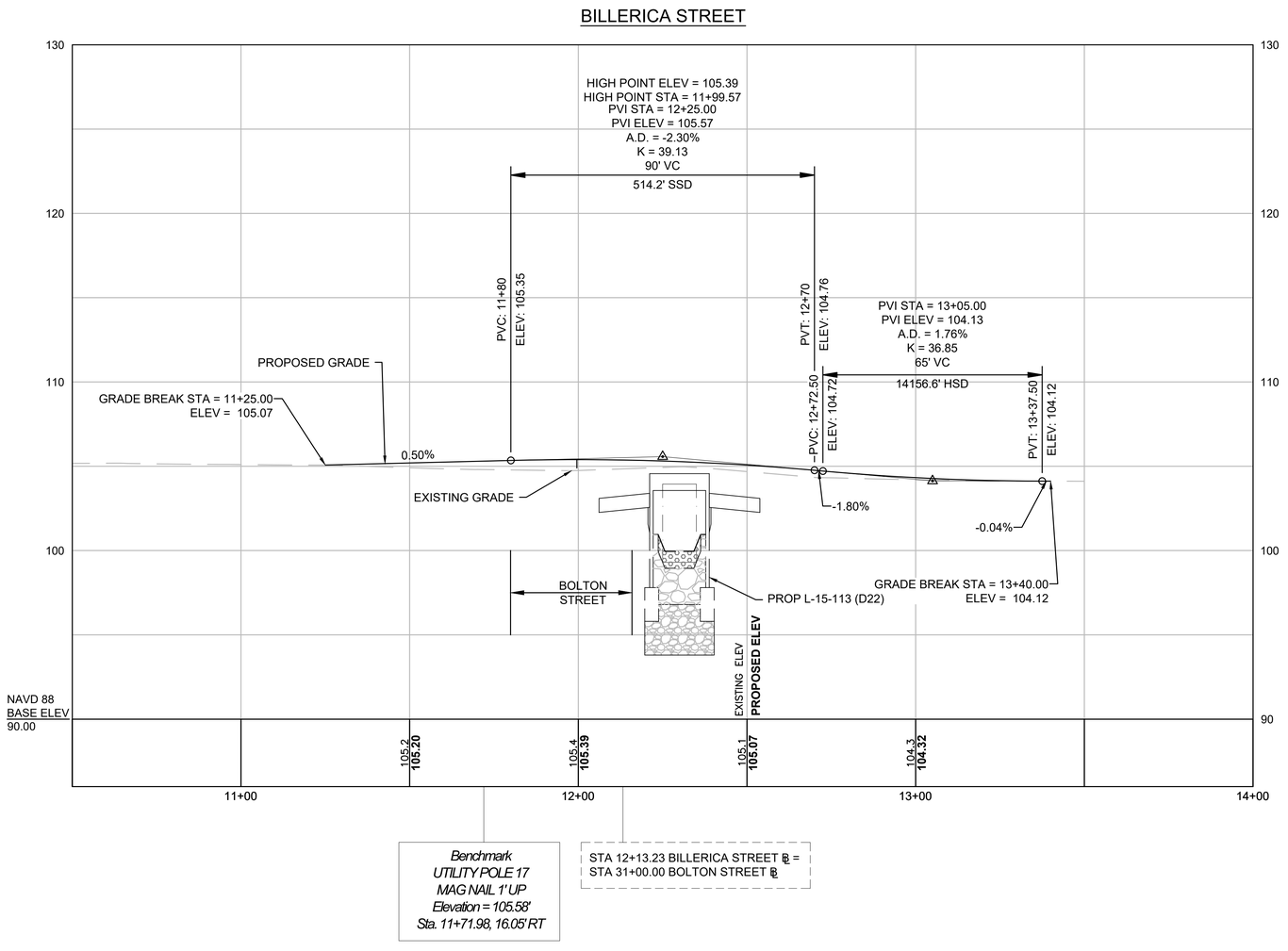
PROPOSED DRAINAGE STRUCTURE DATA

NO.	TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
D1	PROP DMH	11+84.8	8.2' LT	105.20	100.75 ± (EX)	100.65 (D2)	DOGHOUSE
D2	OUTLET	12+06.4	31.5' LT			99.80	18" FES
D3	PROP DMH	12+78.8	7.2' LT	104.46	100.40 ± (EX)	100.30 (D4)	DOGHOUSE
D4	OUTLET	12+40.6	30.2' LT			99.80	24" FES
D5	PROP DMH	30+34.8	9.5' RT	104.10	100.90 (D8) 100.85 ± (EX)	100.75 ± (EX)	DOGHOUSE
D6	PROP DMH	30+61.8	11.6' RT	104.24	100.70 ± (EX)	100.60 (D7)	DOGHOUSE
D7	CEM CONC HEADWALL	30+62.2	22.8' RT	-	-	100.20	SEE MASSDOT STANDARD DETAIL 230.0.1
D8	EXIST CB	30+32.9	12.4' LT	103.95		101.15 (D5)	ADJ

LOWELL
BILLERICA STREET

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	7	20
PROJECT FILE NO.	T1625		

CONSTRUCTION PROFILE

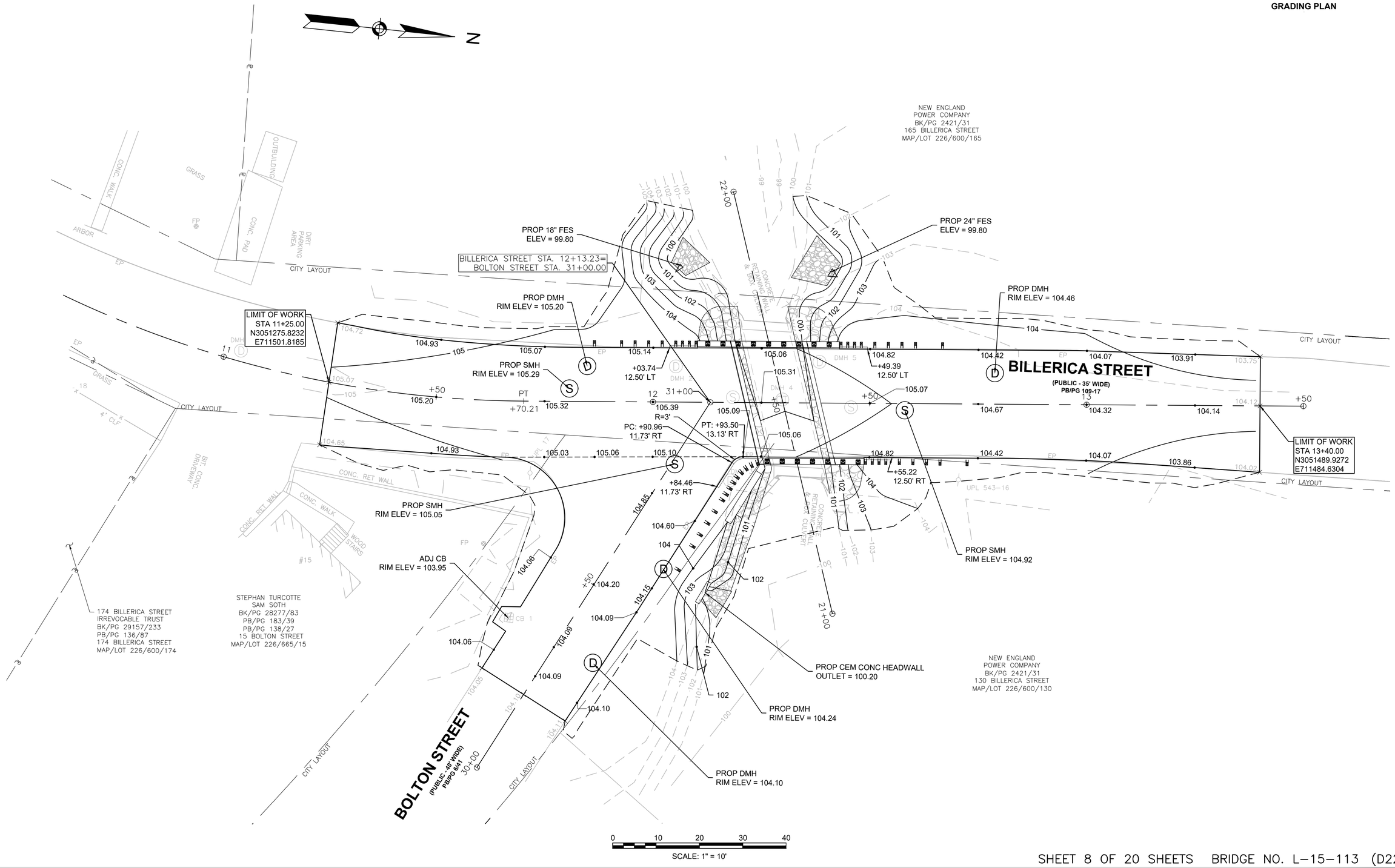


HOR. SCALE IN FEET
20 0 20 40
4 0 4 8
VER. SCALE IN FEET

LOWELL
BILLERICA STREET

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	8	20
PROJECT FILE NO.	T1625		

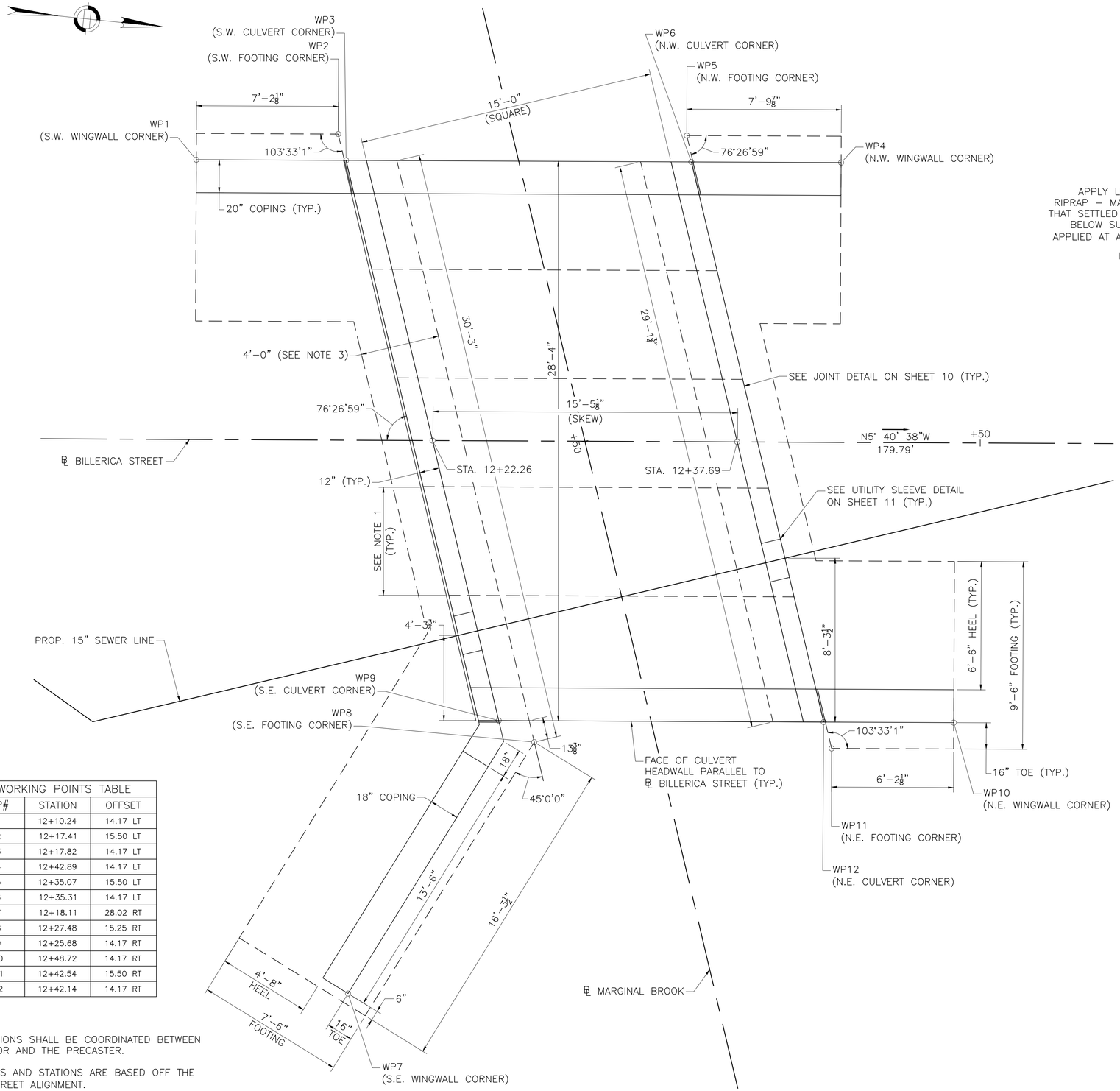
GRADING PLAN



LOWELL
BILLERICA STREET

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	9	20
PROJECT FILE NO.	T1625		

FOUNDATION PLAN



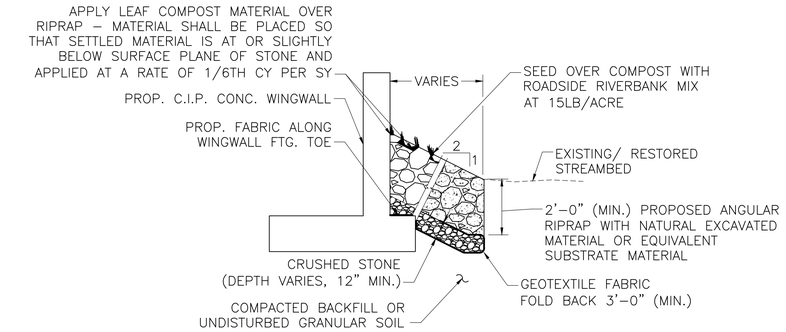
PROPOSED CULVERT PLAN

SCALE: ⅜" = 1'-0"

WORKING POINTS TABLE		
WP#	STATION	OFFSET
1	12+10.24	14.17 LT
2	12+17.41	15.50 LT
3	12+17.82	14.17 LT
4	12+42.89	14.17 LT
5	12+35.07	15.50 LT
6	12+35.31	14.17 LT
7	12+18.11	28.02 RT
8	12+27.48	15.25 RT
9	12+25.68	14.17 RT
10	12+48.72	14.17 RT
11	12+42.54	15.50 RT
12	12+42.14	14.17 RT

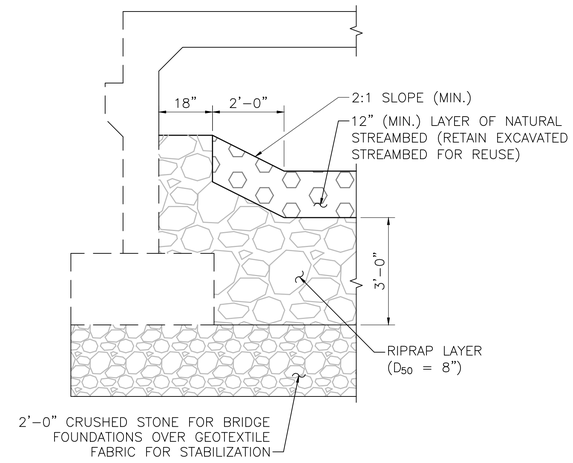
NOTES:

1. WIDTH OF SECTIONS SHALL BE COORDINATED BETWEEN THE CONTRACTOR AND THE PRECASTER.
2. WORKING POINTS AND STATIONS ARE BASED OFF THE ℄ BILLERICA STREET ALIGNMENT.
3. C.I.P. CULVERT FOOTING DIMENSION IS CONCEPTUAL AND SHALL BE DESIGNED BY THE CONTRACTOR.



RIPRAP DETAIL AT WINGWALLS

SCALE: ¼" = 1'-0"

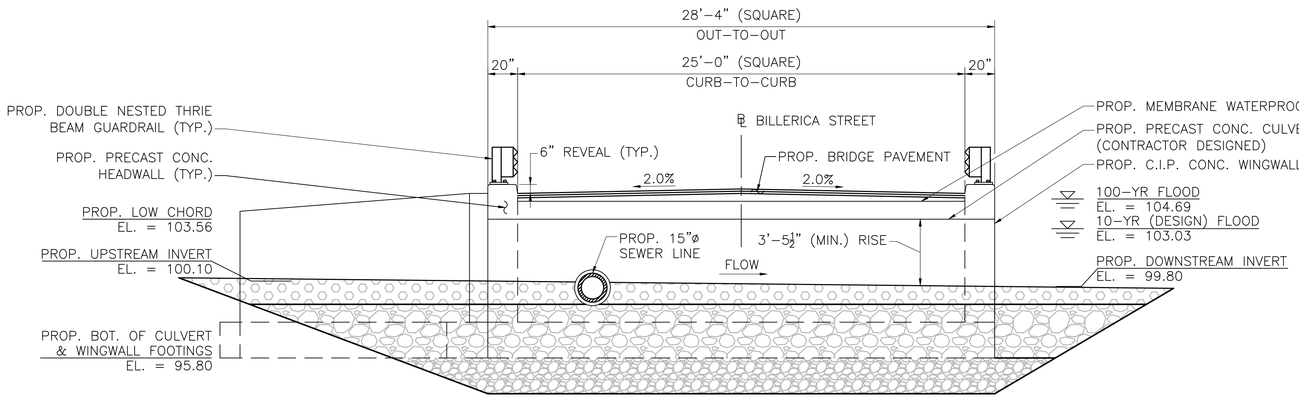


STREAMBED DETAIL

SCALE: ½" = 1'-0"

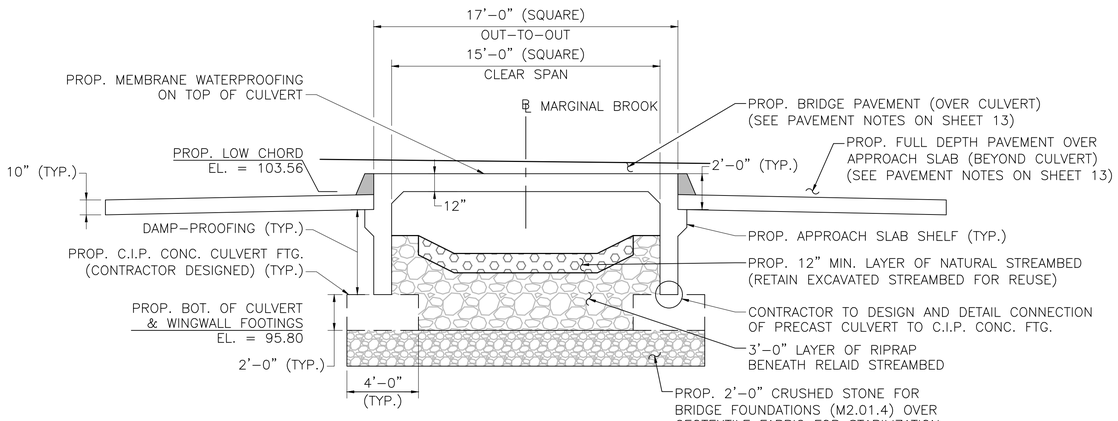
COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

DISTRICT 4 BRIDGE ENGINEER — 1/5/26 DATE



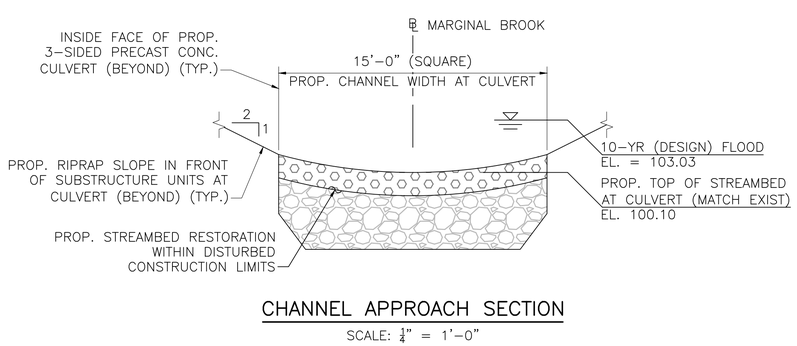
TRANSVERSE SECTION (LOOKING SOUTH)

SCALE: ¼" = 1'-0"



TYPICAL CULVERT SECTION

SCALE: ¼" = 1'-0"



CHANNEL APPROACH SECTION

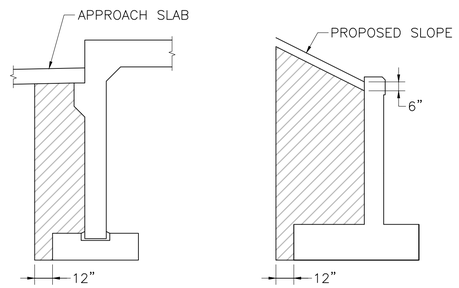
SCALE: ¼" = 1'-0"

TRANSVERSE SECTION NOTES:

1. EXISTING CULVERT AND HEADWALLS NOT SHOWN FOR CLARITY. CONTRACTOR IS RESPONSIBLE FOR DEMOLITION OF ALL EXISTING CULVERT INFRASTRUCTURE.
2. CONTRACTOR SHALL SMOOTHLY TRANSITION ALL PROPOSED ELEMENTS INTO THE EXISTING APPROACHES AND EMBANKMENT SLOPES.
3. WEEP HOLES NOT SHOWN. CONTRACTOR IS PERMITTED TO INCLUDE WEEP HOLES IF WARRANTED BY DESIGN.

PRECAST CONCRETE CULVERT NOTES:

1. CONTRACTOR SHALL SUBMIT PRECAST CONCRETE 3-SIDED BOX CULVERT AND C.I.P. FOOTING DESIGN CALCULATIONS ALONG WITH SHOP DRAWINGS SEALED BY A PROFESSIONAL ENGINEER REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS FOR APPROVAL PRIOR TO FABRICATION. PRESCRIBED HYDRAULIC OPENING (3'-5½" X 15'-0") SHALL BE MAINTAINED.
2. ALL CULVERT CONCRETE SHALL BE 5000 PSI, ¾", 685 HP CEMENT CONCRETE. ALL CULVERT FOOTING AND WINGWALL CONCRETE IS CAST IN PLACE AND SHALL BE 5000 PSI, ¾", 685 CEMENT CONCRETE (SEE SHEET 2 FOR ADDITIONAL CONCRETE NOTES).
3. 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.
4. THE C.I.P. CULVERT AND WINGWALL FOOTINGS SHALL BE CAST AS ONE CONTINUOUS FOOTING. CONTRACTOR SHALL DETAIL THE FOOTING REINFORCING AT THE TRANSITION FROM THE CULVERT TO THE WINGWALL FOOTING REINFORCEMENT.
5. REINFORCEMENT SHALL BE PLACED WITH A MINIMUM OF 1½" COVER.
6. THE CONTRACTOR SHALL DESIGN HEADWALL CONNECTION TO CULVERT FOR IMPACT LOADS AND SHALL SUBMIT DESIGN CALCULATIONS AS PART OF THE SHOP DRAWINGS.
7. DESIGN SHALL BE IN ACCORDANCE WITH THE 2024 AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR HL-93 LOADING.
8. A FACTORED BEARING RESISTANCE OF 3.06 KSF SHALL BE USED IN THE DESIGN OF THE CULVERT FOOTINGS (FOR FOOTINGS THAT ARE OVER-EXCAVATED AND PLACED ON CRUSHED STONE, 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.
9. CONTRACTOR SHALL BE PERMITTED TO SUBSTITUTE BARS WITH EQUIVALENT DOWEL BAR SPLICERS IN THE APPROACH SLAB SHELF.
10. UTILITY SLEEVE SHALL BE CAST INTO THE PRECAST CULVERT. PRECASTER SHALL COORDINATE WITH THE CONTRACTOR TO VERIFY SIZE AND LAYOUT OF SLEEVE.



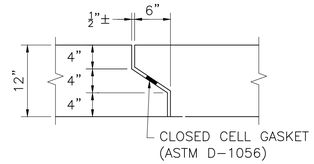
CULVERT WINGWALL

NOTES:

1. HATCHED AREA INDICATES LIMITS OF GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES. SPLAYED WINGWALL SHOWN. U-WINGWALL SIMILAR.
2. 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

NOT TO SCALE



NOTES:

1. JOINT DIMENSIONS ARE CONCEPTUAL AND SHALL BE CONFIRMED BY THE PRECASTER.
2. ALL CULVERT JOINTS SHALL BE LAPPED AND SEALED WITH JOINT SEALER.
3. ALL CULVERT SECTIONS SHALL ALSO BE MECHANICALLY TIED TOGETHER. ALL BOLT POCKETS SHALL BE GROUTED AFTER INSTALLATION OF BOLTS.

JOINT DETAIL

SCALE: 1" = 1'-0"

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
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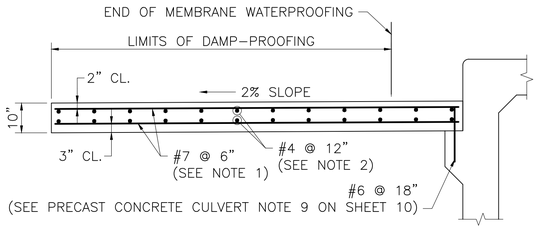
DISTRICT 4 BRIDGE ENGINEER — 1/5/26 DATE

LOWELL
BILLERICA STREET

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	10	20
PROJECT FILE NO.	T1625		

CULVERT DETAILS (1 OF 3)

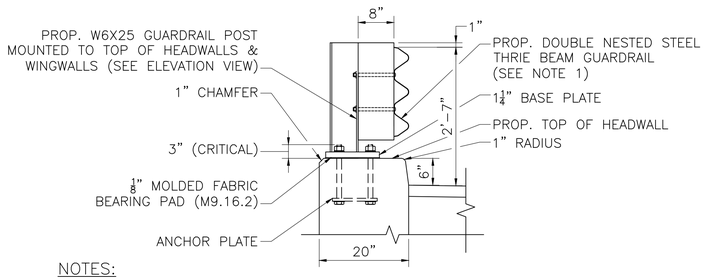


NOTES:

1. PLACE LONGITUDINAL REINFORCEMENT PARALLEL TO ℄ OF CONST.
2. PLACE TRANSVERSE REINFORCEMENT PARALLEL TO CULVERT.
3. ALL REINFORCEMENT SHALL NOT BE COATED.

APPROACH SLAB DETAILS

SCALE: ½" = 1'–0"

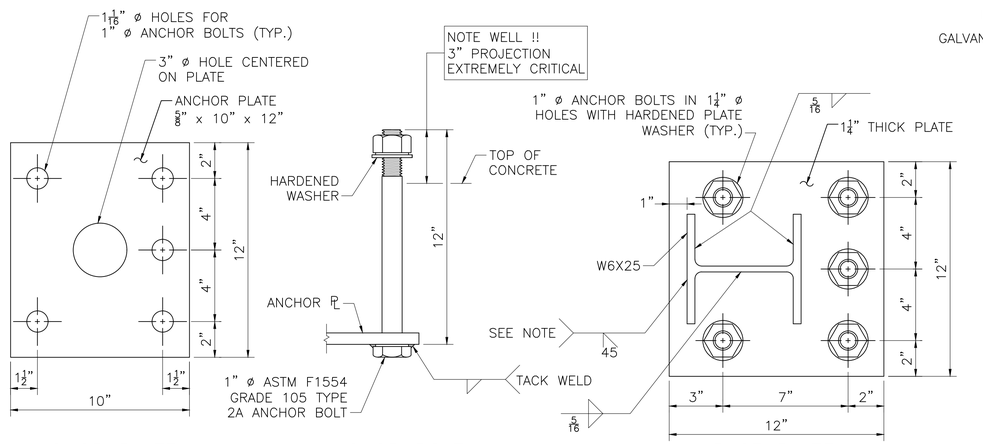


NOTES:

1. REFER TO MASSDOT CONST. STD. DETAILS 601.0.2 AND 601.0.3 FOR ADDITIONAL INFORMATION REGARDING THE THRIE BEAM GUARDRAIL AND HARDWARE DETAILS.
2. SEE BASE PLATE, ANCHOR PLATE AND ANCHOR BOLT DETAILS ON THIS SHEET FOR ADDITIONAL INFORMATION.

GUARDRAIL SECTION THROUGH TOP OF HEADWALL

SCALE: ¾" = 1'–0"



ANCHOR PLATE

SCALE: 3" = 1'–0"

ANCHOR BOLT

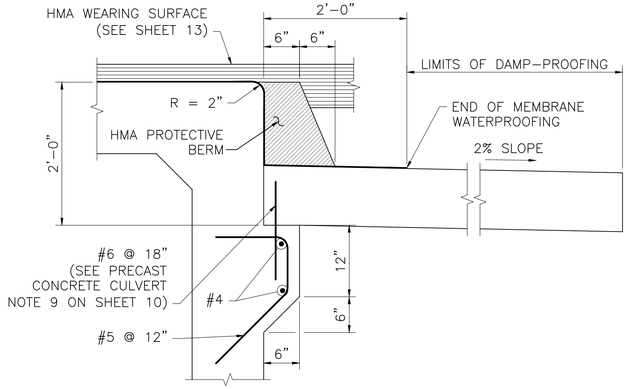
SCALE: 3" = 1'–0"

BASE PLATE

SCALE: 3" = 1'–0"

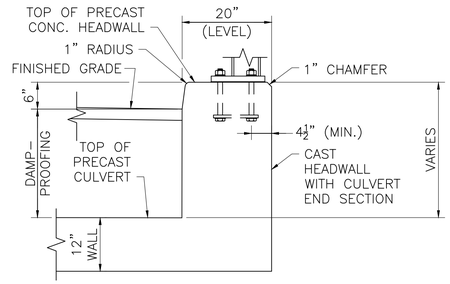
NOTE:

POST TO FLANGE WELD DOES NOT REQUIRE MAGNETIC PARTICLE TESTING. BEVEL OUTSIDE FLANGES OF POST. FIT POST TO BASE PLATE. WELD ⅝" FILLET ON INSIDE OF FLANGE AND WEB. BACKGOUGE OUTSIDE OF FLANGE TO SOUND METAL. COMPLETE GROOVE WELD WITH MINIMUM OF ⅛" REINFORCEMENT. WELD IS THE SAME ON BOTH FLANGES.



APPROACH SLAB SHELF

SCALE: 1" = 1'–0"

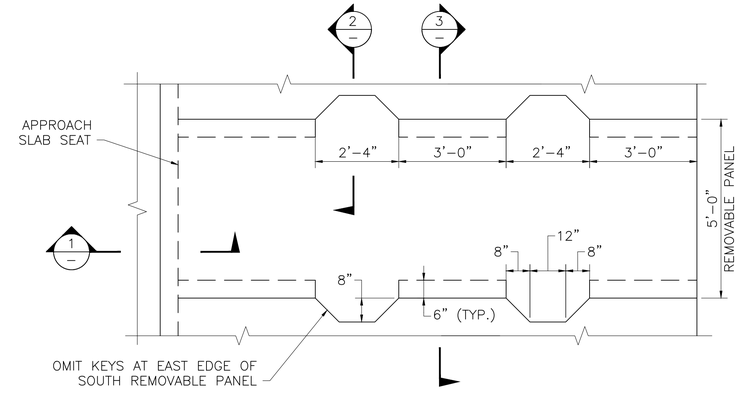


NOTE:

PRECAST HEADWALL REINFORCEMENT SHALL BE CONTRACTOR DESIGNED. SEE PRECAST CONCRETE CULVERT NOTE 6 ON SHEET 10.

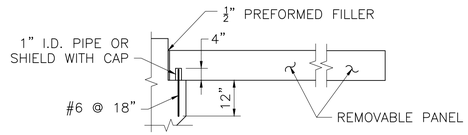
TYPICAL SECTION THROUGH PRECAST HEADWALL

SCALE: ¾" = 1'–0"



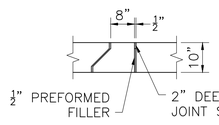
PLAN OF REMOVABLE PANEL

SCALE: ½" = 1'–0"



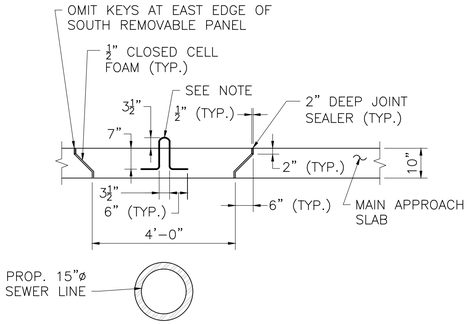
SECTION 1

SCALE: ½" = 1'–0"



SECTION 2

SCALE: ½" = 1'–0"

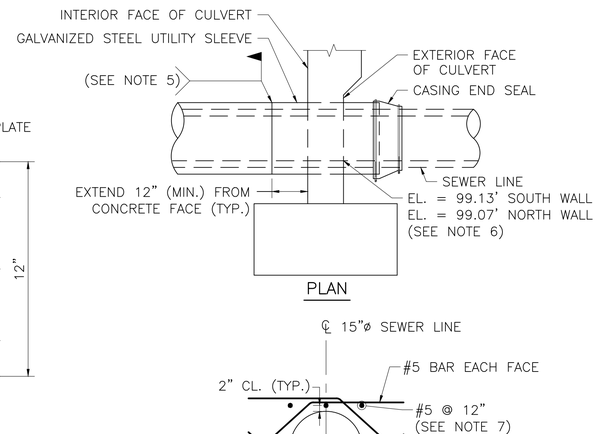


NOTE:

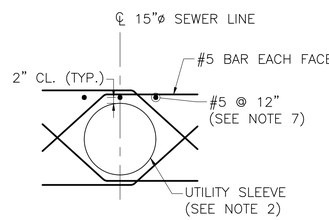
2 LIFT HOOKS REQUIRED. USE #5 COATED REBAR AT QUARTER POINTS.

SECTION 3

SCALE: ½" = 1'–0"



PLAN



ELEVATION

UTILITY SLEEVE AT CULVERT

SCALE: ½" = 1'–0"

UTILITY SLEEVE NOTES:

1. DIMENSIONS ARE SQUARE TO CULVERT.
2. UTILITY SLEEVES SHALL BE STEEL PIPE CONFORMING TO ASTM A 53, TYPE S, GRADE B, STANDARD WEIGHT, PLAIN ENDS, HOT–DIP GALVANIZED AND SHALL BE CAST INTO PRECAST THREE–SIDED CONCRETE CULVERT.
3. CONTRACTOR SHALL COORDINATE WITH UTILITY OWNER TO PROVIDE A SLEEVE SIZE CONSISTENT WITH THE INSULATION AND UTILITY SIZE REQUIREMENTS.
4. 3'–0" (MIN.) LENGTH STEEL UTILITY SLEEVE SHALL BE CAST WITHIN THE PRECAST CONCRETE CULVERT. CONTRACTOR TO INSTALL ADDITIONAL UTILITY SLEEVE ACROSS THE BROOK TO PROTECT THE SEWER LINE WITHIN THE CULVERT.
5. CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN OF THE UTILITY SLEEVE WELD.
6. CONTRACTOR TO INSTALL SEWER LINE THROUGH SLEEVE AT PROPER ELEVATION TO ALLOW FOR PROPER FLOW. ELEVATIONS PROVIDED ARE FOR THE INSIDE OF THE SEWER LINE AT THE CULVERT WALL.
7. BEND #5 @ 12" APPROACH SLAB SHELF BAR AS REQUIRED TO AVOID UTILITY SLEEVE PRIOR TO PRECASTING.

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
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DISTRICT 4 BRIDGE ENGINEER — 1/5/26 DATE

LOWELL
BILLERICA STREET

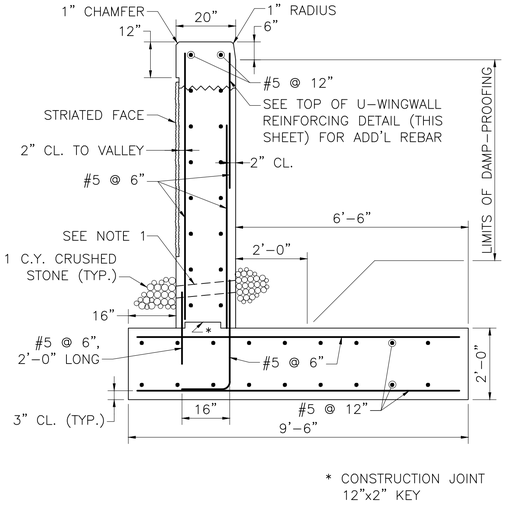
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	11	20
PROJECT FILE NO.	T1625		

CULVERT DETAILS (2 OF 3)

LOWELL
BILLERICA STREET

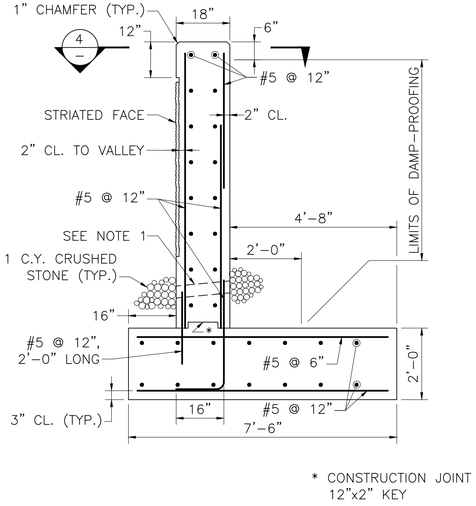
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	12	20
PROJECT FILE NO.	T1625		

CULVERT DETAILS (3 OF 3)



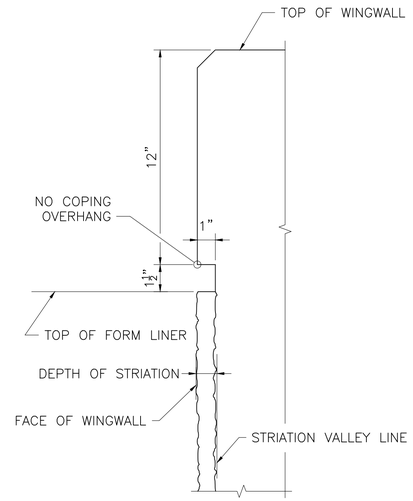
TYPICAL WINGWALL SECTION

SCALE: $\frac{1}{2}$" = 1'-0"



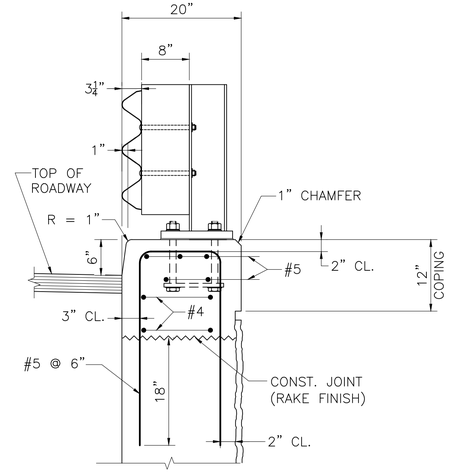
SOUTHWEST WINGWALL SECTION

SCALE: $\frac{1}{2}$" = 1'-0"



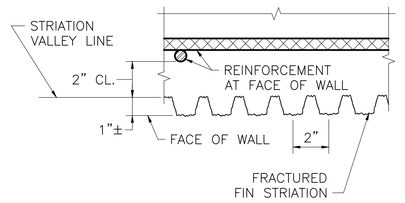
DETAIL AT TOP OF WINGWALL

SCALE: 3" = 1'-0"



TOP OF U-WINGWALL REINFORCING DETAIL

SCALE: 1" = 1'-0"



NOTES:

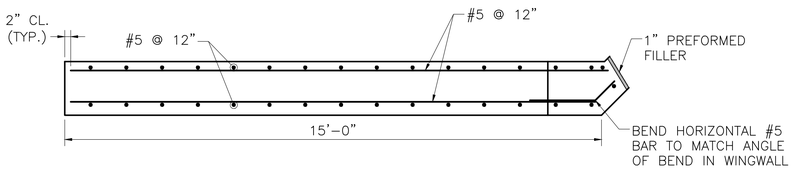
1. THE CONTRACTOR SHALL MAKE SURE THAT THE STRIATION FINS ARE PLUMB AND LINED UP VERTICALLY FROM PANEL TO PANEL FOR THE FULL HEIGHT OF THE WALL.
2. THE HORIZONTAL JOINT MAY BE OMITTED IF THE CONTRACTOR CAN DEMONSTRATE THAT THE FORM LINER PANELS CAN BE INSTALLED END TO END WITHOUT CREATING A VISIBLE SEAM IN THE FINAL CAST CONCRETE.

TYPICAL STRIATION DETAIL

SCALE: 3" = 1'-0"

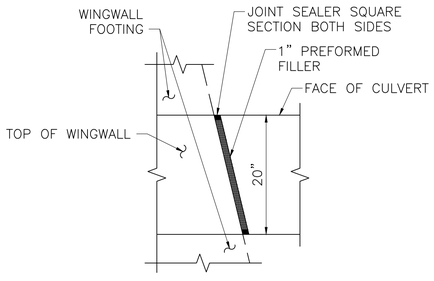
WINGWALL CONSTRUCTION NOTES:

1. PROVIDE TWO 4"ø WEEP HOLES IN EACH WINGWALL, EQUALLY SPACED. WEEP HOLES SHALL LOCATED 12" ABOVE THE HEEL OF THE FOOTING SLOPING 1" PER FOOT TOWARDS THE FRONT FACE. PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF WEEP HOLE.
2. FACTORED BEARING PRESSURE PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.
   - STRENGTH I LIMIT STATE
     FACTORED BEARING PRESSURE (SW WINGWALL) = 2.02 KSF
     FACTORED BEARING PRESSURE (NW, NE, AND SE WINGWALL) = 2.10 KSF
   - EXTREME EVENT II LIMIT STATE
     FACTORED BEARING PRESSURE (NW, NE, AND SE WINGWALL) = 2.91 KSF
3. FACTORED BEARING RESISTANCE = 4.67 KSF FOR THE STRENGTH LIMIT STATE AND IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE OF 10.375 KSF AND A RESISTANCE FACTOR OF 0.45.

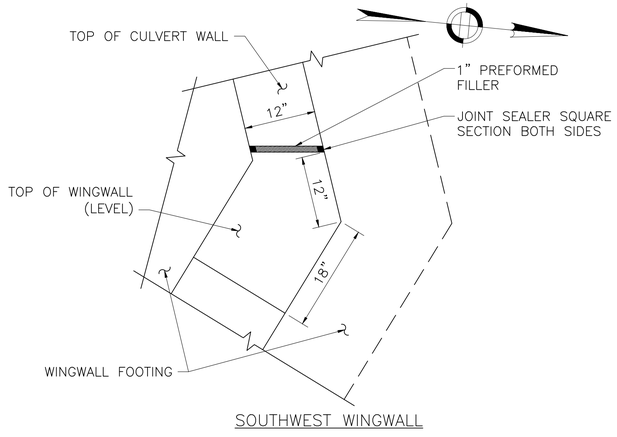


SECTION 4 –

SCALE: $\frac{1}{2}$" = 1'-0"



TYPICAL WINGWALL



SOUTHWEST WINGWALL

EXPANSION JOINT DETAIL

SCALE: 1" = 1'-0"

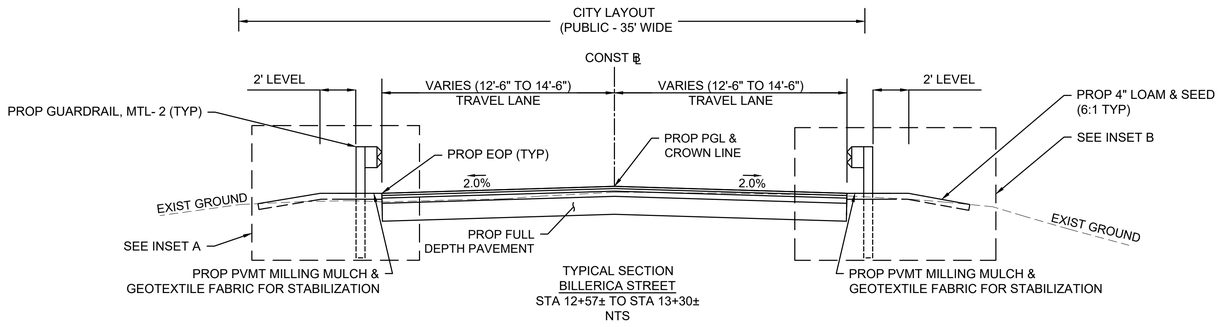
COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

DISTRICT 4 BRIDGE ENGINEER — 1/5/26 DATE

LOWELL
BILLERICA STREET

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	13	20
PROJECT FILE NO.	T1625		

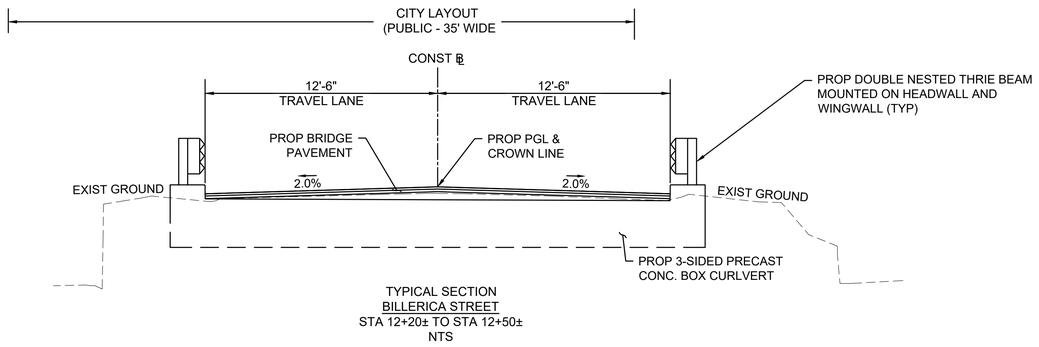
TYPICAL SECTIONS AND PAVEMENT NOTES



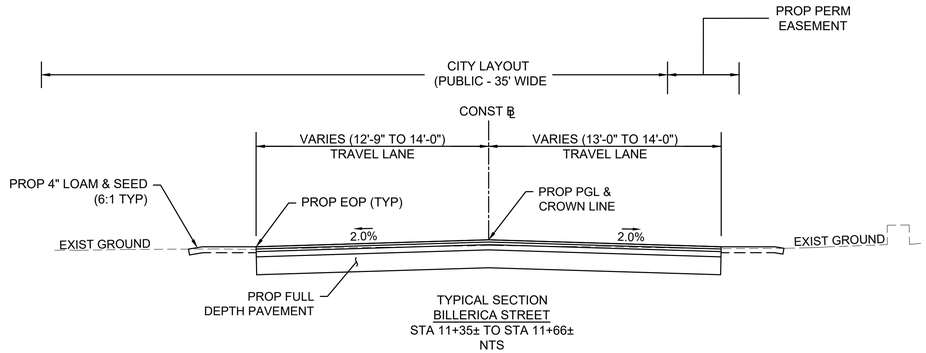
TYPICAL SECTION
BILLERICA STREET
STA 12+57± TO STA 13+30±
NTS

INSET A
STA 13+08 TO STA 13+30

INSET B
STA 12+88 TO STA 13+30



TYPICAL SECTION
BILLERICA STREET
STA 12+20± TO STA 12+50±
NTS



TYPICAL SECTION
BILLERICA STREET
STA 11+35± TO STA 11+66±
NTS

0 20 50 100
SCALE: 1" = 20'

PAVEMENT NOTES:

PROPOSED FULL DEPTH PAVEMENT:
LIMITS: STA 11+35 TO STA 12+21
STA 12+39 TO STA 13+30

SURFACE: 1½" SUPERPAVE SURFACE COURSE – 12.5 (SSC – 12.5) OVER
1¾" SUPERPAVE INTERMEDIATE COURSE – 19.0 (SIC – 19.0) OVER

BASE: 3½" SUPERPAVE BASE COURSE – 37.5 (SBC – 37.5) OVER

SUBBASE: 12" GRAVEL BORROW, TYPE b

PROPOSED FULL DEPTH PAVEMENT (AT APPROACH SLABS):
LIMITS: STA 12+01 TO STA 12+21
STA 12+39 TO STA 12+57

SURFACE: 1½" SUPERPAVE SURFACE COURSE – 12.5 (SSC – 12.5) OVER
1¾" SUPERPAVE INTERMEDIATE COURSE – 19.0 (SIC – 19.0) OVER

BASE: 3½" SUPERPAVE BASE COURSE – 37.5 (SBC – 37.5) OVER

SUBBASE: VARIABLE DEPTH GRAVEL BORROW, TYPE b, TO MEET PROPOSED LINES AND GRADES

PROPOSED BRIDGE PAVEMENT:
LIMITS: STA 12+21 TO STA 12+39

SURFACE: 1½" SUPERPAVE SURFACE COURSE – 12.5 (SSC – 12.5) OVER
1¾" SUPERPAVE INTERMEDIATE COURSE – 19.0 (SIC – 19.0) OVER

BASE: VARIABLE DEPTH SUPERPAVE BASE COURSE – 37.5 (SBC – 37.5) TO MEET
PROPOSED LINES AND GRADES

PROPOSED HMA MILL & OVERLAY:
LIMITS: STA 11+25 TO STA 11+35
STA 13+30 TO STA 13+40
STA 30+20 TO STA 30+50

SURFACE: 1½" SUPERPAVE SURFACE COURSE – 12.5 (SSC –12.5) OVER
1½" PAVEMENT FINE MILLING

PROPOSED PERMANENT PAVEMENT TRENCH PATCH:

SURFACE: 1½" SUPERPAVE SURFACE COURSE – 12.5 (SSC – 12.5) OVER
1¾" SUPERPAVE INTERMEDIATE COURSE – 19.0 (SIC – 19.0) OVER
VARIABLE DEPTH (SEE GENERAL PAVEMENT NOTE 5)
SUPERPAVE INTERMEDIATE COURSE – 19.0 (SIC –19.0) COMPACTED
IN 2¼" (MIN) AND 3' (MAX) LIFTS OVER

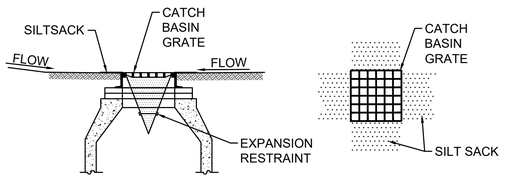
BASE: 8" GRAVEL BORROW, TYPE b OVER

SUBBASE: EXISTING MATERIAL SUITABLE FOR REUSE SUPPLEMENTED WITH
GRAVEL BORROW AS NECESSARY TO MATCH GRADE

GENERAL PAVEMENT NOTES:

1. ASPHALT EMULSION FOR TACK COAT SHALL BE APPLIED BETWEEN ALL ASPHALT SURFACES AND SAWCUT JOINTS BEFORE PAVING. HMA JOINT ADHESIVE SHALL BE APPLIED TO ALL COLD JOINTS (LONGITUDINAL AND TRANSVERSE) BEFORE PAVING SURFACE COURSE. ASPHALT EMULSION FOR TACK COAT SHALL BE APPLIED AT A RATE CONSISTENT WITH MASSDOT STANDARD SPECIFICATION 460.43.G.2. ALL SURFACES SHALL BE CLEAN OF ALL ORGANICS, DEBRIS, AND SAND PRIOR TO PAVING.
2. ALL HMA SHALL BE IN ACCORDANCE WITH SECTION 460.
3. ASPHALT EMULSION FOR TACK COAT SHALL BE RS–1H TO RESIST TRACKING OF TACK BY HAUL VEHICLES.
4. ALL GRAVEL BORROW MEETING SPECIFICATION, AS DETERMINED BY THE ENGINEER, SHALL BE RETAINED IN PLACE, COMPACTED, AND LEVELED AS REQUIRED.
5. TOTAL DEPTH OF PROPOSED PAVEMENT IN TRENCH PATCH SHALL BE 6¾" OR SHALL MATCH THE EXISTING PAVEMENT DEPTH, WHICHEVER DEPTH IS DEEPER.

T1625_BR11(TYP SECTIONS).DWG Plotted on 5-Jan-2026 1:21 PM
MGL CH 85 S35 Review Submission 5-January-2026



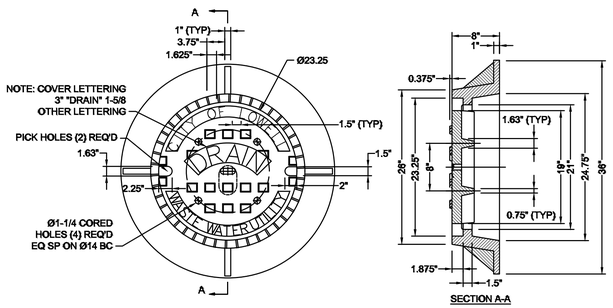
SECTION VIEW PLAN VIEW

NOTES:

1. INSTALL SILT SACK IN EXISTING CATCH BASINS BEFORE COMMENCING WORK, AND IN NEW CATCH BASINS IMMEDIATELY AFTER INSTALLATION OF STRUCTURE. MAINTAIN UNTIL BINDER COURSE PAVING IS COMPLETE OR A PERMANENT STAND OF GRASS HAS BEEN ESTABLISHED.
2. GRATE TO BE PLACED OVER SILT SACK.
3. SILT SACK SHALL BE INSPECTED PERIODICALLY AND AFTER ALL STORM EVENTS AND CLEANING OR REPLACEMENT SHALL BE PERFORMED PROMPTLY AS NEEDED.

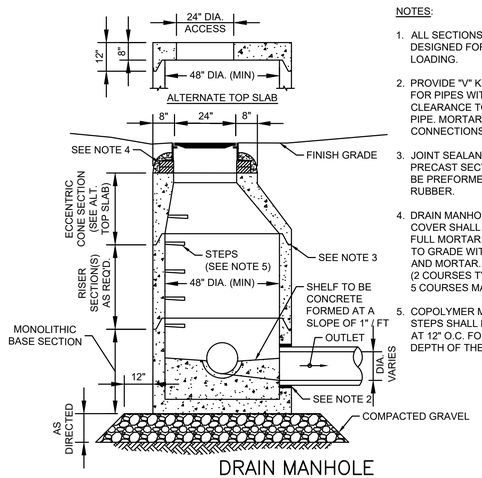
INLET PROTECTION SILT SACK IN CATCH BASIN

NOT TO SCALE



CITY OF LOWELL STANDARD DRAIN FRAME AND COVER

NOT TO SCALE

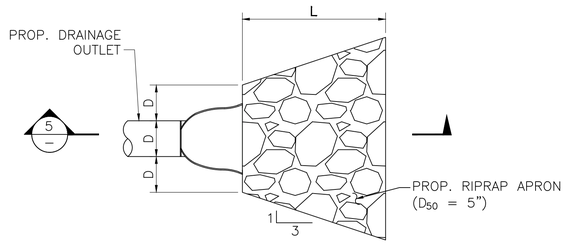


DRAIN MANHOLE

NOT TO SCALE

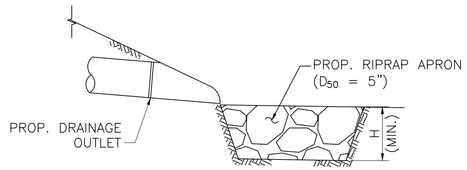
NOTES:

1. ALL SECTIONS SHALL BE DESIGNED FOR HL-93 LOADING.
2. PROVIDE "V" KNOCKOUTS FOR PIPES WITH 2" MAX CLEARANCE TO OUTSIDE OF PIPE. MORTAR ALL PIPE CONNECTIONS.
3. JOINT SEALANT BETWEEN PRECAST SECTIONS SHALL BE PREFORMED BUTYL RUBBER.
4. DRAIN MANHOLE FRAME AND COVER SHALL BE SET IN FULL MORTAR BED. ADJUST TO GRADE WITH CLAY BRICK AND MORTAR. (2 COURSES TYP 5 COURSES MAX)
5. COPOLYMER MANHOLE STEPS SHALL BE INSTALLED AT 12" O.C. FOR THE FULL DEPTH OF THE STRUCTURE.



RIPRAP APRON DETAIL

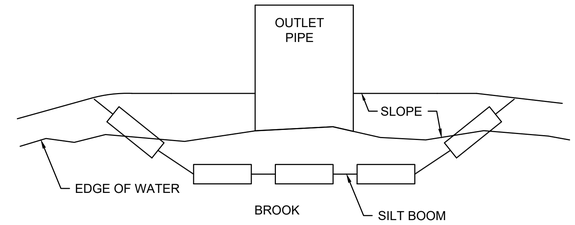
NOT TO SCALE



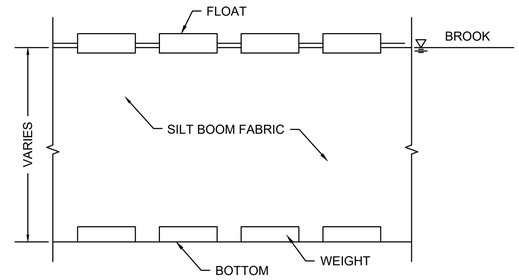
SECTION 5

NOT TO SCALE

RIPRAP APRON DIMENSIONS			
OUTLET	D (FT)	L (FT)	H (FT)
D2	1.5	6.0	1.5
D4	2.0	8.0	1.5
D7	1.3	5.0	1.5



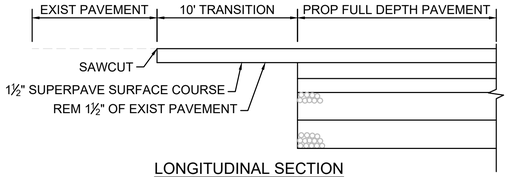
PLAN



PROFILE

FLOATING SILT FENCE

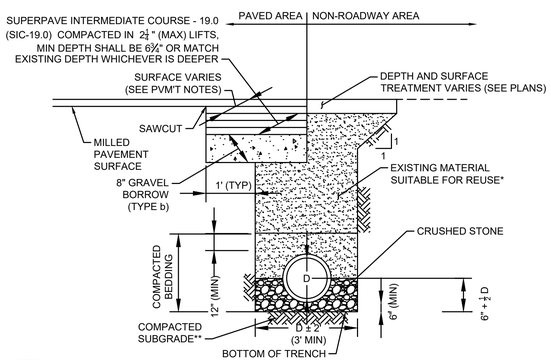
NOT TO SCALE



LONGITUDINAL SECTION

FULL DEPTH PAVEMENT TRANSITION

NOT TO SCALE



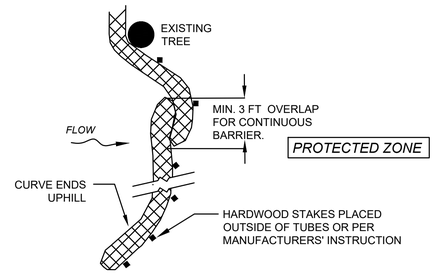
NOTES:

* EXISTING MATERIAL OBTAINED FROM EXCAVATION THAT IS DETERMINED TO BE SUITABLE, AND APPROVED BY THE ENGINEER SHALL BE USED. BACKFILL SHALL BE PLACED IN LAYERS NO MORE THAN 6" IN DEPTH AND THOROUGHLY COMPACTED. BACKFILLING TO A POINT 2' OVER THE PIPE SHALL CONTAIN NO STONES LARGER THAN 3".

**SOFT OR UNSUITABLE MATERIAL EXISTING BELOW THE REQUIRED BEDDING GRADE SHALL BE REMOVED AS DIRECTED AND REPLACED WITH SAND, GRAVEL, CRUSHED STONE OR OTHER SUITABLE MATERIAL AND THOROUGHLY COMPACTED.

UTILITY TRENCH

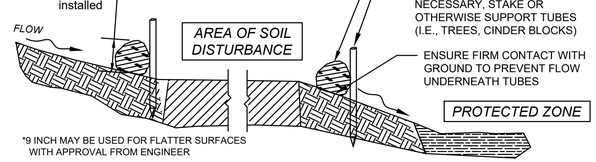
NOT TO SCALE



PLACE TUBE AS CLOSE TO LIMIT OF SOIL DISTURBANCE AS POSSIBLE, ALONG CONTOURS, AND PERPENDICULAR TO FLOW.

ADJUST LOCATION AS REQUIRED FOR OPTIMUM EFFECTIVENESS. DO NOT INSTALL IN WATERWAYS.

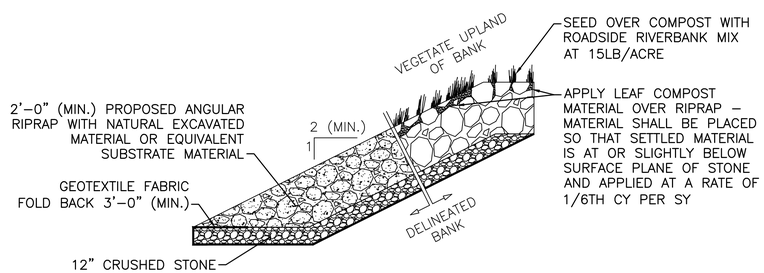
PLAN VIEW



SECTION

SEDIMENT BARRIER – COMPOST FILTER TUBE

NOT TO SCALE



NOTES:

1. SUBSTRATE MATERIALS TO BE USED MUST MEET THE EXISTING STREAMBED.
2. RIPRAP TO BE ANGULAR ROCKS AND WEDGES, AND MEET THE GRADATION SPECIFIED.

RIPRAP EMBANKMENT CROSS SECTION

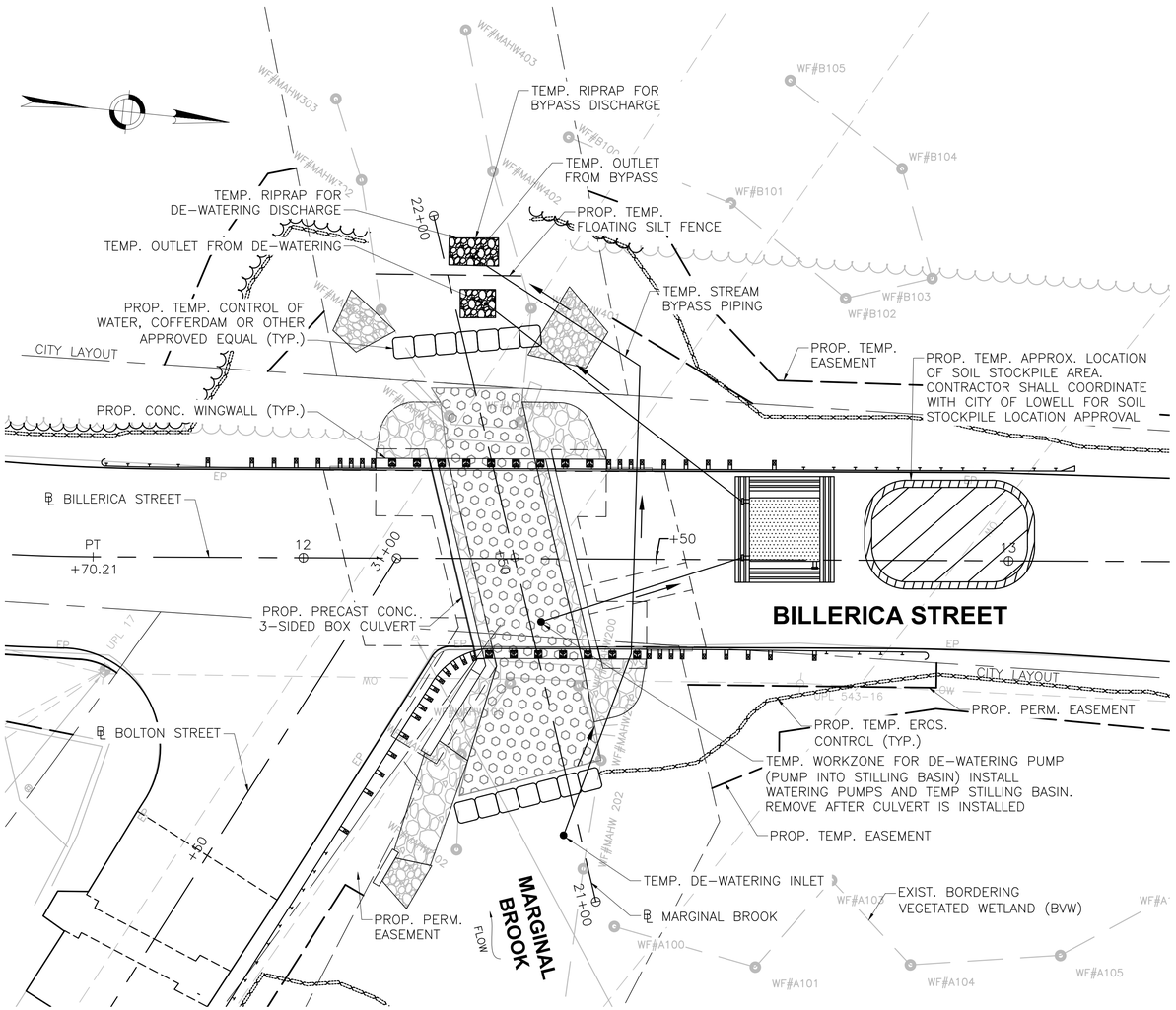
NOT TO SCALE

LOWELL
BILLERICA STREET

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	14	20
PROJECT FILE NO.		T1625	

CONSTRUCTION DETAILS

T1625_BR12(CONST DET).DWG Plotted on 5-Jan-2026 1:21 PM
MGL CH 85 S35 Review Submission 5-January-2026



CONTROL OF WATER PLAN

SCALE: 1" = 10'

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 DESIGN ENGINEER FOR APPROVAL. THE C.O.W. SYSTEM SHOWN IS CONCEPTUAL ONLY. THE C.O.W. SYSTEM SHALL BE DESIGNED USING A FLOOD EVENT RETURN FREQUENCY DETERMINED BY THE CONTRACTOR. THE TOP ELEVATION OF THE TEMPORARY WATER CONTROL MEASURE SHALL BE DESIGN FLOOD ELEVATION +1 FOOT OF FREEBOARD. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THE FLOOD EVENT WATER SURFACE ELEVATION.
2. THE BRIDGE CROSSING AT BILLERICA STREET SHALL BE CLOSED TO VEHICULAR AND PEDESTRIAN TRAFFIC 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 REPAIR PROCEDURES SHALL BE IMPLEMENTED ACCORDINGLY.

SUGGESTED SEQUENCE OF CONSTRUCTION:

1. CLOSE THE ROADWAY TO VEHICULAR AND PEDESTRIAN TRAFFIC AT THE BRIDGE CROSSING.
2. INSTALL EROSION CONTROLS: TEMPORARY EROSION CONTROL AROUND PROJECT LIMITS TO PROTECT MARGINAL BROOK FROM WORK ZONE SEDIMENT; FLOATING SILT FENCE IN MARGINAL BROOK DOWNSTREAM OF THE PROJECT LIMITS TO TRAP ANY FLOATING DEBRIS/SILT THAT MAY ENTER THE TRIBUTARY.
3. INSTALL C.O.W. COFFERDAMS, BYPASS PUMPS, DEWATERING PUMPS, AND TEMPORARY STILLING BASIN.
4. PLACE TEMPORARY RIPRAP AT OUTLET FOR BYPASS DISCHARGE.
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 BROOK.
6. INSTALL THE THREE-SIDED 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.
7. REDIRECT STREAM FLOW THROUGH THE CULVERT.
8. REMOVE THE C.O.W. COFFERDAMS, BYPASS PUMPS AND TEMPORARY STILLING BASIN.

LOWELL
BILLERICA STREET

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	15	20
PROJECT FILE NO.	T1625		

CONTROL OF WATER PLAN

SANDBAG PREPARATION:

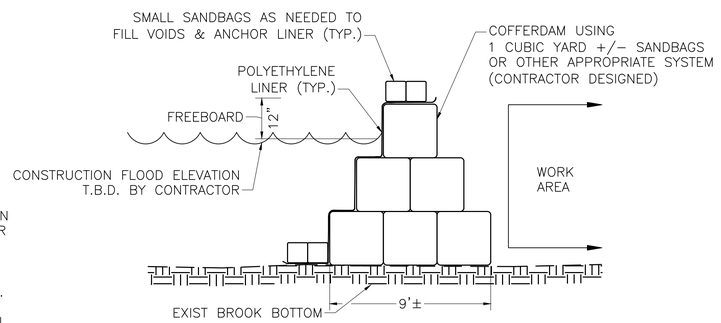
1. UTILIZE 36" X 36" X 36" POLYPROPYLENE BAGS.
2. A HEAVY BODIED OR SANDY SOIL IS MOST DESIRABLE FOR FILLING SANDBAGS. ON-SITE SOURCES MAY BE UTILIZED, AS APPROPRIATE WITH THE APPROVAL OF THE ENGINEER.
3. BAGS SHOULD BE FILLED BETWEEN ONE-THIRD TO ONE-HALF OF THEIR CAPACITY TO PREVENT THE BAG FROM BEING TOO HEAVY AND PERMITS THE BAGS TO BE STACKED WITH A GOOD SEAL.

SANDBAG PLACEMENT:

1. REMOVE ANY DEBRIS FROM THE AREA WHERE THE BAGS ARE TO BE PLACED.
2. FOLD THE OPEN END OF THE UNFILLED PORTION OF THE SANDBAG TO FORM A TRIANGLE.
3. PLACE THE PARTIALLY FILLED BAGS LENGTHWISE AND PARALLEL TO THE DIRECTION OF FLOW WITH THE OPEN END FACING AGAINST THE WATER FLOW.
4. TUCK THE FLAPS UNDER, KEEPING THE UNFILLED PORTION UNDER THE WEIGHT OF THE SACK.
5. PLACE SUCCEEDING BAGS ON TOP, OFFSETTING BY ONE-HALF (I.E. RUNNING BOND) OF THE PREVIOUS BAG AND STAMPING INTO PLACE TO ELIMINATE VOIDS AND FORM A TIGHT SEAL.
6. STAGGER THE JOINT CONNECTIONS WHEN MULTIPLE LAYERS ARE NECESSARY USING THE PYRAMID PLACEMENT METHOD.
7. ALL SANDBAG BERMS SHALL BE A MINIMUM OF THREE BAGS HIGH, UNLESS NOTED OTHERWISE.
8. PLACE POLYETHYLENE LINER ALONG WATER SIDE OF COFFERDAM AND TUCK LINER INTO TOP COURSING OF SANDBAGS AS SHOWN ON THE DETAIL ON THIS PLAN. STABILIZE LINE WITH WOODEN STAKE AND ADDITIONAL SANDBAG IN STREAM.

COFFERDAM NOTE:

THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THE WATER SURFACE ELEVATION FOR THE CONSTRUCTION FLOOD EVENT. THE SANDBAG COFFERDAM SHOWN IS SHOWN IN CONCEPT ONLY AS ONE OPTION FOR CONTROL OF WATER. THE CONTRACTOR SHALL DETERMINE THE APPROPRIATE SYSTEM FOR CONTROLLING THE WATER (I.E. BULK SANDBAGS, SHEETING, ETC.). THE CONTRACTOR SHALL SUBMIT THEIR PROPOSED CONTROL OF WATER DESIGN TO THE ENGINEER FOR REVIEW AND APPROVAL.

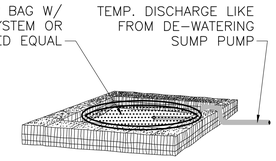


CONTROL OF WATER COFFERDAM

NOT TO SCALE

TEMP. STILLING NOTE:

DISCHARGE TO SEDIMENTATION BASIN (AS SHOWN) OR TO SILTATION/ DEWATERING BAG SUCH AS FLOGARD DEWATERING BAG MODEL SC-DW1215Z, OR APPROVED EQUAL BY LOWELL CONSERVATION COMMISSION. SYSTEM SHOWN IS CONCEPTUAL ONLY AND IS TO BE DESIGNED BY CONTRACTOR. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS TO ENGINEER FOR APPROVAL.

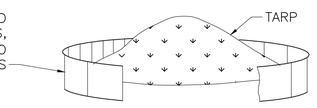


TEMP. STILLING AREA

NOT TO SCALE

TEMP. STOCKPILE NOTE:

IF STOCKPILE IS PLACED ON PAVEMENT, THEN IT SHALL BE SURROUNDED BY COMPOST FILTER TUBES.



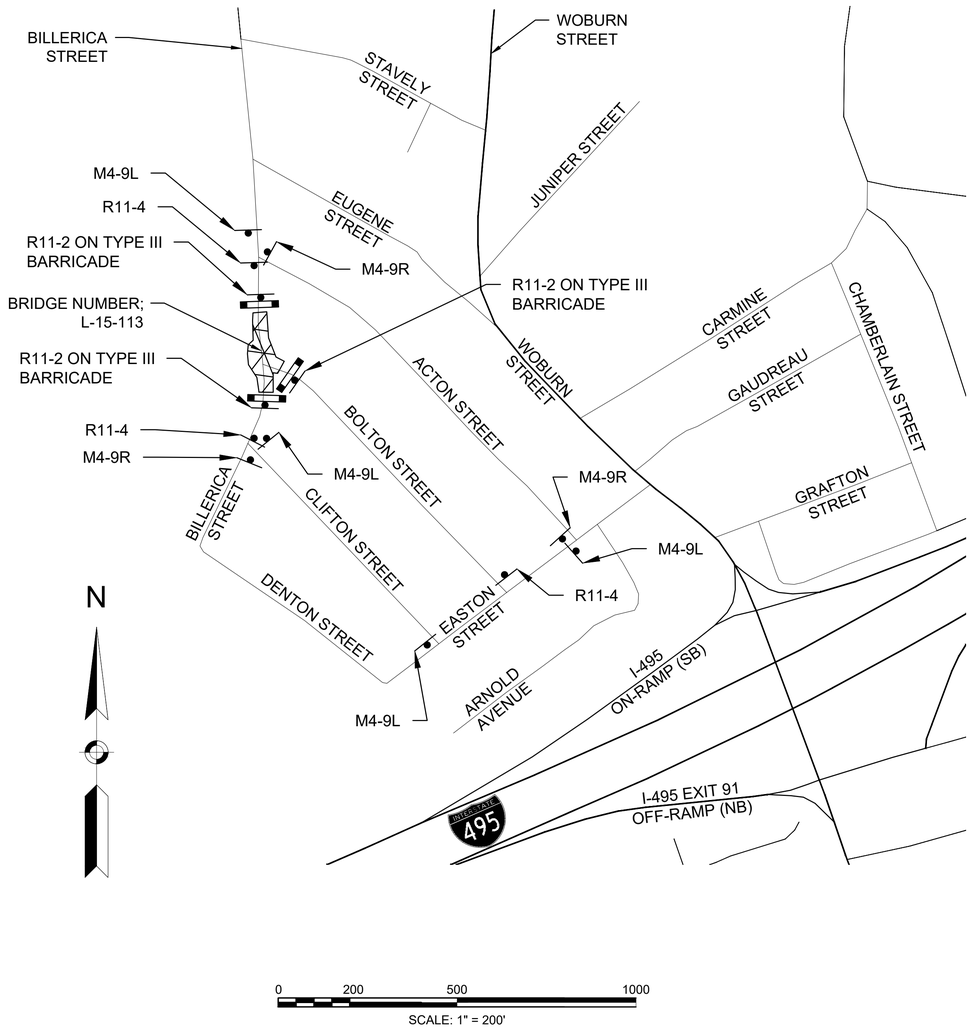
TEMP. SOIL STOCKPILE

NOT TO SCALE

LOWELL
BILLERICA STREET

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	16	20
PROJECT FILE NO.	T1625		

TRAFFIC MANAGEMENT PLAN



TEMPORARY TRAFFIC SIGN SUMMARY

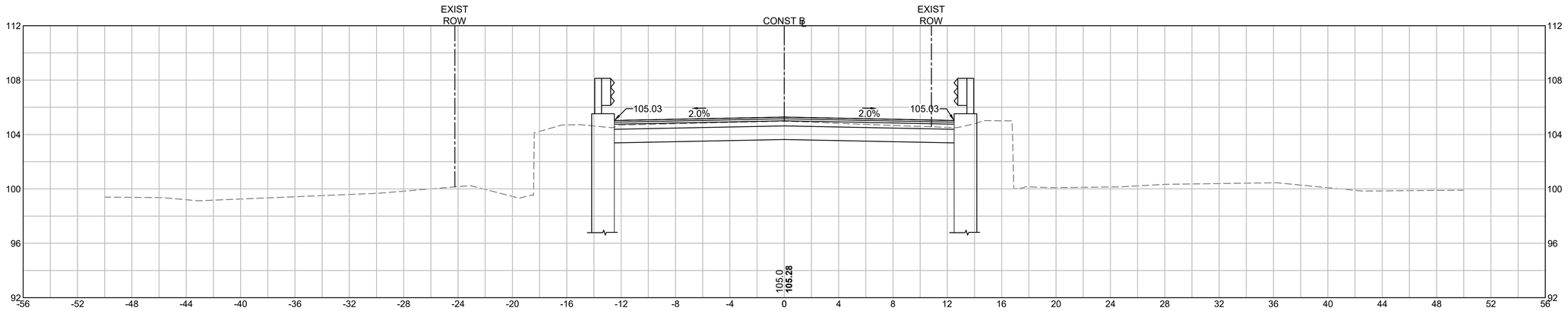
IDENTIFICATION NUMBER	SIZE OF SIGN (INCHES)		LEGEND	TEXT DIMENSIONS (INCHES)			NUMBER OF SIGNS REQUIRED	COLOR			UNIT AREA (S.F.)	AREA IN SQUARE FEET
	WIDTH	HEIGHT		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR.		BACKGROUND	LEGEND	BORDER		
M4-9L	30	24	DETOUR ←	SEE 2023 MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES			4	FL. ORANGE	BLACK	BLACK	5.00	20.00
M4-9R	30	24	DETOUR →				3	FL. ORANGE	BLACK	BLACK	5.00	15.00
R11-2	48	30	ROAD CLOSED				3	WHITE	BLACK	BLACK	10.00	30.00
R11-4	60	30	ROAD CLOSED TO THRU TRAFFIC ↓				3	WHITE	BLACK	BLACK	12.50	37.50

T1625_BR16(TMP).DWG Plotted on: 5-Jan-2026 1:28 PM
MGL CH 85 S35 Review Submission 5-January-2026

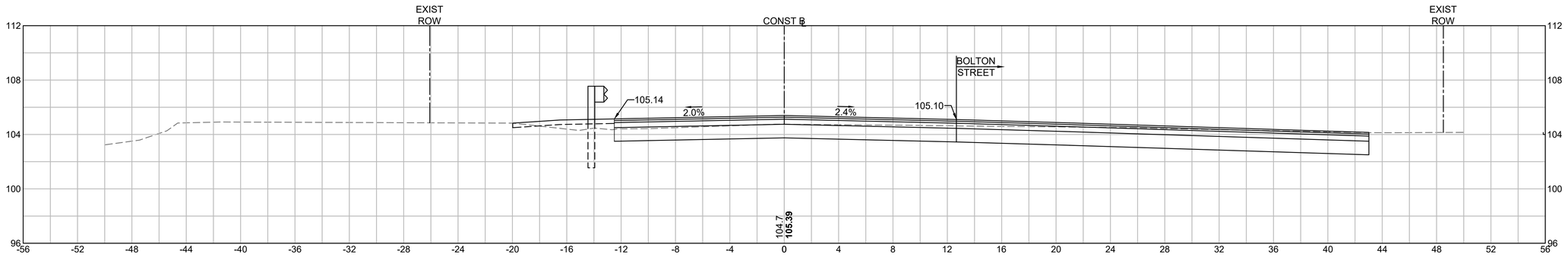
LOWELL
BILLERICA STREET

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	17	20
PROJECT FILE NO.	T1625		

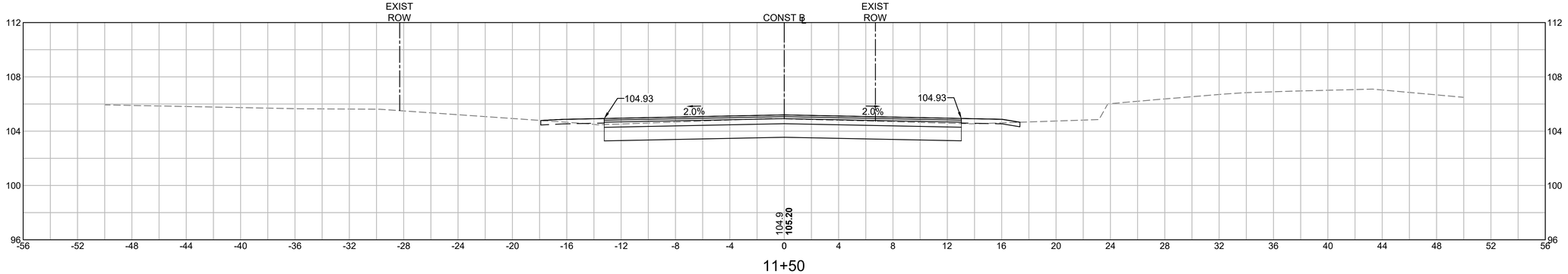
CROSS SECTIONS - 1 OF 4



12+30



12+00



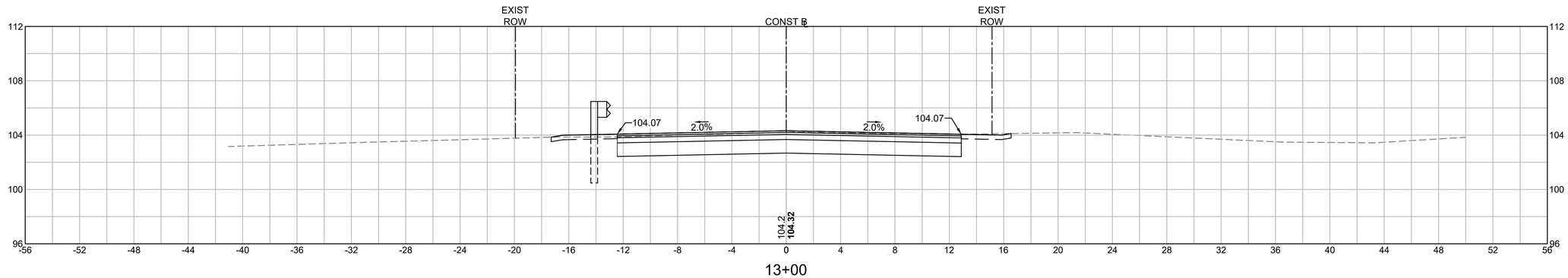
11+50

HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

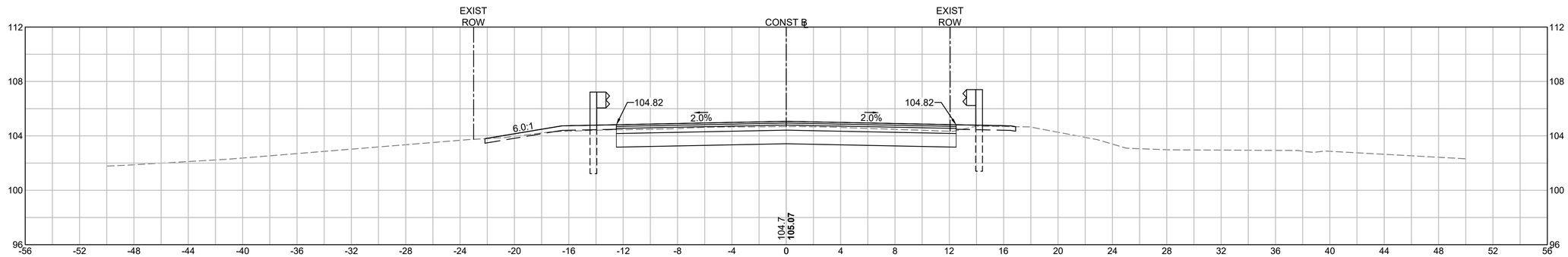
LOWELL
BILLERICA STREET

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	18	20
PROJECT FILE NO.	T1625		

CROSS SECTIONS - 2 OF 4



13+00



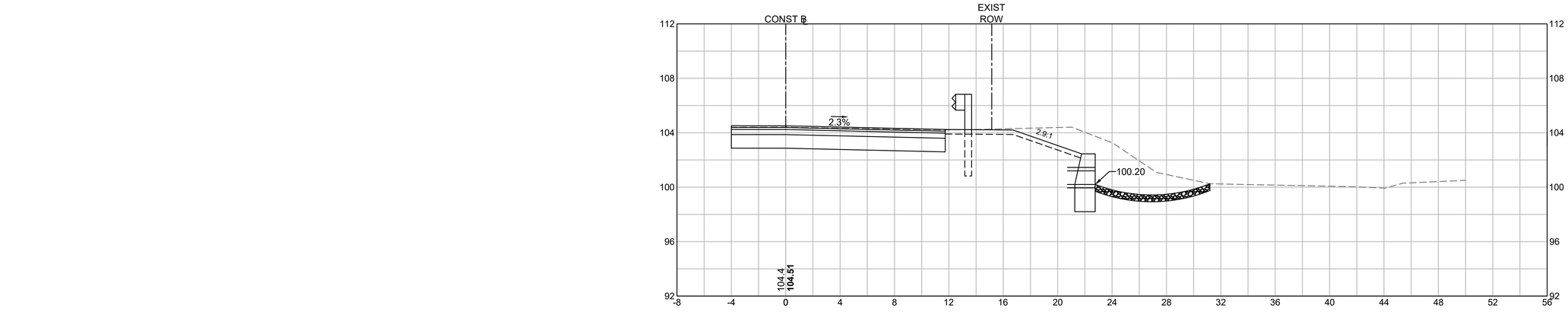
12+50

HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

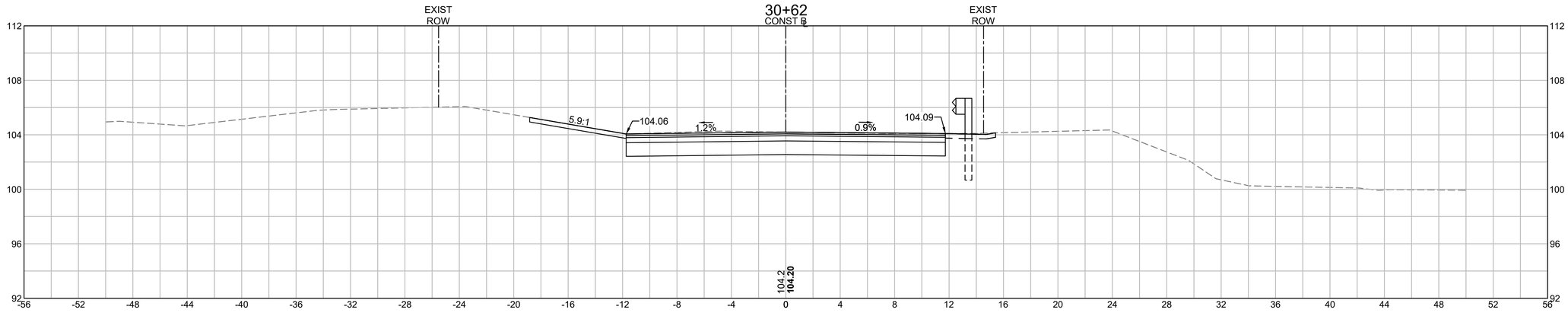
LOWELL
BILLERICA STREET

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	19	20
PROJECT FILE NO.	T1625		

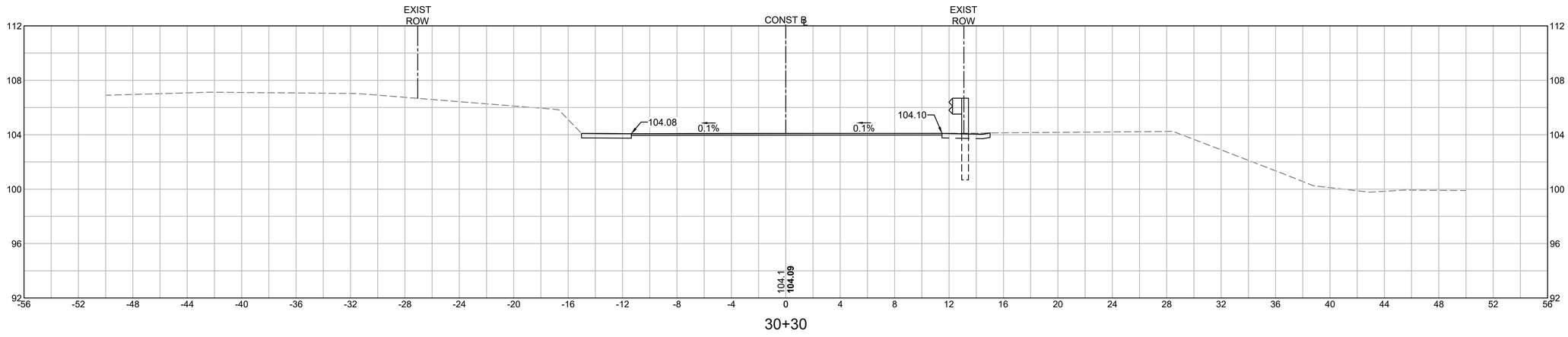
CROSS SECTIONS - 3 OF 4



30+62



30+50



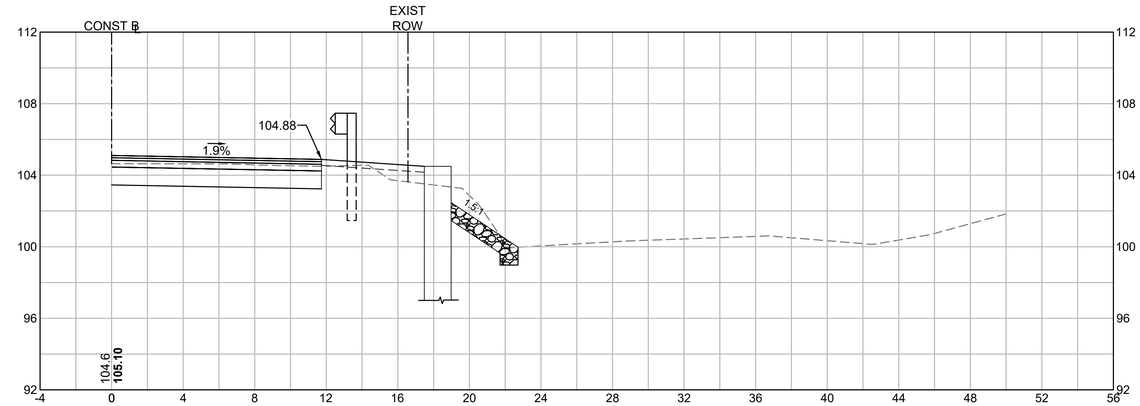
30+30

HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

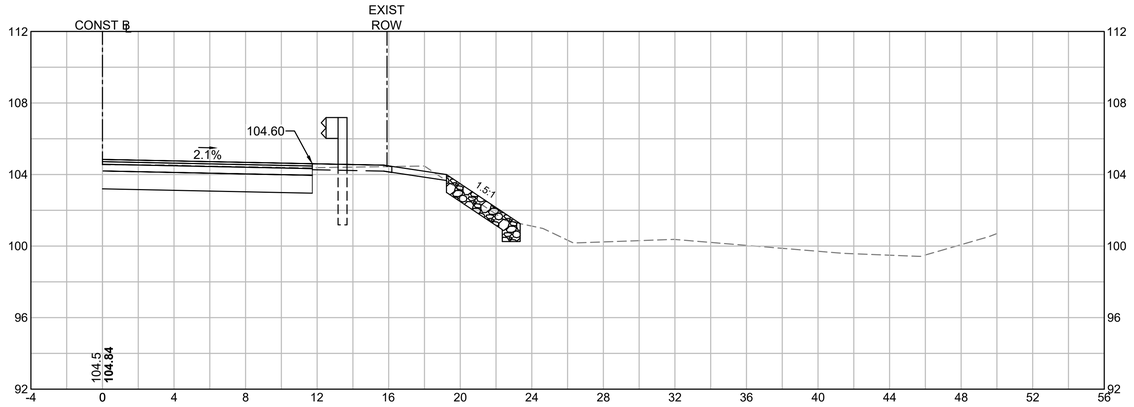
LOWELL
BILLERICA STREET

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	20	20
PROJECT FILE NO.	T1625		

CROSS SECTIONS - 4 OF 4



30+85



30+75

HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET