APPENDIX 1

Design Criteria Exceptions – Track

COMMUTER AND LIGHT RAIL DESIGN EXCEPTIONS

Prepared By: STV Inc. Date: 9/25/2017

Element	Item #	Description	Reference Section(s)	Reference Documents	Status	Date	Last Name (Print Initials)
Existing AECOM/HNTB							
Light Rail	27	The crossovers East of College Ave and Union Square Stations contain non-standard crossover configurations utilizing mainline moves through the diverging side of the crossover. UPDATE 1/27/14: union square issue closed.	N/A	GLX Design Criteria Manual	OPEN	8/6/13	E. DiVirgilio (AECOM/HNTB)
Light Rail	53	The tangent preceding MAF turnout 10 (PS SW—25+23.54) is 8.15 feet due to alignment	1.6.2.1.6	GLX Design Criteria Manual	OPEN	10/11/13	E. DiVirgilio (AECOM/HNTB)
Commuter Rail	65	The 4 foot high interlock fence between the commuter rail and light rail tracks was placed at 8.5 feet from the commuter rail track centerline in the ACD design plans. This dimension does not allow for an increase in clearance due to curvature and superelevation, as required by the MBTA CRDSM. Please clarify the clearance requirement for intertrack fence	6.C.2	Commuter Rail Design Standards Manual (CRDSM)	OPEN	12/16/13	E. DiVirgilio (AECOM/HNTB)
Light Rail	68	Curve US-WB 2 - Required speed of 25 MPH results in an unbalance superelevation of greater than the maximum allowable 0.5 inches. Superelevation cannot be increased without impact to No. 10 turnout east of curve or running off superelevation on tangent Proposed unbalance superelevation for this curve shall be 0.60 inches.	1.6.2.1.4.3B	GLX Design Criteria Manual	OPEN	11/21/14	E. DiVirgilio (AECOM/HNTB)
Light Rail	69	Curve US-WB 3 - Required speed of35 MPH results in an unbalance superelevation of greater than the maximum allowable 0.5 inches. This was done to comply with an MBTA comment requesting spirals be made longer than the minimum. Proposed unbalance superelevation for this curve shall be 0.72 inches.	1.6.2.1.4.3B	GLX Design Criteria Manual	OPEN	11/21/14	E. DiVirgilio (AECOM/HNTB)
Light Rail	76	18” minimum ballast shoulders are required by the design criteria. 12” ballast shoulders on the high side of superelevated double track sections are required on the viaduct due to 11.5 track centers. See IGMP-04 sheet 000-K-1000 for additional information.	1.6.2.2.3.5	GLX Design Criteria Manual	OPEN	11/21/14	E. DiVirgilio (AECOM/HNTB)
Light Rail	80	The tangent preceding MAF turnout I3 (PC Sta= 27+81) is 1.7 feet due to alignment constraints	1.6.2.1.6	GLX Design Criteria Manual	OPEN	11/21/14	E. DiVirgilio (AECOM/HNTB)
Commuter Rail	81	YARD 10 horizontal curves PAR-02, PAR-07, and YL-105-01 are less than 100 ft. in length. These are yard curves and the criteria is intended for mainline curves. Curve lengths less than 100 feet are an existing condition within the yard. The track layout has been approved by Pan-AM.	3.C.3	Commuter Rail Design Standards Manual (CRDSM)	OPEN	11/21/14	E. DiVirgilio (AECOM/HNTB)
Commuter Rail	82	YARD 10 horizontal tangent lengths between curves PAR-01/02 and also at the connection existing track east of Cobble Hill cad are less than the design criteria minimum of 40 ft. The short tangent lengths are an existing condition. The track layout has been approved by Pan-AM	1.C.1.B	Commuter Rail Design Standards Manual (CRDSM)	OPEN	11/21/14	E. DiVirgilio (AECOM/HNTB)
Commuter Rail	83	YARD 10 grades are greater than the maximum allowable storage track grade of 0.25%o. This is an existing condition within the yard.	3.C.5.B	Commuter Rail Design Standards Manual (CRDSM)	OPEN	11/21/14	E. DiVirgilio (AECOM/HNTB)
Light Rail	84	The concrete curb supporting OCS poles on the viaduct structure adjacent to the outside of curve US-EB 1 provides 6 feet of horizontal clearance. The minimum allowable clearance is 6.26 ft. accounting for end overhang. The clearance provided is essentially the minimum less 3 inches of running clearance.	DWG 125	MBTA MOW Standard Plans	OPEN	11/21/14	E. DiVirgilio (AECOM/HNTB)
Light Rail	85	The minimum allowable clearance between track centerline and OCS poles is 6’-6”. The minimum designed clearance to OCS poles within the LRT maintenance yard is 6’-2”, where track centers are spaced at 13’-4”. This is necessary to provide walkways without OCS poles where track centers are spaced at 18’-0”.	1.6.2.1.7.3	GLX Design Criteria Manual	OPEN	11/21/14	E. DiVirgilio (AECOM/HNTB)

COMMUTER AND LIGHT RAIL DESIGN EXCEPTIONS

Prepared By: STV Inc. | Date: 9/25/2017

Element	Item #	Description	Reference Section(s)	Reference Documents	Status	Date	Last Name (Print Initials)
Light Rail	86	The distance from track centerline to edge of all curved station platforms are designed to be a constant horizontal offset of 4'-9". The curved platforms at Lechmere, Union, and Ball Square (future extension) Stations are adjacent to curves that have vehicle inswing and outswings of less than 2", which means the vehicle will not strike the low-level platform. Maintaining a uniform offset will simplify fabrication and construction of the station platforms.	1.6.2.1.7.3	GLX Design Criteria Manual	OPEN	11/21/14	E. DiVirgilio (AECOM/HNTB)
Light Rail	88	The future platform is adjacent to the WB track at Ball Square Station platform is in a horizontal spiral due to corridor right of way constraints.	1.6.2.1.4.2	GLX Design Criteria Manual	OPEN	11/21/14	E. DiVirgilio (AECOM/HNTB)
Light Rail	89	Site constraints within IGMP-04 do not allow space for the LRT maintenance walkway (defined as 30 inches beyond the clearance envelope) on both sides of the track bed at the locations noted in the attached plan.	1.6.2.1.7.3	GLX Design Criteria Manual	OPEN	11/21/14	E. DiVirgilio (AECOM/HNTB)
Light Rail	91	The design criteria states that derails are required on all yard leads to prevent vehicles from inadvertently entering the mainline. Derails are not proposed on Yard Leads 1, 2, 4, and 5 because the prevailing grade of these tracks is down and away from the mainline and therefore the project team considers the derails unnecessary.	1.6.2.2.10	GLX Design Criteria Manual	OPEN	11/21/14	E. DiVirgilio (AECOM/HNTB)
Light Rail	92	The design criteria states that derails are required on all tail tracks. The MBTA does not currently require derails on tail tracks.	1.6.2.2.10	GLX Design Criteria Manual	OPEN	11/21/14	E. DiVirgilio (AECOM/HNTB)
Light Rail	92	The wall mounted signal at Sta. US-EB 16+62 is located 5'-9" from track centerline. The minimum distance per the design criteria is 6'-6". The wall location is set to maintain continuity of the noise barrier on the US-WB viaduct. The track cannot be shifted away from the signal without impacting adjacent property and violating emergency egress requirements. The signal clears the dynamic envelope of the train with 3 inches of running clearance.	1.6.2.1.7.3	GLX Design Criteria Manual	OPEN	11/21/14	E. DiVirgilio (AECOM/HNTB)
NEW / FROM STV PLANSET							
Light Rail	STV-1	Lechmere Station platform is in a horizontal curve and does not meet the requirements for tangent length beyond ends of platform due to site constraints. Horizontal Curves: MB-EB 1, MB-EB 2, MB-WB 1, MB-WB 2. **(#16 CLOSED - 10/11/13) Change to Alignment 7/20/17**	10.2.3.2.c.ii.B	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-2	Lechmere Station platform does not meet the requirements for Vertical tangent length beyond end of platform MB-EB/WB, east of the station. (PVI=186+85)	10.2.3.2.d.iii	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-3	Curve MB-EB 2 and MB-WB 2 - MBTA requested speed increase to 25 MPH results in an unbalance superelevation of greater than the maximum allowable 0.5 inches. Maximum unbalance superelevation for this curve shall be **1.18 inches (new)**. **(#55 CLOSED - 10/11/13) Change to Max Unbalance 7/20/17**	10.2.3.2.c.iii.B	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-4	The length of the MB-EB & WB vertical curve (PVI=Sta198+25) does not meet the length required for combined horizontal and vertical curves. @100A, Min LVC=222.5 Ft, x1.5 = 333.75 Ft. Curve design is 300 Ft.	10.2.3.2.d.iv.D	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-5	Curve MB-EB 4 - unbalance superelevation of 0.6 inches is necessary to shorten the spiral length to prevent a conflict with the US-EB turnout, Curve MB-WB 4 is 1.5 inces. This results in an unbalance superelevation of greater than the maximum allowable 0.5 inches. Maximum unbalance superelevation for this curve **MB-EB 4 is 0.59 inches (new), and curve MB-WB 4 shall be 0.55 inches (new). (#56 CLOSED 10/11/13) Change to Max Unbalance 7/20/17**	10.2.3.2.c.iii.B	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-6	The length of the MB-EB & WB vertical curve (PVI=Sta210+35.61) does not meet the minimum length or required length for combined horizontal and vertical curves. @100A, Min LVC=393.5 Ft, x1.5 = 590.25 Ft. LVC design is 300 Ft.	10.2.3.2.d.iv	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE

COMMUTER AND LIGHT RAIL DESIGN EXCEPTIONS

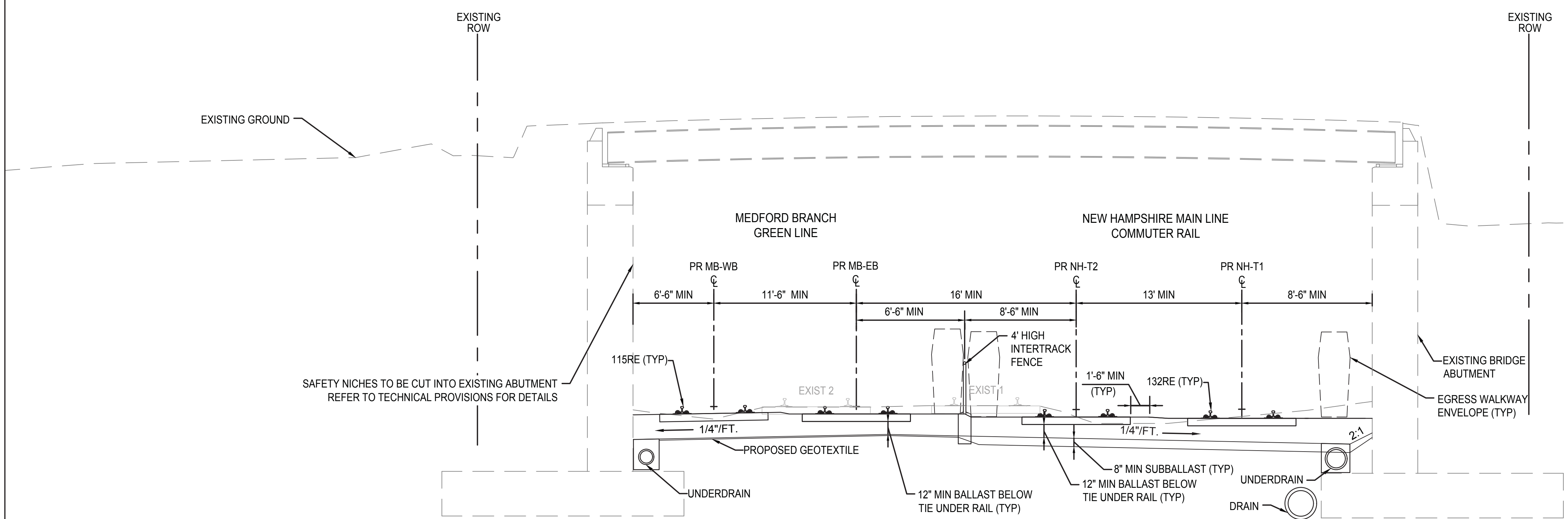
Prepared By: STV Inc. Date: 9/25/2017

Element	Item #	Description	Reference Section(s)	Reference Documents	Status	Date	Last Name (Print Initials)
Light Rail	STV-7	The length of the MB-EB & WB vertical curve (PVI=Sta221+51.33) does not meet the minimum length for vertical curves. @100A, Min LVC=326.5 Ft. LVC design is 230 Ft.	10.2.3.2.d.iv	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-8	East Somerville Station platform does not meet the requirements for tangent length beyond end of platform MB-EB, east of the station due to corridor right of way constraints and MB-WB, West of the station.	10.2.3.2.c.ii.B	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-9	Curve MB-EB 11 has an unbalance superelevation of greater than the maximum allowable 0.5 inches. Maximum unbalance superelevation for this curve shall be 0.51 inches (new).	10.2.3.2.c.iii.B	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-10	The length of tangent track between curves MB-WB 11 and MB-WB 12 does not meet the minimum length requried for tangent track between curves. Min. Tangent length between curve sections shall be 60 Ft. Minimum tangent between MB-WB 11 and MB-WB 12 is 51.13 Ft.	10.2.3.2.c.ii.A	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-11	Gilman Square Station platform does not meet the requirements for tangent length beyond end of platform MB-WB, east of the station due to corridor right of way constraints.	10.2.3.2.c.ii.B	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-12	Gilman Square Station platform does not meet the requirements for Vertical tangent length beyond end of platform MB-EB/WB, east of the station. (PVI=270+75)	10.2.3.2.d.iii	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-13	Magoun Square Station platform does not meet the requirements for tangent length beyond end of platform MB-EB and MB-WB, east of the station. MB-EB to the west.	10.2.3.2.c.ii.B	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-14	Magoun Square Station platform does not meet the requirements for Vertical tangent length beyond end of platform MB-EB/WB, east of the station. (PVI=305+39.91)	10.2.3.2.d.iii	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-15	Ball Square Station platform does not meet the requirements for tangent length beyond end of platform MB-WB, West of the station.	10.2.3.2.c.ii.B	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-16	College Ave. Station platform does not meet the requirements for tangent length beyond end of platform MB-EB and MB-WB, east of the station.	10.2.3.2.c.ii.B	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-17	The Vertical tangent to the west of Crossover No. 8 (MB-EB PS Sta 362+99.85) is 5.15 feet due to alignment constraints	10.2.3.2.e	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-18	The Horizontal tangent preceding MOD US-WB turnout 10 **(MB-WB PS Sta 207+07.16/ US-WB PS Sta 0+00)** is 23 feet due to alignment constraints. Tangent length preceding the switch of less than the 30 foot minimum, but greater than the absolute minimum of 12 feet, due to alignment **(#22/23 CLOSED - 10/11/13) Change to Alignment 7/20/17**	10.2.3.2.e	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-19	The Vertical tangent preceding MOD US-WB No. 10 Turnout **(MB-WB PS Sta 207+07.16/ US-WB PS Sta 0+00)** is 23 feet due to alignment constraints. Tangent length preceding the switch of less than the 30 foot minimum, but greater than the absolute minimum of 12 feet, due to alignment **(#22/23 CLOSED - 10/11/13) Change to Alignment 7/20/17**	10.2.3.2.e	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-20	MOD US-WB No. 10 Turnout (MB-WB PS Sta 207+07.16/ US-WB PS Sta 0+00) is located in the following vertical curve US-WB PVI 1+63.89. Turnout extends into the vertical curve	10.2.3.2.e	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-21	Curve US-WB I - MBTA requested speed increase to 15 MPH results in an unbalance superelevation of greater than the maximum allowable 0.5 inches. Maximum unbalance superelevation for this curve shall be **1.53 inches (new)**. **(#62 CLOSED - 10/11/13) Change to Max Unbalance 7/20/17**	10.2.3.2.c.iii.B	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE

COMMUTER AND LIGHT RAIL DESIGN EXCEPTIONS

Prepared By: STV Inc. | Date: 9/25/2017

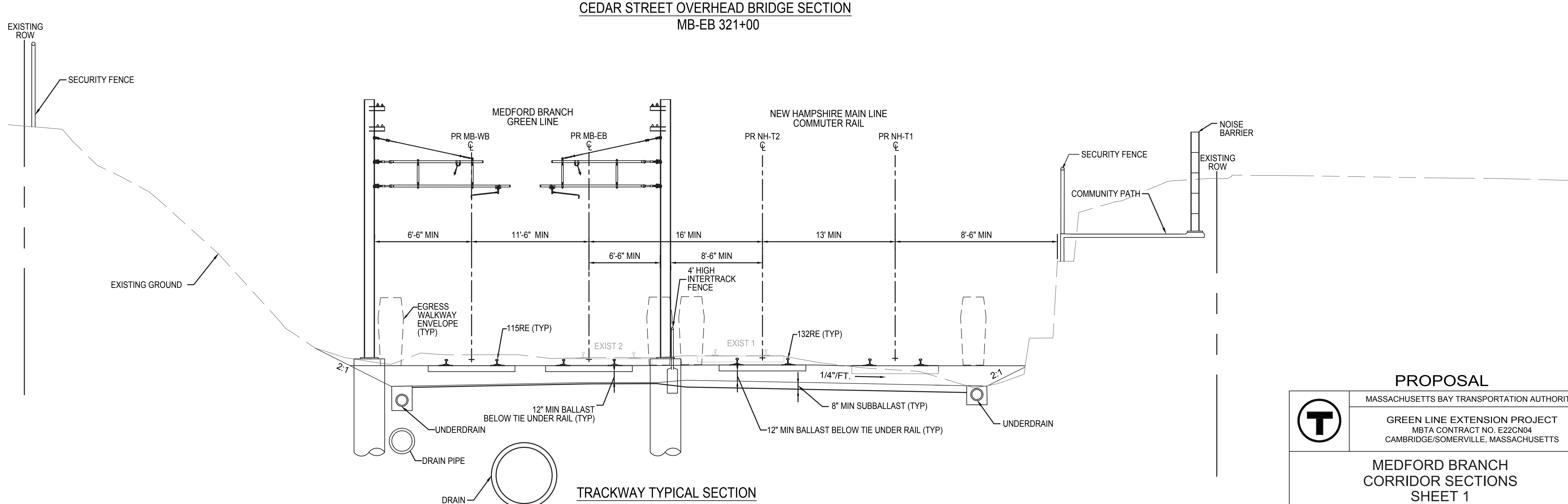
Element	Item #	Description	Reference Section(s)	Reference Documents	Status	Date	Last Name (Print Initials)
Light Rail	STV-22	Curve US-WB 4 - MBTA requested speed increase to 35 MPH results in an unbalance superelevation of greater than the maximum allowable 0.5 inches. Maximum unbalance superelevation for this curve shall be **0.94 inches (new). (#63 CLOSED - 10/11/13) Change to Max Unbalance 7/20/17**	10.2.3.2.c.iii.B	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-23	Curve US-WB 2 - Required speed of 25 MPH results in an unbalance superelevation of greater than the maximum allowable 0.5 inches. Superelevation cannot be increased without impact to No. 10 turnout east of curve or running off superelevation on tangent Proposed unbalance superelevation for this curve shall be **0.35 inches (new). (#68 TO BE CLOSED - OPEN AS OF 11/21/14) Change to Alignment 7/20/17**	1.6.2.1.4.3B	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-24	Curve US-WB 3 - Required speed of35 MPH results in an unbalance superelevation of greater than the maximum allowable 0.5 inches. This was done to comply with an MBTA comment requesting spirals be made longer than the minimum. Proposed unbalance superelevation for this curve shall be **0.47 inches (new). (#69 TO BE CLOSED - OPEN AS OF 11/21/14) Change to Alignment 7/20/17**	1.6.2.1.4.3B	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-25	Union Square Branch EB #6 MOD Turnout (Sta 12+62.59) has a vertical tangent length preceding the switch of less than the 30 foot minimum, but greater than the absolute minimum of 12 feet, due to alignment **(#23 CLOSED - 10/11/13) Change to Alignment 7/20/17**	10.2.3.2.e	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-26	The tangent lengths preceding the points of switch of the No. 8 diamond crossover east of Union Square Station are less than the minimum of 30 ft. This is necessary to allow the adjacent curves to have centerline radii of greater than 1,000 ft. **(#71 CLOSED - 10/11/13) Change to Alignment 7/20/17**	10.2.3.2.e	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-27	The vertical tangent between the vertical curve (PVI 35+38.94) and the No. 8 diamond crossover east of Union Square Station is less than the minimum of 30 ft. The proposed tangent length to the east is 5.34 Ft. This is necessary to create space for the preferred interlocking configuration. **(#72 CLOSED - 10/11/13) Change to Alignment 7/20/17**	10.2.3.2.e	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-28	Track Spacing between alignments MB-WB and MB-EB is less than the miminum spacing at curve locations 0,0; 3,3; 4,4; 5,5; 6,6. These curves are located within the viaduct.	10.2.3.2.e.v	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-29	Track Spacing between alignments MB-WB and MB-EB is less than the miminum spacing at curve locations MB-EB 7, MB-WB 15A and MB-EB 14A, MB-EB 16, and MB-EB 17.	10.2.3.2.e.v	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-30	Vehicle Maintenance track curve numbers VMF-1, VMF-2, and VMF-3 do not meet the minimum circular curve length due to alignment constraints	10.2.3.2.c.iii.A	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Light Rail	STV-31	Vehicle Maintenance lead track vertical profile does not meet grade requirements defined in Yard Track/Yard Storage and Pocket Track due to site grading plan.	10.2.3.2.d.ii	GLX Vol. 2 Technical Provisions	OPEN	7/20/17	T.MOORE
Commuter Rail	STV-32	Track Spacing between NH-T2 and NH-T1 is less than the minimum of 13 ft, from Sta 87+17 to Sta 89+16, and Sta 135+17 to Sta 137+57. Station 87+17 to Station 89+16 is located in existing track territory.	10.1.3.5.b.i	GLX Vol. 2 Technical Provisions/ Commuter Rail Design Standards Manual (CRDSM)	OPEN	7/20/17	T.MOORE
Commuter Rail	STV-33	Track Spacing between Curves NH-T2 10 and NH-T1 10 does not allow for additional track spacing of 2 Inches per degree of curvature due to clearances at structures	10.1.3.5.b.i/ 6.D.2	GLX Vol. 2 Technical Provisions/ Commuter Rail Design Standards Manual (CRDSM)	OPEN	7/20/17	T.MOORE



CEDAR STREET OVERHEAD BRIDGE SECTION
MB-EB 321+00

NOTES:

1. ALL CROSS SECTIONS SHOWN FACING UP-STATION.



TRACKWAY TYPICAL SECTION
MB-EB 278+76 TO MB-EB 284+78

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

MEDFORD BRANCH
CORRIDOR SECTIONS
SHEET 1

STV 100 Years | massDOT Massachusetts Department of Transportation | GLX CONSTRUCTORS

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: NO SCALE	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	CRR	PJB	JEB	SHEET: C-001	

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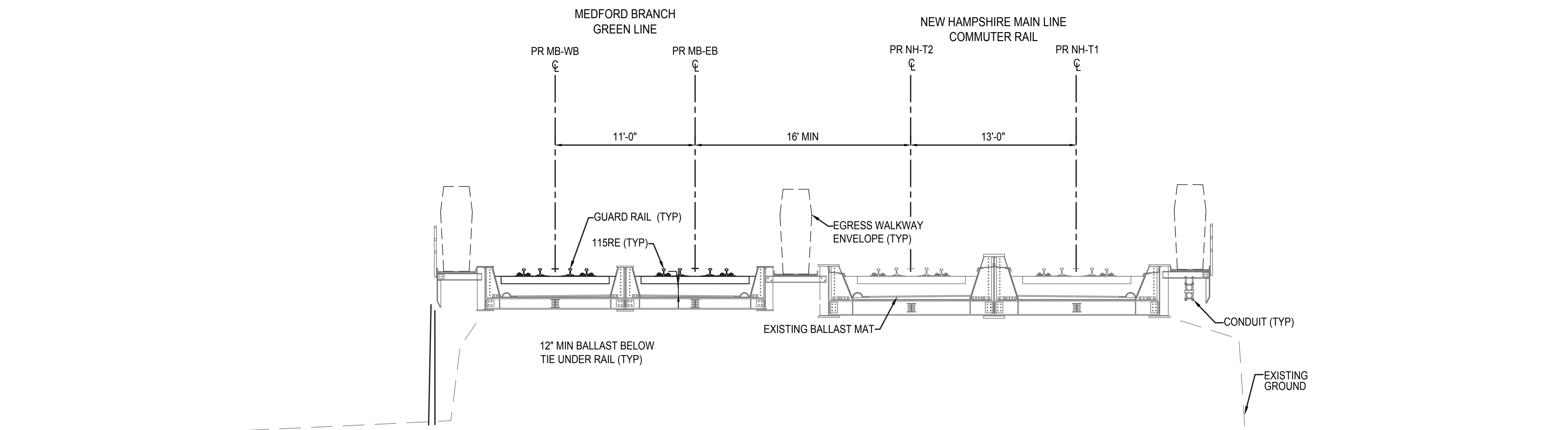
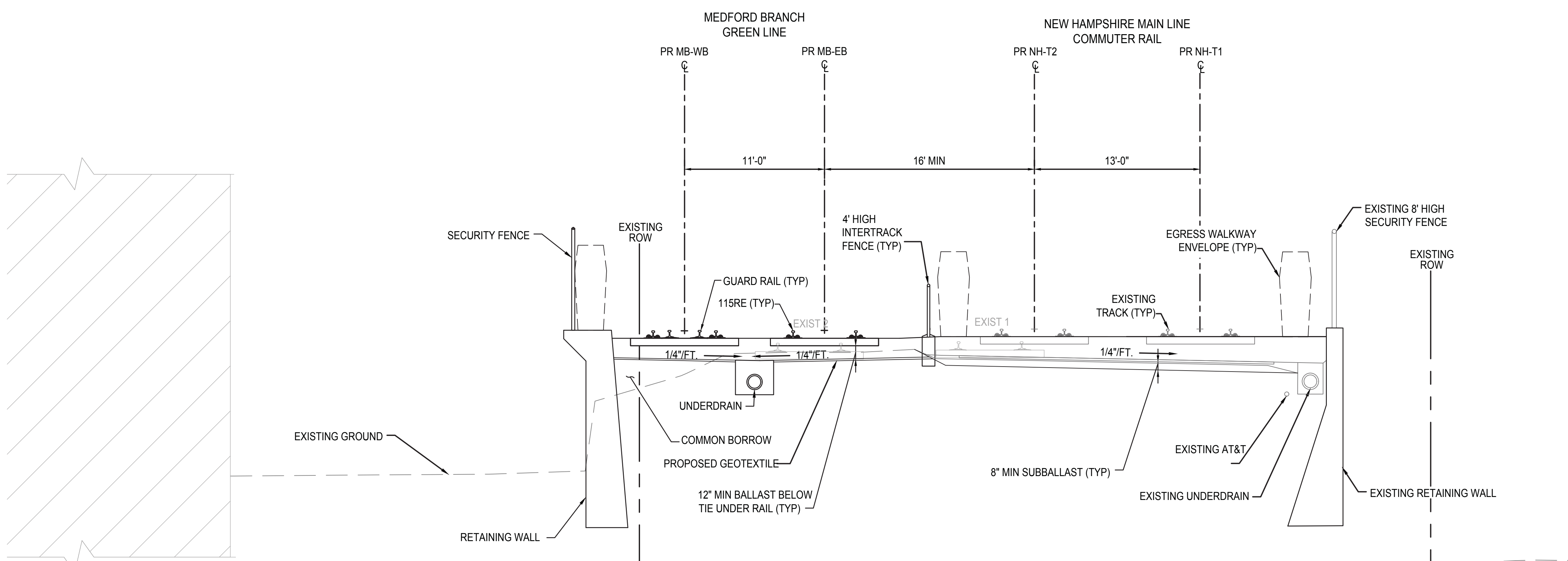


HARVARD STREET RAIL BRIDGE SECTION
REFER TO CONTRACT E22CN01 FOR BRIDGE DETAILS

NOTES:

1. ALL CROSS SECTIONS SHOWN FACING UP-STATION.
2. INTERTRACK FENCE SHALL TERMINATE AT HARVARD STREET BRIDGE STRUCTURE.
3. DESIGN-BUILDER SHALL DESIGN AND CONSTRUCT RETAINING WALL. RETAINING WALL IS PROVIDED FOR REFERENCE.



TRACKWAY TYPICAL SECTION
MB-EB 343+58 TO MB-EB 344+68

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

MEDFORD BRANCH
CORRIDOR SECTIONS
SHEET 2

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ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

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DATE: SEPT. 28, 2017	CRR	PJB	JEB	SHEET: C-002	

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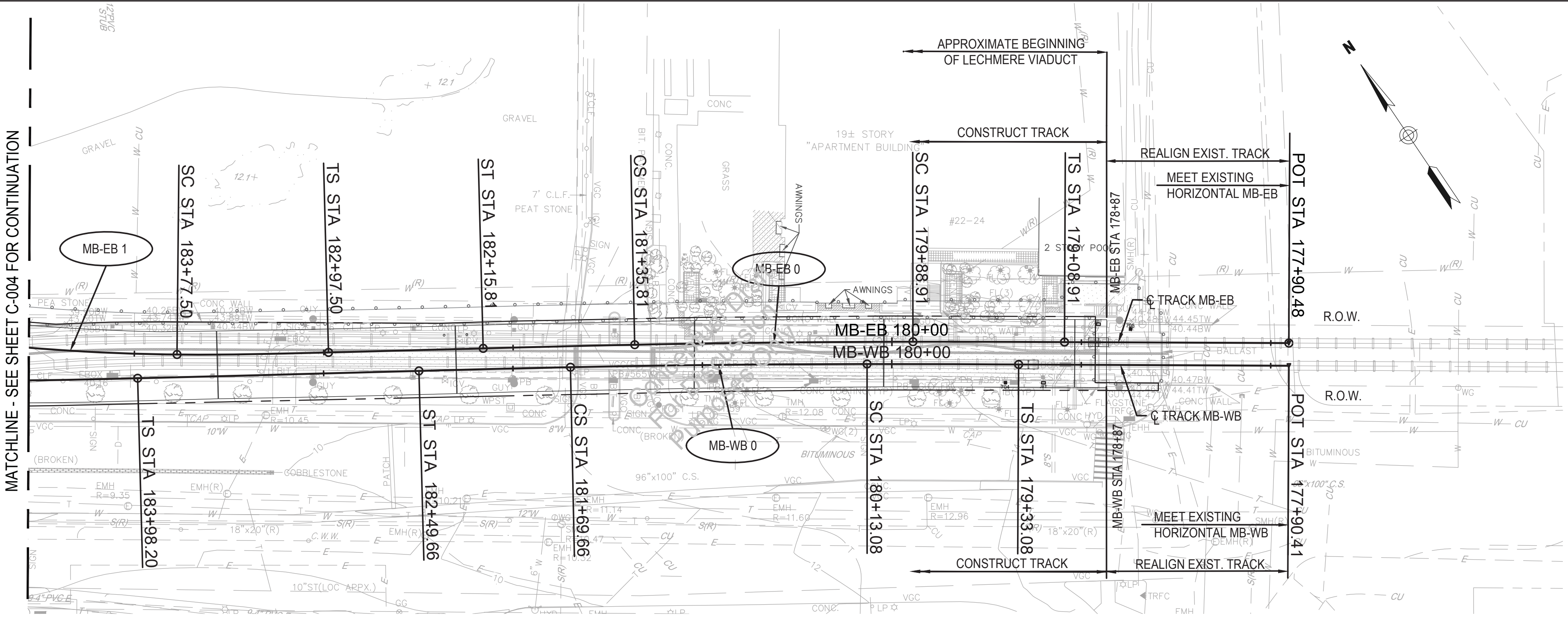
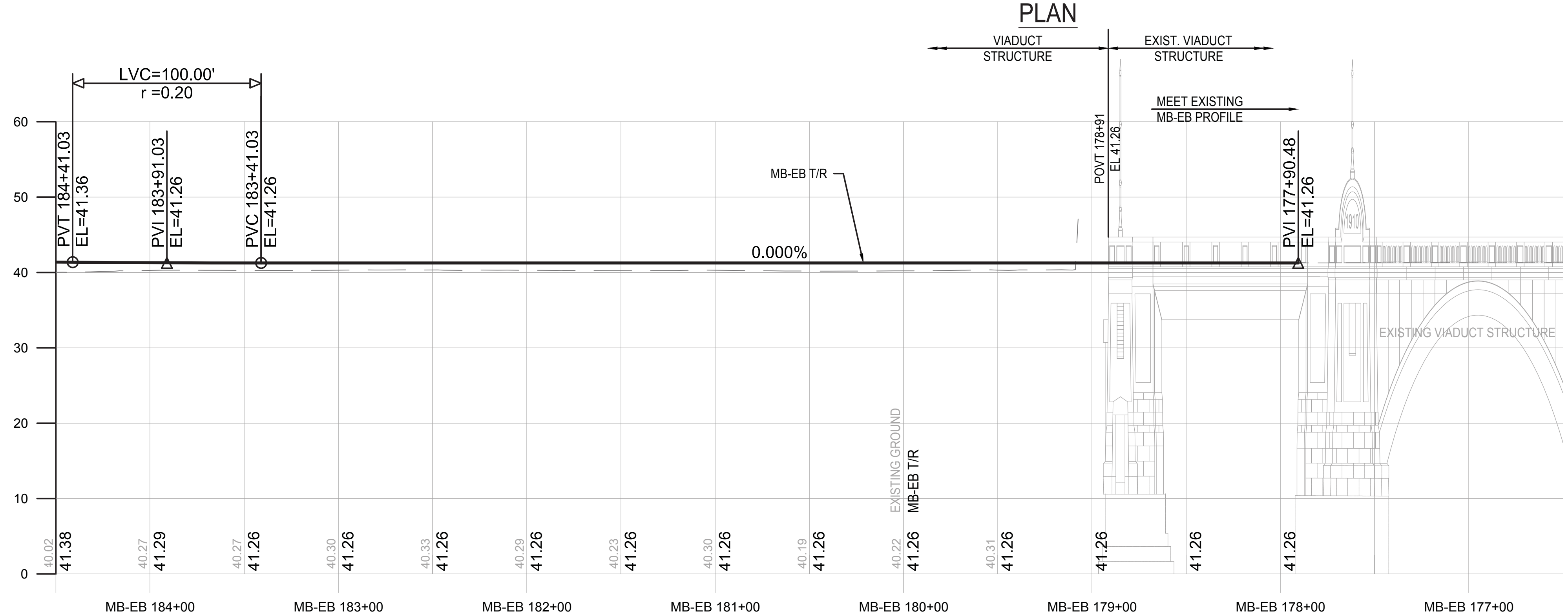


PLAN



PROFILE

CURVE NO.	MB-EB 0	MB-WB 0	MB-EB 1
R	7443.94 FT	7701.29 FT	1100.00 FT
Lc	146.90 FT	156.58 FT	268.27 FT
Ls1	80.00 FT	80.00 FT	80.00 FT
Ls2	80.00 FT	80.00 FT	80.00 FT
Ea	0.25 IN	0.25 IN	2.00 IN
Eu	0.09 IN	0.08 IN	0.28 IN
V	25 MPH	25 MPH	25 MPH

SYMBOL	DESCRIPTION
	EXISTING GROUND
	EXISTING RAILROAD TRACK
	EXISTING RAILROAD RIGHT-OF-WAY LINE
	PROPOSED CENTERLINE OF TRACK (NEW CONSTRUCTION/LINE AND SURFACE EXISTING)/PROPOSED TOP OF RAIL
	CENTERLINE OF TRACK CONSTRUCTED IN A PREVIOUS PHASE
	PROPOSED TURNOUT (RIGHT-HAND SHOWN)
	SINGLE CROSSOVER (LEFT-HAND SHOWN)
	DOUBLE CROSSOVER
	PROPOSED HIGHWAY/ RAILROAD GRADE CROSSING
℄	CENTERLINE
	POINT OF SWITCH - DENOTES SWITCH MACHINE LOCATION
	POINT OF SWITCH - DENOTES ELECTRIC LOCK LOCATION
	POINT OF SWITCH - DENOTES HAND THROW LOCATION
o	POINT OF CURVE/SPIRAL
Ea	ACTUAL SUPERELEVATION
Eu	UNBALANCED SUPERELEVATION
V	DESIGN SPEED IN MPH
TO	TURNOUT
XO	CROSSOVER
MB-EB 1	CURVE NUMBER
MP 1	MILE POST
SIH	SIGNAL INSTRUMENT HOUSE (COMMUTER RAIL)
CIH	CONTROL INSTRUMENT HOUSE (LIGHT RAIL)
EQ	TRACK ALIGNMENT STATION EQUATION
	POINT OF INTERSECTION

ABBREVIATIONS

MB - MEDFORD BRANCH
US - UNION SQUARE BRANCH
NH - NEW HAMPSHIRE
YL - YARD LEAD
ST - STORAGE TRACK
MAF - MAINTENANCE TRACK
PT - POINT OF TANGENT
LVC - LENGTH OF VERTICAL CURVE
PVC - POINT OF VERTICAL CURVE
PVI - POINT OF VERTICAL INTERSECTION
PVT - POINT OF VERTICAL TANGENT
EGL - EXISTING GRADE LINE
TS - TANGENT SPIRAL
SC - SPIRAL CURVE
CS - CURVE SPIRAL
ST - SPIRAL TANGENT
R - RADIUS
Lc - LENGTH OF CURVE
Ls - LENGTH OF SPIRAL
MOD - MODIFIED
P - PIPE
MH - MANHOLE
BG - BOTTOM OF GIRDER
MSE - MECHANICALLY STABILIZED EMBANKMENT
MW - MEDFORD WEST RETAINING WALLT
ME - MEDFORD EAST RETAINING WALL
UN - UNION SQUARE NORTH WALL
MCW - MEDFORD CRIB WALL

HORIZONTAL 40 0 40 80
10 0 10 20 VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

MEDFORD BRANCH
CORRIDOR PLAN AND PROFILE
STA MB-EB 176+50 TO STA MB-EB 184+50

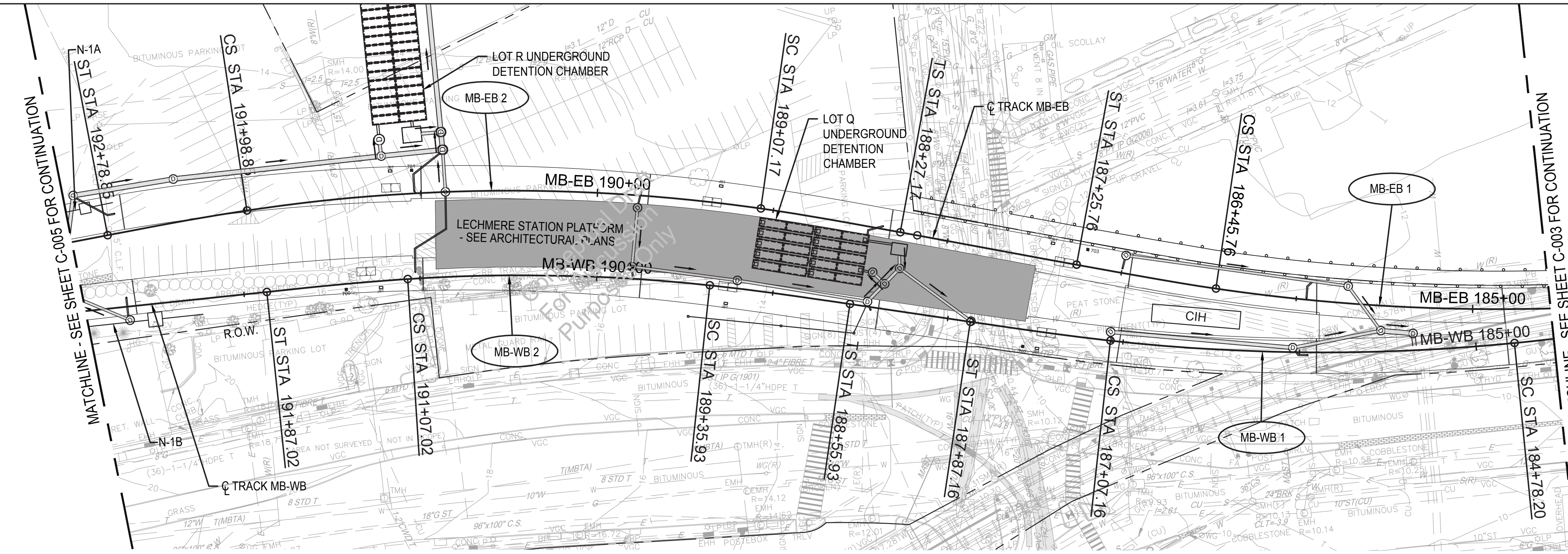
STV 100 Years | massDOT Massachusetts Department of Transportation | GLX CONSTRUCTORS

GV20170258-276

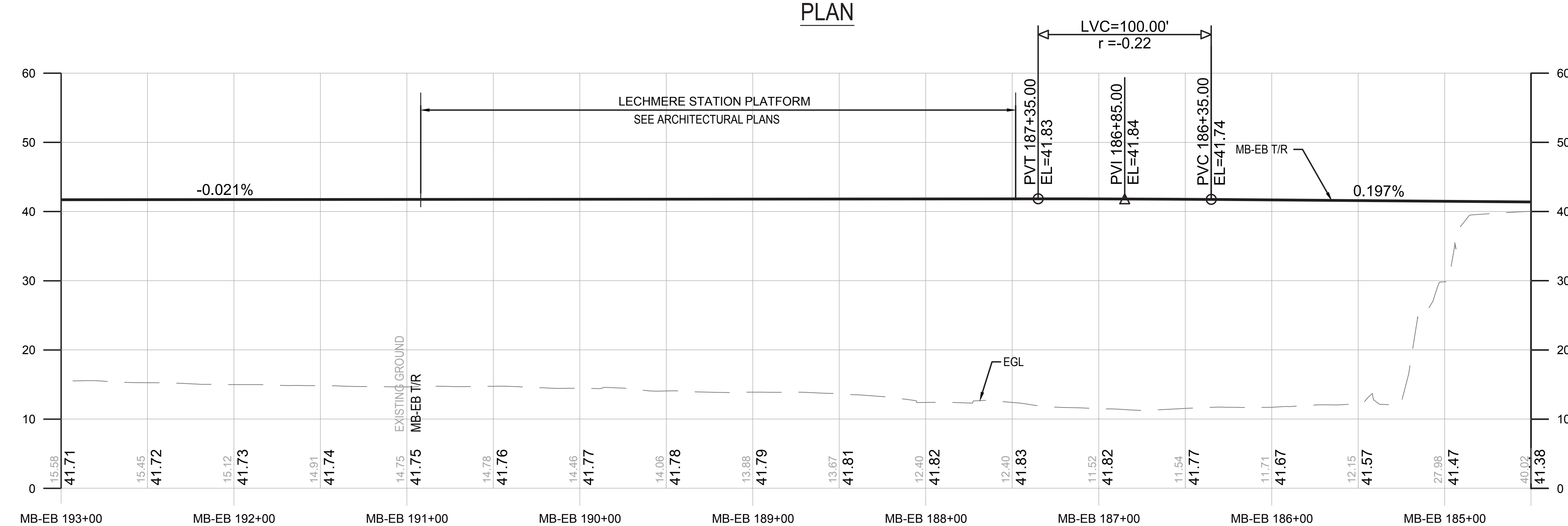
ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	CRR	PJB	PEB	SHEET: C-003	

PLOTTED: 09/21/17 5:35AM BY:BRYANTPJ
DRAWING: I:\PROPOSALS\2017\0062820 GLX D-B\STV 2017 RFP DESIGN\90_CAD MODELS AND SHEETS\04_CK_TRACK_RAIL\000-K-2001-2008.DWG [C-003] 09/20/17 9:47PM



PLAN



PROFILE

CURVE NO.	MB-EB 1	MB-EB 2	MB-WB 1	MB-WB 2
R	1100.00 FT	1000.00 FT	1100.00 FT	1000.00 FT
Lc	268.27 FT	291.68 FT	228.96 FT	171.09 FT
Ls1	80.00 FT	80.00 FT	80.00 FT	80.00 FT
Ls2	80.00 FT	80.00 FT	80.00 FT	80.00 FT
Ea	2.00 IN	1.50 IN	2.00 IN	1.50 IN
Eu	0.28 IN	1.01 IN	0.28 IN	1.01 IN
V	25 MPH	25 MPH	25 MPH	25 MPH

HORIZONTAL 40 0 40 80
10 0 10 20
VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

MEDFORD BRANCH
CORRIDOR PLAN AND PROFILE
STA MB-EB 184+50 TO STA MB-EB 193+00

STV 100 Years | massDOT Massachusetts Department of Transportation | GLX CONSTRUCTORS

GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED | DRAWN BY: CRR | DESIGN BY: PJB | CHECK BY: PEB | PLAN NO.
DATE: SEPT. 28, 2017 | SHEET: C-004 | ISSUE

PLOTTED: 09/21/17 1:42PM BY: BRYANTPJ
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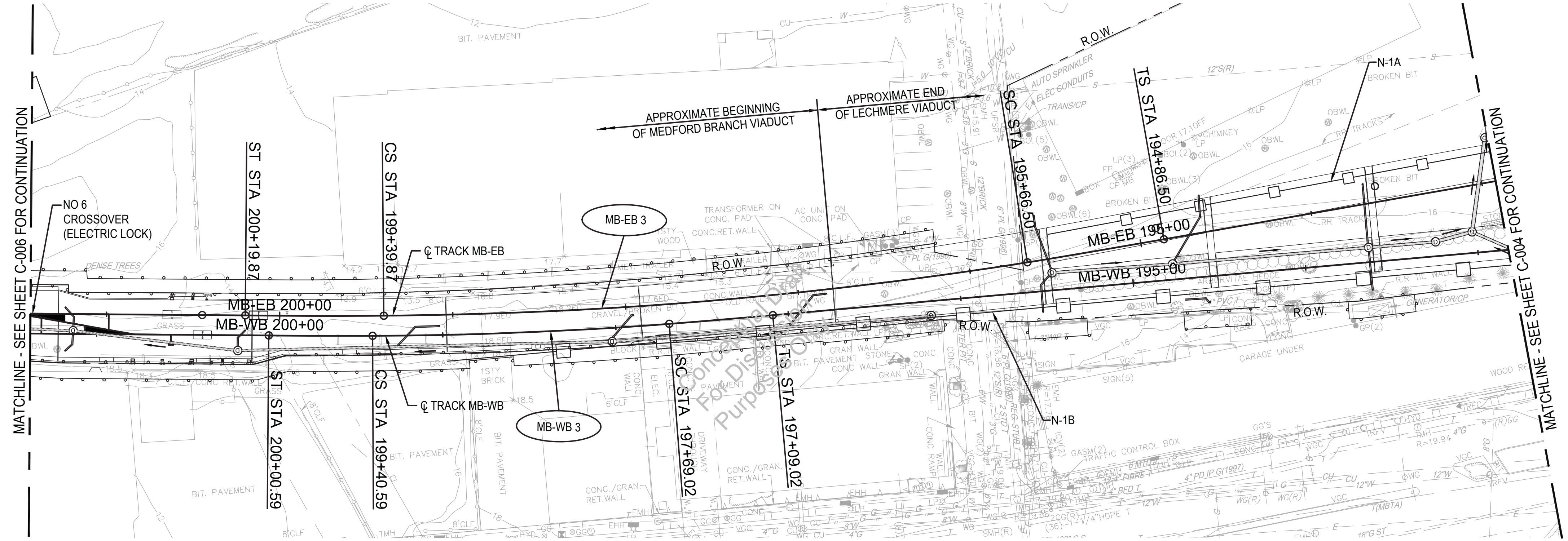

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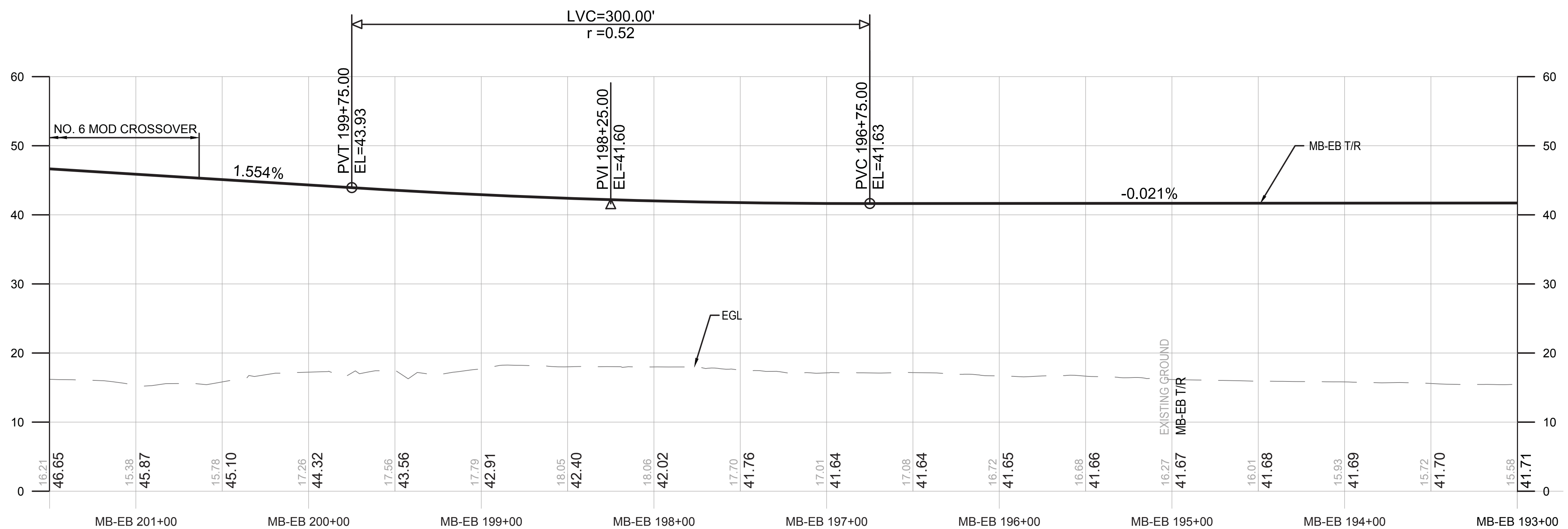

PROFILE

CURVE NO.	MB-EB 3	MB-WB 3
R	2500.00 FT	2400.00 FT
Lc	373.37 FT	171.57 FT
Ls1	80.00 FT	60.00 FT
Ls2	80.00 FT	60.00 FT
Ea	1.00 IN	1.00 IN
Eu	0.44 IN	0.50 IN
V	30 MPH	30 MPH

HORIZONTAL
40 0 40 80
10 0 10 20
VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

MEDFORD BRANCH
CORRIDOR PLAN AND PROFILE
STA MB-EB 193+00 TO STA MB-EB 201+50

STV 100 Years
massDOT Massachusetts Department of Transportation
GLX CONSTRUCTORS

GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	CRR	PJB	JEB	SHEET: C-005	

PLOTTED: 09/22/17 7:25AM BY:BRYANTPJ
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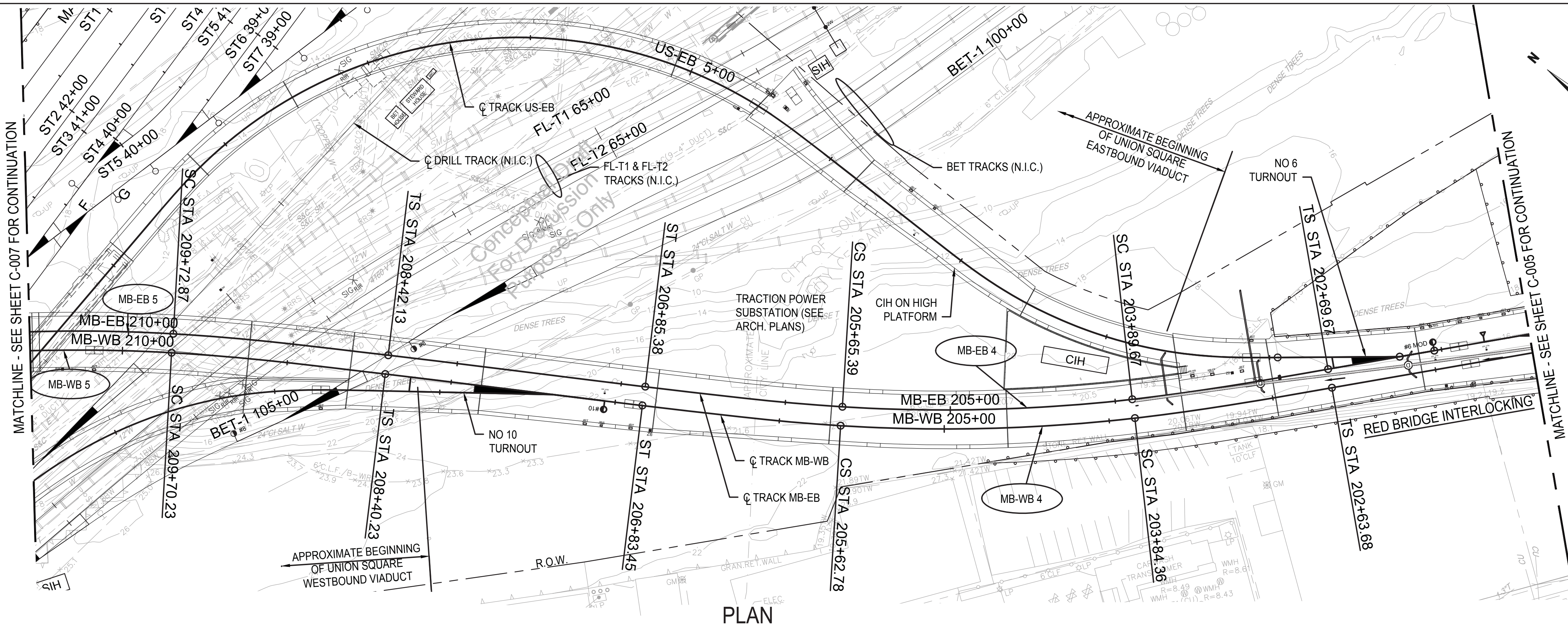

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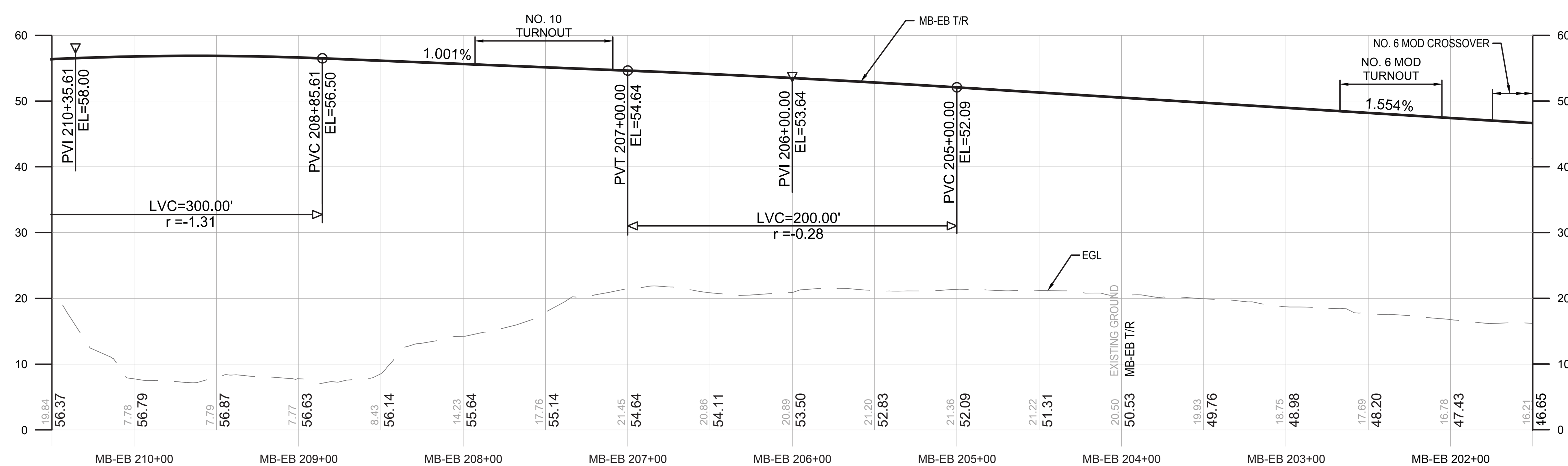

PROFILE

CURVE NO.	MB-EB 4	MB-WB 4	MB-EB 5	MB-WB 5
R	1005.00 FT	1016.50 FT	1016.50 FT	1005.00 FT
Lc	175.71 FT	178.42 FT	194.16 FT	191.23 FT
Ls1	120.00 FT	120.68 FT	130.74 FT	130.00 FT
Ls2	120.00 FT	120.68 FT	130.74 FT	130.00 FT
Ea	3.00 IN	3.00 IN	3.25 IN	3.25 IN
Eu	0.59 IN	0.55 IN	0.30 IN	0.34 IN
V	30 MPH	30 MPH	30 MPH	30 MPH

NOTES:

1. REFER TO SHEETS C-026 TO C-032 FOR UNION SQUARE BRANCH ALIGNMENT AND PROFILE.
2. REFER TO SHEET C-056 FOR DRAINAGE FROM STA 203+85 TO STA 213+85 .

HORIZONTAL
40 0 40 80
10 0 10 20
VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

MEDFORD BRANCH
CORRIDOR PLAN AND PROFILE
STA MB-EB 201+50 TO STA MB-EB 210+50

STV 100 Years | massDOT Massachusetts Department of Transportation | GLX CONSTRUCTORS

GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	CRR	PJB	PEB	SHEET: C-006	

PLOTTED: 09/22/17 9:01AM BY:BRYANTPJ
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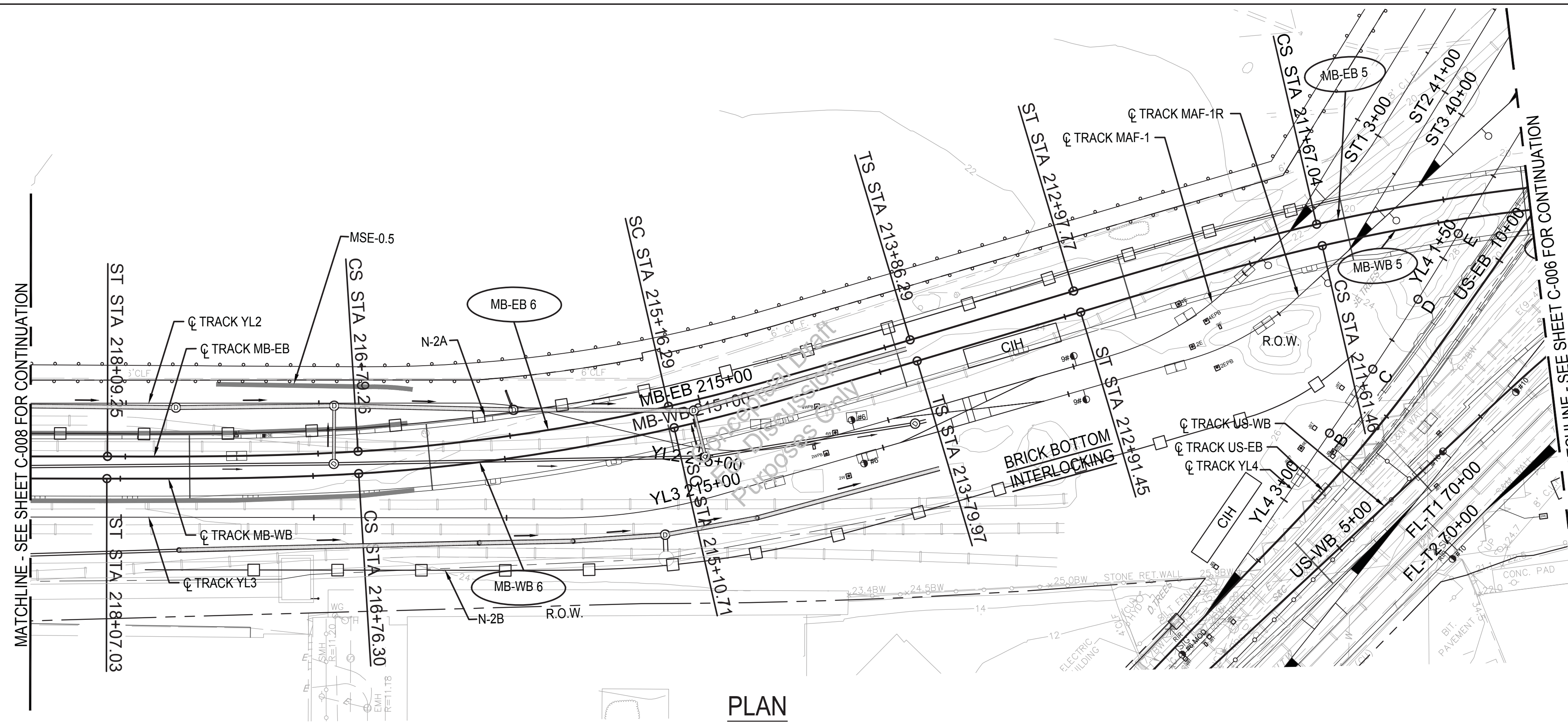

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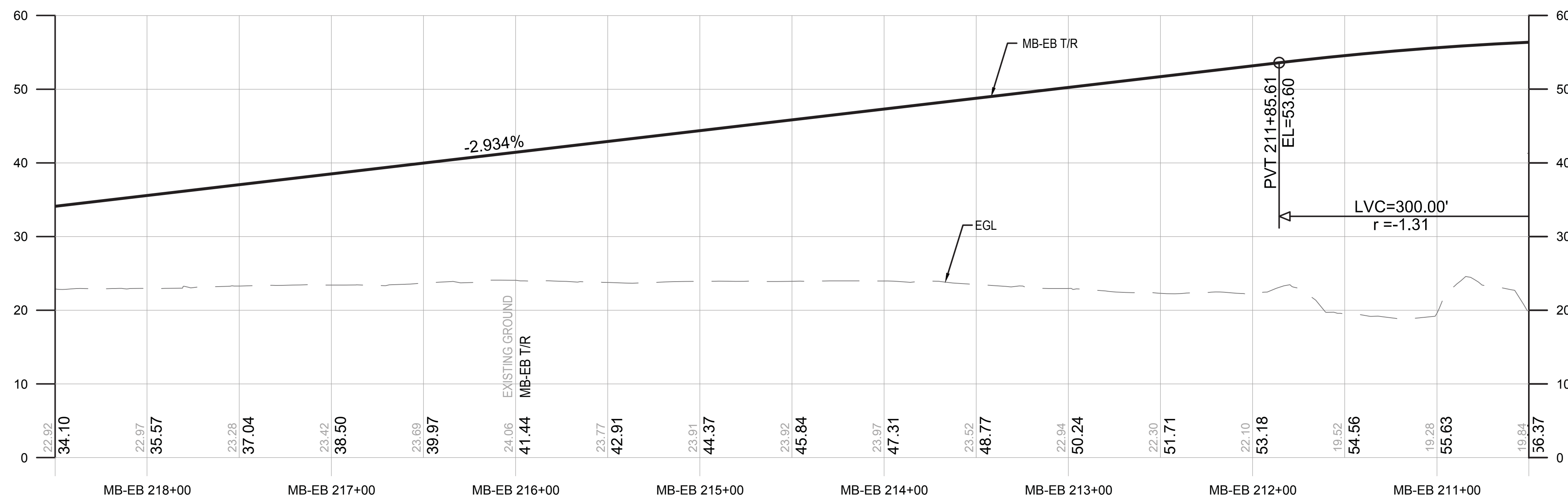

PROFILE

HORIZONTAL 40 0 40 80

VERTICAL 10 0 10 20

SCALE IN FEET

CURVE NO.	MB-EB 5	MB-WB 5	MB-EB 6	MB-WB 6
R	1016.50 FT	1005.00 FT	1005.00 FT	1016.50 FT
Lc	194.16 FT	191.23 FT	162.97 FT	165.58 FT
Ls1	130.74 FT	130.00 FT	130.00 FT	130.74 FT
Ls2	130.74 FT	130.00 FT	130.00 FT	130.74 FT
Ea	3.25 IN	3.25 IN	3.25 IN	3.25 IN
Eu	0.30 IN	0.34 IN	0.34 IN	0.30 IN
V	30 MPH	30 MPH	30 MPH	30 MPH

NOTES:

1. REFER TO SHEETS C-026 TO C-032 FOR UNION SQUARE BRANCH ALIGNMENT AND PROFILE.
2. REFER TO SHEETS C-050 TO C-055 FOR YARD LEAD ALIGNMENT AND PROFILE.
3. REFER TO SHEET C-056 FOR DRAINAGE FROM STA 203+80 TO STA 213+85.

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

MEDFORD BRANCH
CORRIDOR PLAN AND PROFILE
STA MB-EB 210+50 TO STA MB-EB 218+50

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GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	CRR	PJB	JEB	SHEET: C-007	

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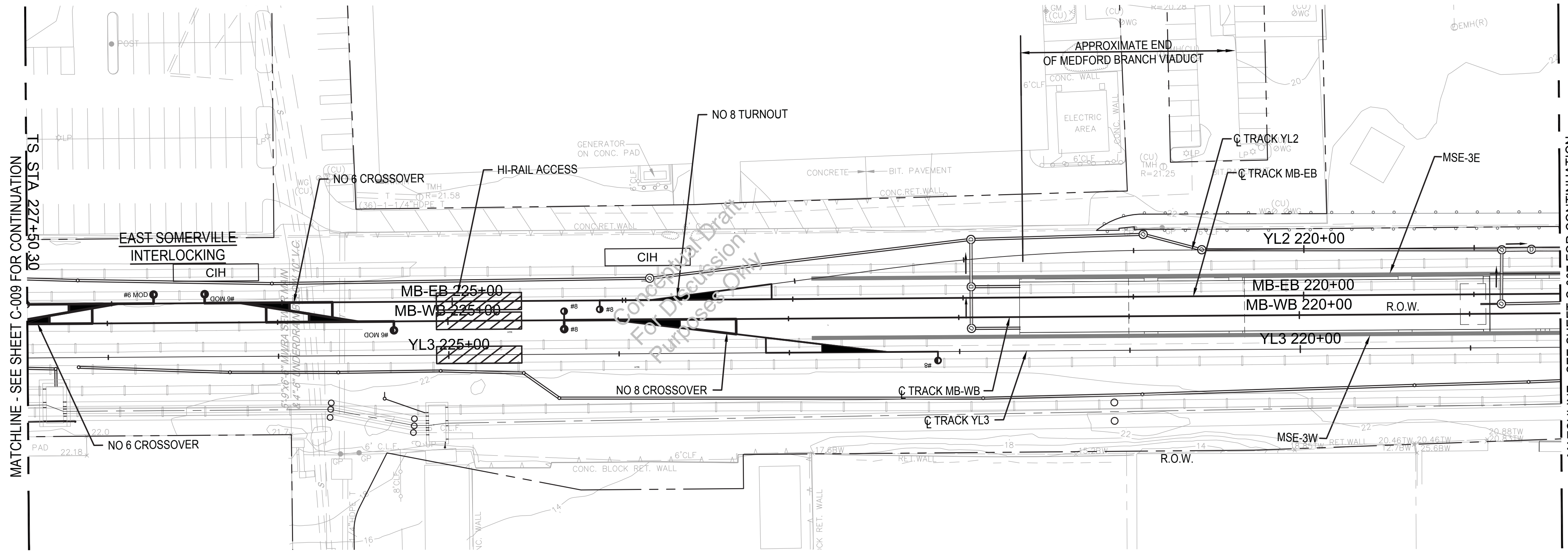

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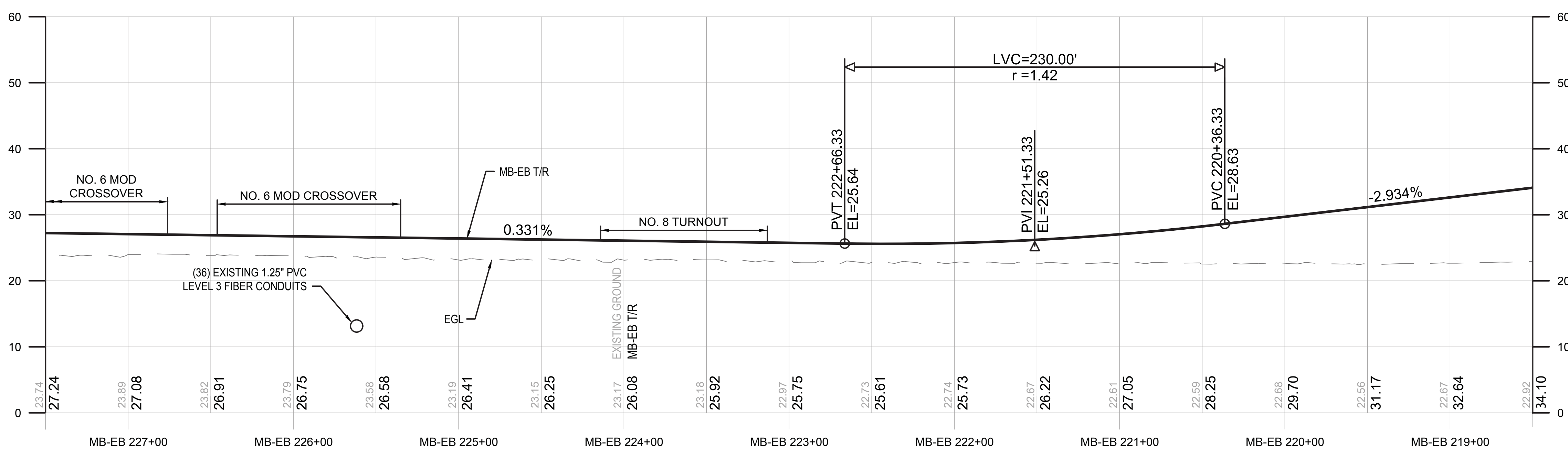

PROFILE

NOTES:

1. REFER TO SHEETS C-050 TO C-055 FOR YARD LEAD ALIGNMENT AND PROFILE.

HORIZONTAL 40 0 40 80
10 0 10 20
VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

MEDFORD BRANCH
CORRIDOR PLAN AND PROFILE
STA MB-EB 218+50 TO STA MB-EB 227+50

STV 100 Years | massDOT Massachusetts Department of Transportation | GLX CONSTRUCTORS

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ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	CRR	PJB	JEB	SHEET: C-008	

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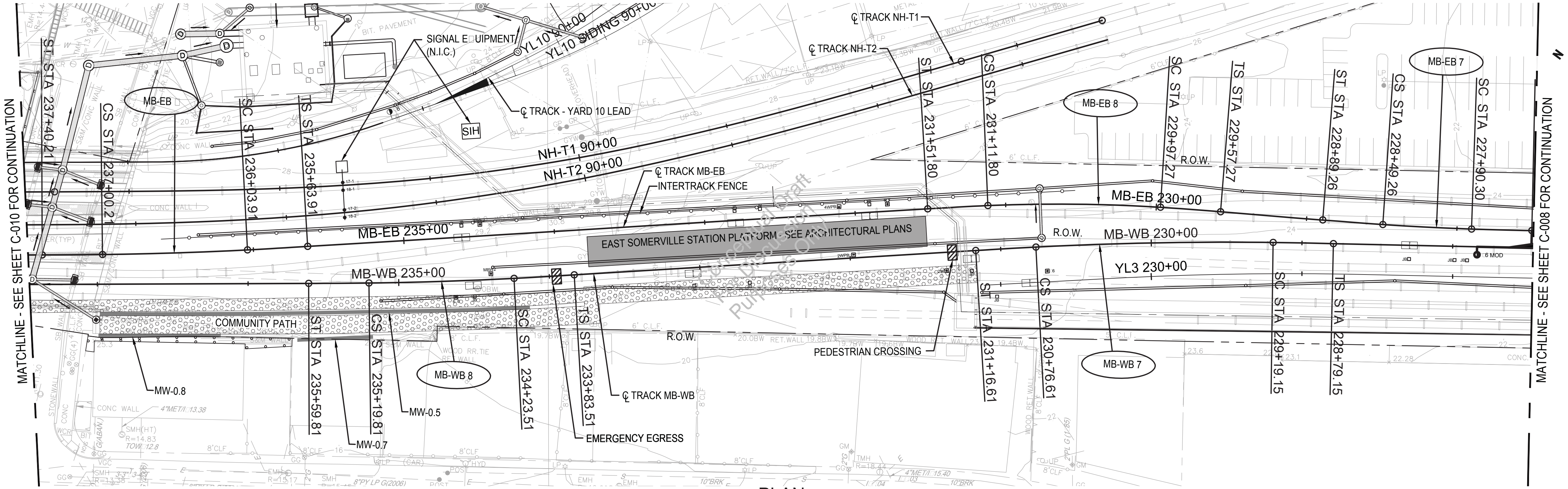

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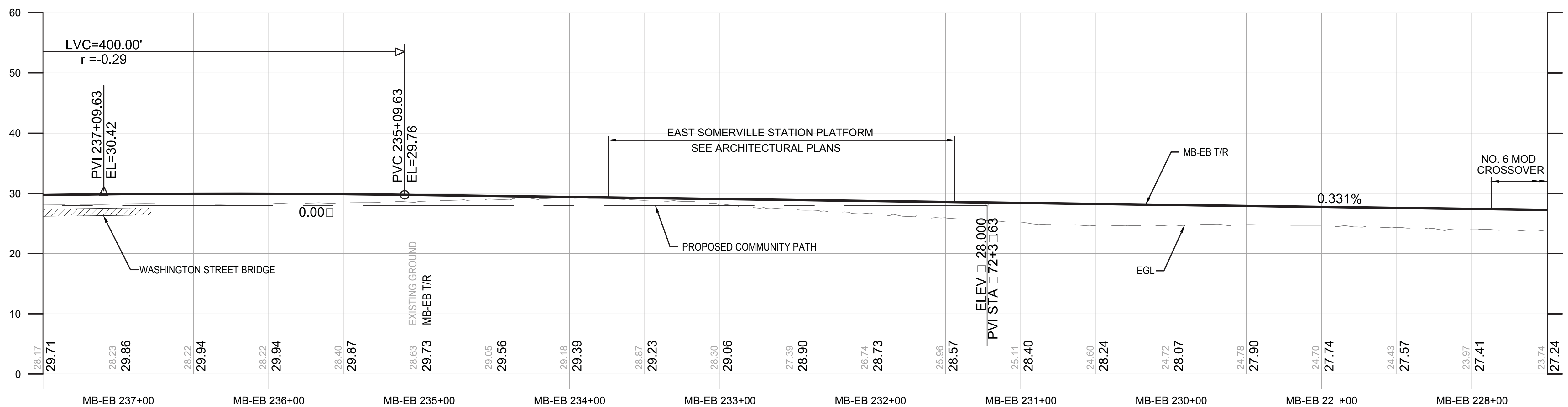

PROFILE

CURVE NO.	MB-EB 7	MB-EB 8	MB-WB 7	MB-WB 8	MB-EB 9
R	1700.00 FT	1100.00 FT	2400.00 FT	2400.00 FT	2400.00 FT
Lc	58.96 FT	114.54 FT	157.46 FT	96.30 FT	96.30 FT
Ls1	40.00 FT	40.00 FT	40.00 FT	40.00 FT	40.00 FT
Ls2	40.00 FT	40.00 FT	40.00 FT	40.00 FT	40.00 FT
Ea	1.00 IN	1.00 IN	1.00 IN	1.25 IN	1.25 IN
Eu	0.43 IN	0.46 IN	0.49 IN	0.22 IN	0.22 IN
V	25 MPH	20 MPH	25 MPH	30 MPH	30 MPH

NOTES:

1. REFER TO SHEETS C-033 TO C-04□ FOR NEW HAMPSHIRE MAINLINE ALIGNMENT AND PROFILE.
2. REFER TO SHEETS C-050 TO C-055 FOR YARD LEAD ALIGNMENT AND PROFILE.

HORIZONTAL 40 0 40 80
10 0 10 20 VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

MEDFORD BRANCH
CORRIDOR PLAN AND PROFILE
STA MB-EB 227+50 TO STA MB-EB 237+50

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GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED | DRAWN BY: CRR | DESIGN BY: PJB | CHECK BY: JEB | PLAN NO.
DATE: SEPT. 28, 2017 | SHEET: C-00□ | ISSUE

PLOTTED: 09/21/17 6:33PM BY:BRYANTPJ
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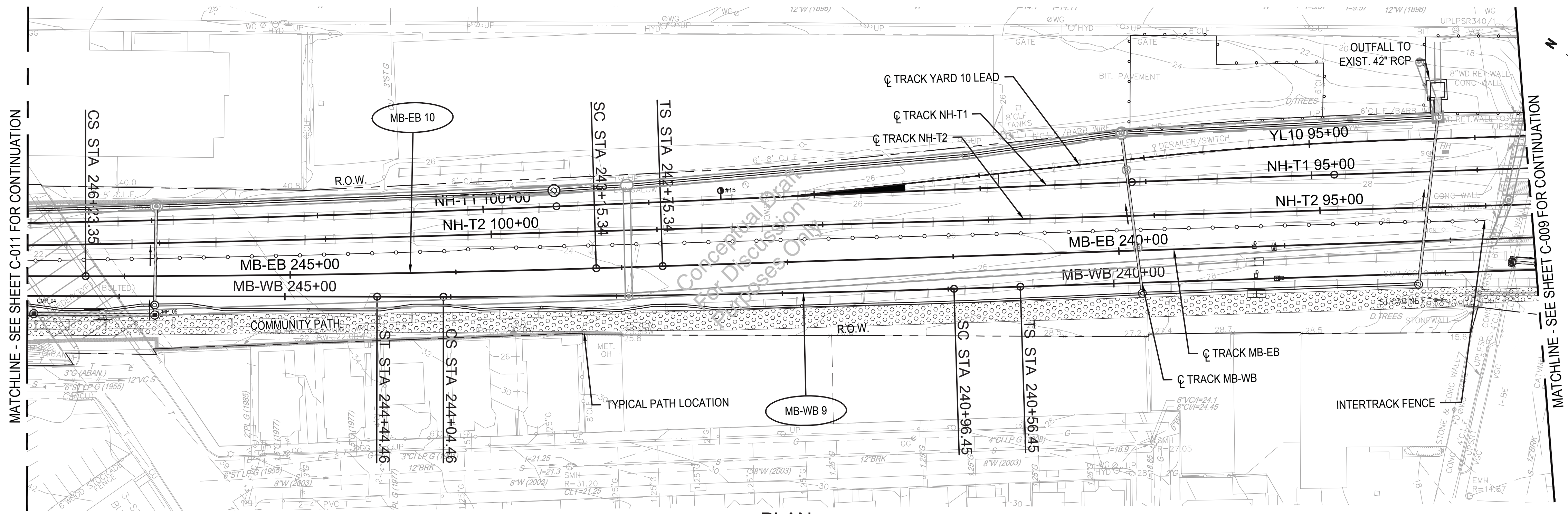

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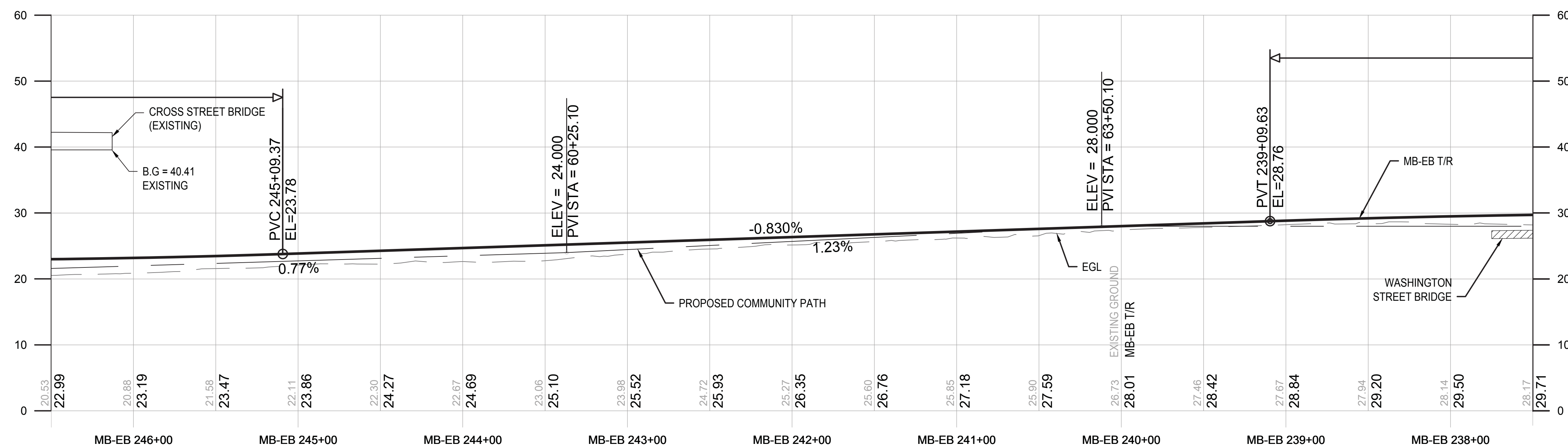

PROFILE

CURVE NO.	MB-WB 9	MB-EB 10
R	10000.00 FT	10000.00 FT
Lc	308.01 FT	308.01 FT
Ls1	40.00 FT	40.00 FT
Ls2	40.00 FT	40.00 FT
Ea	1.00 IN	1.00 IN
Eu	0.00 IN	0.00 IN
V	50 MPH	50 MPH

NOTES:

1. REFER TO SHEETS C-033 TO C-049 FOR NEW HAMPSHIRE MAINLINE ALIGNMENT AND PROFILE.

HORIZONTAL
40 0 40 80
10 0 10 20
VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

MEDFORD BRANCH
CORRIDOR PLAN AND PROFILE
STA MB-EB 237+50 TO STA MB-EB 246+50

STV 100 Years | massDOT Massachusetts Department of Transportation | GLX CONSTRUCTORS

GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	CRR	PJB	JEB	SHEET: C-010	

PLOTTED: 09/21/17 6:40PM BY: BRYANTPJ
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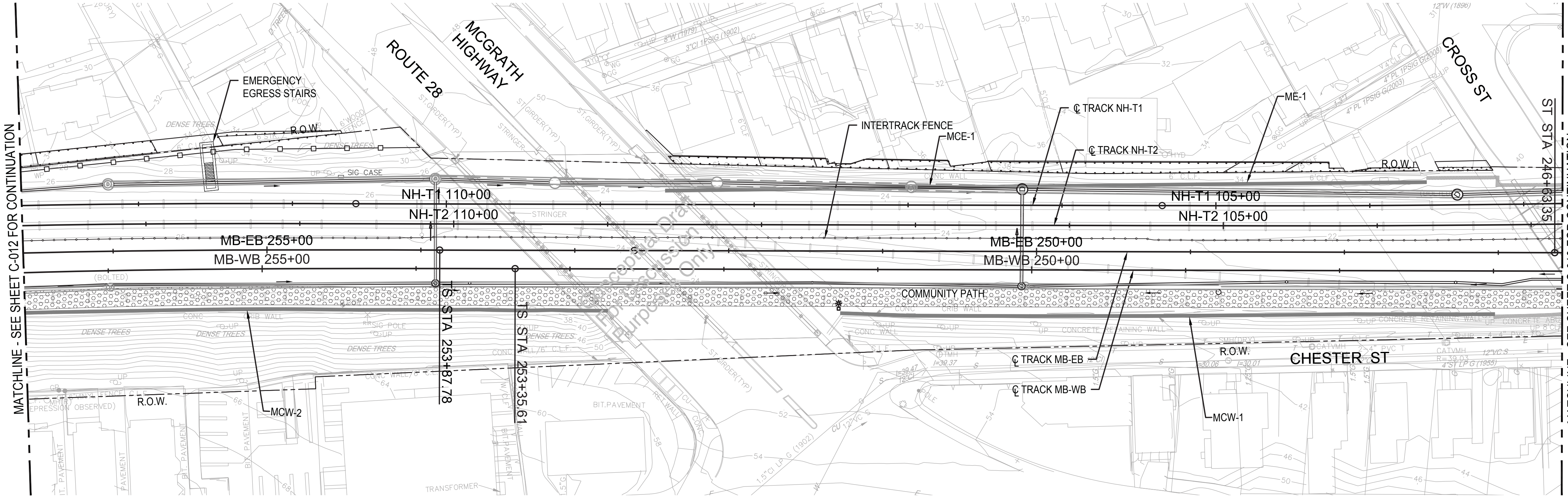

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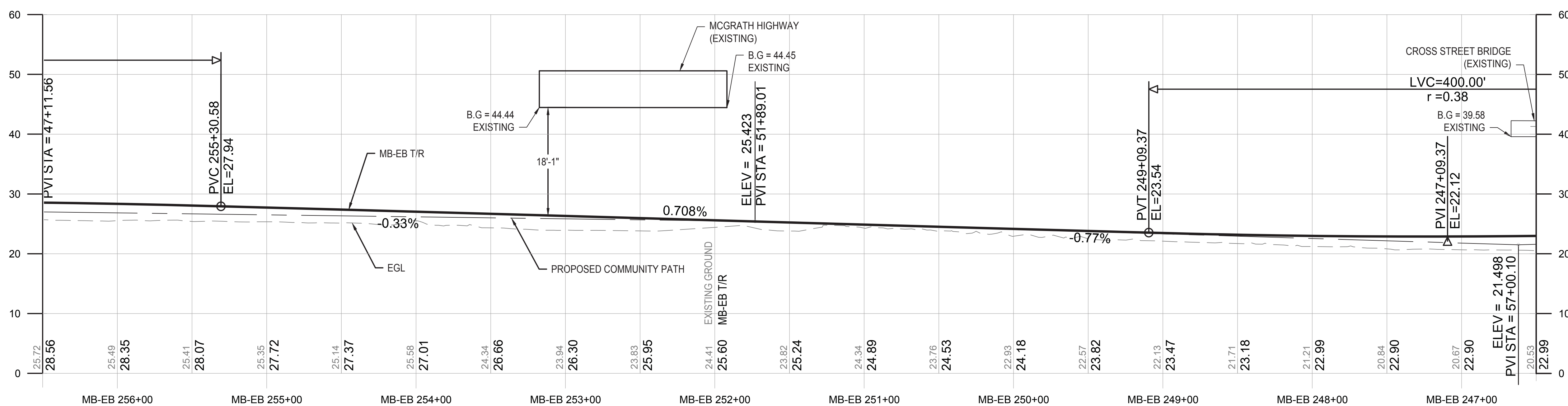

PROFILE

HORIZONTAL
40 0 40 80
10 0 10 20
VERTICAL
SCALE IN FEET

NOTES:

1. REFER TO SHEETS C-033 TO C-049 FOR NEW HAMPSHIRE MAINLINE ALIGNMENT AND PROFILE.
2. THE MB-WB T/R TRACK PROFILE TO BE THE SAME AS MB-EB T/R TRACK PROFILE.

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

MEDFORD BRANCH
CORRIDOR PLAN AND PROFILE
STA MB-EB 246+50 TO STA MB-EB 256+50

STV 100 Years — massDOT Massachusetts Department of Transportation — GLX CONSTRUCTORS

GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	CRR	PJB	JEB	SHEET: C-011	

PLOTTED: 09/22/17 1:49PM BY:REINEKC
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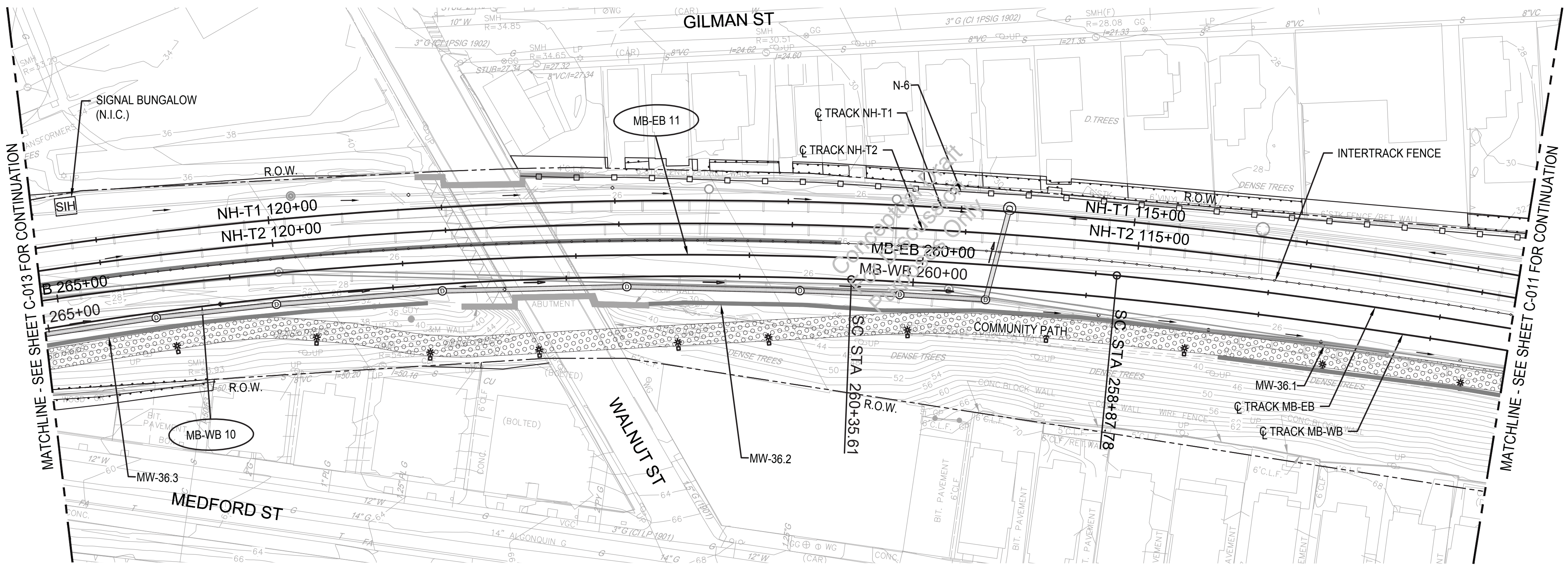

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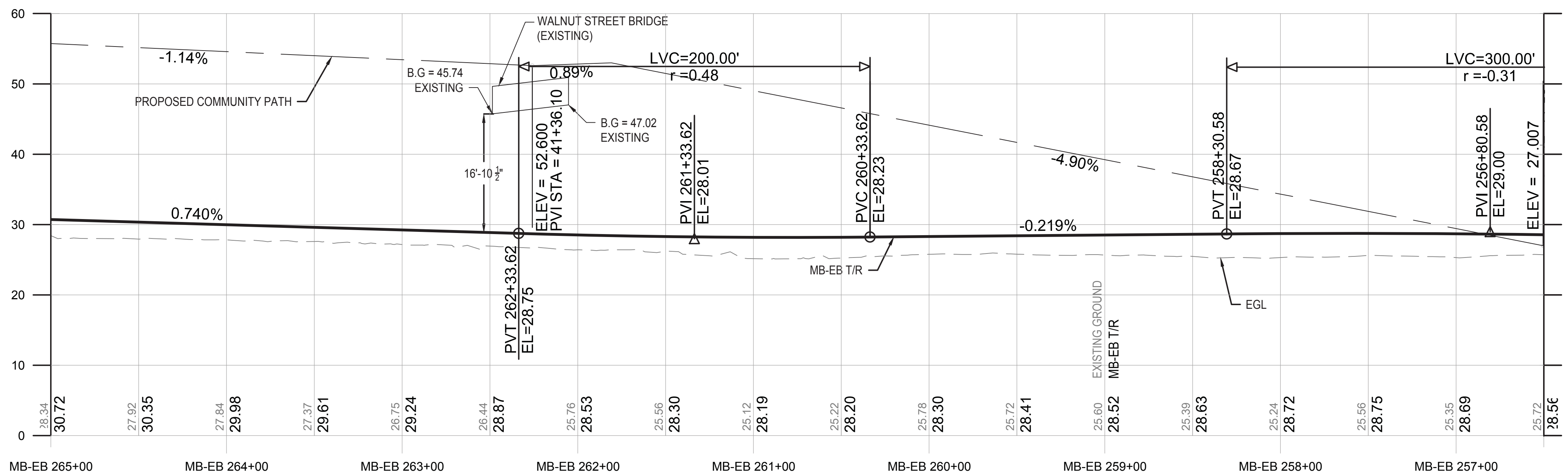


PROFILE

CURVE NO.	MB-WB 10	MB-EB 11
R	2300.00 FT	2600.00 FT
Lc	532.41 FT	739.49 FT
Ls1	700.00 FT	500.00 FT
Ls2	150.00 FT	200.00 FT
Ea	3.25 IN	3.50 IN
Eu	0.28 IN	0.36 IN
V	45 MPH	50 MPH

NOTES:

1. REFER TO SHEETS C-033 TO C-049 FOR NEW HAMPSHIRE MAINLINE ALIGNMENT AND PROFILE.
2. THE MB-WB T/R TRACK PROFILE TO BE THE SAME AS MB-EB T/R TRACK PROFILE.

HORIZONTAL 40 0 40 80
VERTICAL 10 0 10 20
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

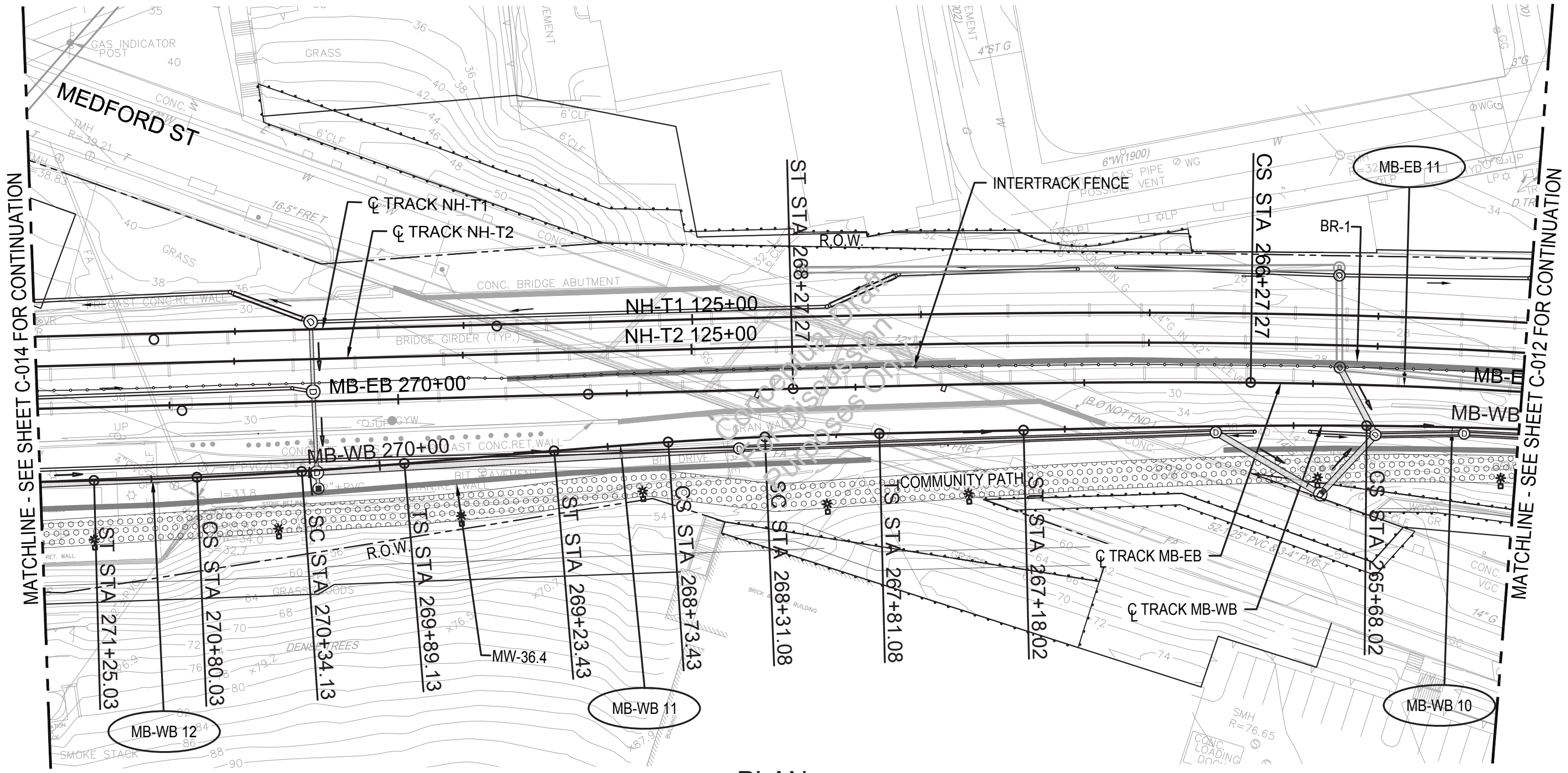
MEDFORD BRANCH
CORRIDOR PLAN AND PROFILE
STA MB-EB 256+50 TO STA MB-EB 265+00

STV 100 Years | massDOT Massachusetts Department of Transportation | GLX CONSTRUCTORS

GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	CRR	PJB	JEB	SHEET: C-012	



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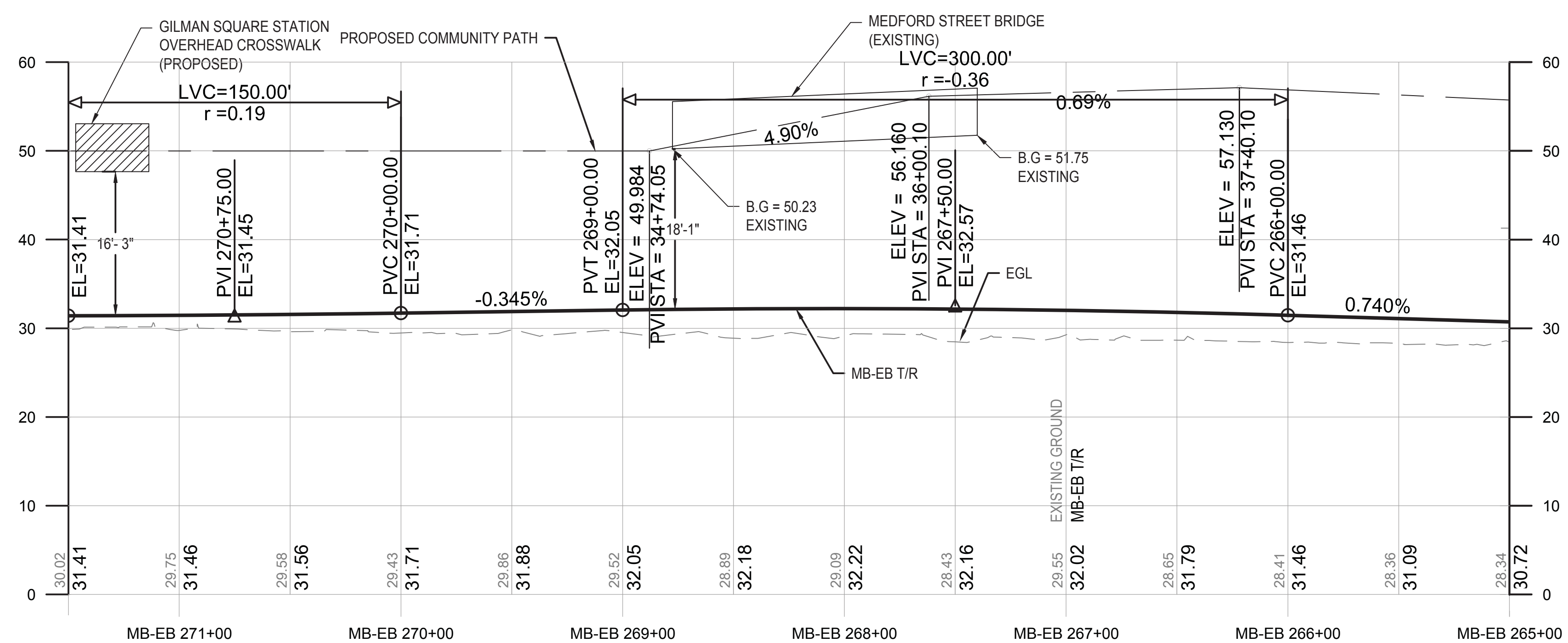


PROFILE

CURVE NO.	MB-WB 10	MB-WB 11	MB-WB 12	MB-EB 11
R	2300.00 FT	1550.00 FT	1600.00 FT	2600.00 FT
Lc	532.41 FT	42.35 FT	45.90 FT	739.49 FT
Ls1	700.00 FT	50.00 FT	45.00 FT	500.00 FT
Ls2	150.00 FT	50.00 FT	45.00 FT	200.00 FT
Ea	3.25 IN	1.00 IN	1.00 IN	3.50 IN
Eu	0.28 IN	0.12 IN	0.57 IN	0.36 IN
s	45 MPH	25 MPH	25 MPH	50 MPH

NOTES:

1. REFER TO SHEETS C-033 TO C-049 FOR NEW HAMPSHIRE MAINLINE ALIGNMENT AND PROFILE.
2. CURVE MB-EB 12 DOES NOT EXIST.
3. THE MB-WB T/R TRACK PROFILE TO BE THE SAME AS MB-EB T/R TRACK PROFILE.

HORIZONTAL
40 0 40 80
10 0 10 20
VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

MEDFORD BRANCH
CORRIDOR PLAN AND PROFILE
STA MB-EB 265+00 TO STA MB-EB 271+50

STV 100 Years

massDOT Massachusetts Department of Transportation

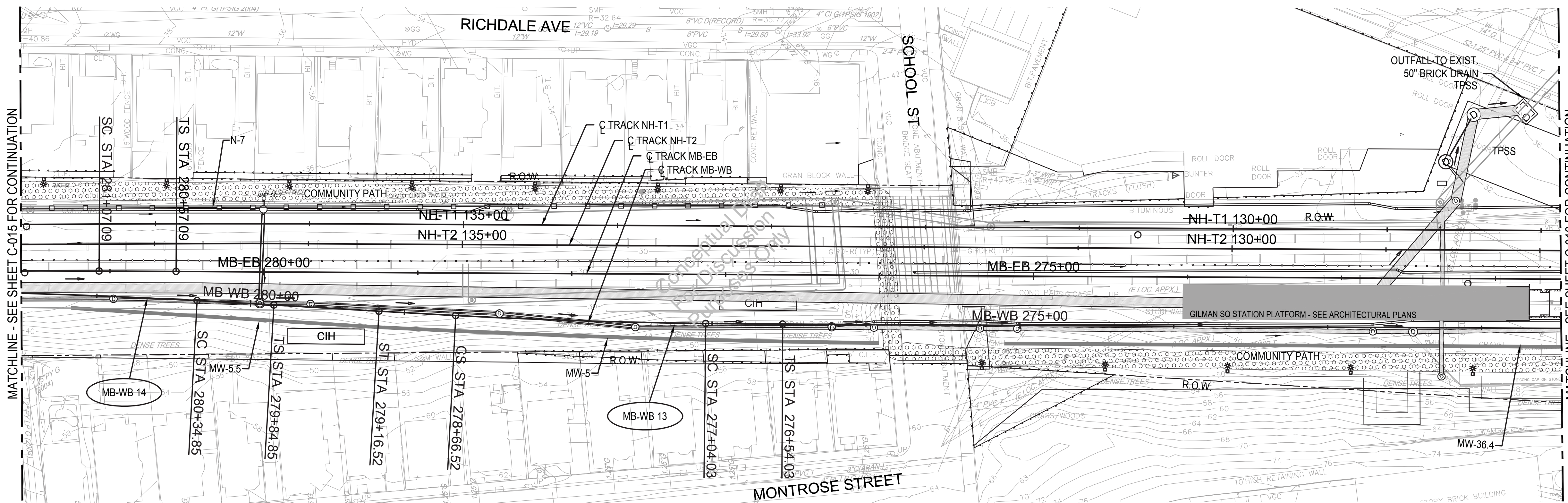
GLX CONSTRUCTORS

GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED | DRAWN BY: CRR | DESIGN BY: PJB | CHECK BY: JEB | PLAN NO.
DATE: SEPT. 28, 2017 | SHEET: C-013 | ISSUE

PLOTTED: 09/22/17 2:40PM BY:REINEKC
DRAWING: I:\PROPOSALS\2017\0062820 GLX D-B\STV 2017 RFP DESIGN\90_CAD MODELS AND SHEETS\04_CK_TRACK_RAIL\000-K-2009-2022.DWG [C-013] 09/22/17 2:29PM



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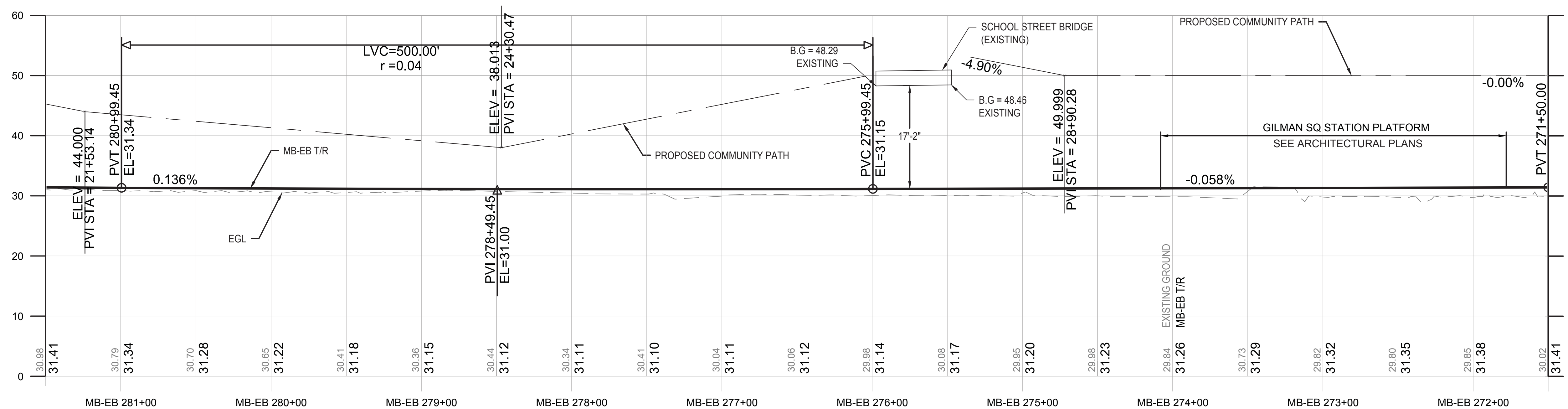

PROFILE

CURVE NO.	MB-WB 13	MB-WB 14
R	4000.00 FT	5000.00 FT
Lc	162.49 FT	265.74 FT
Ls1	50.00 FT	50.00 FT
Ls2	50.00 FT	50.00 FT
Ea	1.00 IN	1.00 IN
Eu	0.23 IN	0.28 IN
V	35 MPH	40 MPH

NOTES:

1. REFER TO SHEETS C-033 TO C-049 FOR NEW HAMPSHIRE MAINLINE ALIGNMENT AND PROFILE.
2. THE MB-WB T/R TRACK PROFILE TO BE THE SAME AS MB-EB T/R TRACK PROFILE.

HORIZONTAL 40 0 40 80
VERTICAL 10 0 10 20
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

MEDFORD BRANCH
CORRIDOR PLAN AND PROFILE
STA MB-EB 271+50 TO STA MB-EB 281+50

STV 100 Years | massDOT Massachusetts Department of Transportation | GLX CONSTRUCTORS

GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	CRR	PJB	JEB	SHEET: C-014	

PLOTTED: 09/22/17 2:34PM BY:REINEKC
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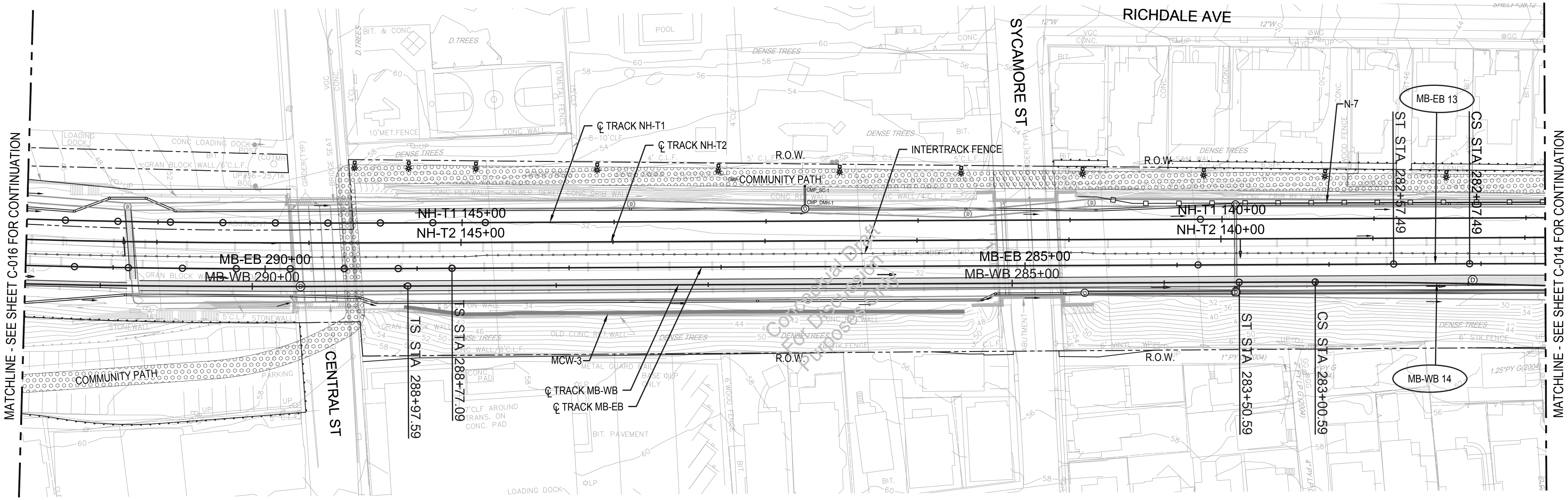
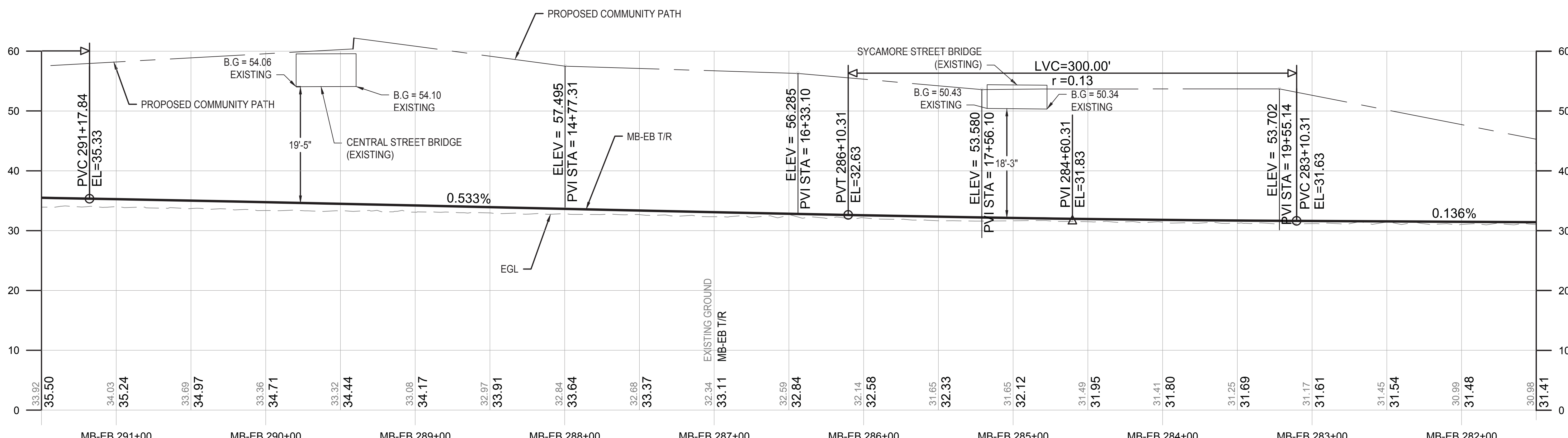


PLAN



PROFILE

CURVE NO.	MB-EB 13	MB-WB 14
R	15000.00 FT	5000.00 FT
Lc	100.39 FT	265.74 FT
Ls1	50.00 FT	50.00 FT
Ls2	50.00 FT	50.00 FT
Ea	0.50 IN	1.00 IN
Eu	0.17 IN	0.28 IN
V	50 MPH	40 MPH

NOTES:

1. REFER TO SHEETS C-033 TO C-049 FOR NEW HAMPSHIRE MAINLINE ALIGNMENT AND PROFILE.
2. THE MB-WB T/R TRACK PROFILE TO BE THE SAME AS MB-EB T/R TRACK PROFILE.

HORIZONTAL 40 0 40 80
VERTICAL 10 0 10 20
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

MEDFORD BRANCH
CORRIDOR PLAN AND PROFILE
STA MB-EB 281+50 TO STA MB-EB 291+50

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GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	CRR	PJB	JEB	SHEET: C-015	

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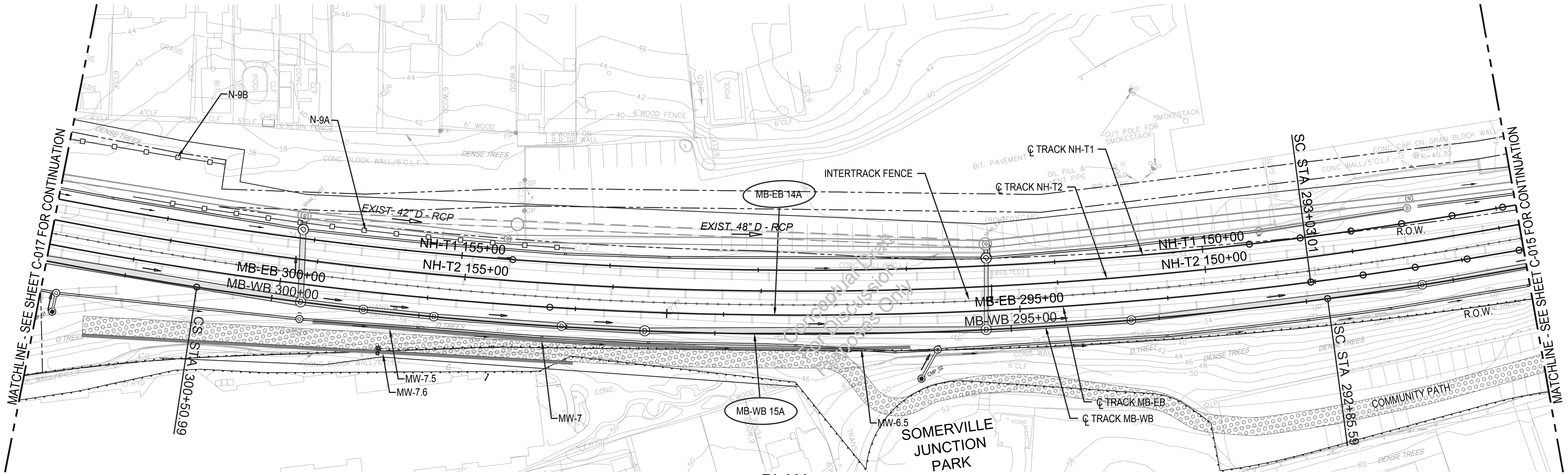

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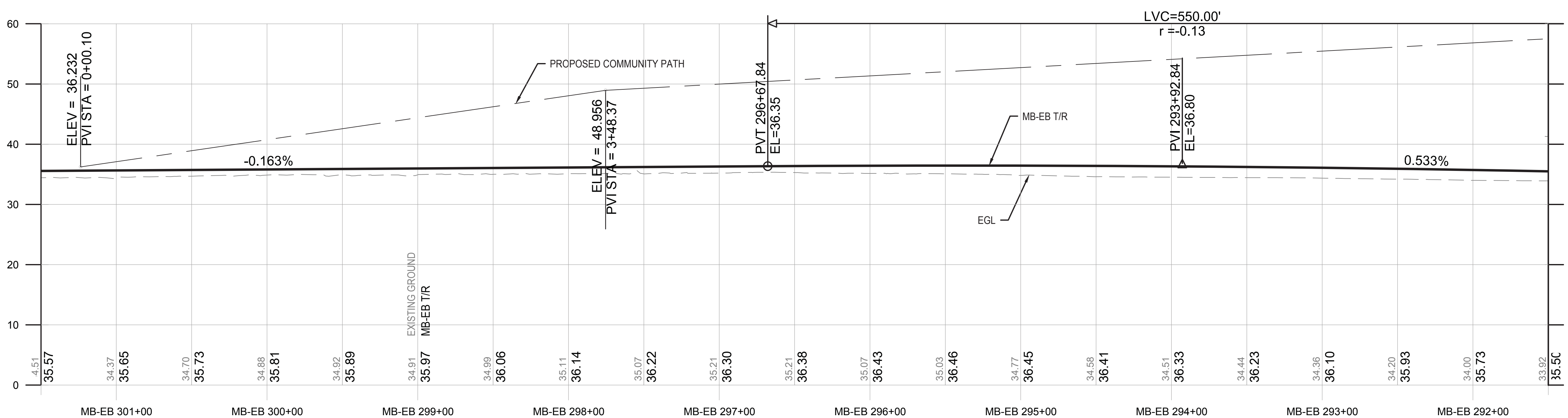

PROFILE

CURVE NO.	MB-EB 14A	MB-WB 15A
R	2690.00 FT	2644.92 FT
Lc	1041.25 FT	765.39 FT
Ls1	425.92 FT	388.00 FT
Ls2	110.00 FT	131.00 FT
Ea	2.00 IN	2.25 IN
Eu	0.39 IN	0.18 IN
V	40 MPH	40 MPH

NOTES:

1. REFER TO SHEETS C-033 TO C-049 FOR NEW HAMPSHIRE MAINLINE ALIGNMENT AND PROFILE.
2. THE MB-WB T/R TRACK PROFILE TO BE THE SAME AS MB-EB T/R TRACK PROFILE.

HORIZONTAL 40 0 40 80
10 0 10 20
VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

MEDFORD BRANCH
CORRIDOR PLAN AND PROFILE
STA MB-EB 291+50 TO STA MB-EB 301+50

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GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP

SCALE: AS NOTED | DRAWN BY CRR | DESIGN BY PJB | CHECK BY JEB | PLAN NO.

DATE: SEPT. 28, 2017 | SHEET: C-016 | ISSUE

PLOTTED: 09/22/17 2:07PM BY:REINEKC
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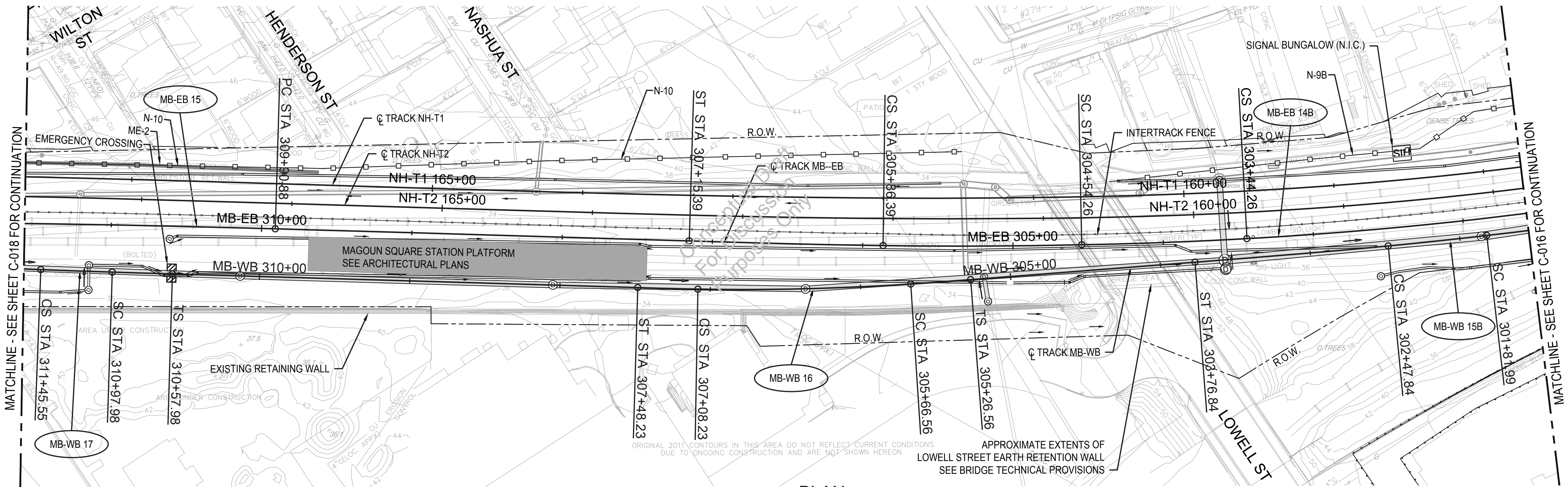

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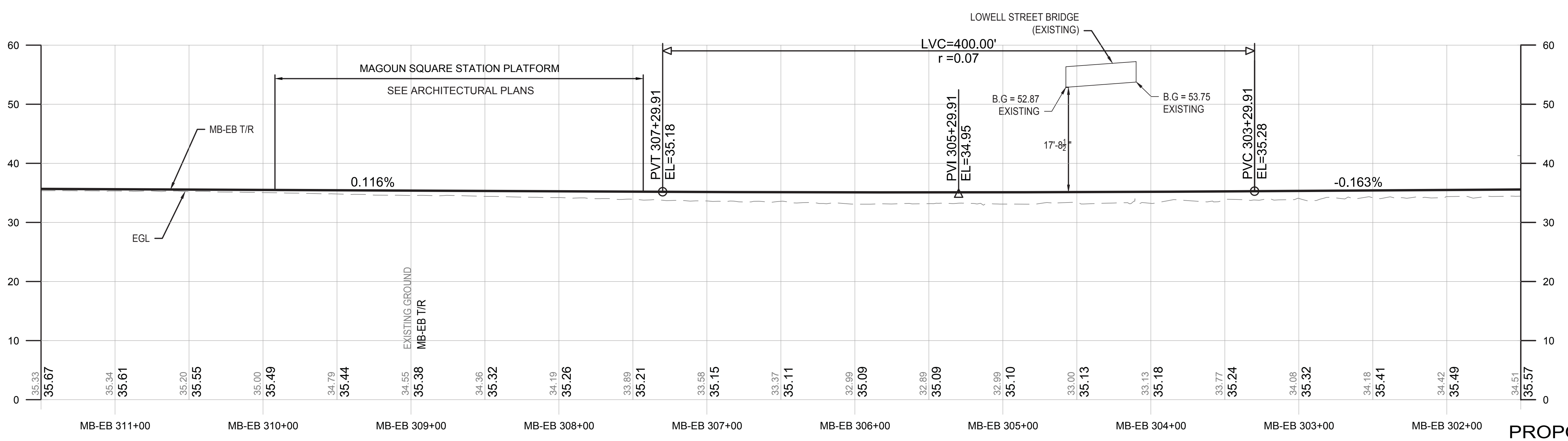

PROFILE

CURVE NO.	MB-EB 14B	MB-EB 15	MB-WB 15B	MB-WB 16	MB-WB 17
R	3900.00 FT	10000.00 FT	3444.88 FT	1700.00 FT	8000.00 FT
Lc	132.13 FT	401.85 FT	65.85 FT	141.68 FT	47.57 FT
Ls1	110.00 FT	0.00 FT	131.00 FT	40.00 FT	40.00 FT
Ls2	129.00 FT	0.00 FT	129.00 FT	40.00 FT	40.00 FT
Ea	1.50 IN	0.00 IN	1.75 IN	1.00 IN	1.00 IN
Eu	0.15 IN	0.49 IN	0.11 IN	0.47 IN	0.25 IN
V	40 MPH	35 MPH	40 MPH	25 MPH	30 MPH

NOTES:

1. REFER TO SHEETS C-033 TO C-049 FOR NEW HAMPSHIRE MAINLINE ALIGNMENT AND PROFILE.
2. THE MB-WB T/R TRACK PROFILE TO BE THE SAME AS MB-EB T/R TRACK PROFILE.

HORIZONTAL 40 0 40 80
10 0 10 20 VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

MEDFORD BRANCH
CORRIDOR PLAN AND PROFILE
STA MB-EB 301+50 TO STA MB-EB 311+50

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GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP

SCALE: AS NOTED | DRAWN BY: CRR | DESIGN BY: PJB | CHECK BY: JEB | PLAN NO. | ISSUE
DATE: SEPT. 28, 2017 | SHEET: C-017

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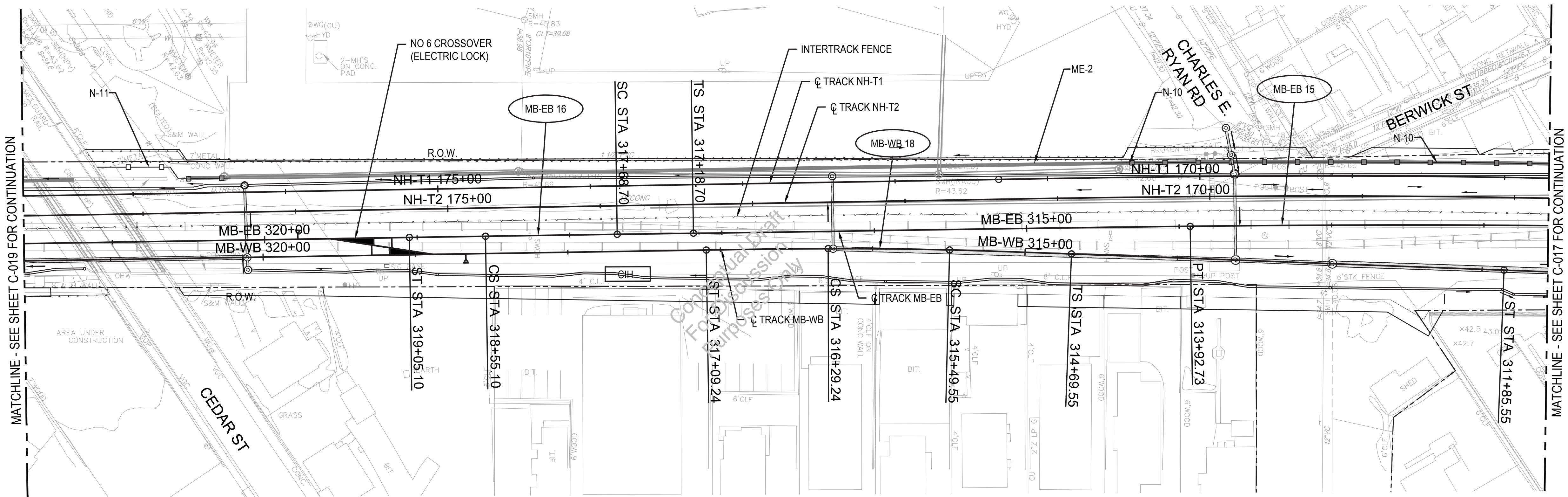

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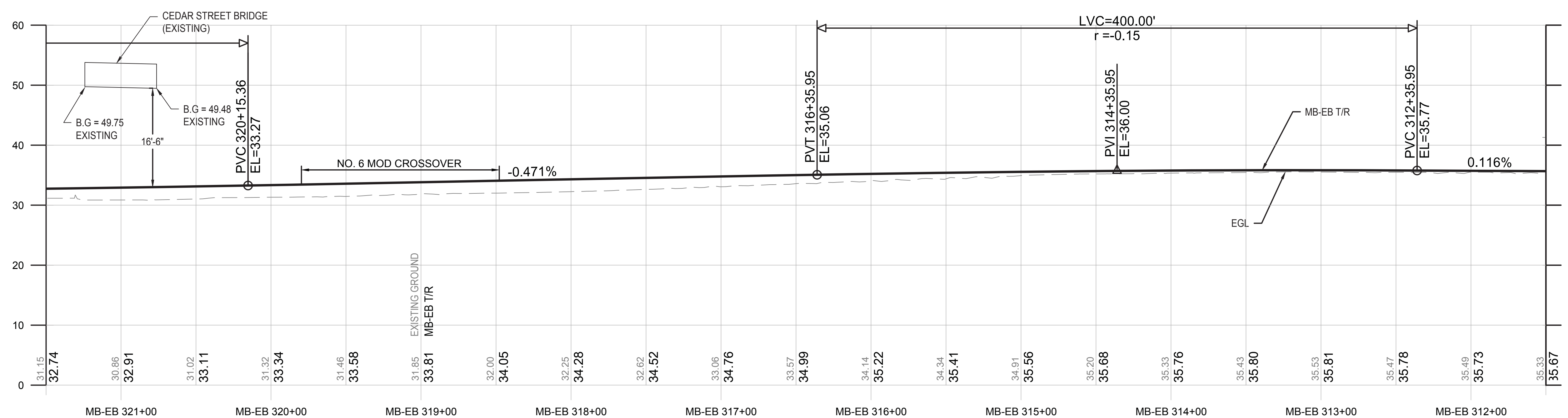

PROFILE

CURVE NO.	MB-EB 15	MB-EB 16	MB-WB 18
R	10000.00 FT	65000.00 FT	3000.00 FT
Lc	401.85 FT	86.40 FT	79.69 FT
Ls1	0.00 FT	50.00 FT	80.00 FT
Ls2	0.00 FT	50.00 FT	80.00 FT
Ea	0.00 IN	0.00 IN	1.75 IN
Eu	0.49 IN	0.15 IN	0.39 IN
V	35 MPH	50 MPH	40 MPH

NOTES:

1. REFER TO SHEETS C-033 TO C-049 FOR NEW HAMPSHIRE MAINLINE ALIGNMENT AND PROFILE.
2. THE MB-WB T/R TRACK PROFILE TO BE THE SAME AS MB-EB T/R TRACK PROFILE.

HORIZONTAL 40 0 40 80
VERTICAL 10 0 10 20
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

MEDFORD BRANCH
CORRIDOR PLAN AND PROFILE
STA MB-EB 311+50 TO STA MB-EB 321+50

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GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	CRR	PJB	JEB	SHEET: C-018	

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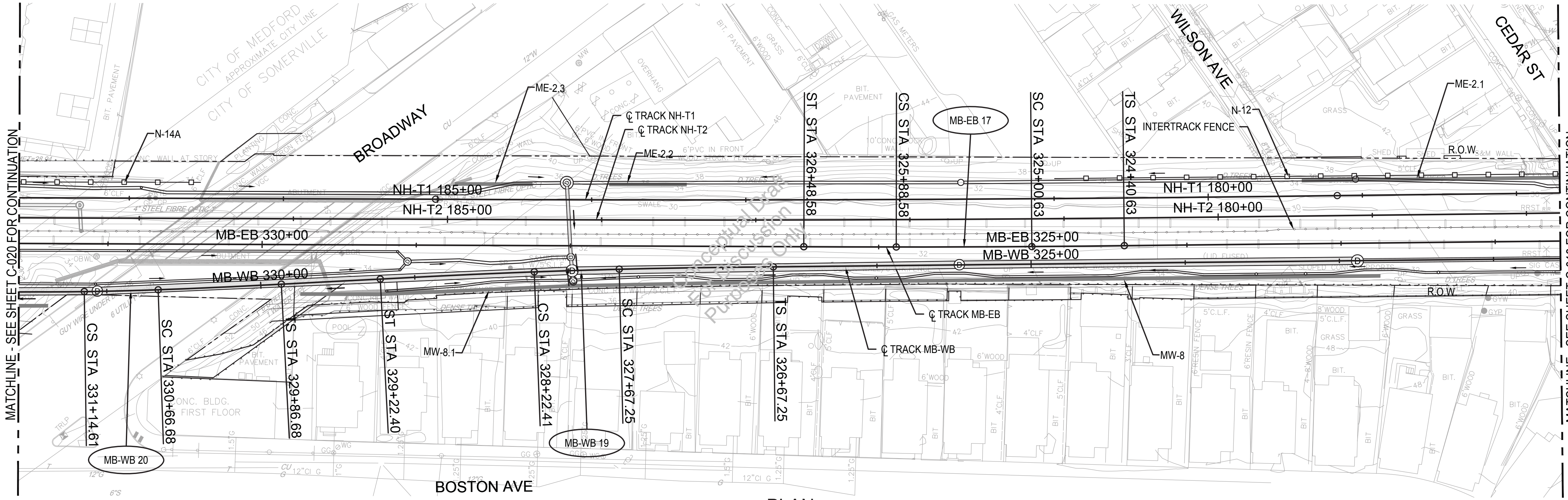

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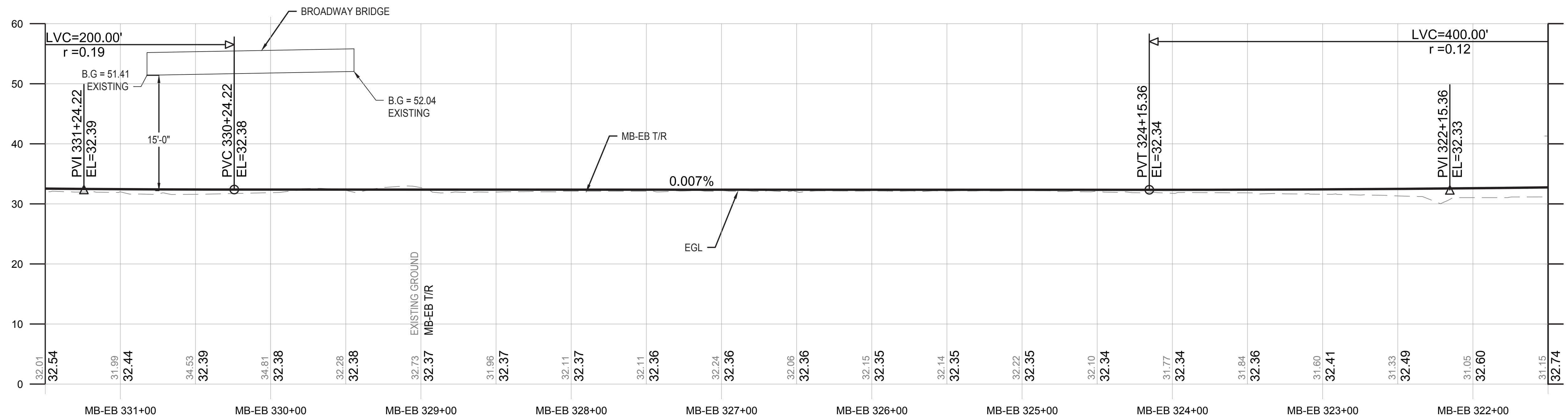

PROFILE

CURVE NO.	MB-EB 17	MB-WB 19	MB-WB 20
R	10000.00 FT	3800.00 FT	2300.00 FT
Lc	87.95 FT	55.15 FT	47.93 FT
Ls1	60.00 FT	100.00 FT	80.00 FT
Ls2	60.00 FT	100.00 FT	80.00 FT
Ea	0.75 IN	1.75 IN	1.75 IN
Eu	0.25 IN	0.39 IN	0.39 IN
V	50 MPH	45 MPH	35 MPH

NOTES:

1. REFER TO SHEETS C-033 TO C-049 FOR NEW HAMPSHIRE MAINLINE ALIGNMENT AND PROFILE.
2. THE MB-WB T/R TRACK PROFILE TO BE THE SAME AS MB-EB T/R TRACK PROFILE.

HORIZONTAL
40 0 40 80
10 0 10 20
VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

MEDFORD BRANCH
CORRIDOR PLAN AND PROFILE
STA MB-EB 321+50 TO STA MB-EB 331+50

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GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED | DRAWN BY CRR | DESIGN BY PJB | CHECK BY JEB | PLAN NO. .
DATE: SEPT. 28, 2017 | SHEET: C-019 | ISSUE

PLOTTED: 09/21/17 12:28AM BY:BRYANTPJ
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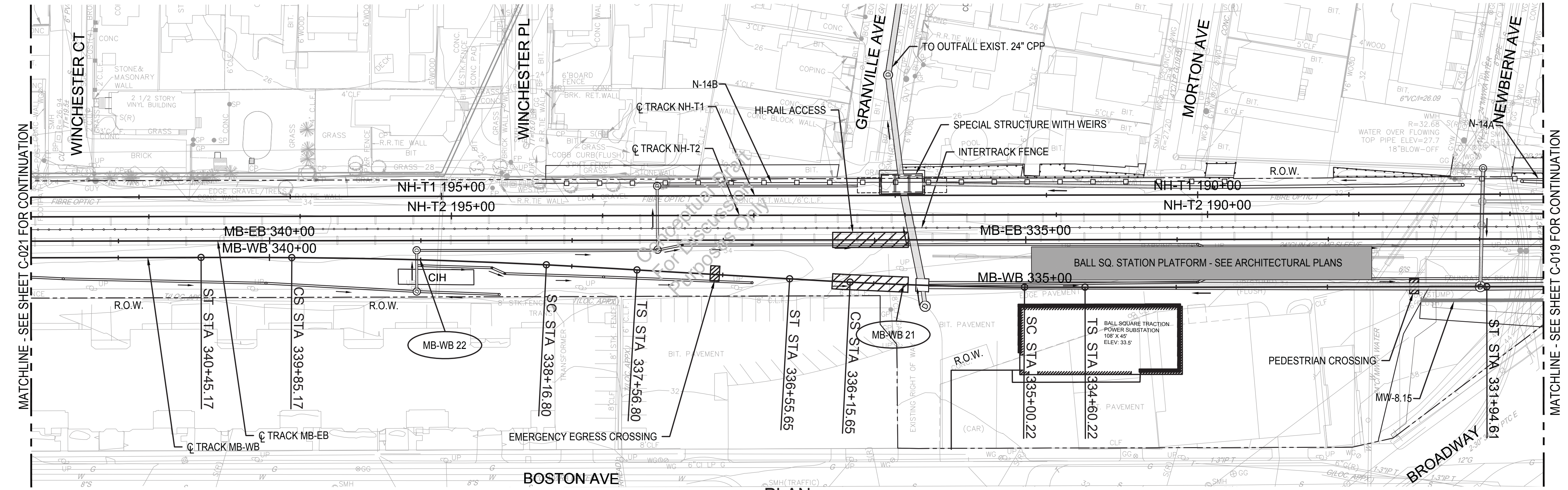

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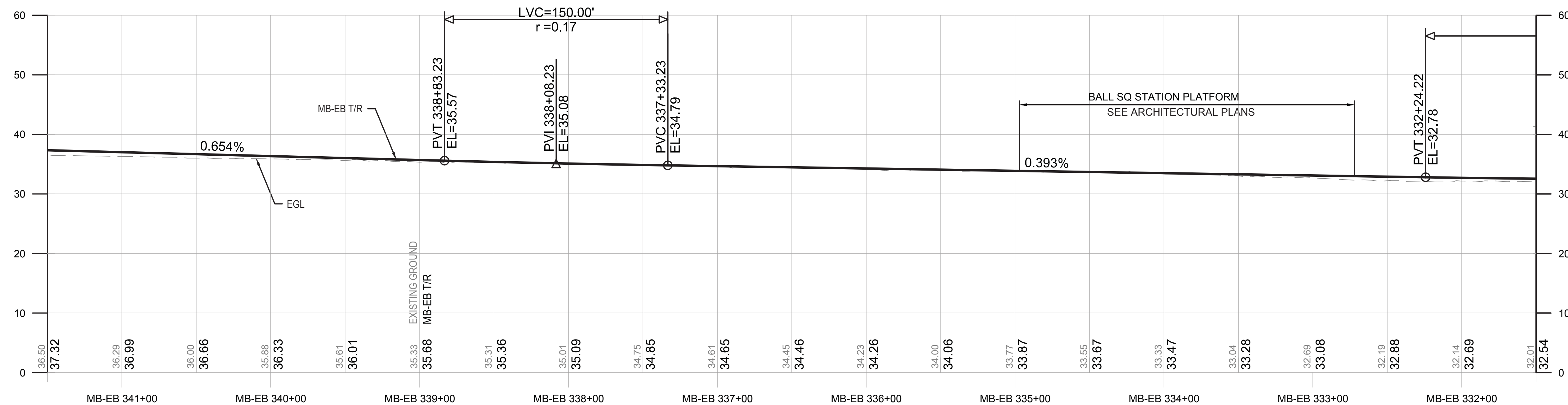

PROFILE

CURVE NO.	MB-WB 21	MB-WB 22
R	2600.00 FT	3820.00 FT
Lc	115.44 FT	168.37 FT
Ls1	40.00 FT	60.00 FT
Ls2	40.00 FT	60.00 FT
Ea	1.00 IN	1.50 IN
Eu	0.42 IN	0.18 IN
V	30 MPH	40 MPH

NOTES:

1. REFER TO SHEETS C-033 TO C-049 FOR NEW HAMPSHIRE MAINLINE ALIGNMENT AND PROFILE.
2. THE MB-WB T/R TRACK PROFILE TO BE THE SAME AS MB-EB T/R TRACK PROFILE.

HORIZONTAL 40 0 40 80
VERTICAL 10 0 10 20
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

MEDFORD BRANCH
CORRIDOR PLAN AND PROFILE
STA MB-EB 331+50 TO STA MB-EB 341+50

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GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	CRR	PJB	JEB	SHEET: C-020	

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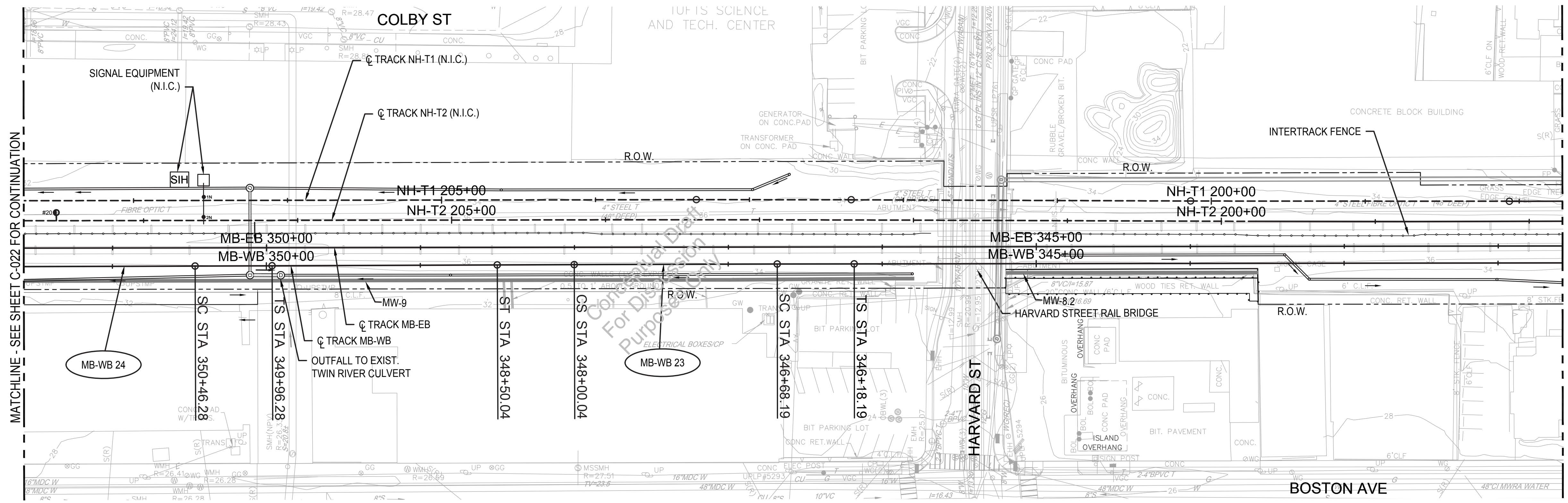

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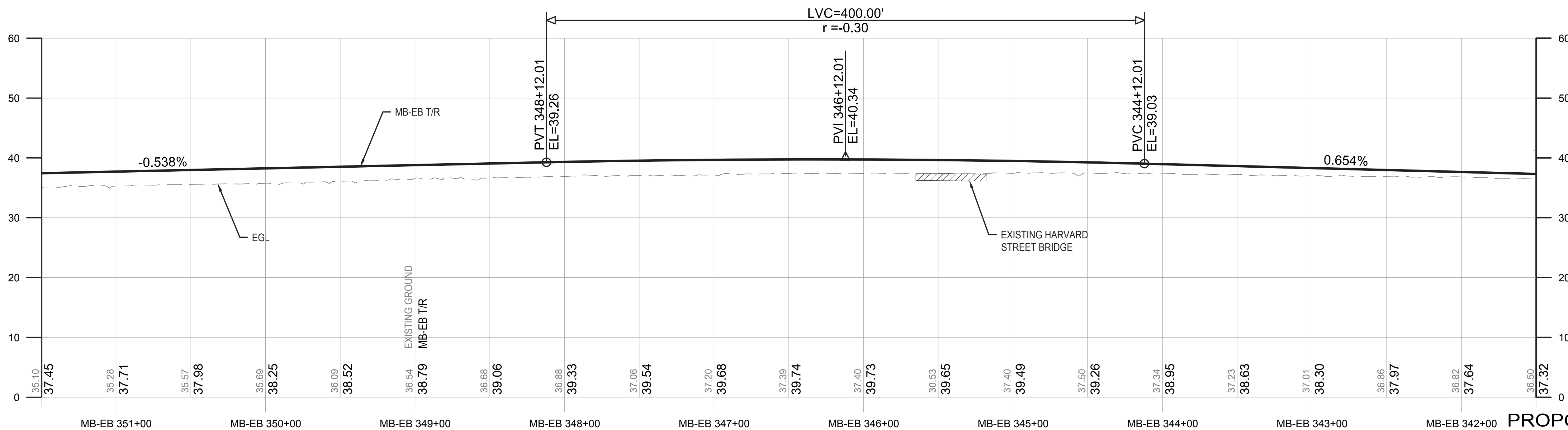

PROFILE

CURVE NO.	MB-WB 22	MB-WB 23	MB-WB 24
R	3820.00 FT	68754.94 FT	68754.94 FT
Lc	168.37 FT	131.84 FT	131.84 FT
Ls1	60.00 FT	50.00 FT	50.00 FT
Ls2	60.00 FT	50.00 FT	50.00 FT
Ea	1.50 IN	0.00 IN	0.00 IN
Eu	0.18 IN	0.15 IN	0.15 IN
V	40 MPH	50 MPH	50 MPH

NOTES:

1. REFER TO SHEETS C-033 TO C-049 FOR NEW HAMPSHIRE MAINLINE ALIGNMENT AND PROFILE.
2. THE MB-WB T/R TRACK PROFILE TO BE THE SAME AS MB-EB T/R TRACK PROFILE.

HORIZONTAL 40 0 40 80
10 0 10 20 VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

MEDFORD BRANCH
CORRIDOR PLAN AND PROFILE
STA MB-EB 341+50 TO STA MB-EB 351+50

STV 100 Years | massDOT Massachusetts Department of Transportation | GLX CONSTRUCTORS

GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	CRR	PJB	JEB	SHEET: C-021	

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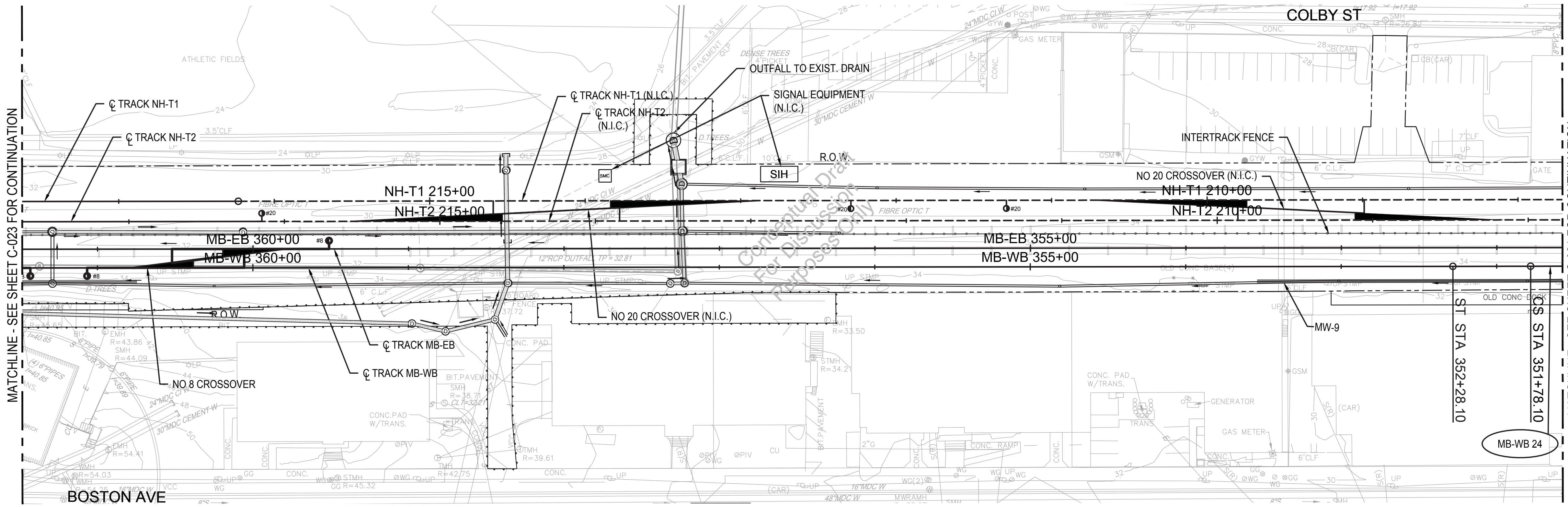

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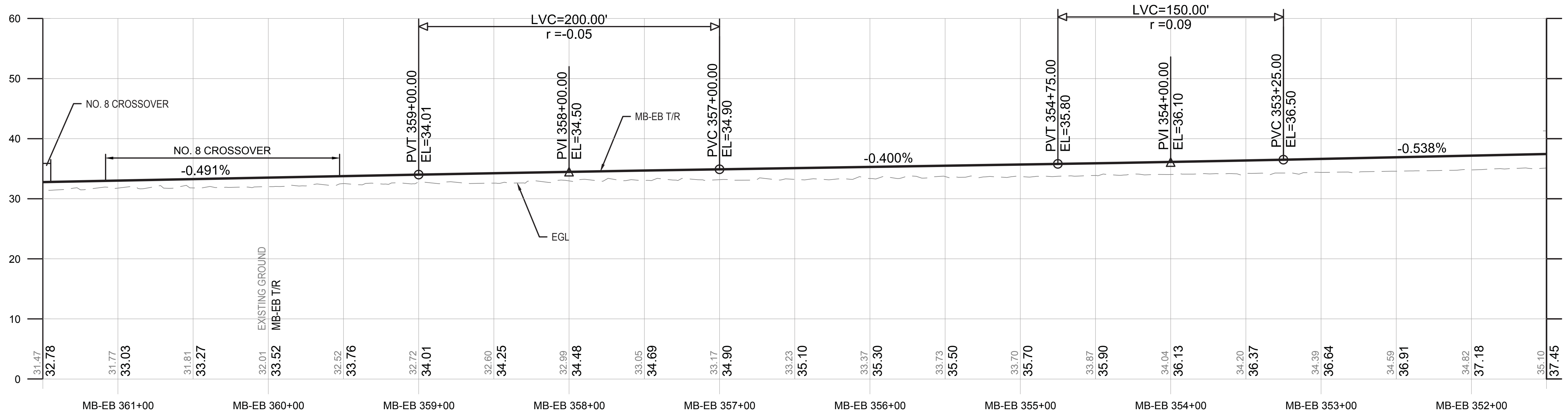

PROFILE

CURVE NO.	MB-WB 24
R	68754.94 FT
Lc	131.84 FT
Ls1	50.00 FT
Ls2	50.00 FT
Ea	0.00 IN
Eu	0.15 IN
V	50 MPH

NOTES:

1. REFER TO SHEETS C-033 TO C-049 FOR NEW HAMPSHIRE MAINLINE ALIGNMENT AND PROFILE.
2. THE MB-WB T/R TRACK PROFILE TO BE THE SAME AS MB-EB T/R TRACK PROFILE.

HORIZONTAL 40 0 40 80
10 0 10 20
VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

MEDFORD BRANCH
CORRIDOR PLAN AND PROFILE
STA MB-EB 351+50 TO STA MB-EB 361+50

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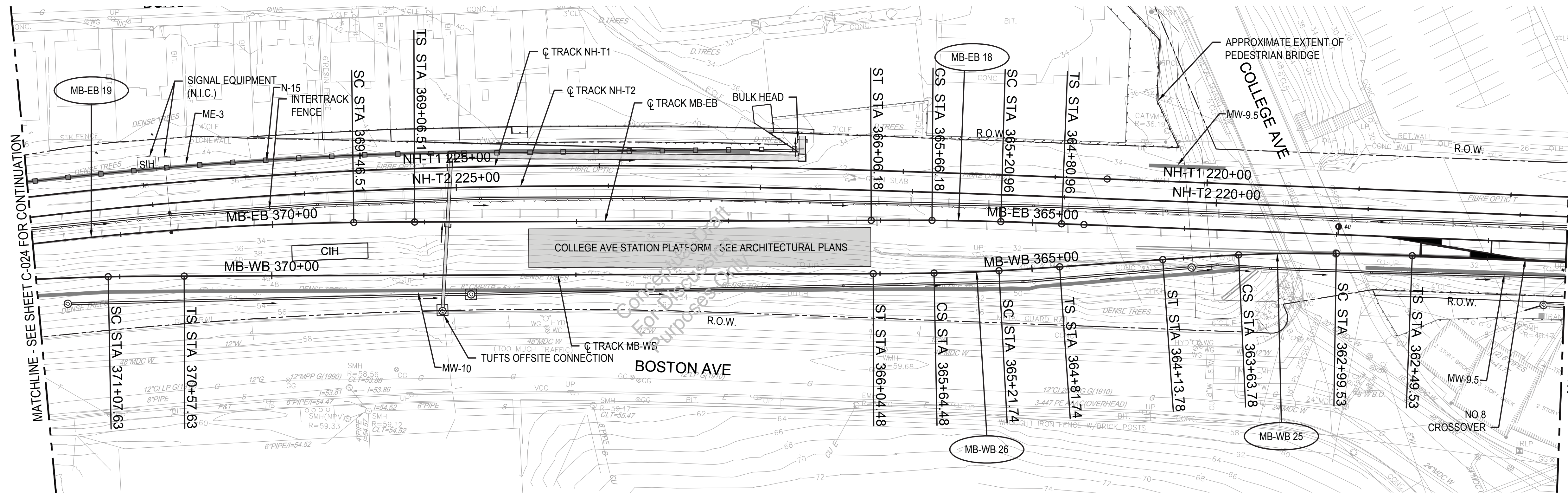
GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP

SCALE: AS NOTED | DRAWN BY | DESIGN BY | CHECK BY | PLAN NO.
DATE: SEPT. 28, 2017 | CRR | PJB | JEB | SHEET: C-022 | ISSUE



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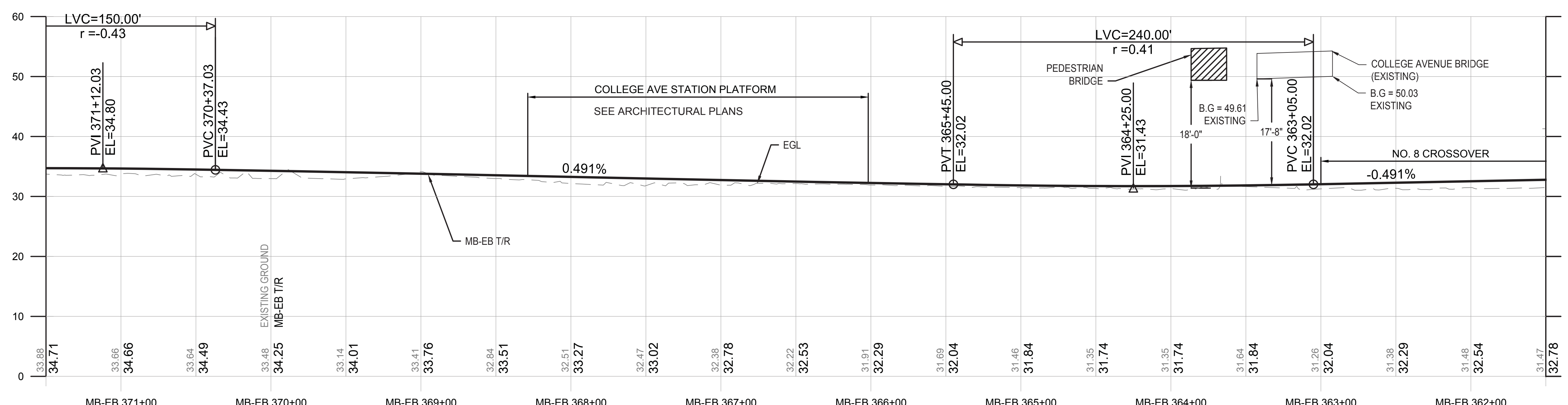

PROFILE

CURVE NO.	MB-EB 18	MB-EB 19	MB-WB 25	MB-WB 26
R	2000.00 FT	2000.00 FT	1050.00 FT	1250.00 FT
Lc	45.22 FT	292.96 FT	64.25 FT	42.74 FT
Ls1	40.00 FT	40.00 FT	50.00 FT	40.00 FT
Ls2	40.00 FT	40.00 FT	50.00 FT	40.00 FT
Ea	1.00 IN	1.25 IN	2.00 IN	1.00 IN
Eu	0.25 IN	0.34 IN	0.39 IN	0.50 IN
V	25 MPH	25 MPH	25 MPH	20 MPH

NOTES:

1. REFER TO SHEETS C-033 TO C-049 FOR NEW HAMPSHIRE MAINLINE ALIGNMENT AND PROFILE.
2. THE MB-WB T/R TRACK PROFILE TO BE THE SAME AS MB-EB T/R TRACK PROFILE.

HORIZONTAL 40 0 40 80
VERTICAL 10 0 10 20
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

MEDFORD BRANCH
CORRIDOR PLAN AND PROFILE
STA MB-EB 361+50 TO STA MB-EB 371+50

STV 100 Years | massDOT Massachusetts Department of Transportation | GLX CONSTRUCTORS

GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED | DRAWN BY CRR | DESIGN BY PJB | CHECK BY JEB | PLAN NO. | ISSUE
DATE: SEPT. 28, 2017 | SHEET: C-023

PLOTTED: 09/21/17 1:06AM BY:BRYANTPJ
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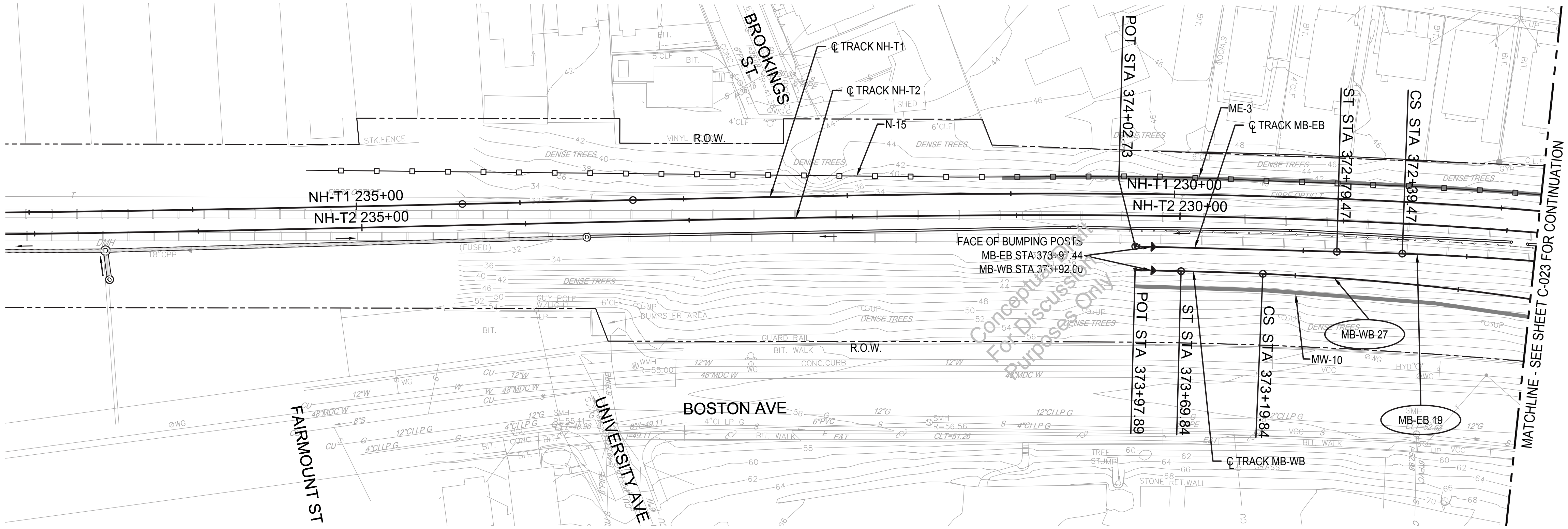

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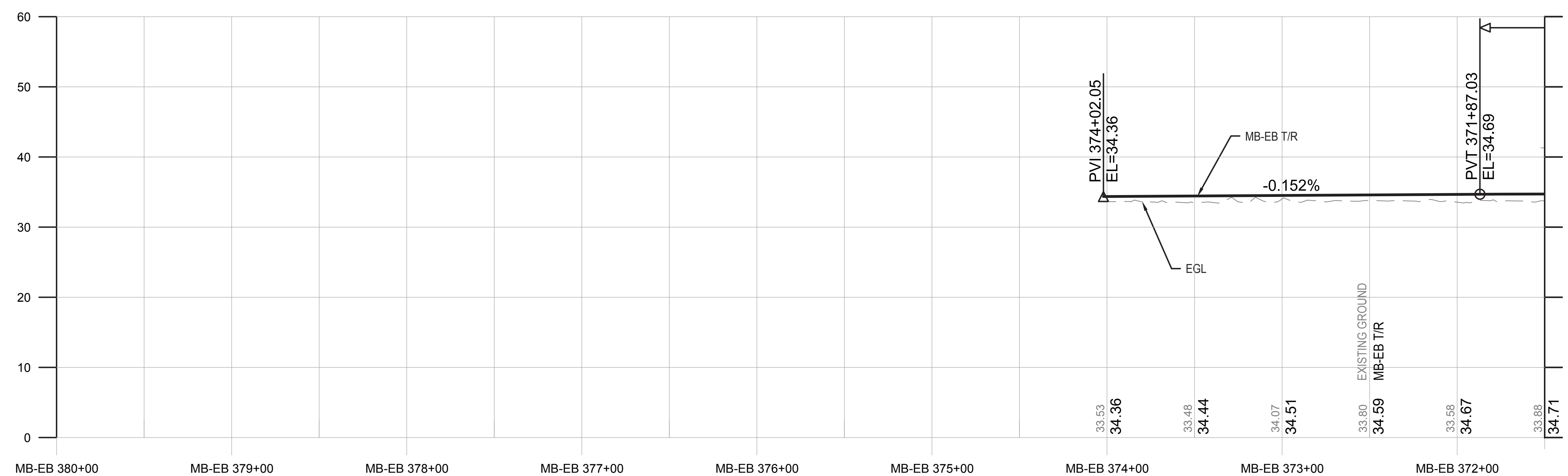

PROFILE

CURVE NO.	MB-EB 19	MB-WB 27
R	2000.00 FT	1575.00 FT
Lc	292.96 FT	212.21 FT
Ls1	40.00 FT	50.00 FT
Ls2	40.00 FT	50.00 FT
Ea	1.25 IN	0.75 IN
Eu	0.34 IN	0.32 IN
V	25 MPH	20 MPH

NOTES:

1. REFER TO SHEETS C-033 TO C-049 FOR NEW HAMPSHIRE MAINLINE ALIGNMENT AND PROFILE.
2. THE MB-WB T/R TRACK PROFILE TO BE THE SAME AS MB-EB T/R TRACK PROFILE.

HORIZONTAL 40 0 40 80
10 0 10 20 VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

MEDFORD BRANCH
CORRIDOR PLAN AND PROFILE
STA MB-EB 371+50 TO STA MB-EB 380+00

STV 100 Years | massDOT Massachusetts Department of Transportation | GLX CONSTRUCTORS

GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED | DRAWN BY: CRR | DESIGN BY: PJB | CHECK BY: JEB | PLAN NO. .
DATE: SEPT. 28, 2017 | SHEET: C-024 | ISSUE

PLOTTED: 09/21/17 1:14AM BY:BRYANTPJ
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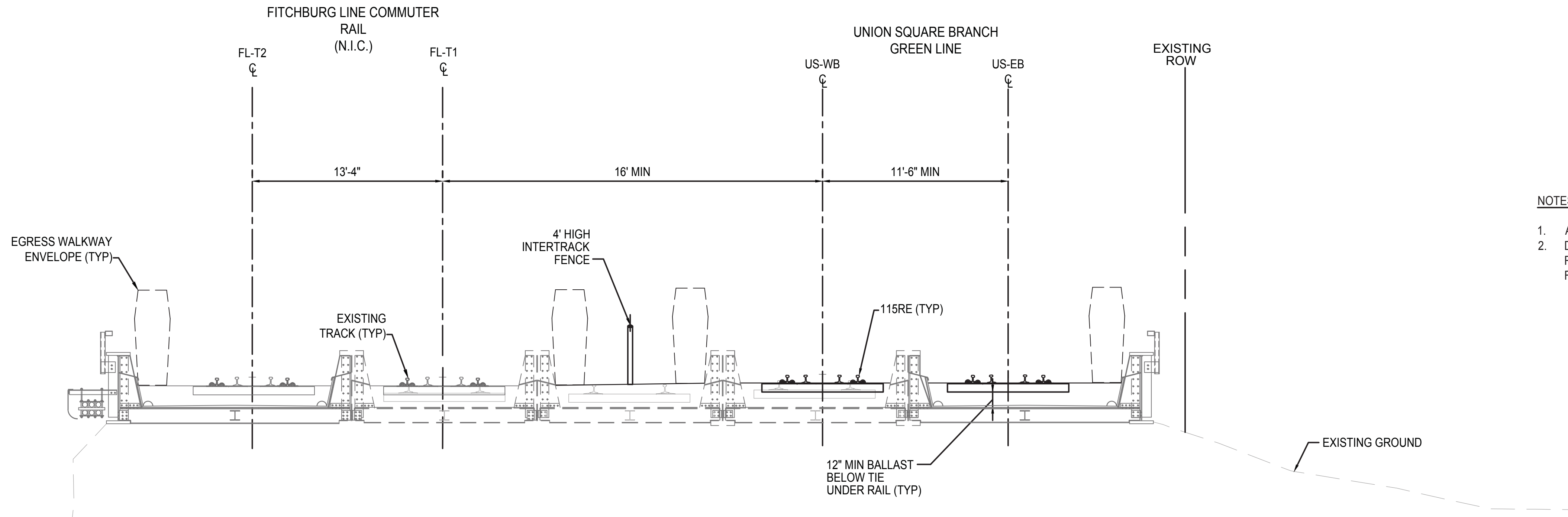
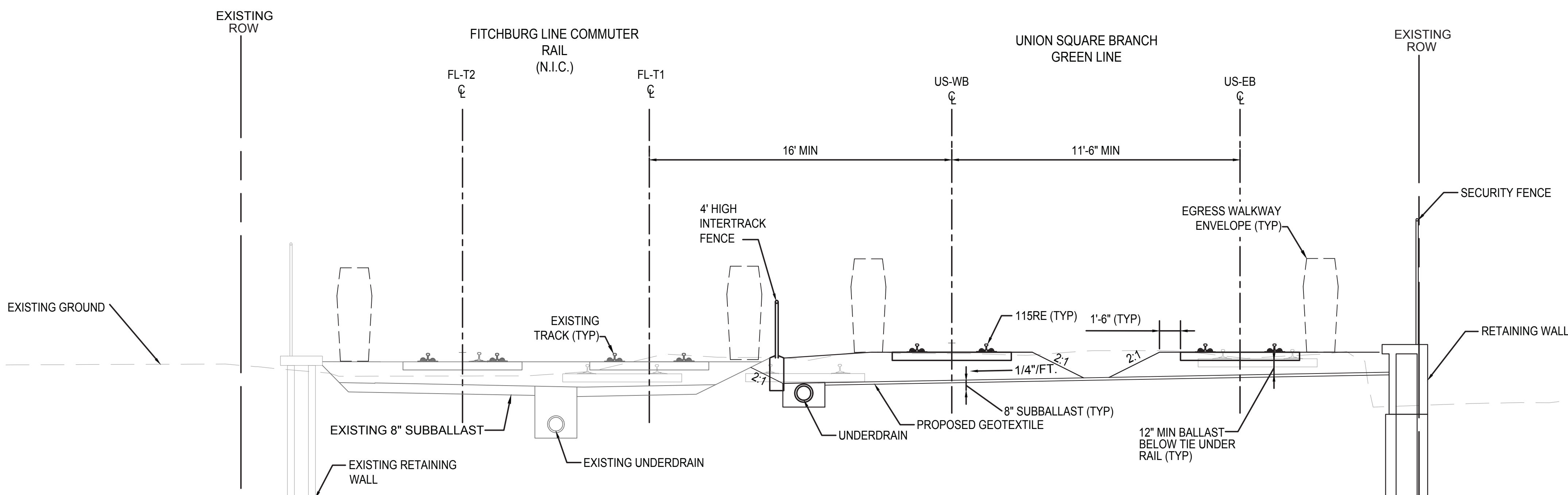


MEDFORD STREET RAIL BRIDGE TYPICAL SECTION
REFER TO CONTRACT E22CN01 FOR BRIDGE DETAILS

NOTES:

1. ALL CROSS SECTIONS SHOWN FACING UP-STATION.
2. DESIGN-BUILDER SHALL DESIGN AND CONSTRUCT RETAINING WALL. RETAINING WALL IS PROVIDED FOR REFERENCE.



TRACKWAY TYPICAL SECTION
US-EB 21+00 TO US-EB 26+08

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

UNION SQUARE BRANCH
CORRIDOR SECTIONS
SHEET 1

STV 100 Years

massDOT Massachusetts Department of Transportation

GLX CONSTRUCTORS

GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP

SCALE: NO SCALE	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	CRR	PJB	JEB	SHEET: C-025	

PLOTTED: 09/21/17 2:16PM BY:BRYANTPJ
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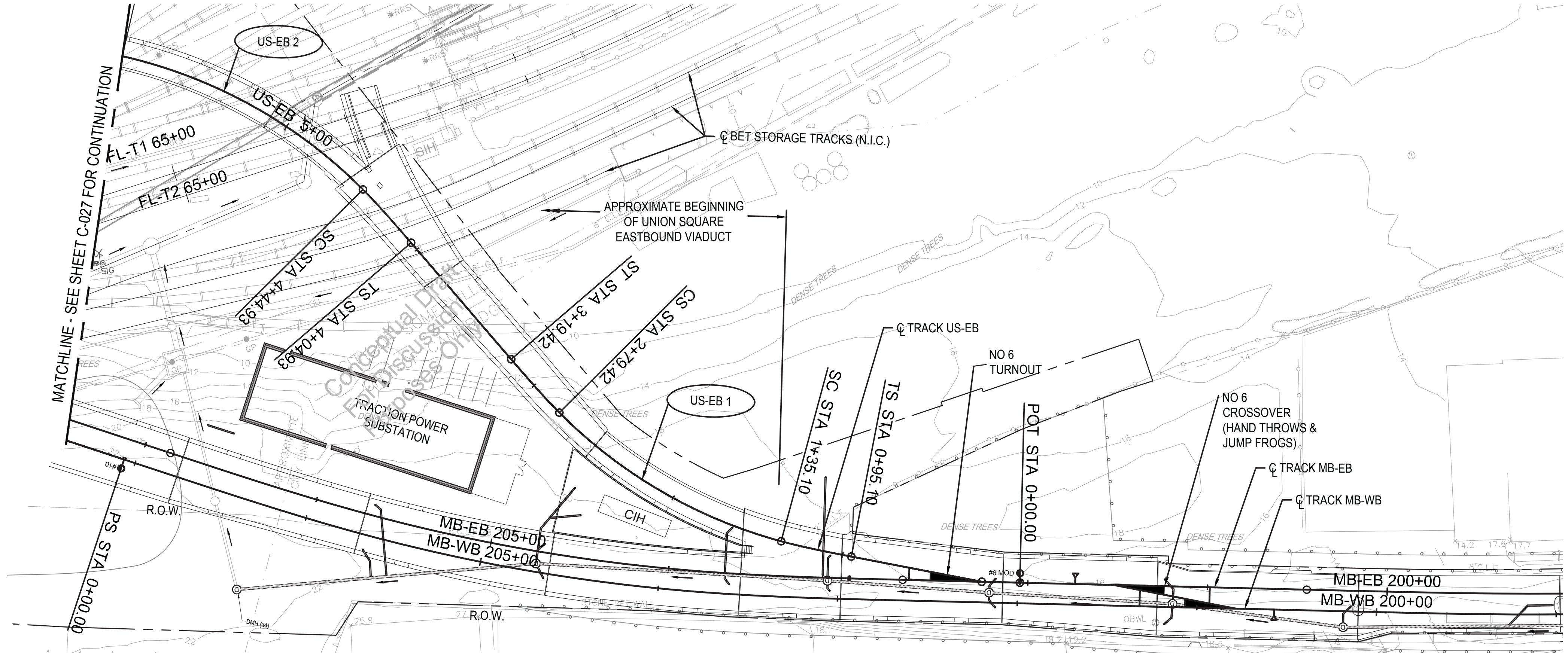
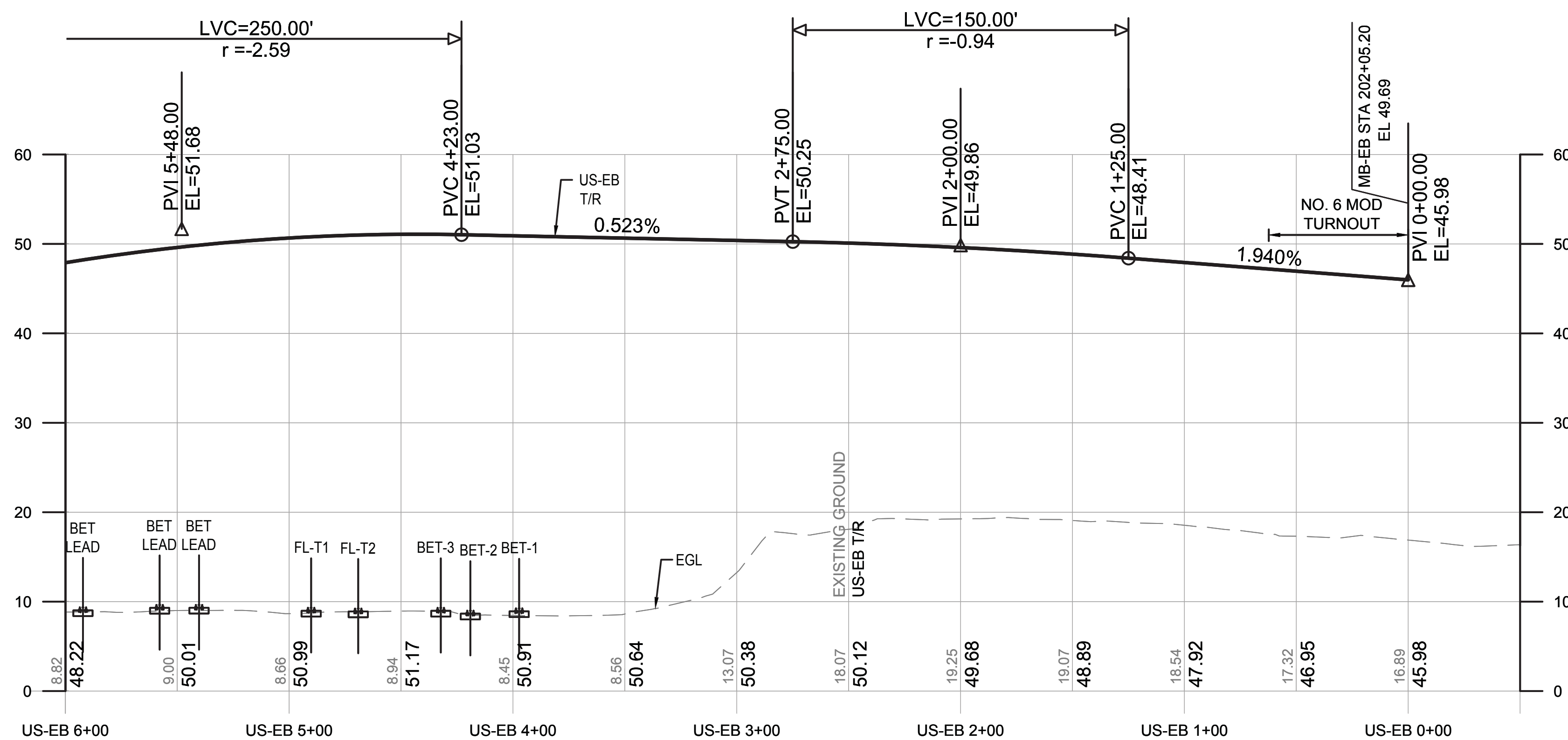


PLAN



PROFILE

CURVE NO.	US-EB 1	US-EB 2
R	275.00 FT	275.00 FT
Lc	144.32 FT	380.64 FT
Ls1	40.00 FT	40.00 FT
Ls2	40.00 FT	40.00 FT
Ea	1.00 IN	1.00 IN
Eu	0.46 IN	0.46 IN
V	10 MPH	10 MPH

NOTES:

1. REFER TO SHEETS C-003 TO C-024 FOR MEDFORD BRANCH ALIGNMENT AND PROFILE.
2. REFER TO SHEETS C-050 TO C-055 FOR YARD LEAD ALIGNMENT AND PROFILE.
3. REFER TO SHEET C-056 FOR DRAINAGE FROM STA 0+00 TO STA 6+00.

HORIZONTAL 40 0 40 80
10 0 10 20 VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

UNION SQUARE BRANCH
CORRIDOR PLAN AND PROFILE
STA US-EB 0+00 TO STA US-EB 6+00

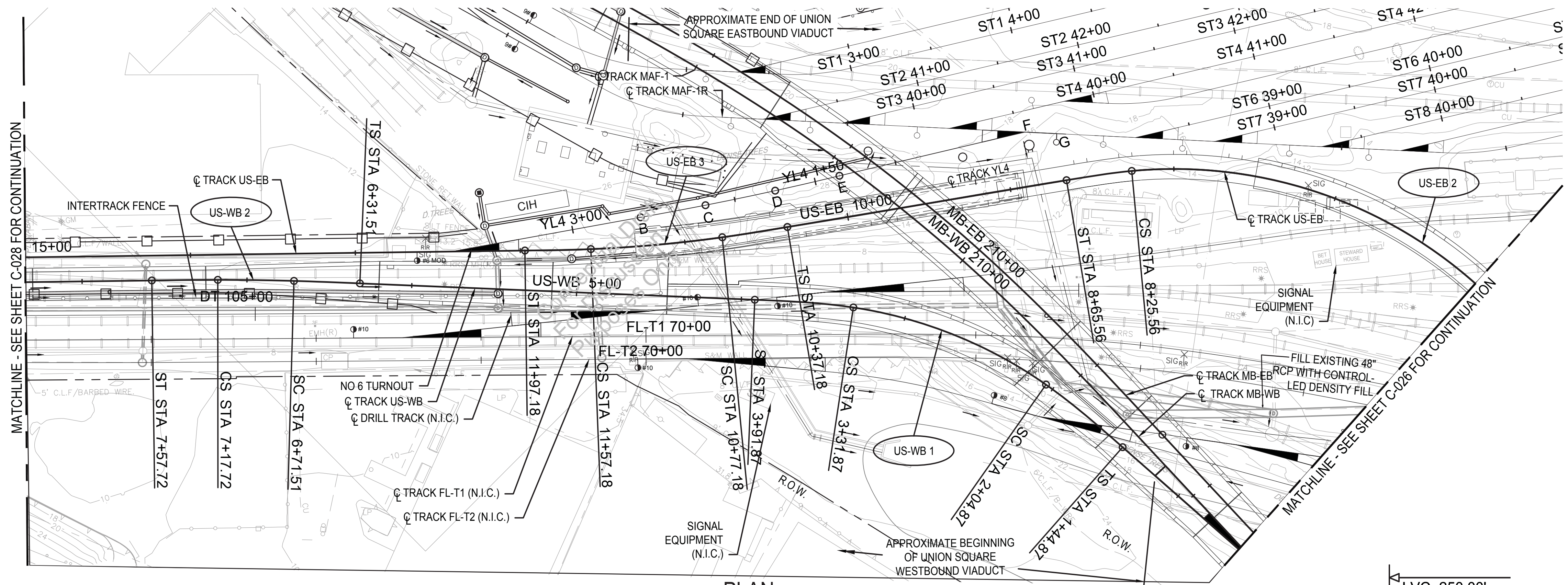
STV 100 Years — massDOT Massachusetts Department of Transportation — GLX CONSTRUCTORS

GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED | DRAWN BY CRR | DESIGN BY PJB | CHECK BY JEB | PLAN NO. .
DATE: SEPT. 28, 2017 | SHEET: C-026 | ISSUE

PLOTTED: 09/21/17 1:21AM BY:BRYANTPJ
DRAWING: I:\PROPOSALS\2017\0062820 GLX D-B\STV 2017 RFP DESIGN\90_CAD MODELS AND SHEETS\04_CK_TRACK_RAIL\000-K-2061-2066.DWG [C-026] 09/20/17 10:23PM



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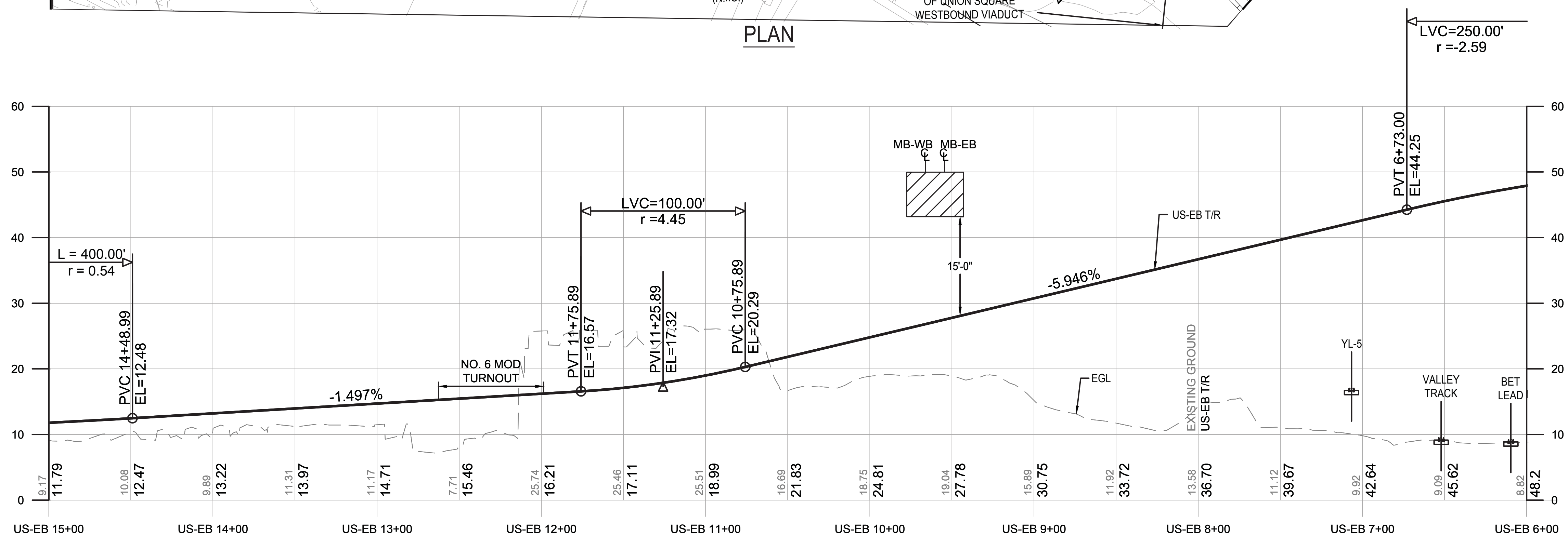

PROFILE

CURVE NO.	US-EB 2	US-EB 3	US-WB 1	US-WB 2
R	275.00 FT	787.59 FT	275.00 FT	1567.17 FT
Lc	380.64 FT	80.00 FT	127.00 FT	46.21 FT
Ls1	40.00 FT	40.00 FT	60.00 FT	40.00 FT
Ls2	40.00 FT	40.00 FT	60.00 FT	40.00 FT
Ea	1.00 IN	0.50 IN	1.75 IN	1.25 IN
Eu	0.46 IN	0.01 IN	1.53 IN	0.35 IN
V	10 MPH	10 MPH	15 MPH	25 MPH

NOTES:

1. REFER TO SHEETS C-003 TO C-024 FOR MEDFORD BRANCH ALIGNMENT AND PROFILE.
2. REFER TO SHEETS C-050 TO C-055 FOR YARD LEAD ALIGNMENT AND PROFILE.
3. REFER TO SHEET C-056 FOR DRAINAGE FROM STA 6+00 TO STA 15+00.

HORIZONTAL 40 0 40 80
10 0 10 20 VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

UNION SQUARE BRANCH
CORRIDOR PLAN AND PROFILE
STA US-EB 6+00 TO STA US-EB 15+00

STV 100 Years | massDOT Massachusetts Department of Transportation | GLX CONSTRUCTORS

GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	CRR	PJB	JEB	SHEET: C-027	

PLOTTED: 09/21/17 1:28AM BY:BRYANTPJ
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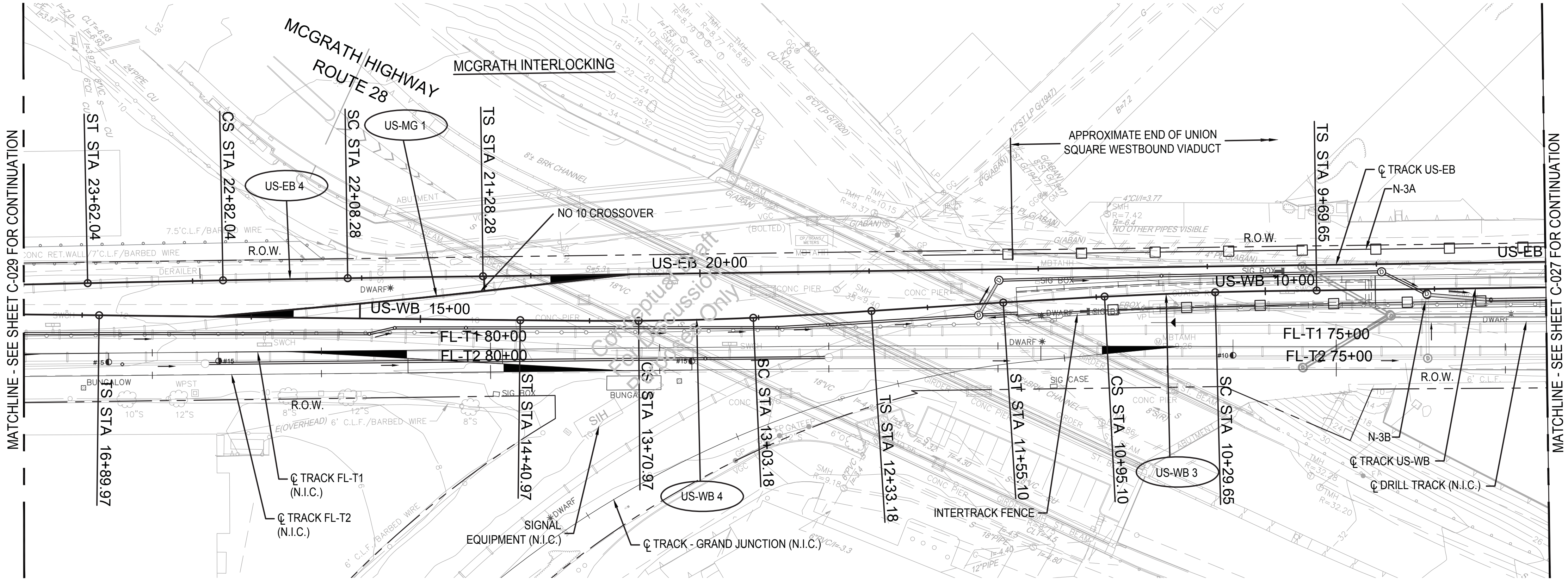

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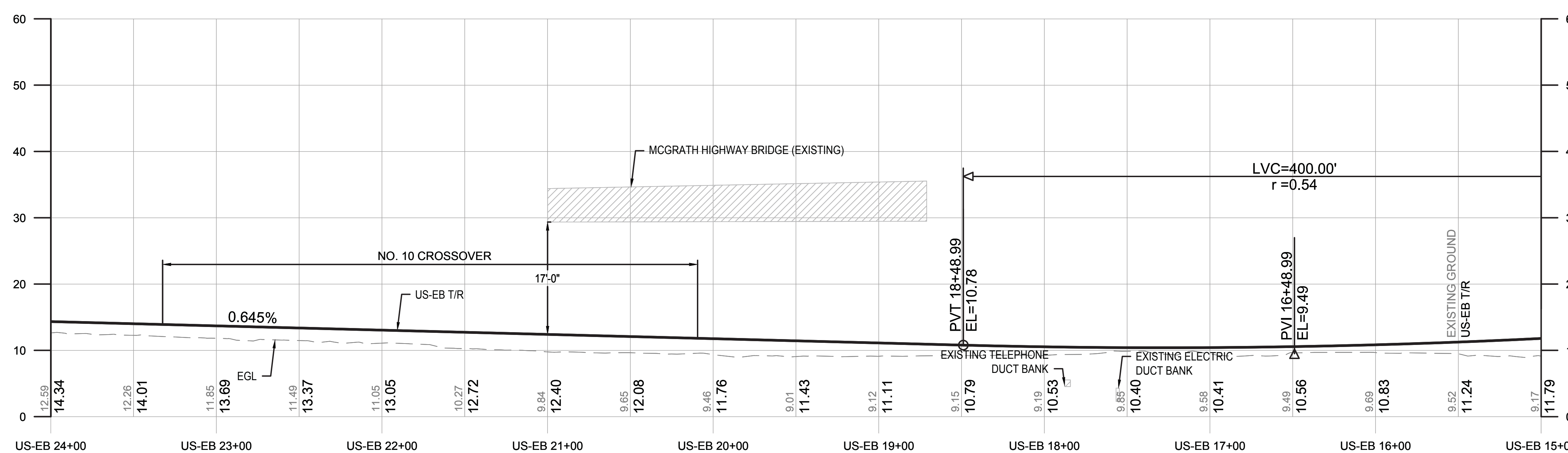

PROFILE

CURVE NO.	US-EB 4	US-WB 3	US-WB 4	US-MG 1
R	20000.00 FT	2500.00 FT	1829.82 FT	3800.00 FT
Lc	73.76 FT	65.46 FT	67.78 FT	70.00 FT
Ls1	80.00 FT	60.00 FT	70.00 FT	-
Ls2	80.00 FT	60.00 FT	70.00 FT	-
Ea	0.00 IN	1.50 IN	1.75 IN	0.00 IN
Eu	0.18 IN	0.47 IN	0.94 IN	0.24 IN
V	30 MPH	35 MPH	35 MPH	15 MPH

HORIZONTAL
40 0 40 80
10 0 10 20
VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

UNION SQUARE BRANCH
CORRIDOR PLAN AND PROFILE
STA US-EB 15+00 TO STA US-EB 24+00

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GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED | DRAWN BY: CRR | DESIGN BY: PJB | CHECK BY: JEB | PLAN NO. | ISSUE
DATE: SEPT. 28, 2017 | SHEET: C-028

PLOTTED: 09/21/17 1:36AM BY:BRYANTPJ
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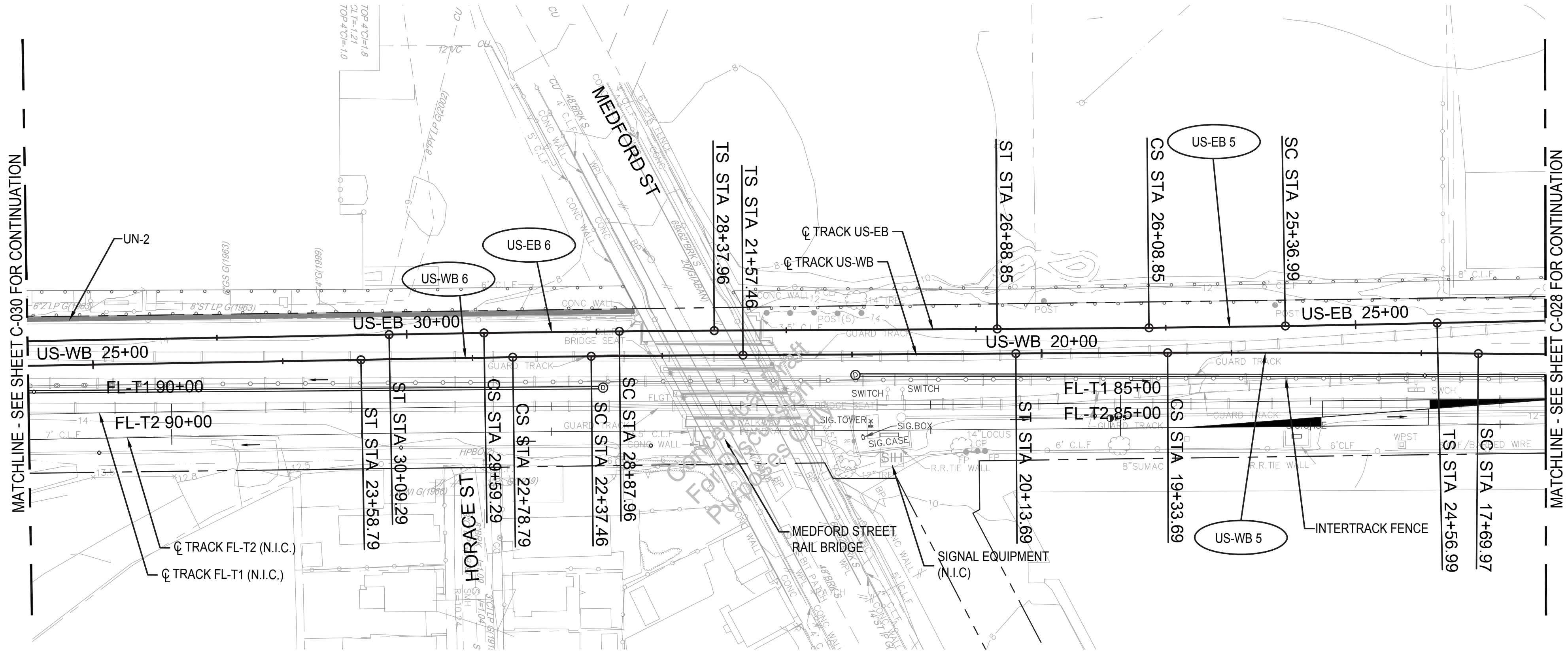
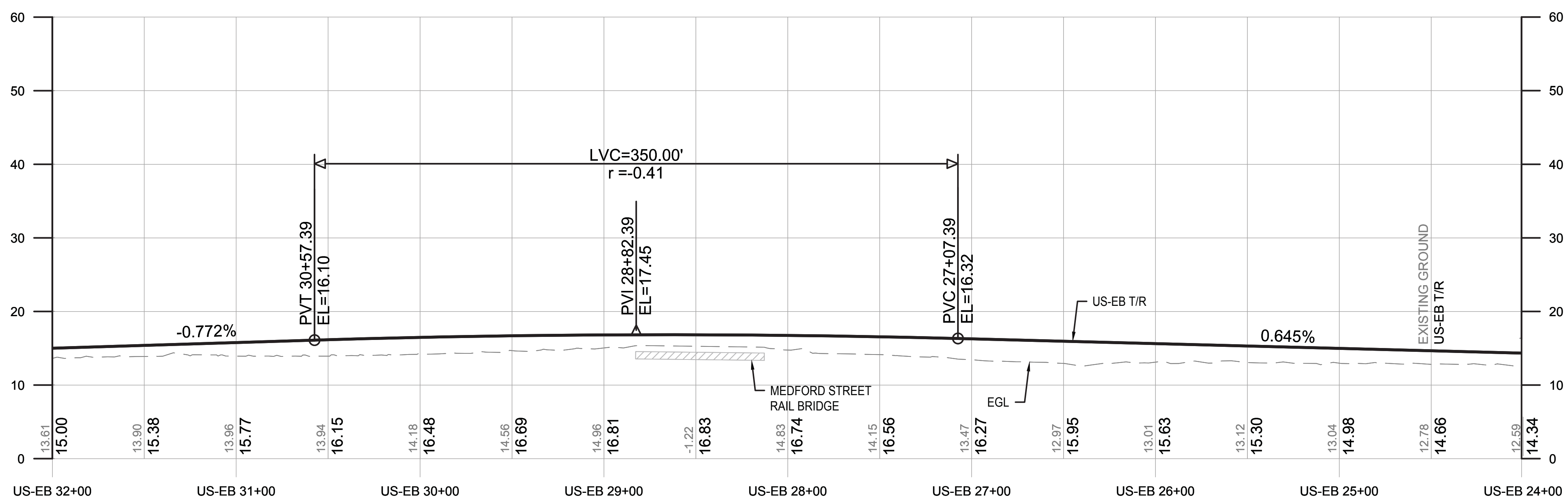


PLAN



PROFILE

CURVE NO.	US-EB 5	US-EB 6	US-WB 5	US-WB 6
R	10000.00 FT	10000.00 FT	13833.65 FT	10000.00 FT
Lc	71.86 FT	71.33 FT	163.72 FT	41.33 FT
Ls1	80.00 FT	50.00 FT	80.00 FT	80.00 FT
Ls2	80.00 FT	50.00 FT	80.00 FT	80.00 FT
Ea	0.75 IN	0.75 IN	0.50 IN	0.75 IN
Eu	0.25 IN	0.25 IN	0.22 IN	0.25 IN
V	50 MPH	50 MPH	50 MPH	50 MPH

HORIZONTAL
40 0 40 80
10 0 10 20
VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

UNION SQUARE BRANCH
CORRIDOR PLAN AND PROFILE
STA US-EB 24+00 TO STA US-EB 32+00

STV 100 Years
massDOT Massachusetts Department of Transportation
GLX CONSTRUCTORS

GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED | DRAWN BY: CRR | DESIGN BY: PJB | CHECK BY: JEB | PLAN NO.
DATE: SEPT. 28, 2017 | SHEET: C-029 | ISSUE

PLOTTED: 09/21/17 1:43AM BY:BRYANTPJ
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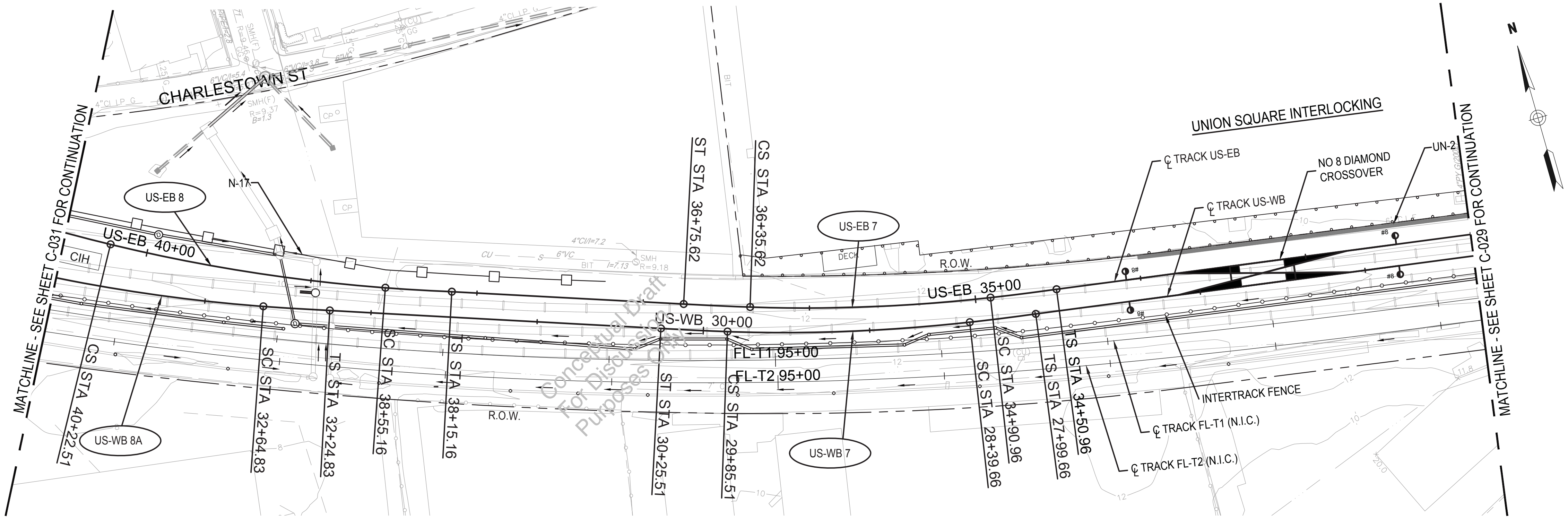
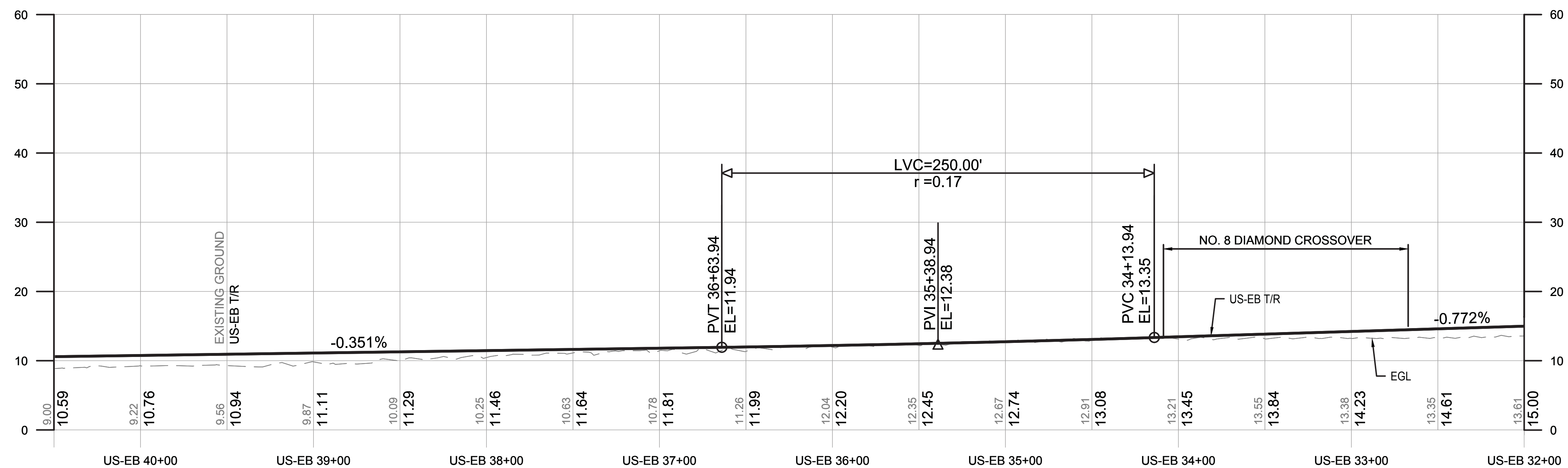


PLAN



PROFILE

CURVE NO.	US-EB 7	US-EB 8	US-WB 7	US-WB 8A
R	1000.00 FT	1000.00 FT	1000.00 FT	1000.00 FT
Lc	144.67 FT	167.35 FT	145.85 FT	166.16 FT
Ls1	40.00 FT	40.00 FT	40.00 FT	40.00 FT
Ls2	40.00 FT	40.00 FT	40.00 FT	40.00 FT
Ea	1.25 IN	1.25 IN	1.25 IN	1.25 IN
Eu	0.35 IN	0.35 IN	0.35 IN	0.35 IN
V	20 MPH	20 MPH	20 MPH	20 MPH

HORIZONTAL 40 0 40 80
10 0 10 20 VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

UNION SQUARE BRANCH
CORRIDOR PLAN AND PROFILE
STA US-EB 32+00 TO STA US-EB 40+50

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ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED | DRAWN BY: CRR | DESIGN BY: PJB | CHECK BY: JEB | PLAN NO.
DATE: SEPT. 28, 2017 | SHEET: C-030 | ISSUE

PLOTTED: 09/21/17 2:39PM BY:BRYANTPJ
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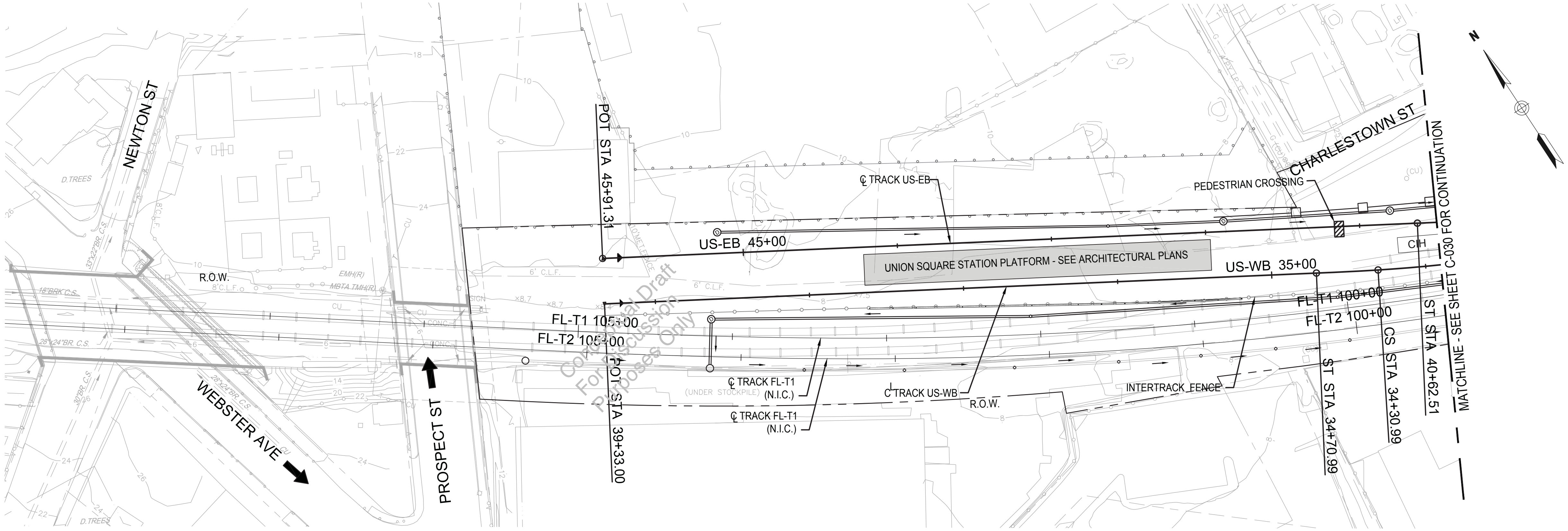

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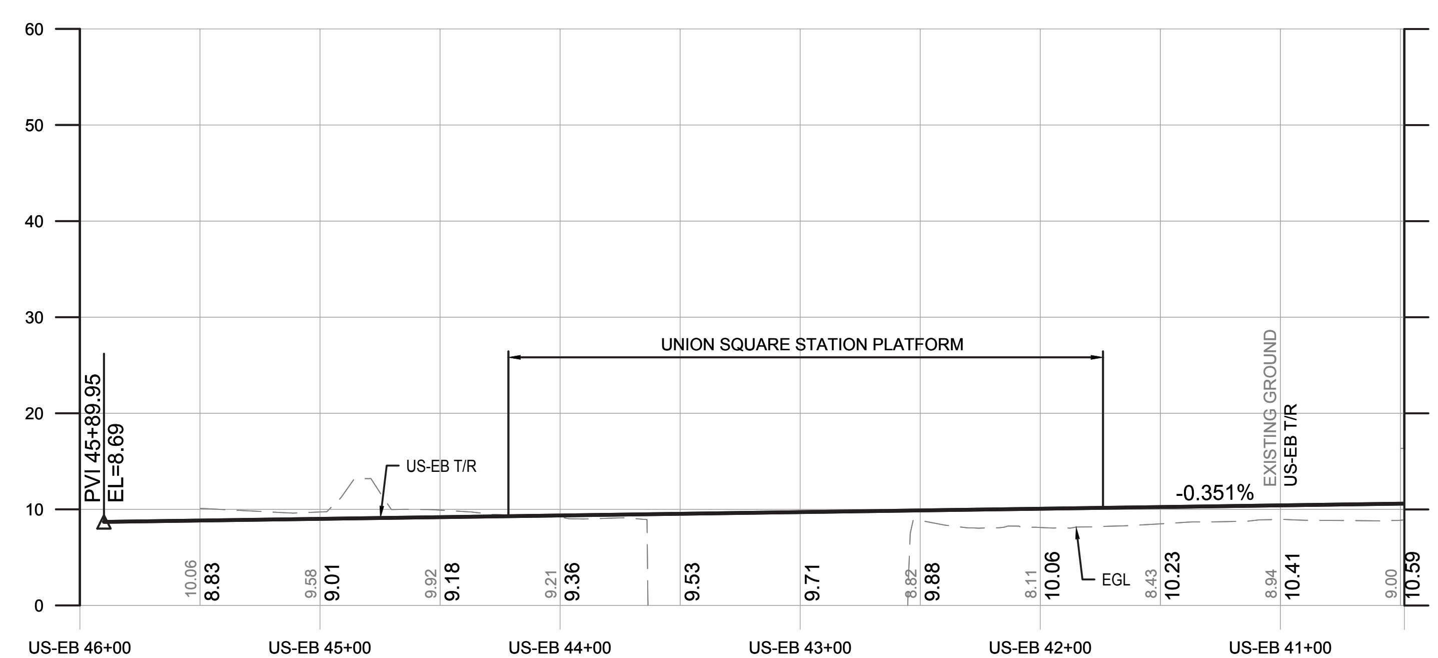

PROFILE

HORIZONTAL 40 0 40 80
10 0 10 20 VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

UNION SQUARE BRANCH
CORRIDOR PLAN AND PROFILE
STA US-EB 40+50 TO STA US-EB 46+00

STV 100 Years | massDOT Massachusetts Department of Transportation | GLX CONSTRUCTORS

GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	CRR	PJB	JEB	SHEET: C-031	

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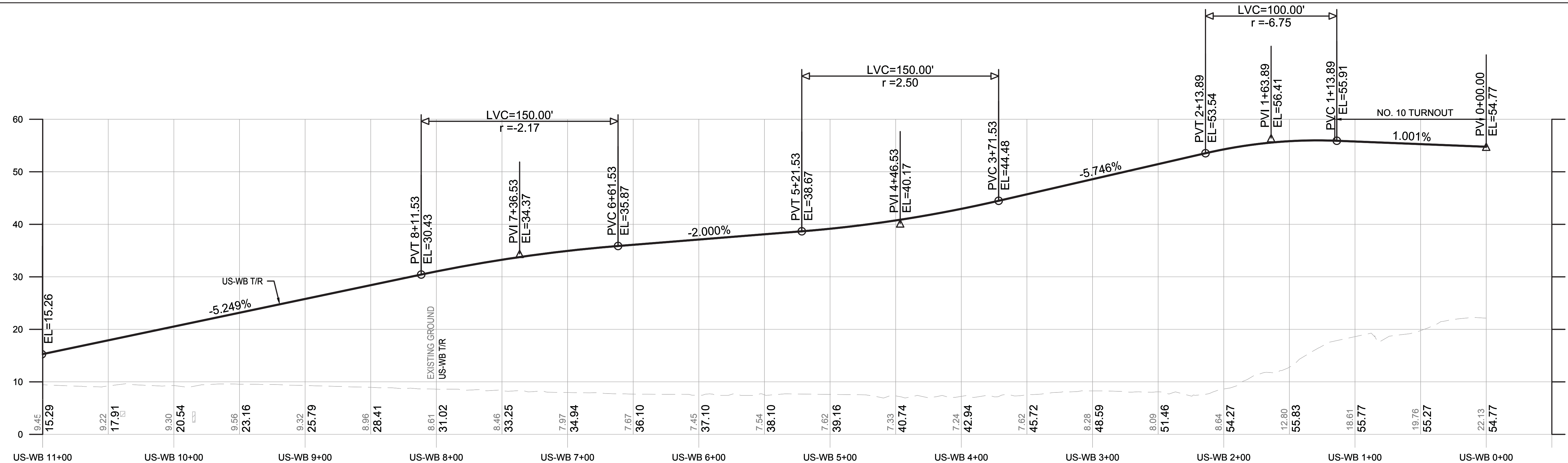
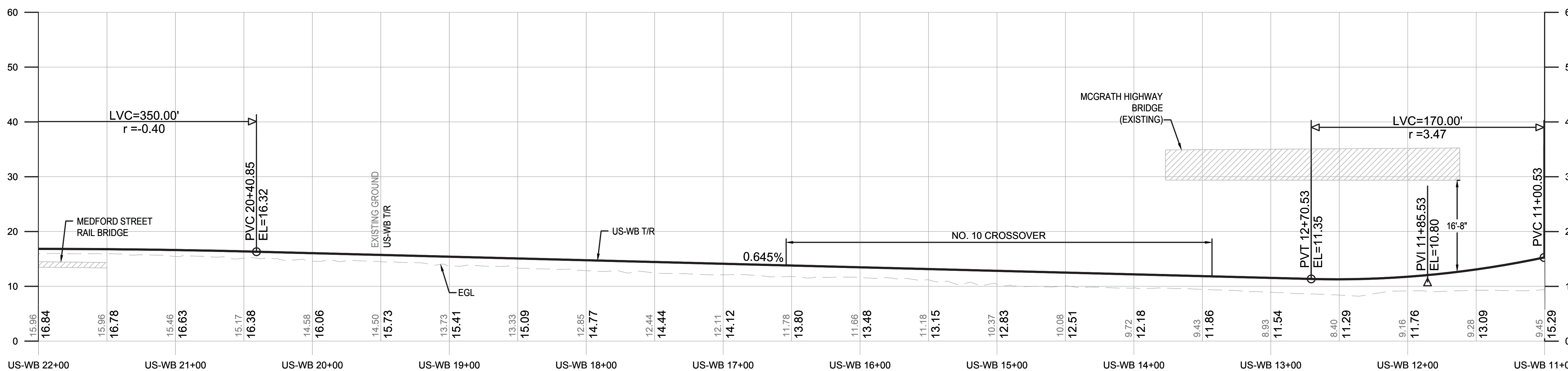


PROFILE



PROFILE

NOTE:
1. THE US-WB T/R TRACK PROFILE TO BE THE SAME AS US-EB T/R TRACK PROFILE FROM US-WB 22+00.00 TO US-WB 39+33.00

HORIZONTAL 40 0 40 80
VERTICAL 10 0 10 20
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

UNION SQUARE BRANCH
TRACK PROFILE
STA US-WB 0+00 TO STA US-WB 22+00

GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	CRR	PJB	JEB	SHEET: C-032	

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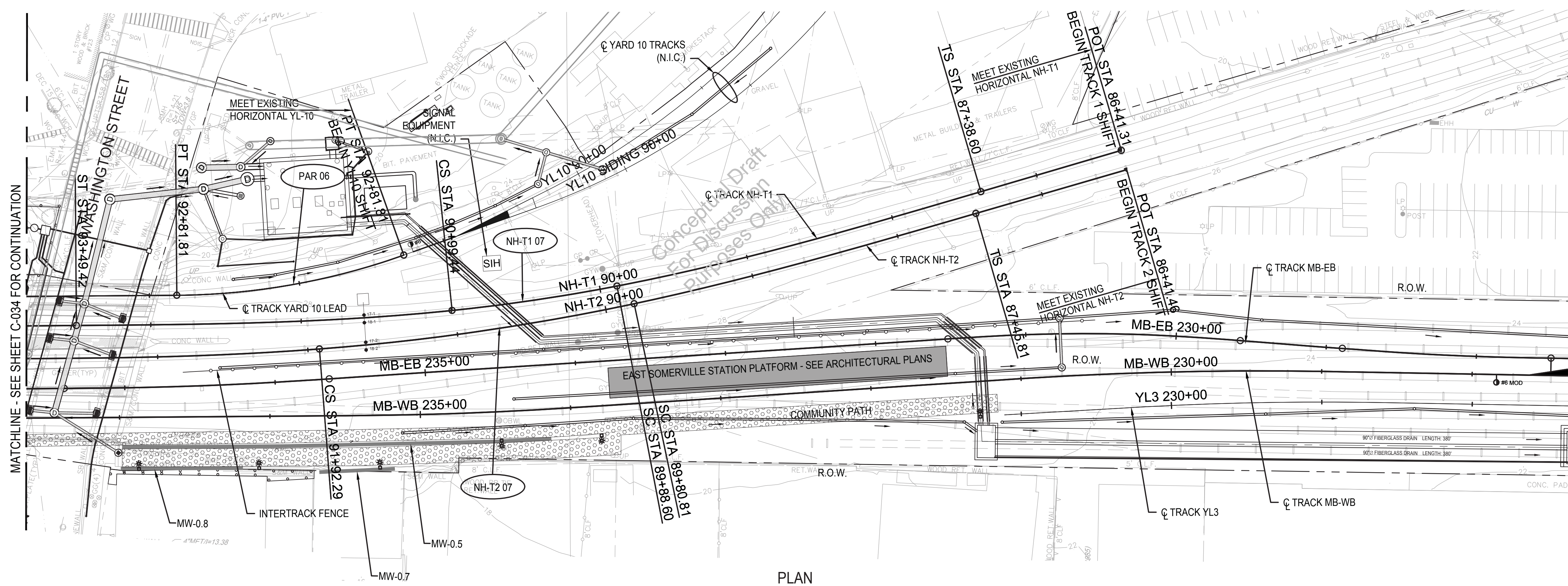
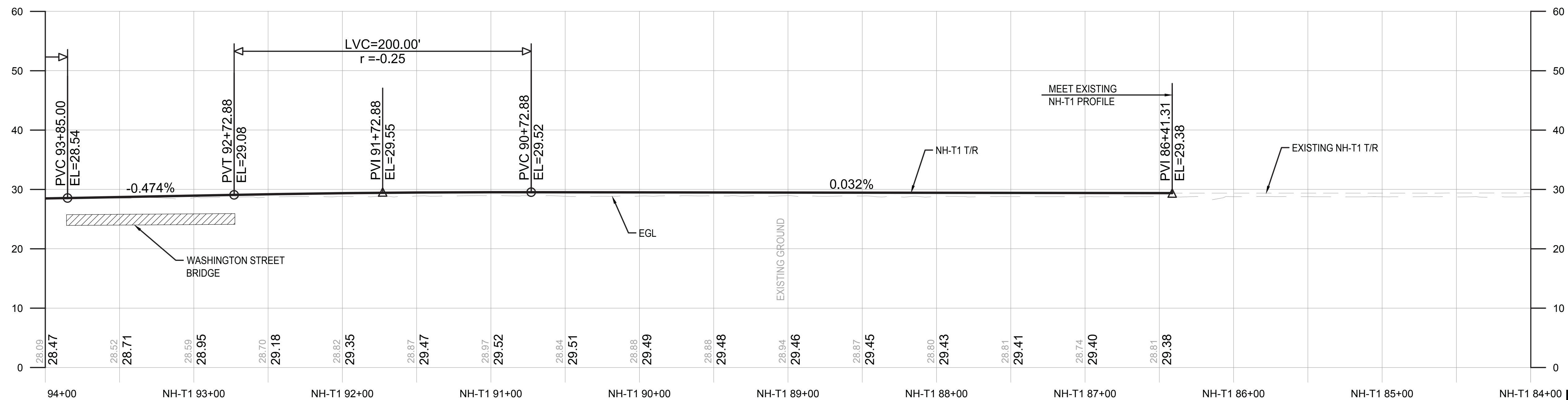


PLAN



PROFILE

PROPOSAL

CURVE NO.	NH-T1 07	NH-T2 07	PAR 06
Dc	4°25'0.00"	3°35'0.00"	12°30'0.00"
Lc (CHORDED)	110.81 FT	211.44 FT	153.54 FT
Ls1	250.00 FT	235.00 FT	0.00 FT
Ls2	250.00 FT	235.00 FT	0.00 FT
Ea	2.00 IN	2.00 IN	0.00 IN
Eu	1.79 IN	1.07 IN	1.97 IN
V	35 MPH	35 MPH	15 MPH

NOTES:

1. REFER TO SHEETS C-003 TO C-024 FOR MEDFORD BRANCH ALIGNMENT AND PROFILE.
2. YARD 10 LEAD PROFILE SHALL BE COORDINATED WITH KEOLIS.
3. THE NH-T2 T/R TRACK PROFILE TO BE THE SAME AS NH-T1 T/R TRACK PROFILE.

HORIZONTAL 40 0 40 80
VERTICAL 10 0 10 20
SCALE IN FEET

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

NEW HAMPSHIRE MAINLINE
CORRIDOR PLAN AND PROFILE
STA NH-T1 84+00 TO STA NH-T1 94+00

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GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	KLN	PJB	JEB	SHEET: C-033	

PLOTTED: 09/22/17 8:52AM BY:BRYANTPJ
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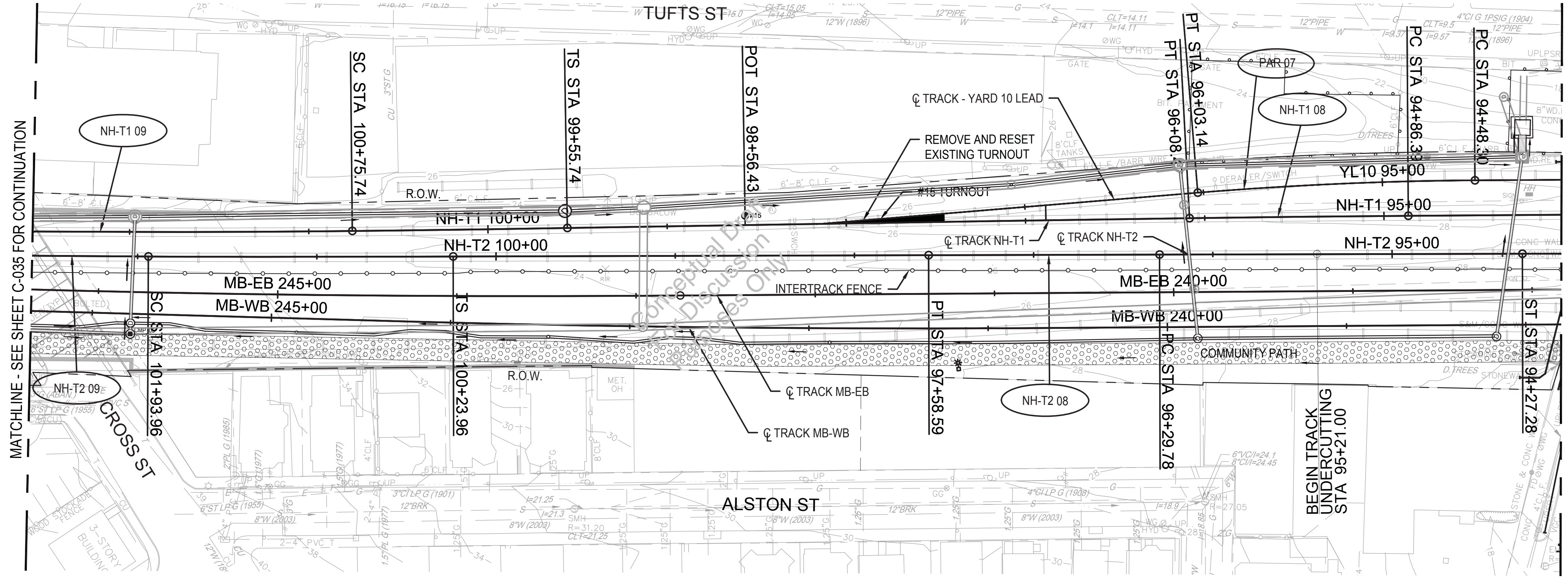

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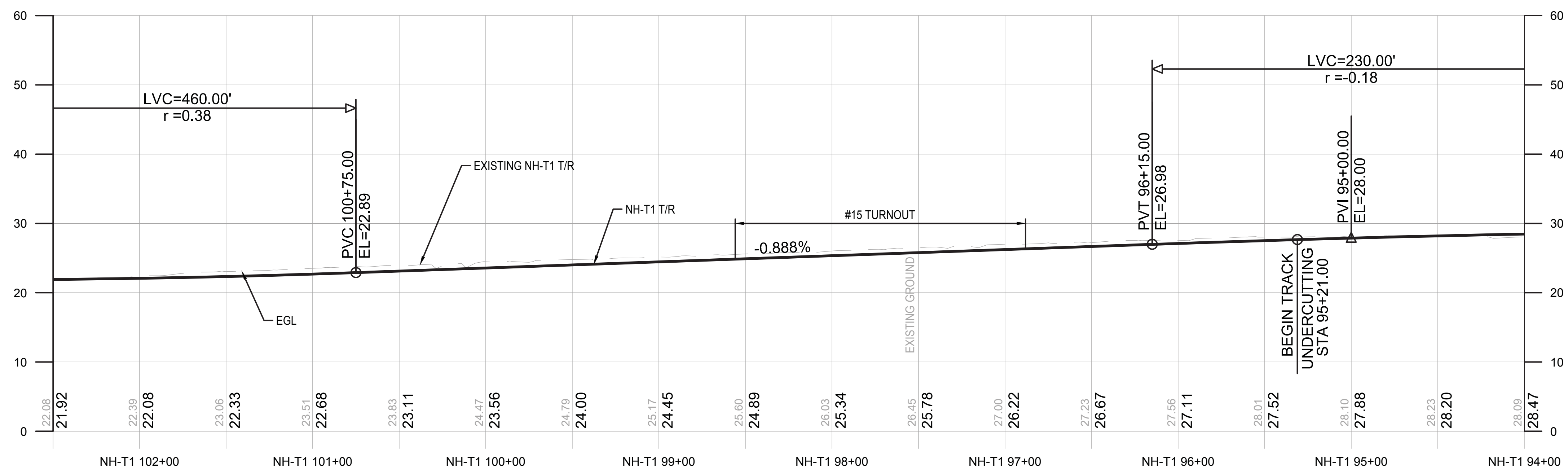

PROFILE

CURVE NO.	NH-T1 08	NH-T2 08	NH-T1 09	NH-T2 09	PAR 07
Dc	0°25'0.00"	0°0'30.00"	0°32'45.00"	0°29'57.91"	2°47'48.44"
Lc (CHORDED)	122.08 FT	128.81 FT	339.14 FT	181.78 FT	154.84 FT
Ls1	0.00 FT	0.00 FT	120.00 FT	170.00 FT	0.00 FT
Ls2	0.00 FT	0.00 FT	120.00 FT	170.00 FT	0.00 FT
Ea	0.00 IN	0.00 IN	1.25 IN	1.00 IN	0.00 IN
Eu	0.36 IN	0.01 IN	0.62 IN	0.71 IN	0.44 IN
V	35 MPH	35 MPH	70 MPH	70 MPH	15 MPH

NOTES:

1. REFER TO SHEETS C-003 TO C-024 FOR MEDFORD BRANCH ALIGNMENT AND PROFILE.
2. YARD 10 LEAD PROFILE SHALL BE COORDINATED WITH KEOLIS.
3. THE NH-T2 T/R TRACK PROFILE TO BE THE SAME AS NH-T1 T/R TRACK PROFILE.

HORIZONTAL 40 0 40 80
10 0 10 20 VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

NEW HAMPSHIRE MAINLINE
CORRIDOR PLAN AND PROFILE
STA NH-T1 94+00 TO STA NH-T1 102+50

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GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	KLN	PJB	JEB	SHEET: C-034	

PLOTTED: 09/22/17 9:14AM BY:BRYANTPJ
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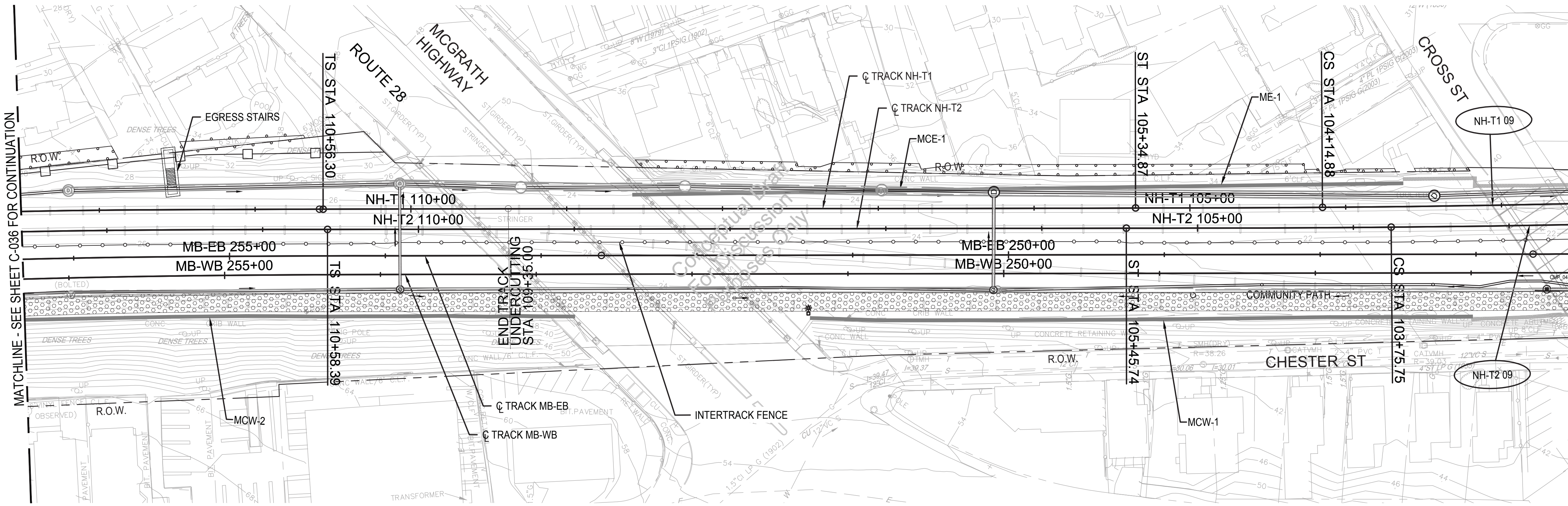

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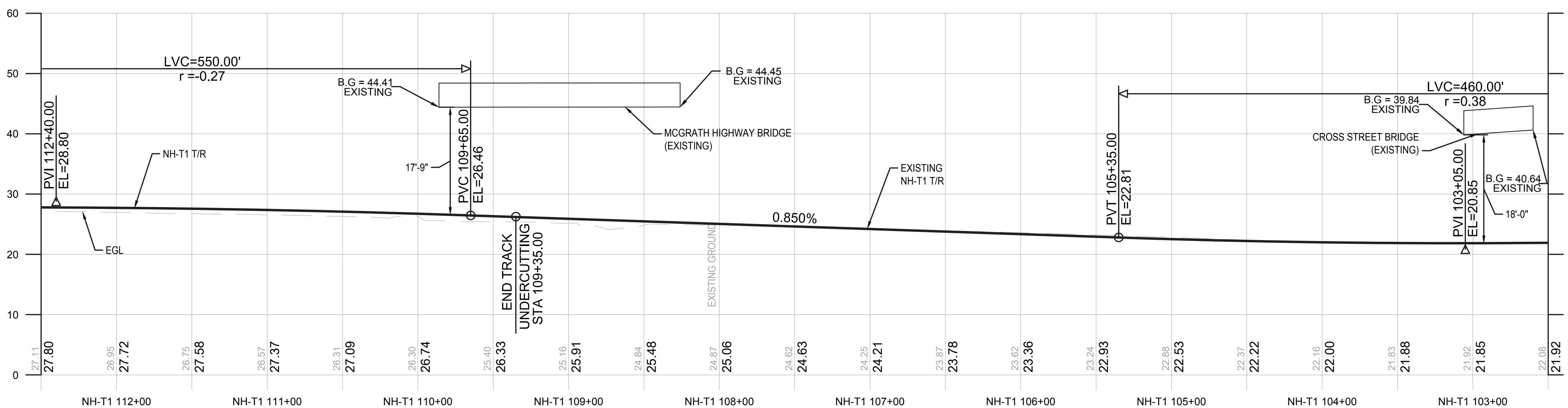

PROFILE

CURVE NO.	NH-T1 09	NH-T2 09
Dc	0°32'45.00"	0°29'57.91"
Lc (CHORDED)	339.14 FT	181.78 FT
Ls1	120.00 FT	170.00 FT
Ls2	120.00 FT	170.00 FT
Ea	1.25 IN	1.00 IN
Eu	0.62 IN	0.71 IN
V	70 MPH	70 MPH

NOTES:

1. REFER TO SHEETS C-003 TO C-024 FOR MEDFORD BRANCH ALIGNMENT AND PROFILE.
2. THE NH-T2 T/R TRACK PROFILE TO BE THE SAME AS NH-T1 T/R TRACK PROFILE.

HORIZONTAL 40 0 40 80
10 0 10 20 VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

NEW HAMPSHIRE MAINLINE
CORRIDOR PLAN AND PROFILE
STA NH-T1 102+50 TO STA NH-T1 112+50

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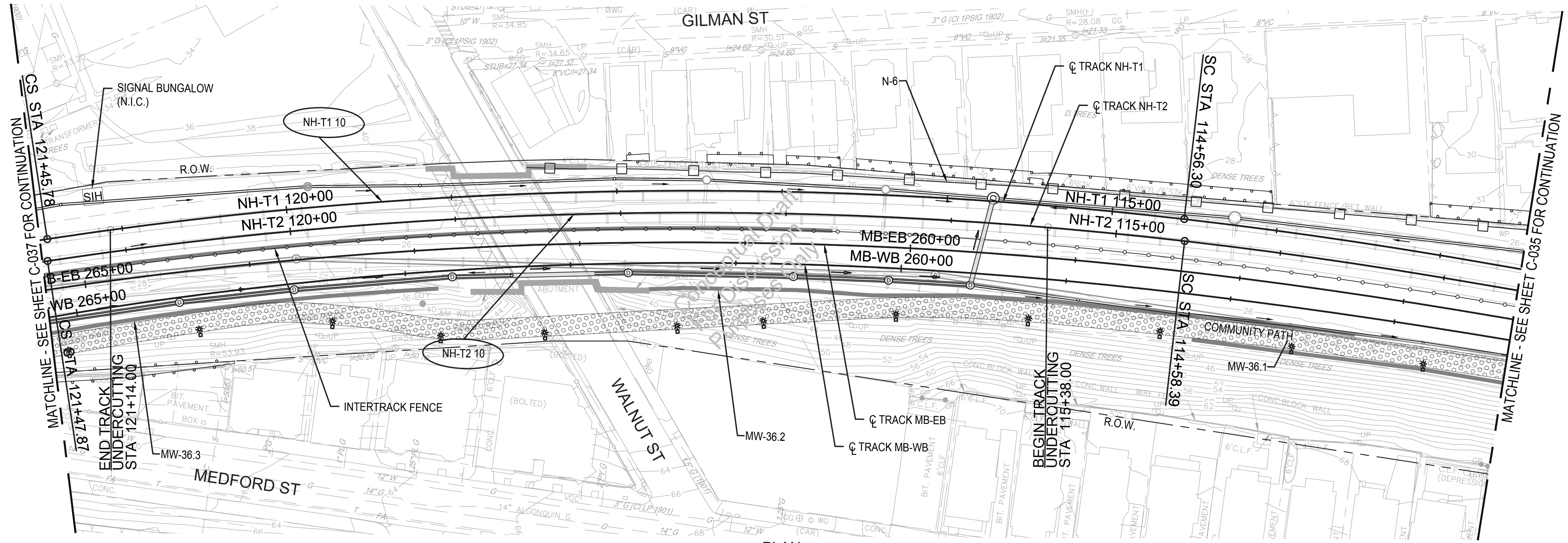
GV20170258-276

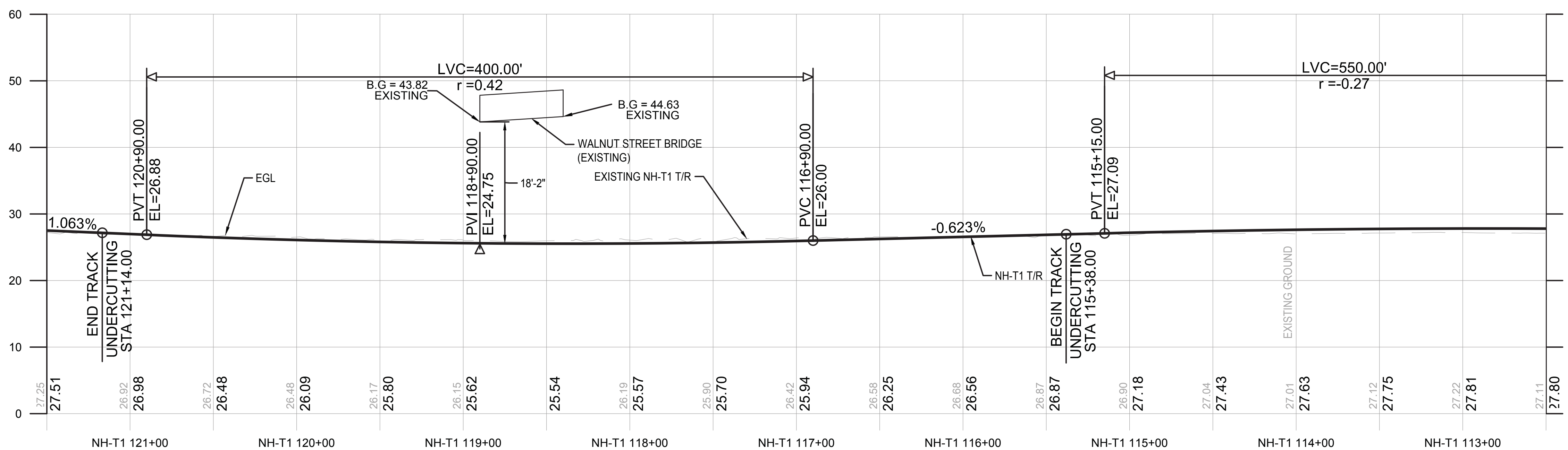
ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED | DRAWN BY: KLN | DESIGN BY: PJB | CHECK BY: JEB | PLAN NO.
DATE: SEPT. 28, 2017 | SHEET: C-035 | ISSUE

PLOTTED: 09/22/17 9:25AM BY:BRYANTPJ
DRAWING: I:\PROPOSALS\2017\0062820 GLX D-B\STV 2017 RFP DESIGN\90_CAD MODELS AND SHEETS\04_CK_TRACK_RAIL\000-K-2107-2114.DWG [C-035] 09/21/17 4:46PM



PLAN



PROFILE

CURVE NO.	NH-T1 10	NH-T2 10
Dc	2°12'13.80"	2°12'13.80"
Lc (CHORDED)	689.49 FT	689.49 FT
Ls1	400.00 FT	400.00 FT
Ls2	400.00 FT	400.00 FT
Ea	3.75 IN	3.75 IN
Eu	2.35 IN	2.38 IN
V	65 MPH	65 MPH

NOTES:

1. REFER TO SHEETS C-003 TO C-024 FOR MEDFORD BRANCH ALIGNMENT AND PROFILE.
2. THE NH-T2 T/R TRACK PROFILE TO BE THE SAME AS NH-T1 T/R TRACK PROFILE.

HORIZONTAL 40 0 40 80
VERTICAL 10 0 10 20
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

NEW HAMPSHIRE MAINLINE
CORRIDOR PLAN AND PROFILE
STA NH-T1 112+50 TO STA NH-T1 121+50

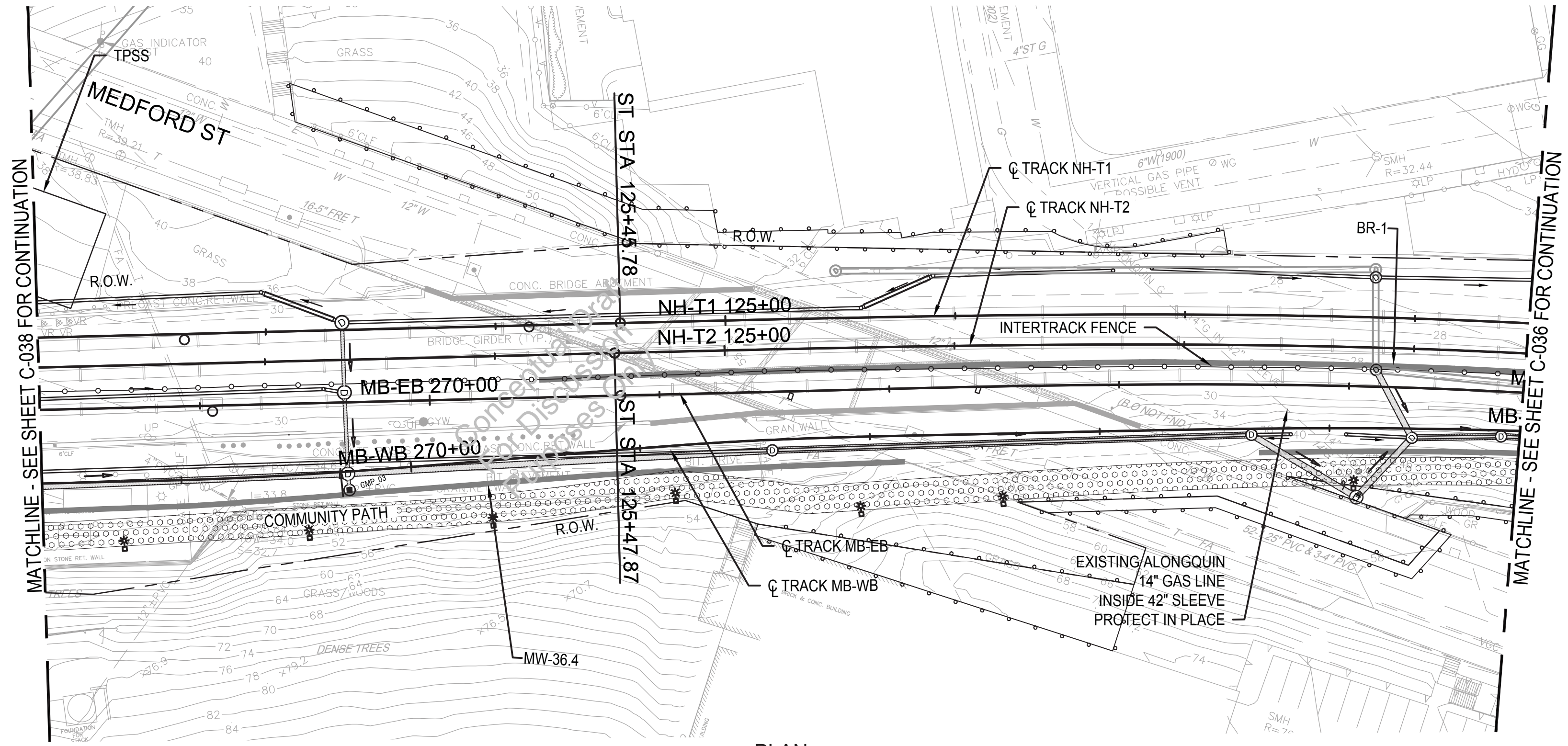
STV 100 Years | massDOT Massachusetts Department of Transportation | GLX CONSTRUCTORS

GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED | DRAWN BY KLN | DESIGN BY PJB | CHECK BY JEB | PLAN NO. | SHEET: C-036 | ISSUE
DATE: SEPT. 28, 2017

PLOTTED: 09/22/17 3:04PM BY:REINEKC
DRAWING: I:\PROPOSALS\2017\0062820 GLX D-B\STV 2017 RFP DESIGN\90_CAD MODELS AND SHEETS\04_CK_TRACK_RAIL\000-K-2107-2114.DWG [C-036] 09/22/17 1:34PM



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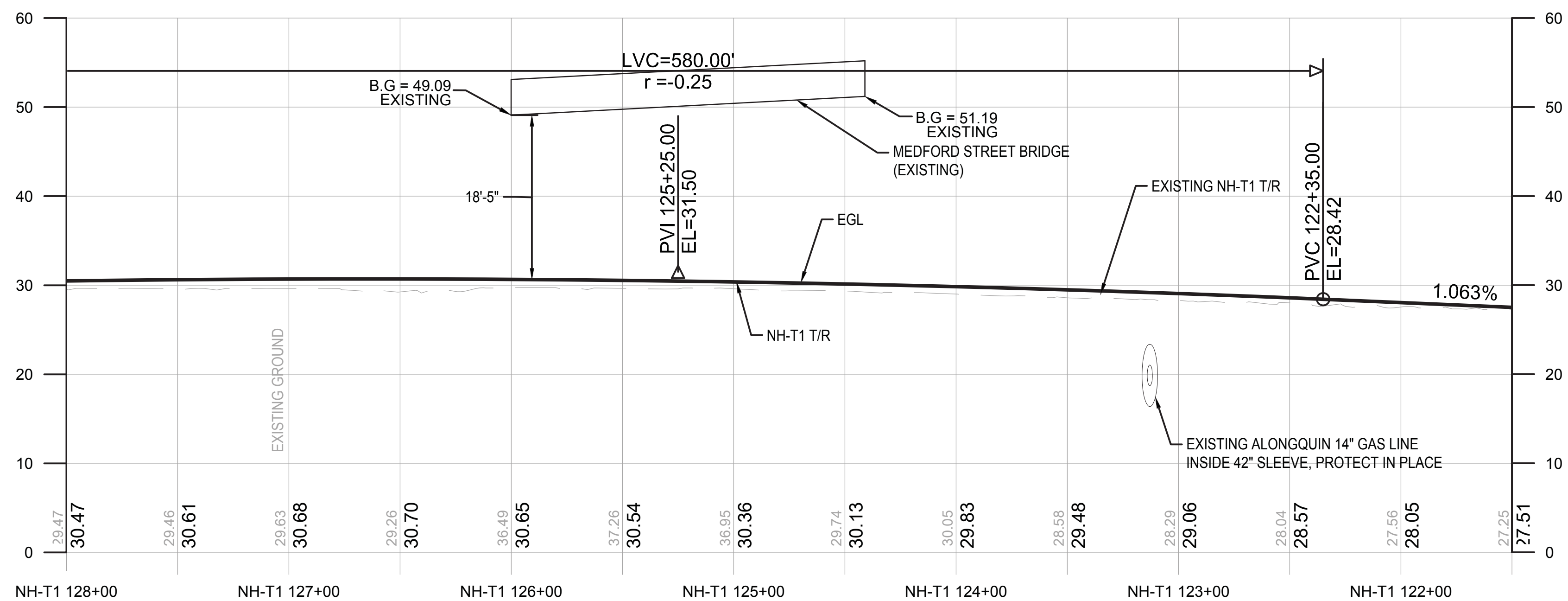


PROFILE

HORIZONTAL
VERTICAL
SCALE IN FEET

NOTES:

1. REFER TO SHEETS C-003 TO C-024 FOR MEDFORD BRANCH ALIGNMENT AND PROFILE.
2. THE NH-T2 T/R TRACK PROFILE TO BE THE SAME AS NH-T1 T/R TRACK PROFILE.

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

NEW HAMPSHIRE MAINLINE
CORRIDOR PLAN AND PROFILE
STA NH-T1 121+50 TO STA NH-T1 128+00

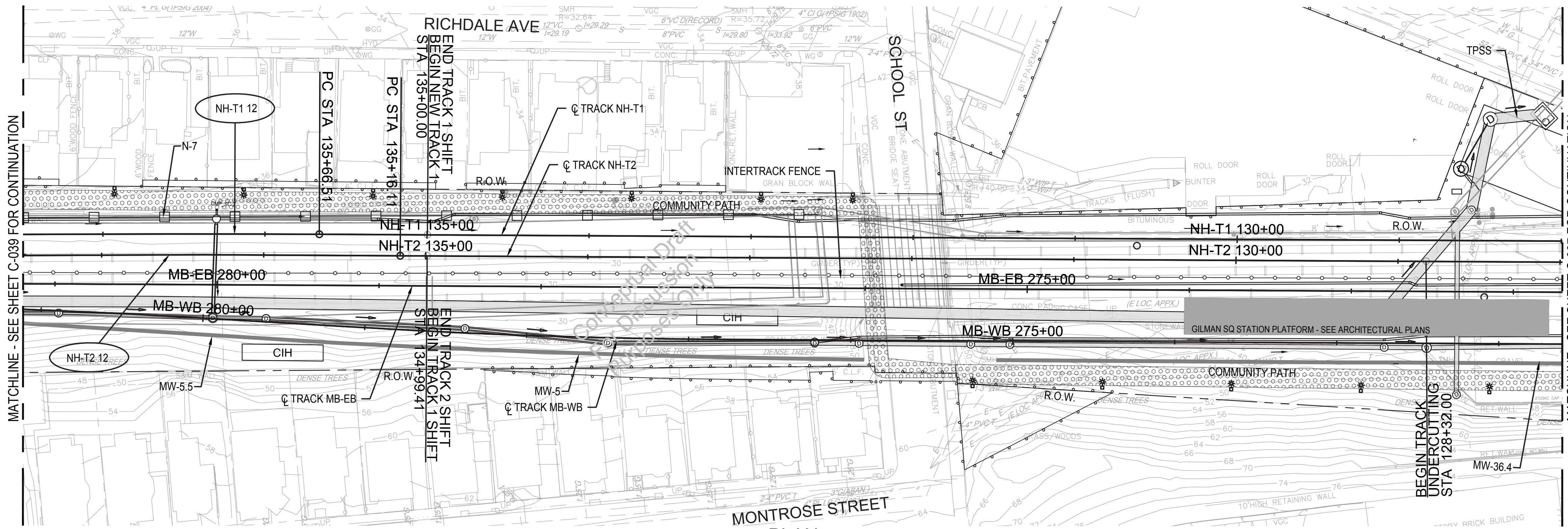
STV 100 Years | massDOT Massachusetts Department of Transportation | GLX CONSTRUCTORS

GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	KLN	PJB	JEB	SHEET: C-037	

PLOTTED: 09/22/17 2:45PM BY: REINEKC
DRAWING: I:\PROPOSALS\2017\0062820 GLX D-B\STV 2017 RFP DESIGN\90_CAD MODELS AND SHEETS\04_CK_TRACK_RAIL\000-K-2107-2114.DWG [C-037] 09/22/17 1:34PM



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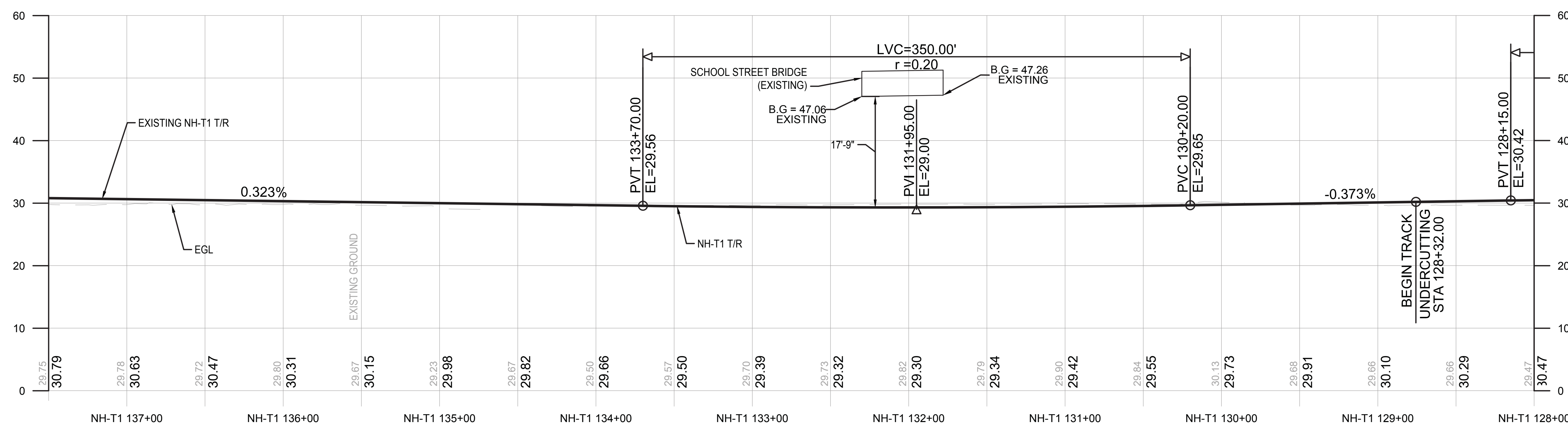

PROFILE

CURVE NO.	NH-T1 12	NH-T2 12
Dc	0°18'00.00"	0°11'51.26"
Lc (CHORDED)	230.40 FT	349.85 FT
Ls1	0.00 FT	0.00 FT
Ls2	0.00 FT	0.00 FT
Ea	0.00 IN	0.00 IN
Eu	1.34 IN	0.89 IN
V	80 MPH	80 MPH

NOTES:

1. REFER TO SHEETS C-003 TO C-024 FOR MEDFORD BRANCH ALIGNMENT AND PROFILE.
2. THE NH-T2 T/R TRACK PROFILE TO BE THE SAME AS NH-T1 T/R TRACK PROFILE.

HORIZONTAL 40 0 40 80
10 0 10 20 VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

NEW HAMPSHIRE MAINLINE
CORRIDOR PLAN AND PROFILE
STA NH-T1 128+00 TO STA NH-T1 137+50

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GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	KLN	PJB	JEB	SHEET: C-038	

PLOTTED: 09/22/17 2:52PM BY:REINEKC
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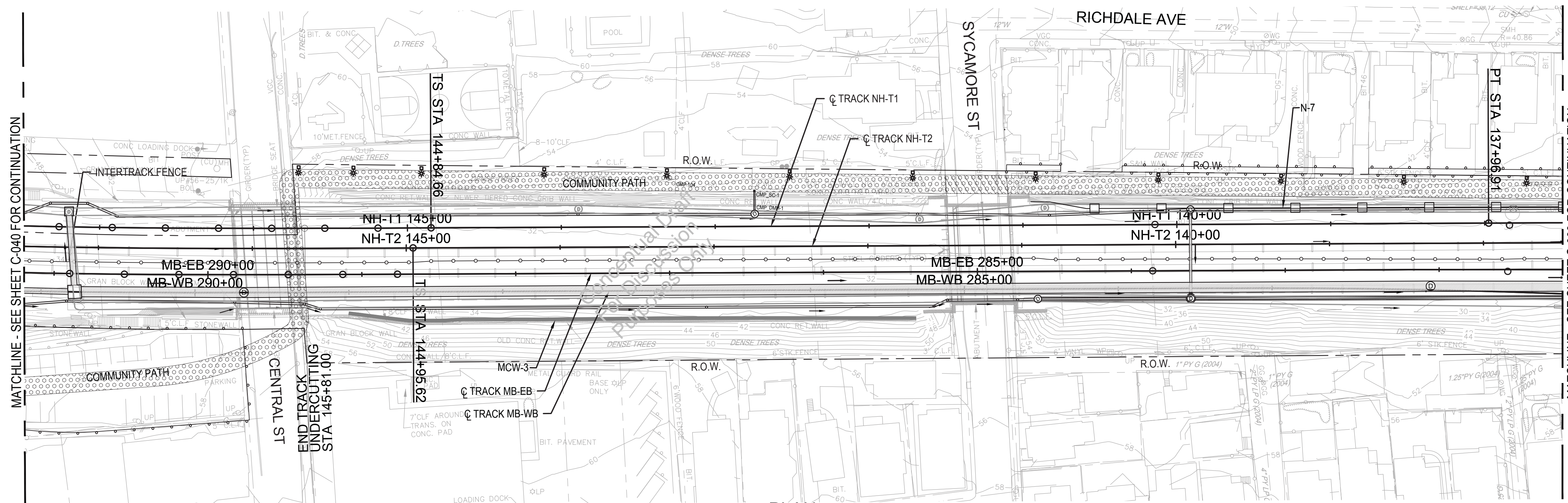

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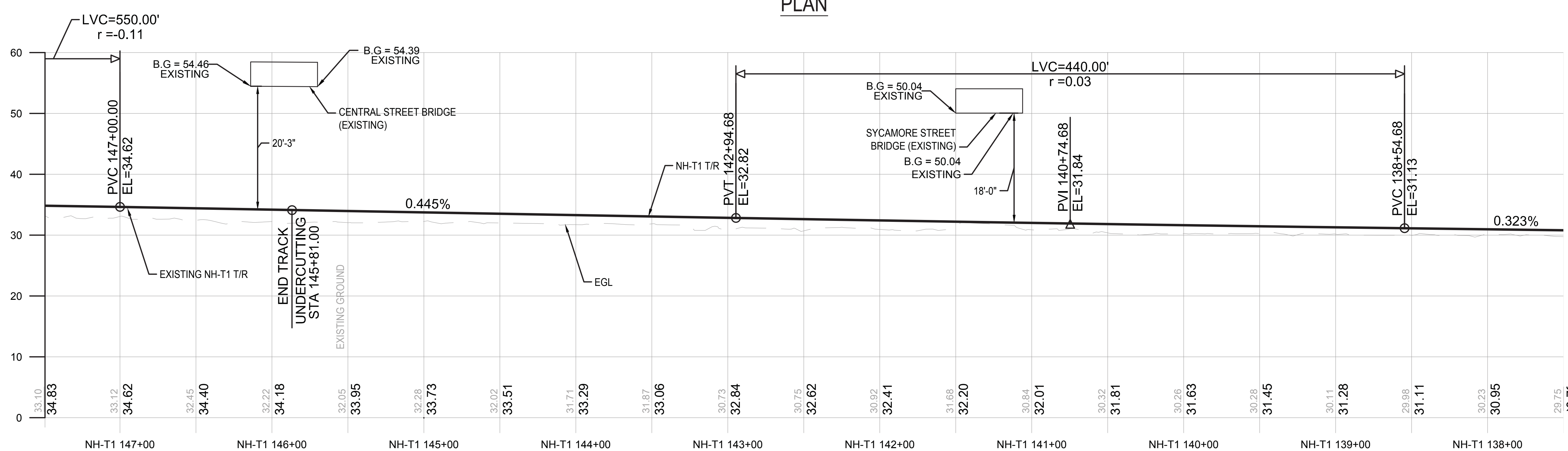


PROFILE

HORIZONTAL
40 0 40 80
10 0 10 20
VERTICAL
SCALE IN FEET

NOTES:

1. REFER TO SHEETS C-003 TO C-024 FOR MEDFORD BRANCH ALIGNMENT AND PROFILE.
2. THE NH-T2 T/R TRACK PROFILE TO BE THE SAME AS NH-T1 T/R TRACK PROFILE.

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

NEW HAMPSHIRE MAINLINE
CORRIDOR PLAN AND PROFILE
STA NH-T1 137+50 TO STA NH-T1 147+50

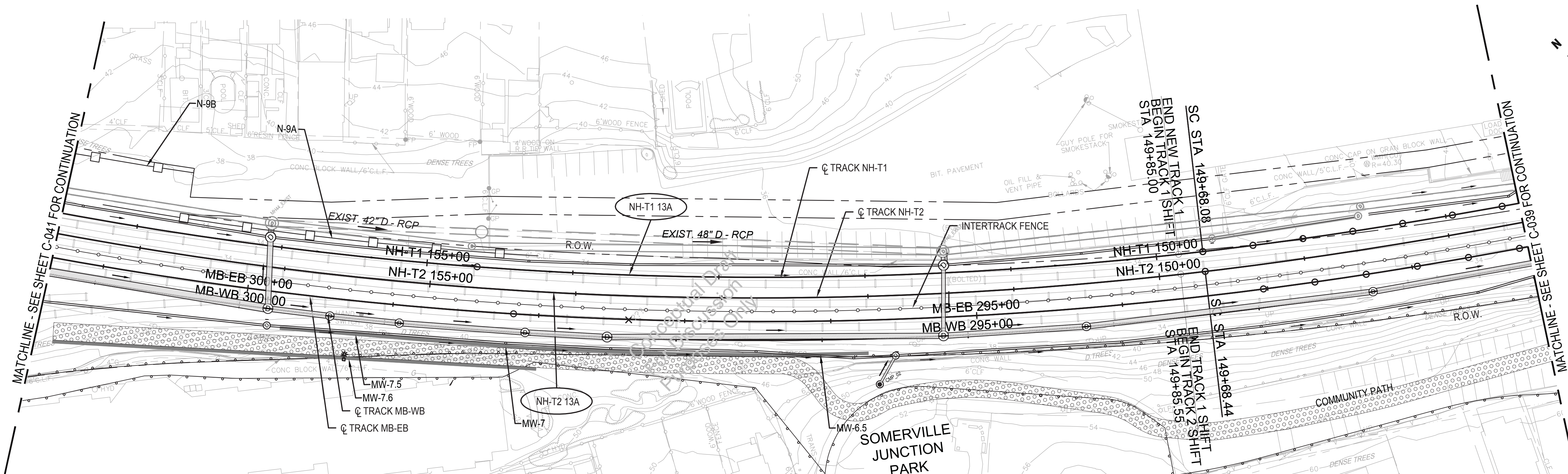
STV 100 Years | massDOT Massachusetts Department of Transportation | GLX CONSTRUCTORS

GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	KLN	PJB	JEB	SHEET: C-039	

PLOTTED: 09/22/17 8:38AM BY:BRYANTPJ
DRAWING: I:\PROPOSALS\2017\0062820 GLX D-B\STV 2017 RFP DESIGN\90_CAD MODELS AND SHEETS\04_CK_TRACK_RAIL\000-K-2107-2114.DWG [C-039] 09/21/17 4:46PM



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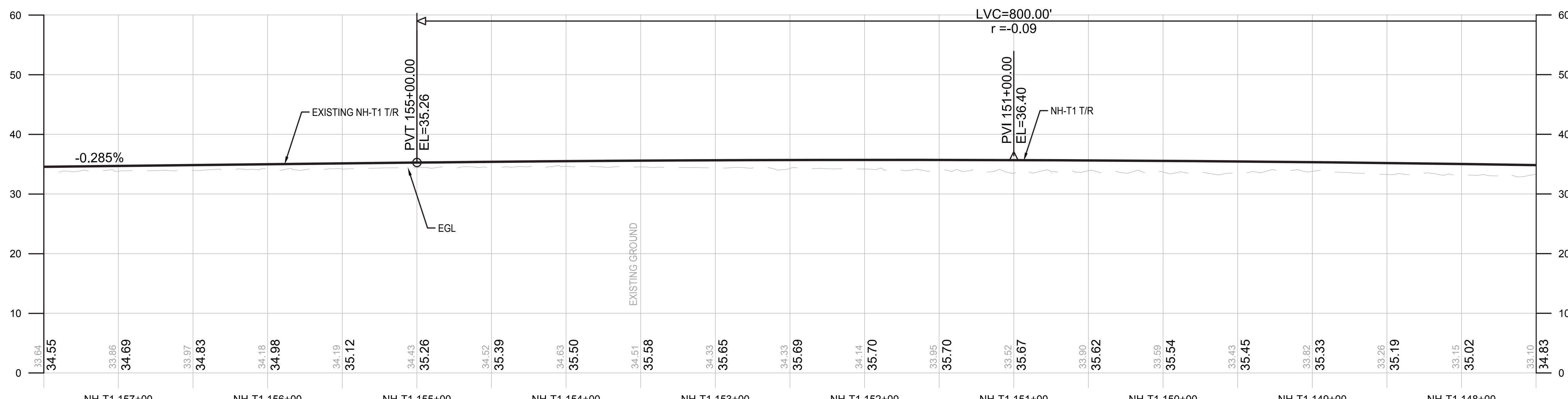

PROFILE

CURVE NO.	NH-T1 13A	NH-T1 13B	NH-T2 13A	NH-T2 13B
Dc	2°10'58.20"	1°01'23.30"	2°11'13.2"	1°01'10.2"
Lc (CHORDED)	997.21 FT	108.16 FT	1000.86 FT	83.19 FT
Ls1	483.42 FT	125.50 FT	472.82 FT	151.13 FT
Ls2	125.50 FT	278.07 FT	151.13 FT	245.97 FT
Ea	4.00 IN	2.75 IN	4.00 IN	2.75 IN
Eu	2.51 IN	2.23 IN	2.51 IN	2.23 IN
V	65 MPH	65 MPH	65 MPH	65 MPH

NOTES:

1. REFER TO SHEETS C-003 TO C-024 FOR MEDFORD BRANCH ALIGNMENT AND PROFILE..
2. THE NH-T2 T/R TRACK PROFILE TO BE THE SAME AS NH-T1 T/R TRACK PROFILE.

HORIZONTAL 40 0 40 80
10 0 10 20 VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

NEW HAMPSHIRE MAINLINE
CORRIDOR PLAN AND PROFILE
STA NH-T1 147+50 TO STA NH-T1 157+50

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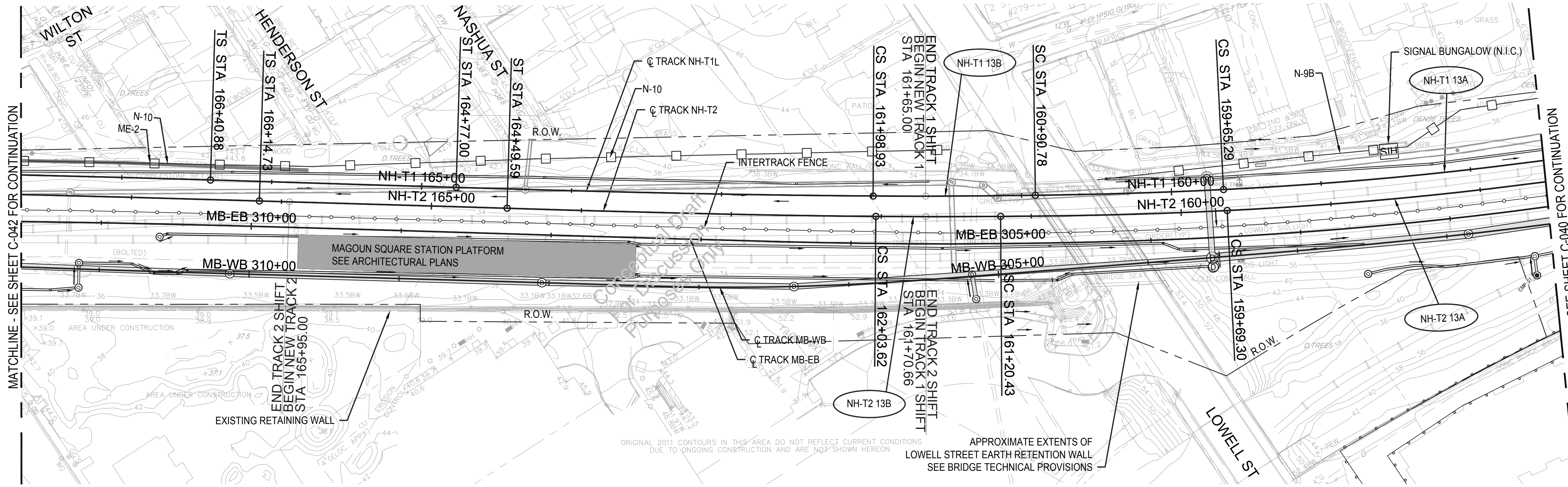
GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	KLN	PJB	JEB	SHEET: C-040	

PLOTTED: 09/22/17 2:33PM BY:BRYANTPJ
DRAWING: I:\PROPOSALS\2017\0062820 GLX D-B\STV 2017 RFP DESIGN\90_CAD MODELS AND SHEETS\04_CK_TRACK_RAIL\000-K-2107-2114.DWG [C-040] 09/22/17 1:34PM



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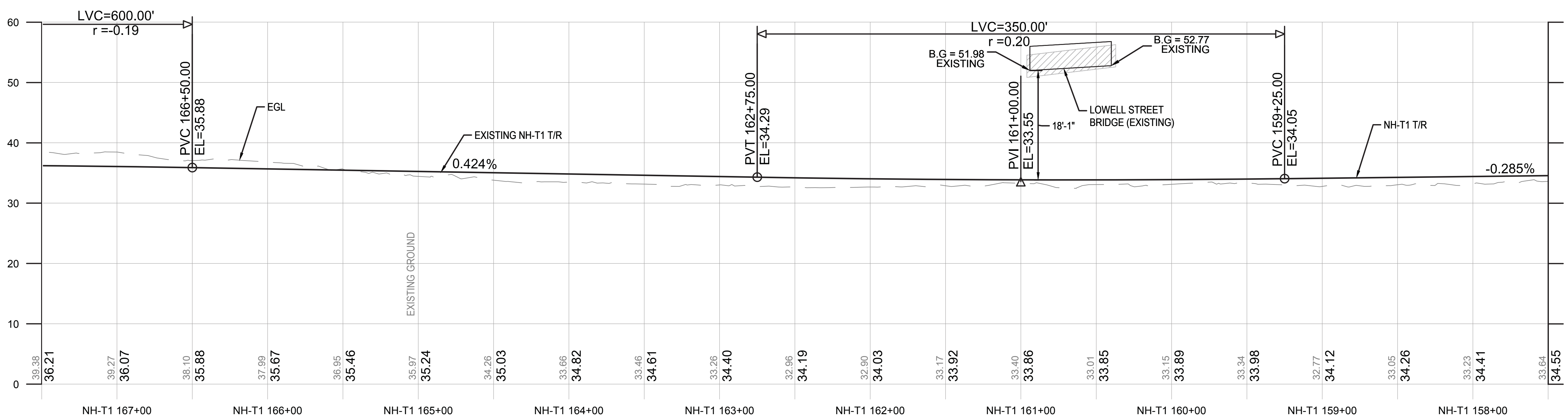

PROFILE

CURVE NO.	NH-T1 13A	NH-T1 13B	NH-T2 13A	NH-T2 13B
Dc	2°10'58.20"	1°01'23.30"	2°11'13.2"	1°01'10.2"
Lc (CHORDED)	997.21 FT	108.16 FT	1000.86 FT	83.19 FT
Ls1	483.42 FT	125.50 FT	472.82 FT	151.13 FT
Ls2	125.50 FT	278.07 FT	151.13 FT	245.97 FT
Ea	4.00 IN	2.75 IN	4.00 IN	2.75 IN
Eu	2.51 IN	2.23 IN	2.51 IN	2.23 IN
V	65 MPH	65 MPH	65 MPH	65 MPH

NOTES:

1. REFER TO SHEETS C-003 TO C-024 FOR MEDFORD BRANCH ALIGNMENT AND PROFILE.
2. THE NH-T2 T/R TRACK PROFILE TO BE THE SAME AS NH-T1 T/R TRACK PROFILE.

HORIZONTAL
40 0 40 80
10 0 10 20
VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

NEW HAMPSHIRE MAINLINE
CORRIDOR PLAN AND PROFILE
STA NH-T1 157+50 TO STA NH-T1 167+50

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GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	KLN	PJB	JEB	SHEET: C-041	

PLOTTED: 09/22/17 2:28PM BY:BRYANTPJ
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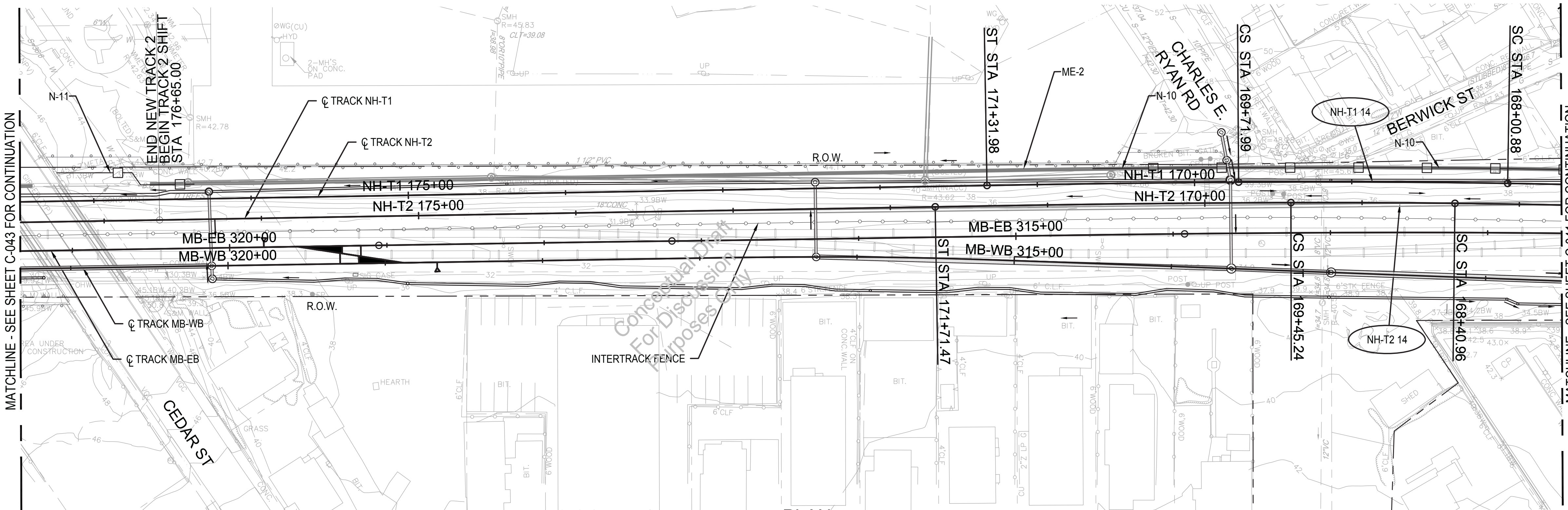

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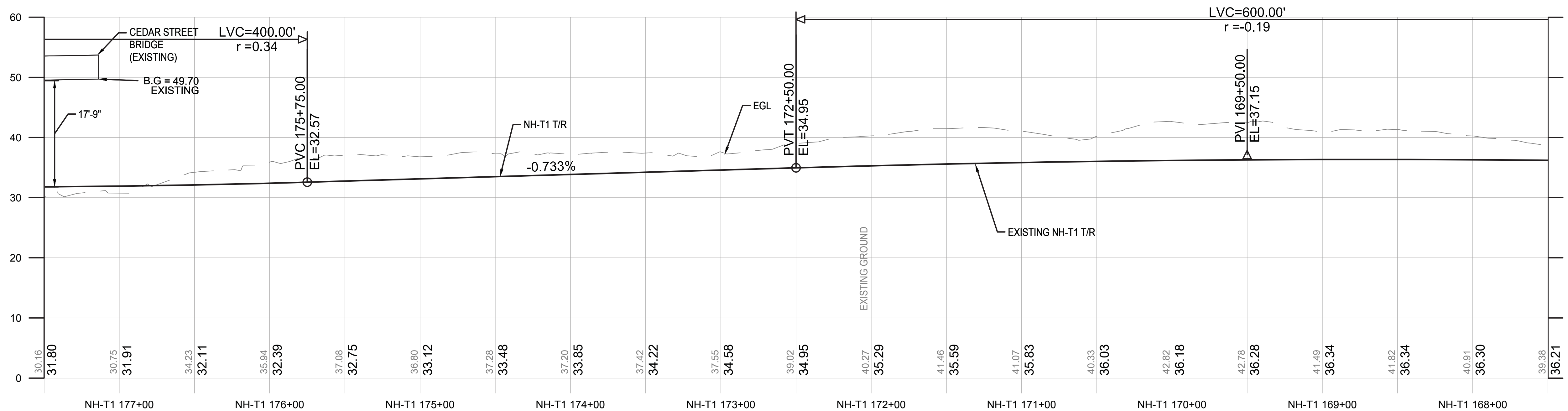

PROFILE

CURVE NO.	NH-T1 14	NH-T2 14
Dc	0°45'0.00"	0°45'04.7"
Lc (CHORDED)	171.11 FT	104.29 FT
Ls1	160.00 FT	226.23 FT
Ls2	160.00 FT	226.23 FT
Ea	1.75 IN	1.75 IN
Eu	1.61 IN	1.62 IN
V	80 MPH	80 MPH

NOTES:

1. REFER TO SHEETS C-003 TO C-024 FOR MEDFORD BRANCH ALIGNMENT AND PROFILE.
2. THE NH-T2 T/R TRACK PROFILE TO BE THE SAME AS NH-T1 T/R TRACK PROFILE.

HORIZONTAL
40 0 40 80
10 0 10 20
VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

NEW HAMPSHIRE MAINLINE
CORRIDOR PLAN AND PROFILE
STA NH-T1 167+50 TO STA NH-T1 177+50

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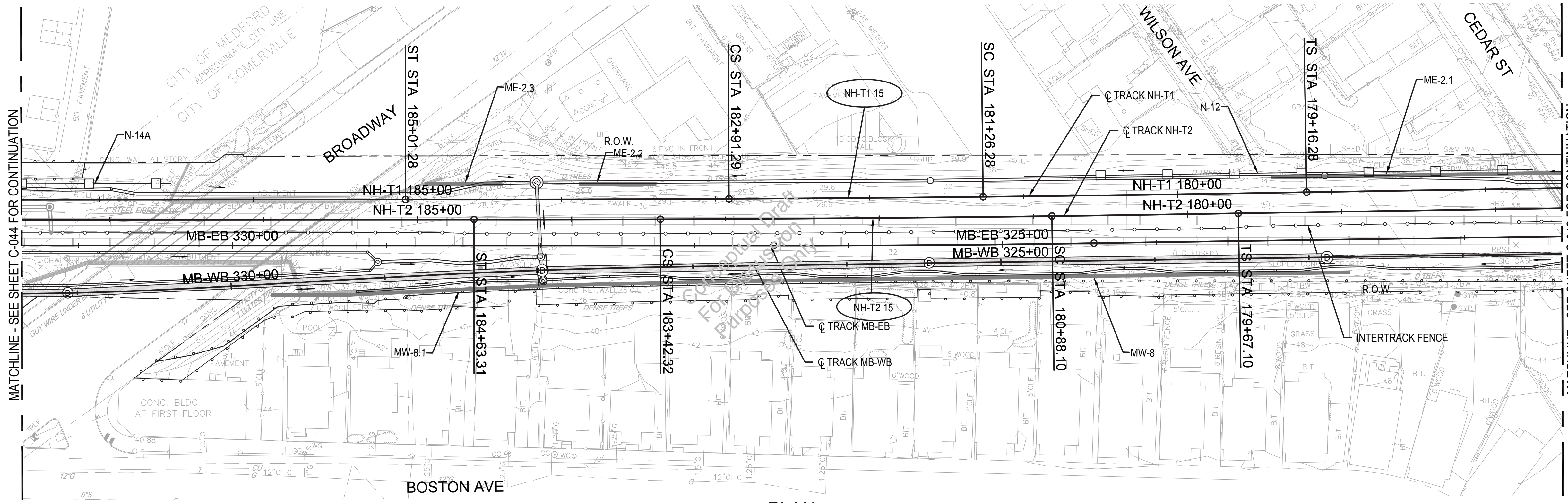
GV20170258-276

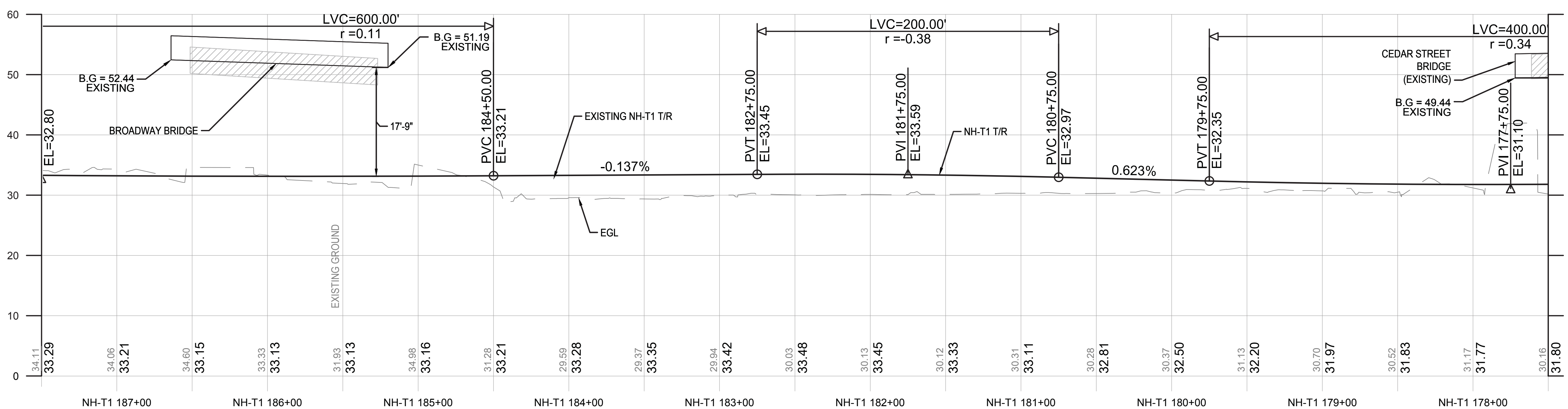
SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	KLN	PJB	JEB	SHEET: C-042	

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

PLOTTED: 09/21/17 3:29AM BY:BRYANTPJ
DRAWING: I:\PROPOSALS\2017\062820 GLX D-B\STV 2017 RFP DESIGN\90_CAD MODELS AND SHEETS\04_CK_TRACK_RAIL\000-K-2115-2123.DWG [C-042] 09/20/17 9:38PM



PLAN



PROFILE

CURVE NO.	NH-T1 15	NH-T2 15
Dc	0°14'0.00"	0°13'59.55"
Lc (CHORDED)	165.02 FT	254.21 FT
Ls1	210.00 FT	121.00 FT
Ls2	210.00 FT	121.00 FT
Ea	1.00 IN	1.00 IN
Eu	0.05 IN	0.04 IN
V	80 MPH	80 MPH

NOTES:

1. REFER TO SHEETS C-003 TO C-024 FOR MEDFORD BRANCH ALIGNMENT AND PROFILE.
2. THE NH-T2 T/R TRACK PROFILE TO BE THE SAME AS NH-T1 T/R TRACK PROFILE.

HORIZONTAL 40 0 40 80
10 0 10 20 VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

NEW HAMPSHIRE MAINLINE
CORRIDOR PLAN AND PROFILE
STA NH-T1 177+50 TO STA NH-T1 187+50

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GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	KLN	PJB	JEB	SHEET: C-043	

PLOTTED: 09/22/17 2:13PM BY:BRYANTPJ
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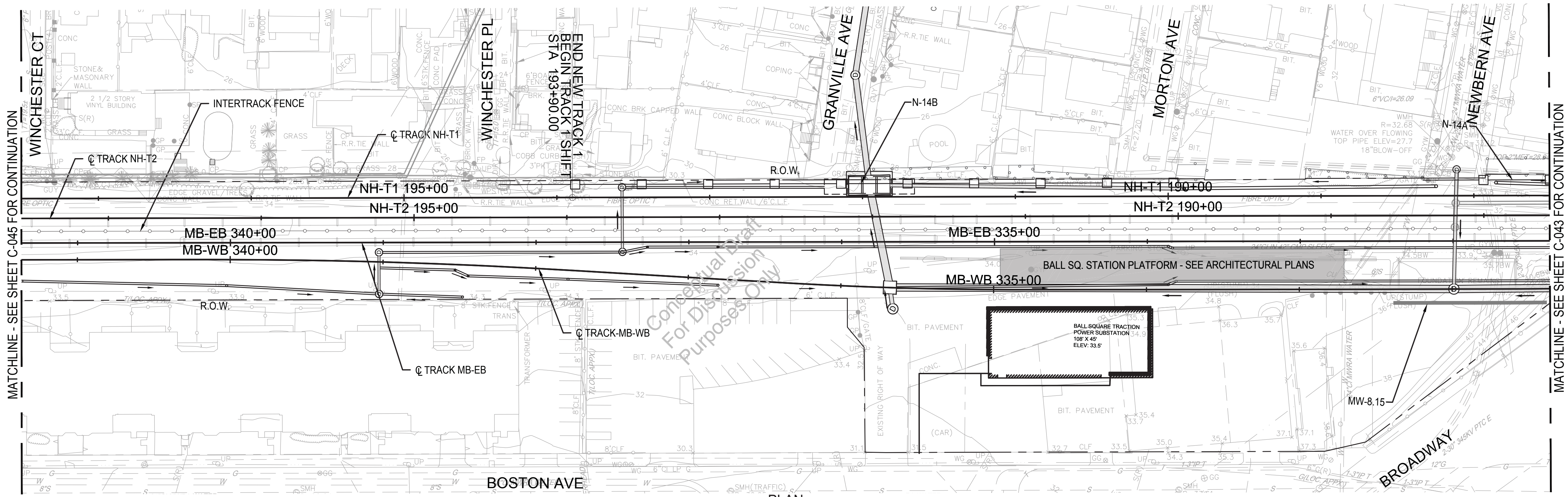

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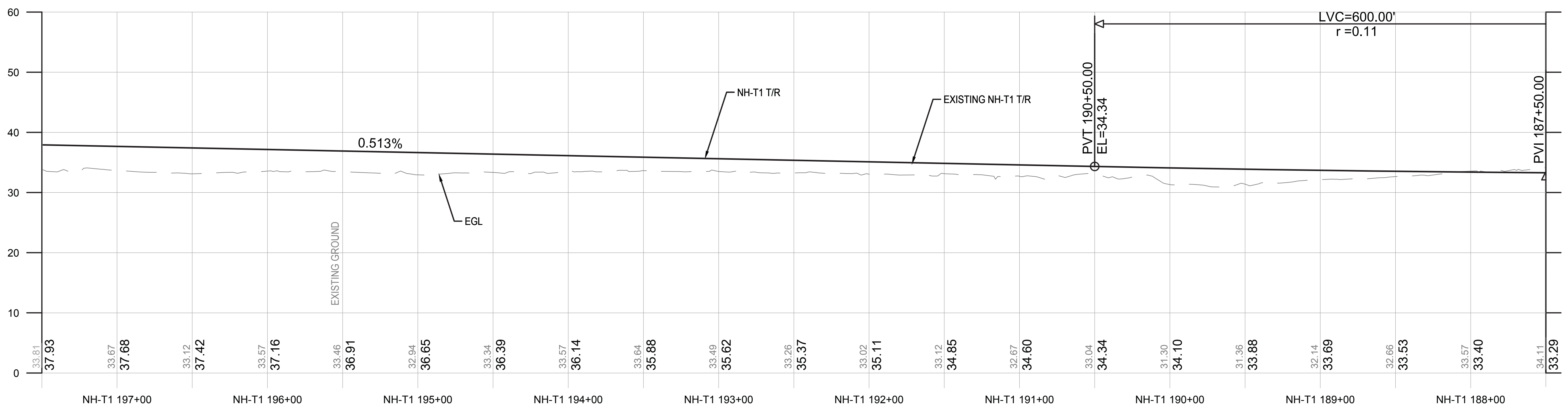

PROFILE

HORIZONTAL
40 0 40 80
10 0 10 20
VERTICAL
SCALE IN FEET

NOTES:

1. REFER TO SHEETS C-003 TO C-024 FOR MEDFORD BRANCH ALIGNMENT AND PROFILE.
2. THE NH-T2 T/R TRACK PROFILE TO BE THE SAME AS NH-T1 T/R TRACK PROFILE.

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

NEW HAMPSHIRE MAINLINE
CORRIDOR PLAN AND PROFILE
STA NH-T1 187+50 TO STA NH-T1 197+50

STV 100 Years
massDOT Massachusetts Department of Transportation
GLX CONSTRUCTORS

GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	KLN	PJB	JEB	SHEET: C-044	

PLOTTED: 09/21/17 3:46AM BY:BRYANTPJ
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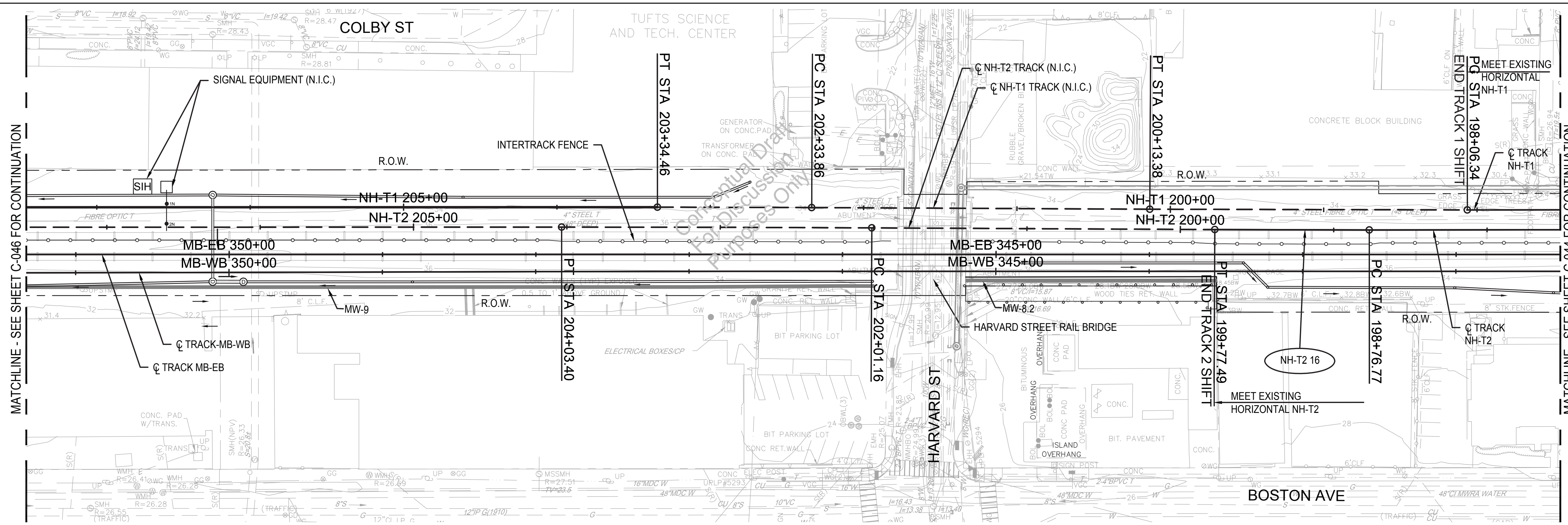

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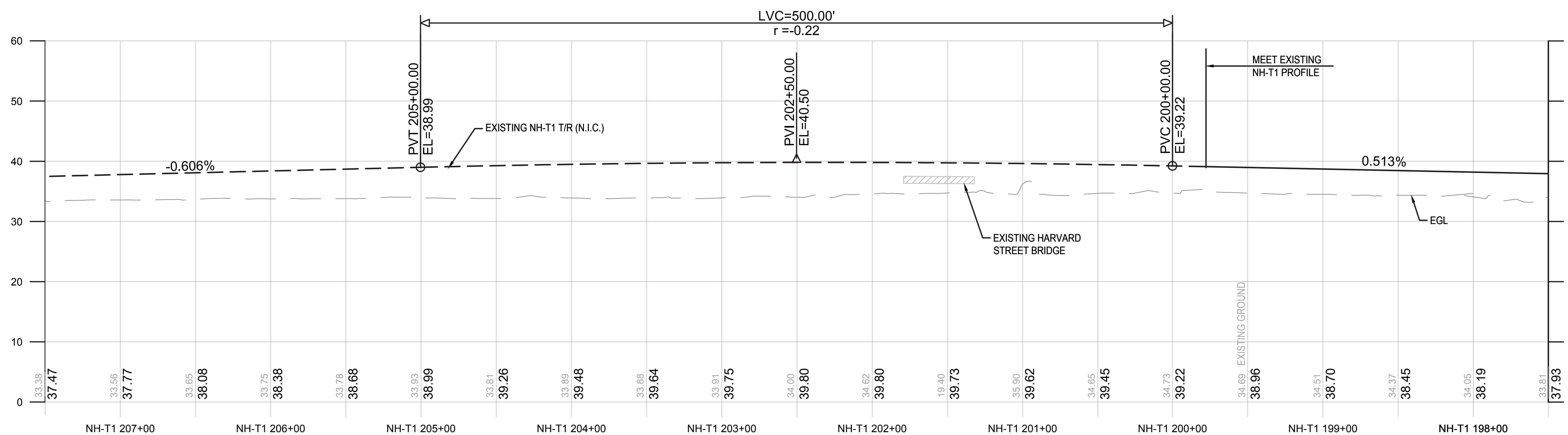

PROFILE

PROPOSAL

CURVE NO.	NH-T2 16
Dc	0°19'05.92"
Lc (CHORDED)	100.72 FT
Ls1	0.00 FT
Ls2	0.00 FT
Ea	0.00 IN
Eu	1.43 IN
V	80 MPH

HORIZONTAL
40 0 40 80
10 0 10 20
VERTICAL
SCALE IN FEET

NOTES:

1. REFER TO SHEETS C-003 TO C-024 FOR MEDFORD BRANCH ALIGNMENT AND PROFILE.
2. THE NH-T2 T/R TRACK PROFILE TO BE THE SAME AS NH-T1 T/R TRACK PROFILE.

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

NEW HAMPSHIRE MAINLINE
CORRIDOR PLAN AND PROFILE
STA NH-T1 197+50 TO STA NH-T1 207+50

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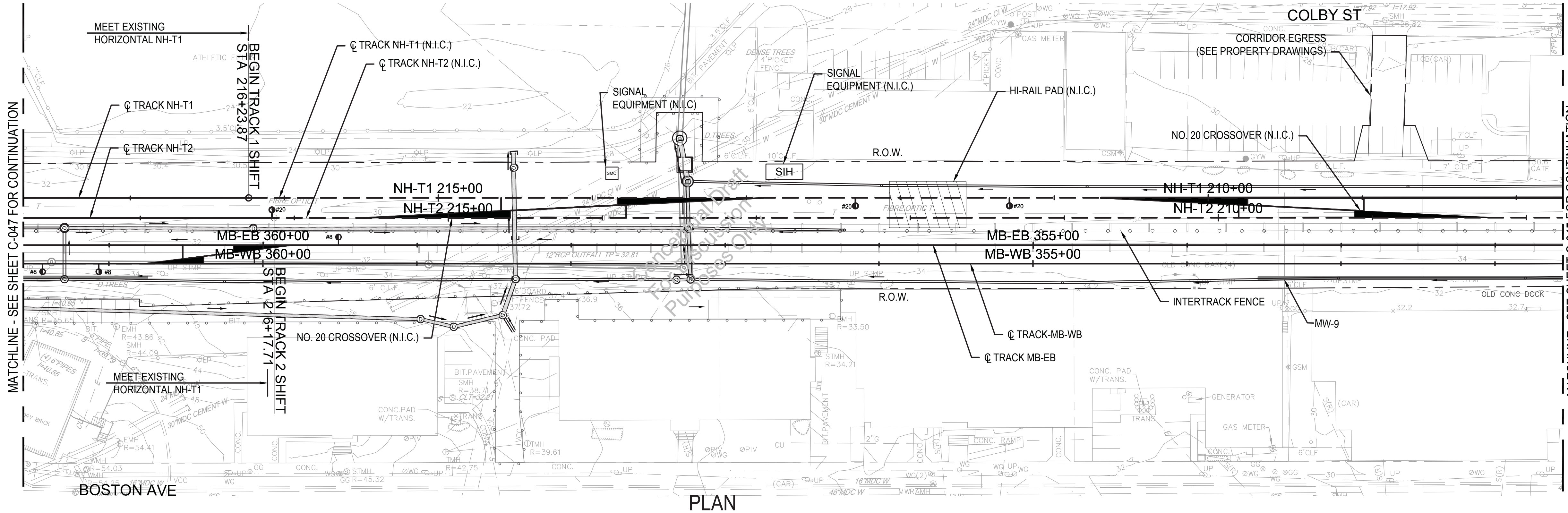
GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	KLN	PJB	JEB	SHEET: C-045	

PLOTTED: 09/22/17 1:49PM BY:BRYANTPJ
DRAWING: I:\PROPOSALS\2017\0062820 GLX D-B\STV 2017 RFP DESIGN\90_CAD MODELS AND SHEETS\04_CK_TRACK_RAIL\000-K-2115-2123.DWG [C-045] 09/22/17 12:53PM



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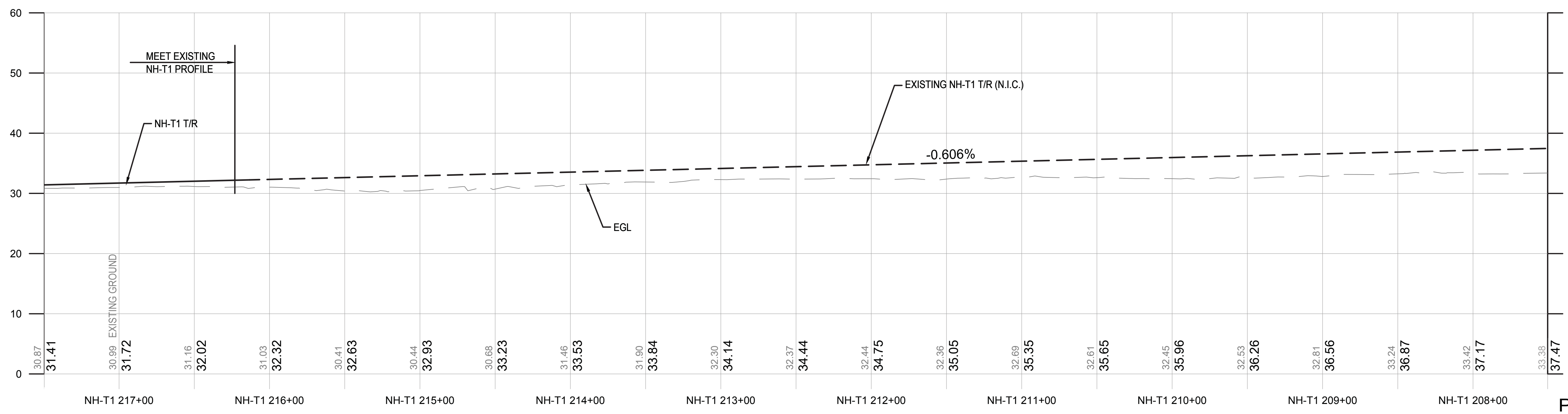


PROFILE

HORIZONTAL
40 0 40 80
10 0 10 20
VERTICAL
SCALE IN FEET

NOTES:

1. REFER TO SHEETS C-003 TO C-024 FOR MEDFORD BRANCH ALIGNMENT AND PROFILE.
2. THE NH-T2 T/R TRACK PROFILE TO BE THE SAME AS NH-T1 T/R TRACK PROFILE.

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

NEW HAMPSHIRE MAINLINE
CORRIDOR PLAN AND PROFILE
STA NH-T1 207+50 TO STA NH-T1 217+50

STV 100 Years | massDOT Massachusetts Department of Transportation | GLX CONSTRUCTORS

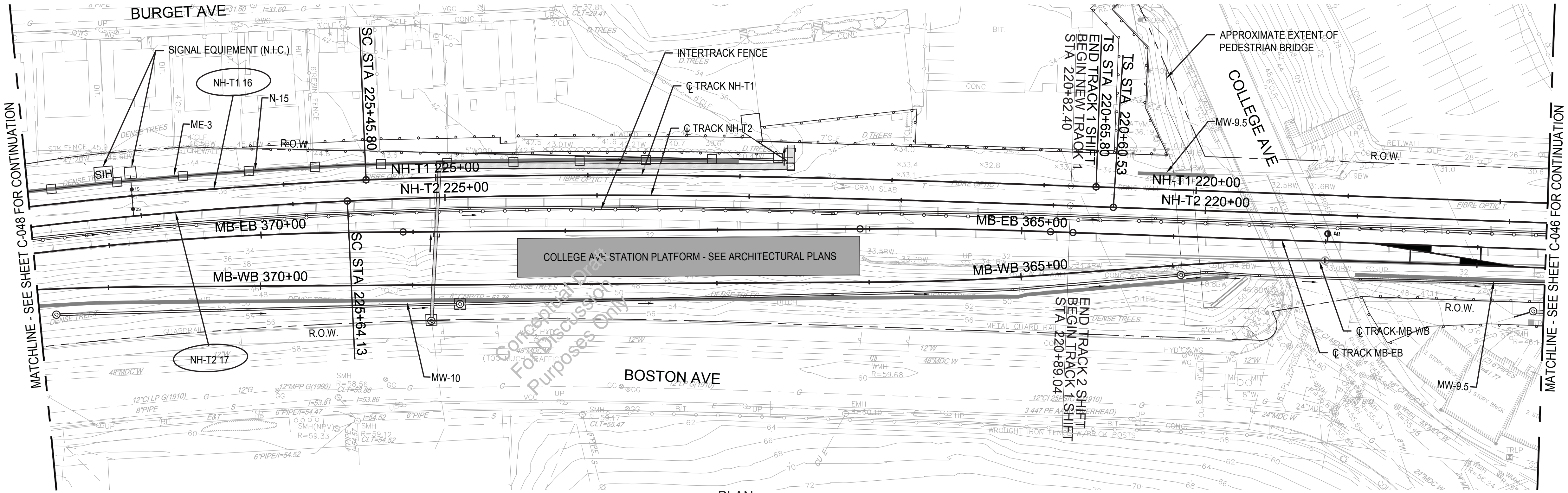
GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
DATE: SEPT. 28, 2017	KLN	PJB	JEB	SHEET: C-046	

PLOTTED: 09/21/17 4:04AM BY:BRYANTPJ
DRAWING: I:\PROPOSALS\2017\0062820 GLX D-B\STV 2017 RFP DESIGN\90_CAD MODELS AND SHEETS\04_CK_TRACK_RAIL\000-K-2115-2123.DWG [C-046] 09/20/17 9:38PM

PLOTTED: 09/22/17 1:59PM BY:BRYANTPJ
DRAWING: I:\PROPOSALS\2017\0062820 GLX D-B\STV 2017 RFP DESIGN\90_CAD MODELS AND SHEETS\04_CK_TRACK_RAIL\000-K-2115-2123.DWG [C-047] 09/22/17 12:53PM



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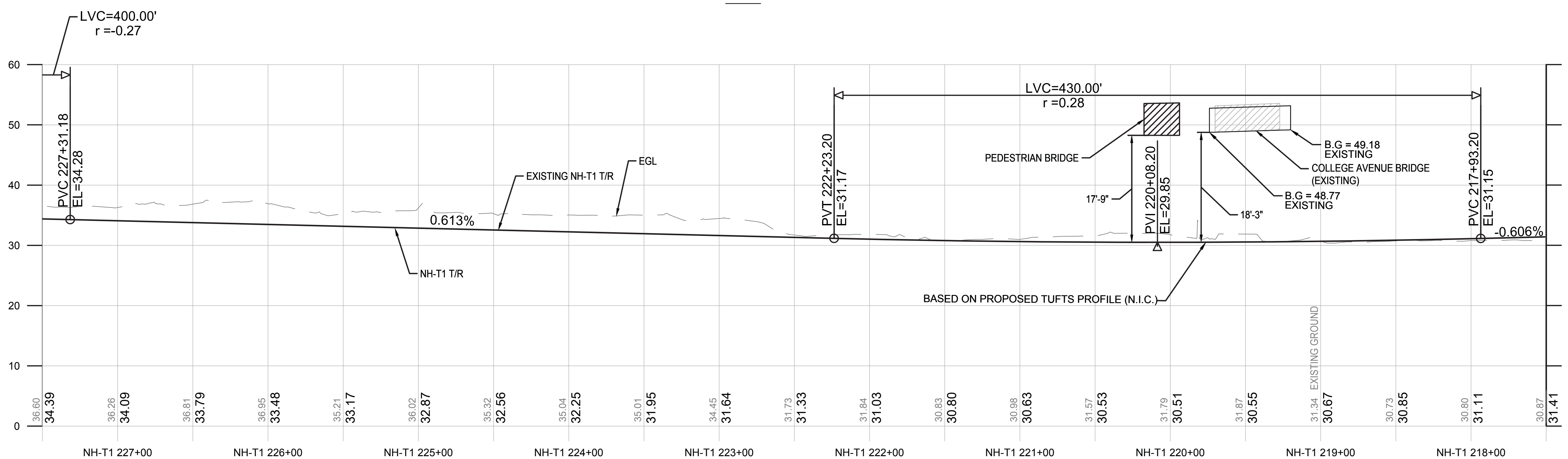

PROFILE

CURVE NO.	NH-T1 16	NH-T2 17
Dc	1°53'05.49"	1°53'35.38"
Lc (CHORDED)	305.15 FT	278.10 FT
Ls1	480.00 FT	503.60 FT
Ls2	480.00 FT	503.60 FT
Ea	4.00 IN	4.00 IN
Eu	2.47 IN	2.49 IN
V	70 MPH	70 MPH

NOTES:

1. REFER TO SHEETS C-003 TO C-024 FOR MEDFORD BRANCH ALIGNMENT AND PROFILE.
2. THE NH-T2 T/R TRACK PROFILE TO BE THE SAME AS NH-T1 T/R TRACK PROFILE.

HORIZONTAL
40 0 40 80
10 0 10 20
VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

NEW HAMPSHIRE MAINLINE
CORRIDOR PLAN AND PROFILE
STA NH-T1 217+50 TO STA NH-T1 227+50

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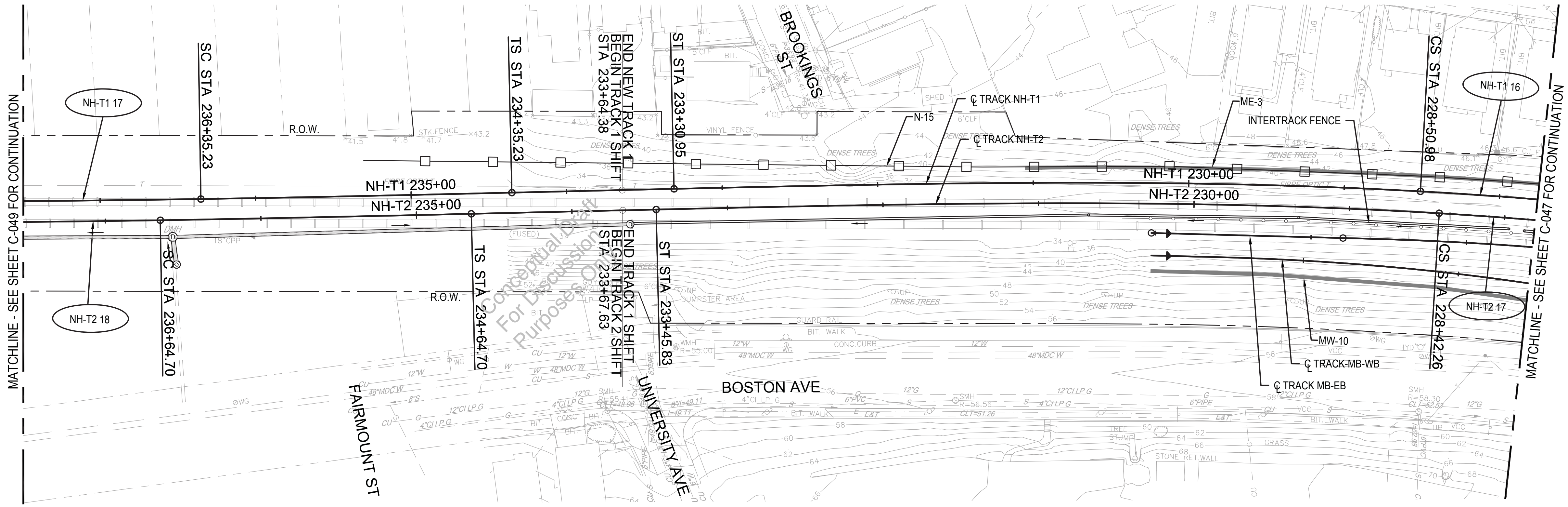
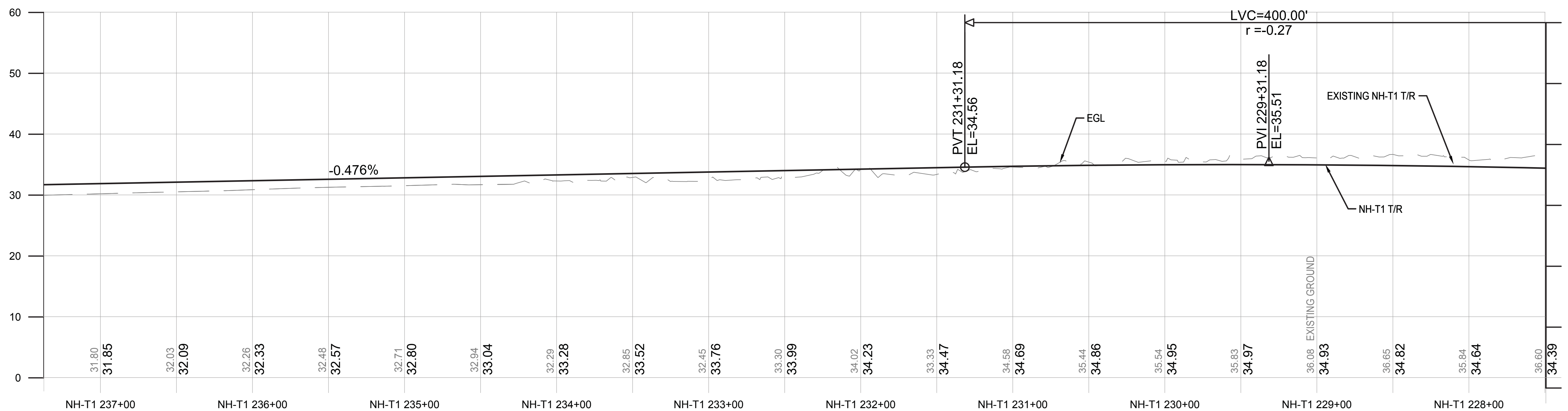
GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO. .	ISSUE
DATE: SEPT. 28, 2017	KLN	PJB	JEB	SHEET: C-047	



PLAN



PROFILE

CURVE NO.	NH-T1 16	NH-T2 17	NH-T1 17	NH-T2 18
Dc	1°53'05.49"	1°53'35.38"	0°24'34.7"	0°24'34.7"
Lc (CHORDED)	305.15 FT	278.10 FT	140.16 FT	140.77 FT
Ls1	480.00 FT	503.60 FT	200.00 FT	200.00 FT
Ls2	480.00 FT	503.60 FT	200.00 FT	200.00 FT
Ea	4.00 IN	4.00 IN	1.00 IN	1.00 IN
Eu	2.47 IN	2.49 IN	0.41 IN	0.41 IN
V	70 MPH	70 MPH	70 MPH	70 MPH

HORIZONTAL 40 0 40 80
10 0 10 20 VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

NEW HAMPSHIRE MAINLINE
CORRIDOR PLAN AND PROFILE
STA NH-T1 227+50 TO STA NH-T1 237+50

STV 100 Years | massDOT Massachusetts Department of Transportation | GLX CONSTRUCTORS

GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED | DRAWN BY KLN | DESIGN BY PJB | CHECK BY JEB | PLAN NO. .
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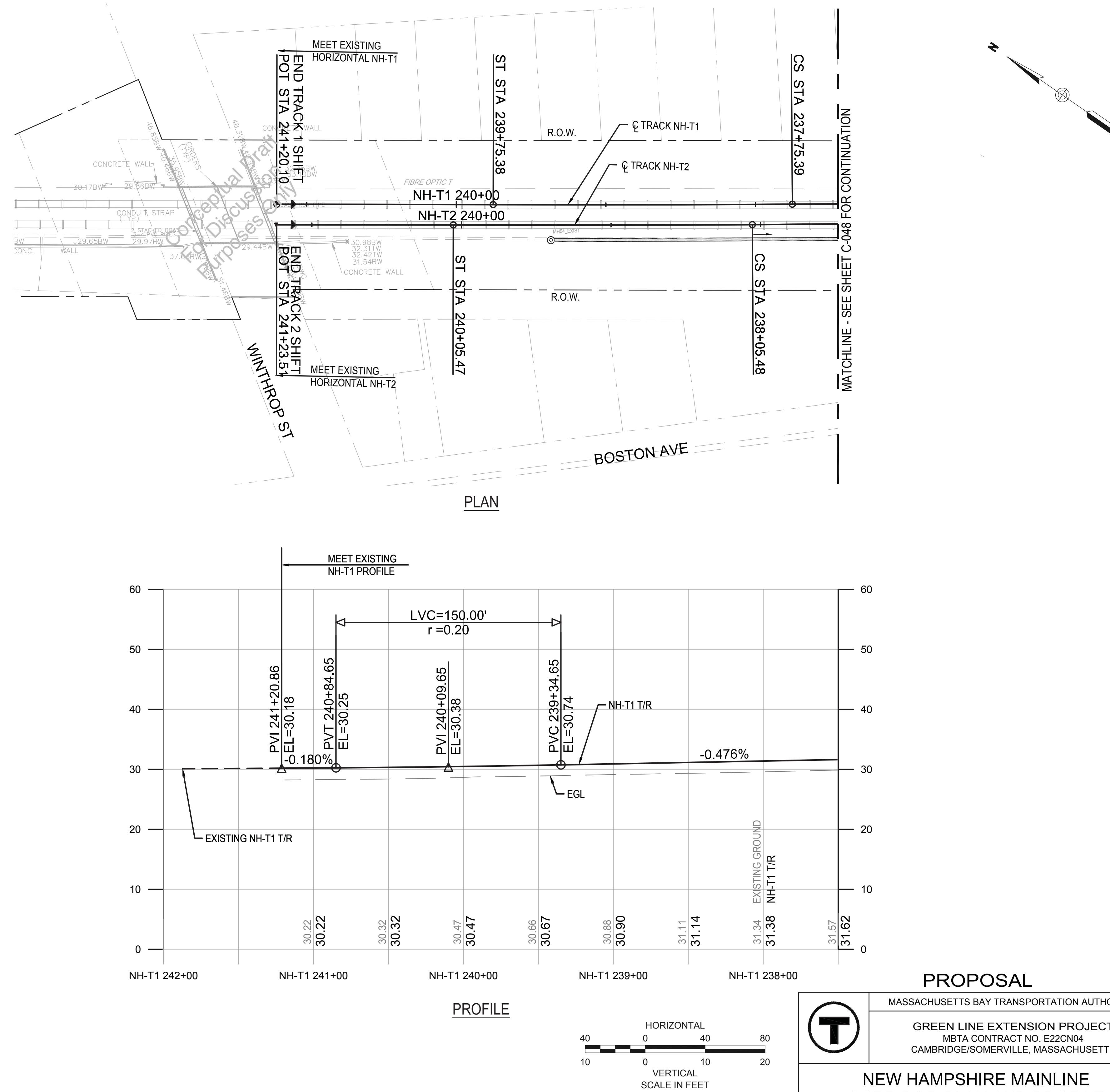

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

NEW HAMPSHIRE MAINLINE
CORRIDOR PLAN AND PROFILE
STA NH-T1 237+50 TO STA NH-T1 241+20.86

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GV20170258-276

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
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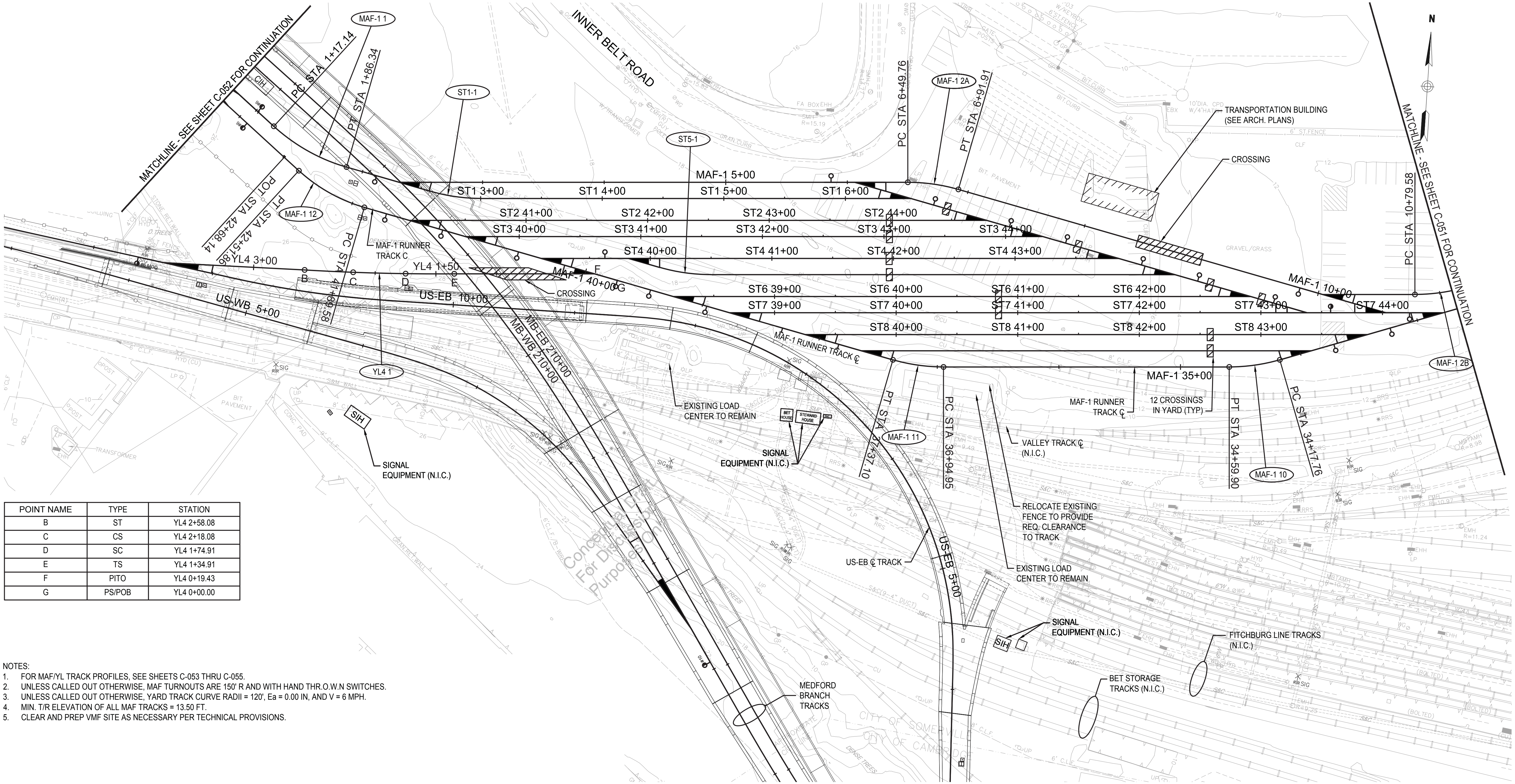

POINT NAME	TYPE	STATION
B	ST	YL4 2+58.08
C	CS	YL4 2+18.08
D	SC	YL4 1+74.91
E	TS	YL4 1+34.91
F	PITO	YL4 0+19.43
G	PS/POB	YL4 0+00.00

NOTES:
1. FOR MAF/YL TRACK PROFILES, SEE SHEETS C-053 THRU C-055.
2. UNLESS CALLED OUT OTHERWISE, MAF TURNOUTS ARE 150' R AND WITH HAND THR.O.W.N SWITCHES.
3. UNLESS CALLED OUT OTHERWISE, YARD TRACK CURVE RADII = 120', Ea = 0.00 IN, AND V = 6 MPH.
4. MIN. T/R ELEVATION OF ALL MAF TRACKS = 13.50 FT.
5. CLEAR AND PREP VMF SITE AS NECESSARY PER TECHNICAL PROVISIONS.

PLAN

CURVE NO.	YL4 1	MAF-1 1	MAF-1 2A	MAF-1 2B	MAF-1 10	MAF-1 11	MAF-1 12	ST1-1	ST5-1
R	1600.00 FT	150 FT	150 FT	150 FT	150 FT	150 FT	150 FT	150 FT	150 FT
Lc	43.18 FT	69.2 FT	42.15 FT	42.15 FT	42.15 FT	42.15 FT	69.2 FT	42.15 FT	42.15 FT
Ls1	40.00 FT	0 FT	0 FT	0 FT	0 FT	0 FT	0 FT	0 FT	0 FT
Ls2	40.00 FT	0 FT	0 FT	0 FT	0 FT	0 FT	0 FT	0 FT	0 FT
Ea	.00 IN	0 IN	0 IN	0 IN	0 IN	0 IN	0 IN	0 IN	0 IN
Eu	0.25 IN	0.96 IN	0.96 IN	.96 IN	0.96 IN	0.96 IN	0.96 IN	.96 IN	0.96 IN
V	10 MPH	6 MPH	6 MPH	6 MPH	6 MPH	6 MPH	6 MPH	6 MPH	6 MPH

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

VEHICLE MAINTENANCE & STORAGE FACILITY
YARD LEAD TRACK PLAN
SHEET 1

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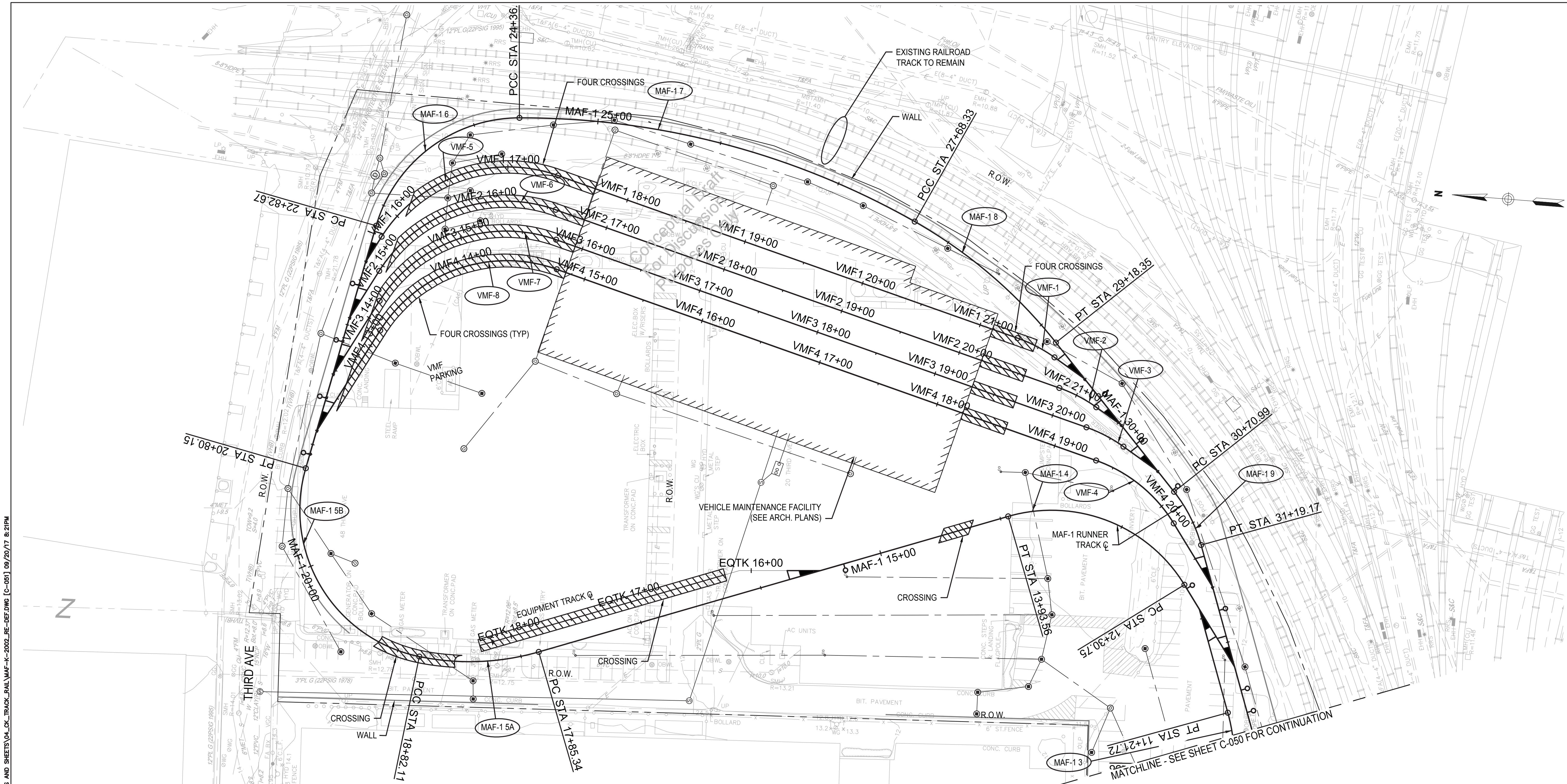

CURVE NO.	MAF-1 3	MAF-1 4	MAF-1 5A	MAF-1 5B	MAF-1 6	MAF-1 7	MAF-1 8	MAF-1 9
R	150 FT	125 FT	200 FT	120 FT	120 FT	638.74 FT	390 FT	120 FT
Lc	42.15 FT	162.81 FT	96.77 FT	198.04 FT	154.3 FT	331.36 FT	150.02 FT	48.19 FT
Ls1	0 FT	0 FT	0 FT	0 FT	0 FT	0 FT	0 FT	0 FT
Ls2	0 FT	0 FT	0 FT	0 FT	0 FT	0 FT	0 FT	0 FT
Ea	0 IN	0 IN	0 IN	0 IN	0 IN	0 IN	0 IN	0 IN
Eu	0.96 IN	1.16 IN	0.72 IN	1.2 IN	1.2 IN	0.23 IN	0.37 IN	1.2 IN
V	6 MPH	6 MPH	6 MPH	6 MPH	6 MPH	6 MPH	6 MPH	6 MPH

CURVE NO.	VMF-1	VMF-2	VMF-3	VMF-4	VMF-5	VMF-6	VMF-7	VMF-8
R	120 FT	120 FT	120 FT	120 FT	120 FT	120 FT	120 FT	120 FT
Lc	33.56 FT	33.56 FT	33.56 FT	81.69 FT	158.66 FT	161.71 FT	161.71 FT	161.78 FT
Ls1	0 FT	0 FT	0 FT	0 FT	0 FT	0 FT	0 FT	0 FT
Ls2	0 FT	0 FT	0 FT	0 FT	0 FT	0 FT	0 FT	0 FT
Ea	0 IN	0 IN	0 IN	0 IN	0 IN	0 IN	0 IN	0 IN
Eu	1.2 IN	1.2 IN	1.2 IN	1.2 IN	1.2 IN	1.2 IN	1.2 IN	1.2 IN
V	6 MPH	6 MPH	6 MPH	6 MPH	6 MPH	6 MPH	6 MPH	6 MPH

PLAN

NOTES:
1. FOR MAF/YL TRACK PROFILES, SEE SHEETS C-053 THRU C-055.
2. UNLESS CALLED OUT OTHERWISE, MAF TURNOUTS ARE 150' R AND WITH HAND THROWN SWITCHES.
3. UNLESS CALLED OUT OTHERWISE, YARD TRACK CURVE RADII = 120', Ea = 0.00 IN, AND V = 6 MPH.
4. MIN. T/R ELEVATION FOR ALL TRACKS = 13.50 FT.
5. CLEAR AND PREP VMF SITE AS NECESSARY PER TECHNICAL PROVISIONS.

40 0 40 80
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

VEHICLE MAINTENANCE & STORAGE FACILITY YARD LEAD TRACK PLAN SHEET 2

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SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO.	ISSUE
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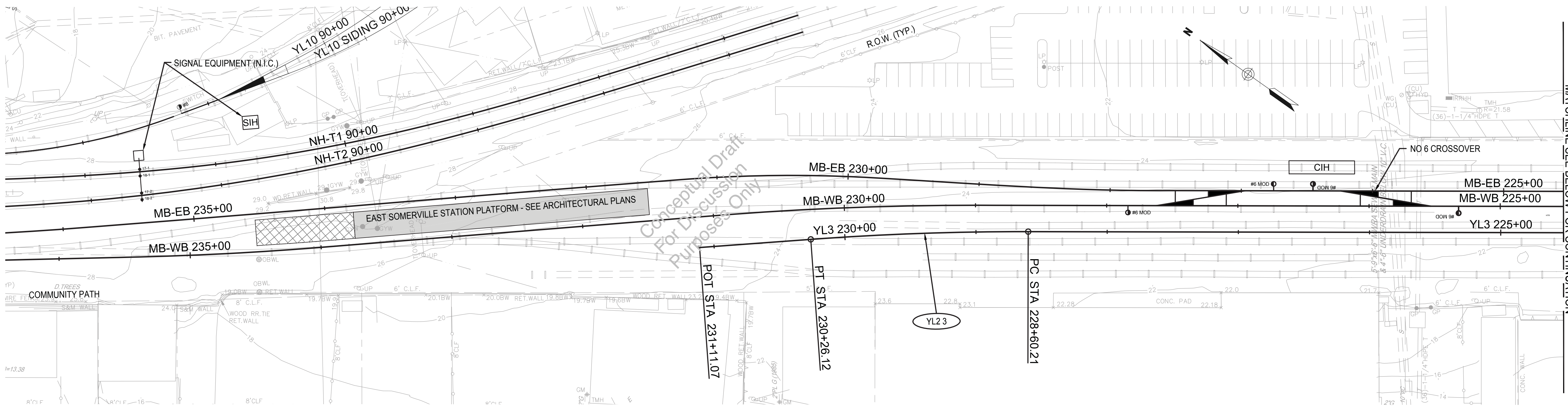
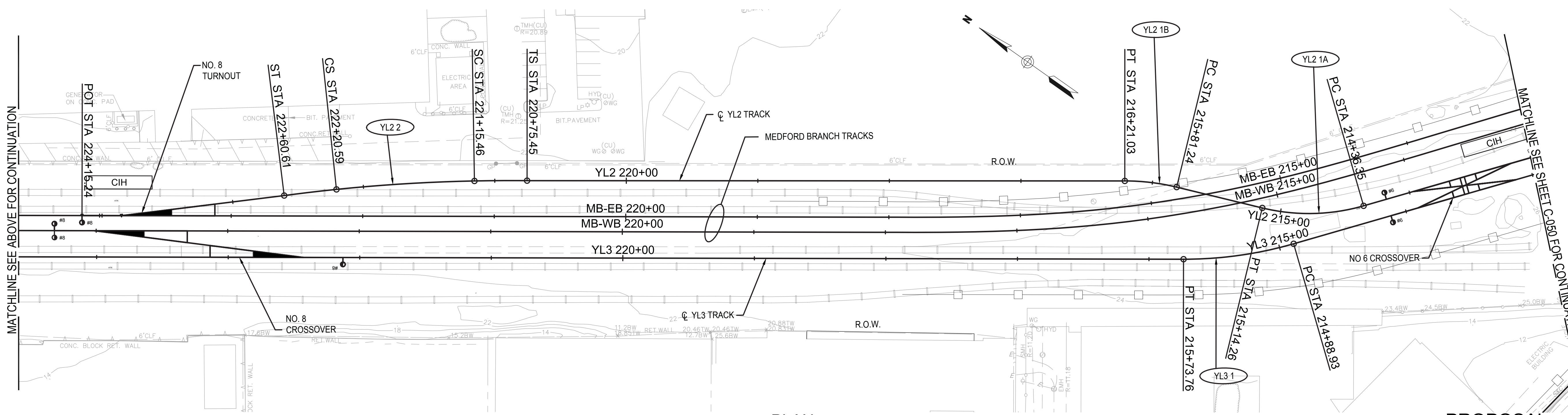


PLAN



PLAN

NOTES:
1. FOR MAF/YL TRACK PROFILES, SEE SHEETS C-053 THRU C-055.
2. UNLESS CALLED OUT OTHERWISE, MAF TURNOUTS ARE 150' R AND WITH HAND THROWN SWITCHES.
3. UNLESS CALLED OUT OTHERWISE, YARD TRACK CURVE RADII = 120', Ea = 0.00 IN, AND V = 6 MPH.

CURVE NO.	YL2 1A	YL2 1B	YL2 2	YL3 1	YL2 3
R	140 FT	167 FT	1178 FT	300 FT	2213.39 FT
Lc	49.47 FT	39.79 FT	105.14 FT	84.82 FT	101.16 FT
Ls1	0 FT	0 FT	40.01 FT	0 FT	65 FT
Ls2	0 FT	0 FT	40.01 FT	0 FT	65 FT
Ea	0 IN	0 IN	1 IN	1 IN	0.5 IN
Eu	1.03 IN	0.86 IN	0.36 IN	0.34 IN	0.22 IN
V	6 MPH	6 MPH	20 MPH	10 MPH	20 MPH

40 0 40 80
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

VEHICLE MAINTENANCE & STORAGE FACILITY
YARD LEAD TRACK PLAN
SHEET 3

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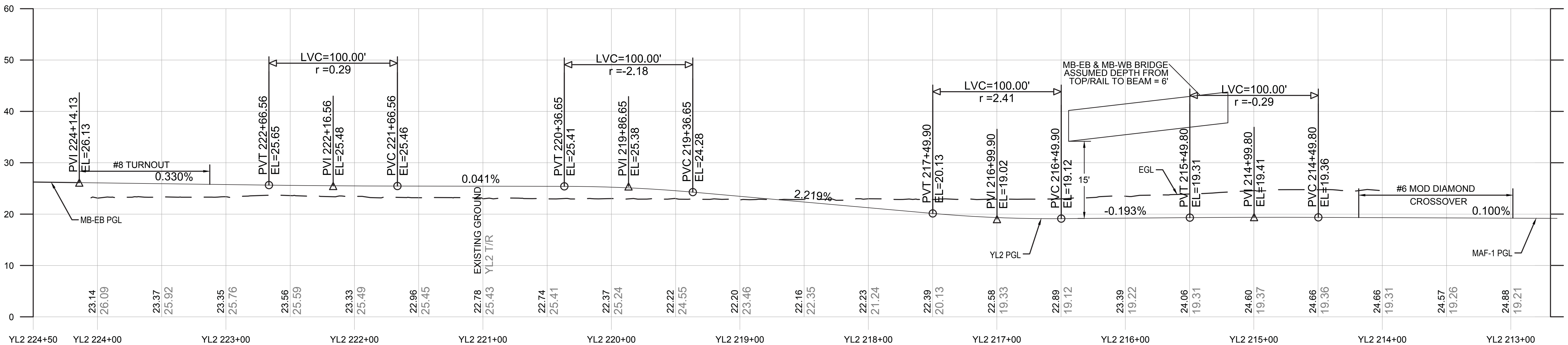
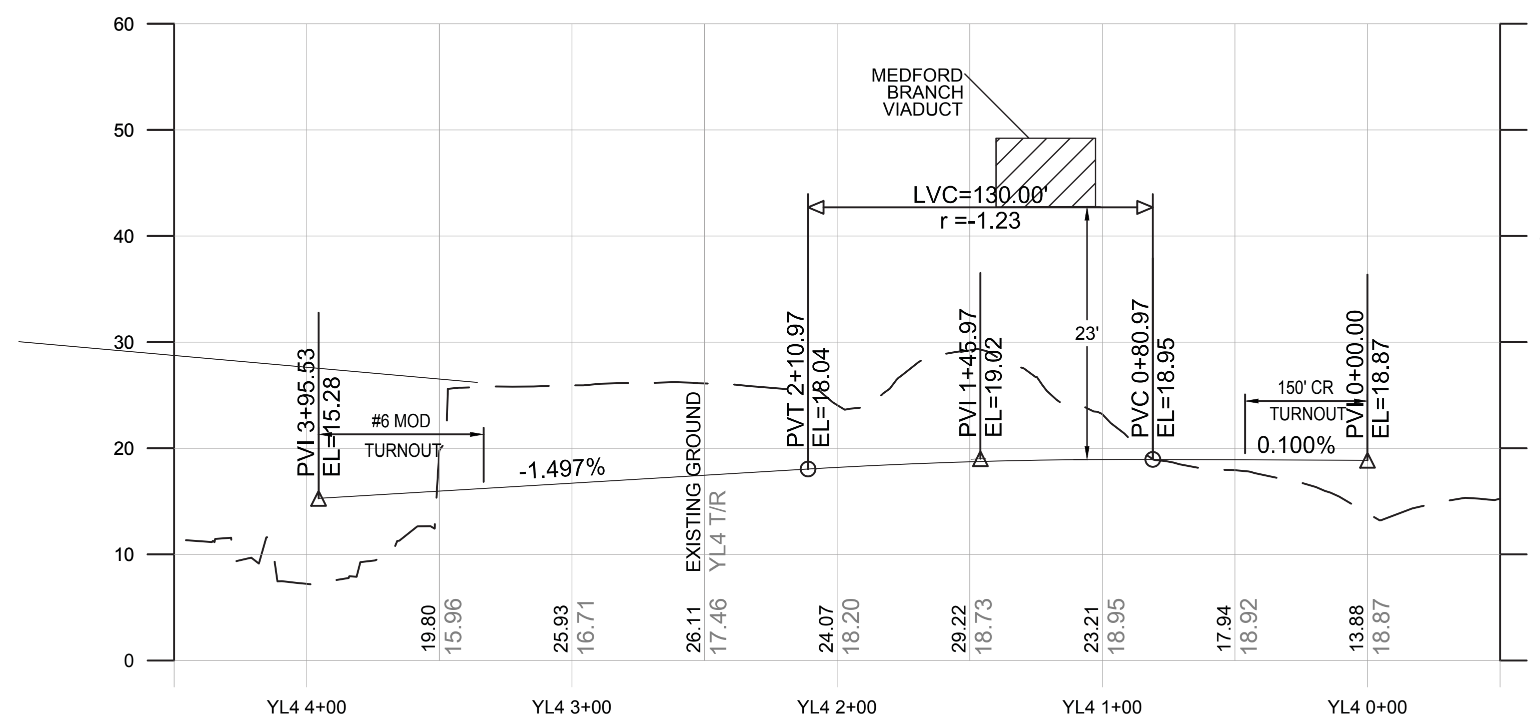


YARD LEAD 2 PROFILE



YARD LEAD 4 PROFILE

HORIZONTAL
40 0 40 80
10 0 10 20
VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

VEHICLE MAINTENANCE & STORAGE FACILITY
MAF TRACK PROFILE
SHEET 1

STV 100 Years

massDOT Massachusetts Department of Transportation

GLX CONSTRUCTORS

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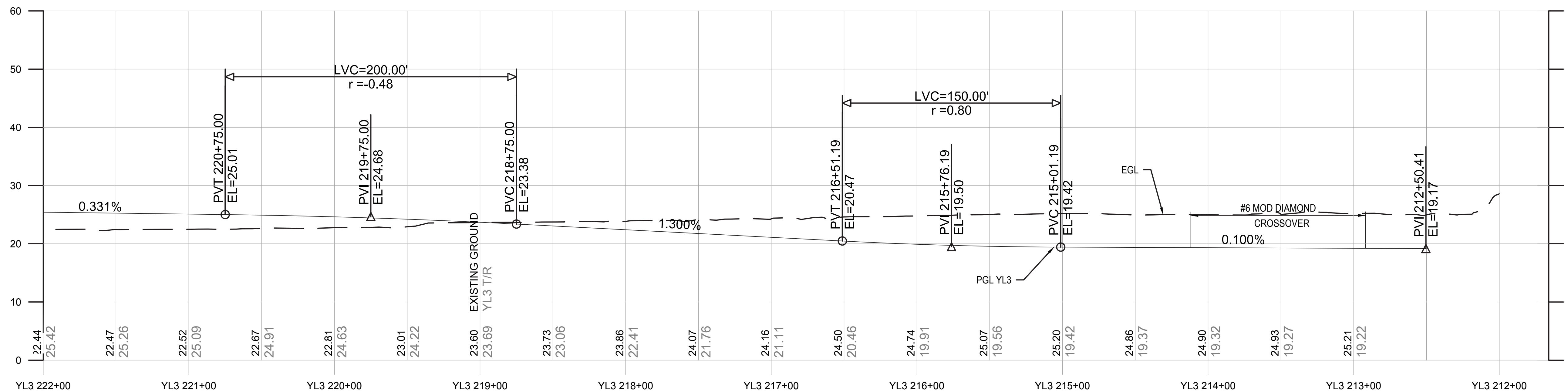
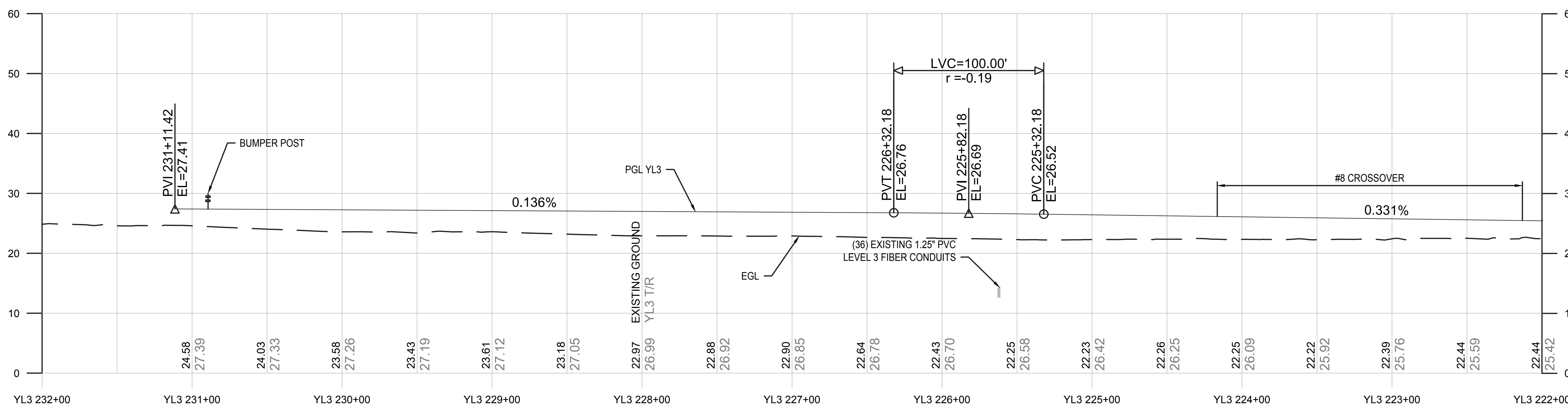


YARD LEAD 3
PROFILE



YARD LEAD 3
PROFILE

HORIZONTAL
40 0 40 80
10 0 10 20
VERTICAL
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

VEHICLE MAINTENANCE & STORAGE FACILITY
MAF TRACK PROFILE
SHEET 2

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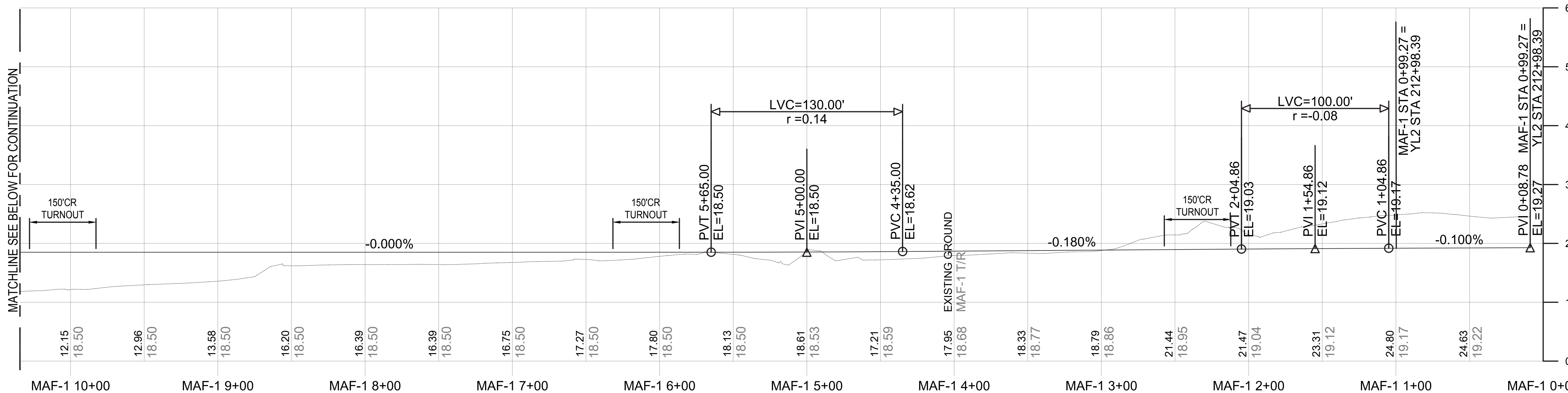
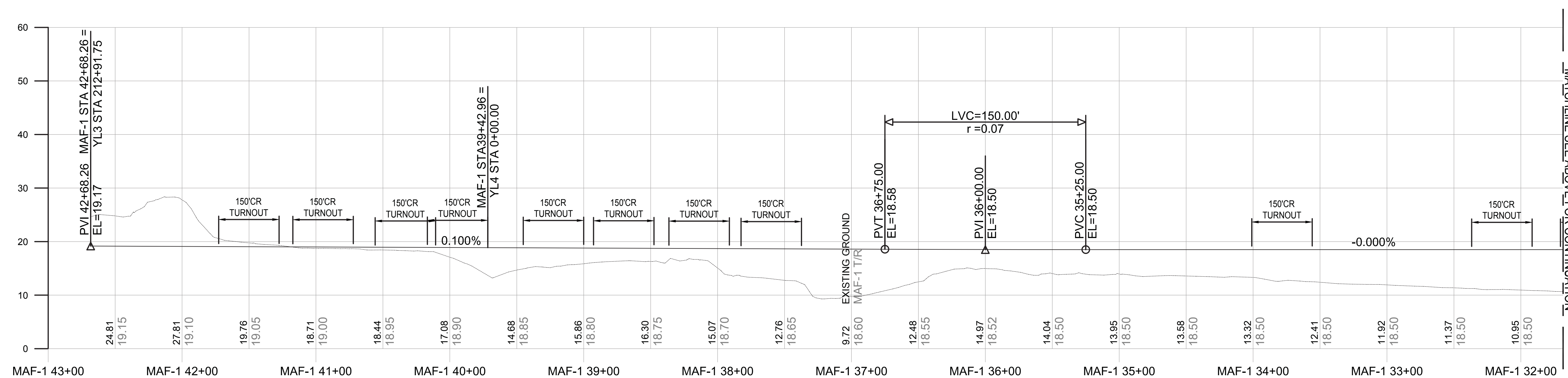


YARD TRACKS - MAF-1
PROFILE



YARD TRACKS - MAF-1
PROFILE

HORIZONTAL
40 0 40 80
10 0 10 20
VERTICAL
SCALE IN FEET

NOTES:
1. ELEVATION OF MAF-1 FROM BREAKLINE MAF-1 10+00 TO BREAKLINE MAF-1 32+00 IS TO STAY AT 18.50FT AT GRADE 0.00%.

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

VEHICLE MAINTENANCE & STORAGE FACILITY
MAF-1 TRACK PROFILE
SHEET 3

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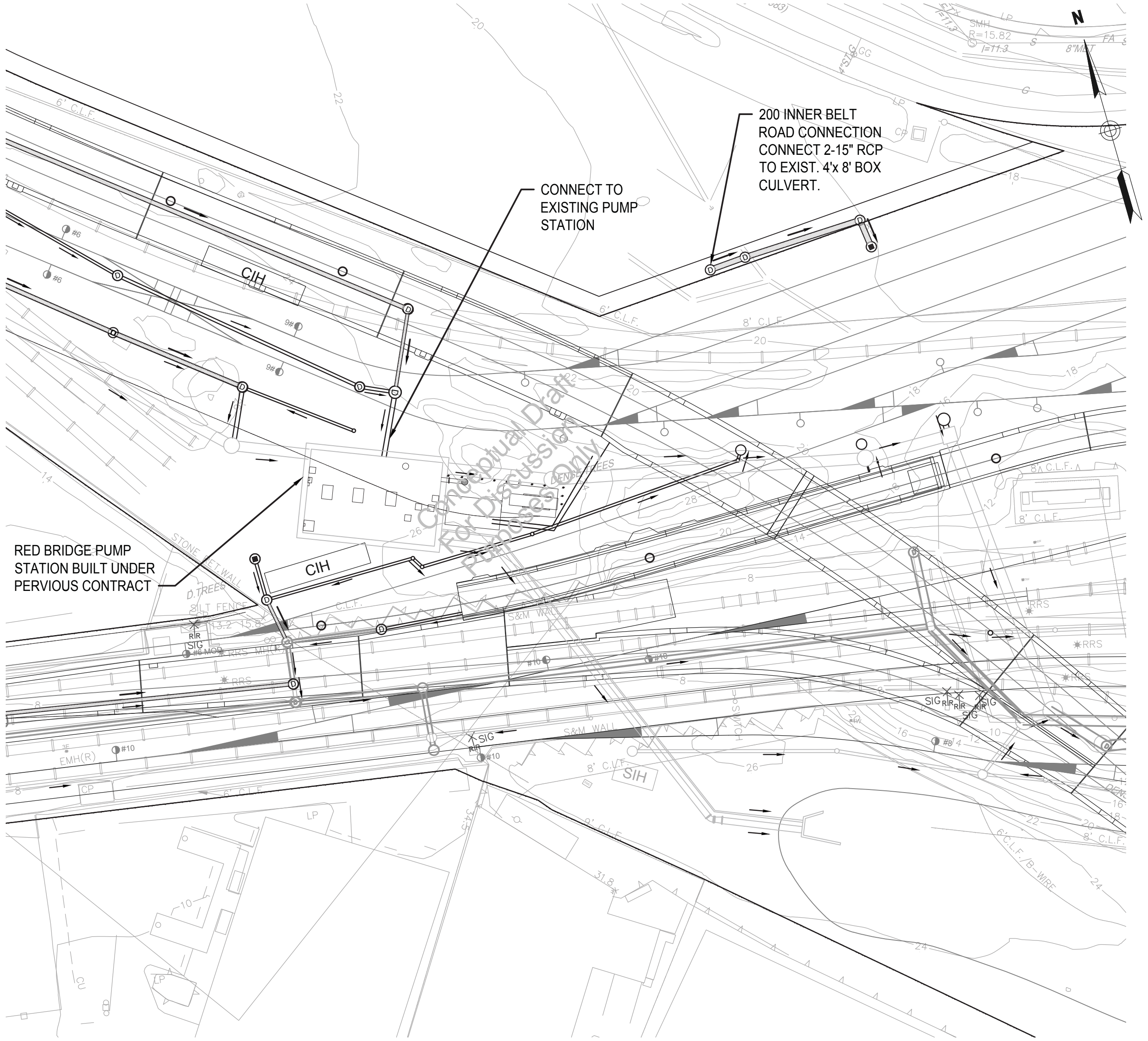

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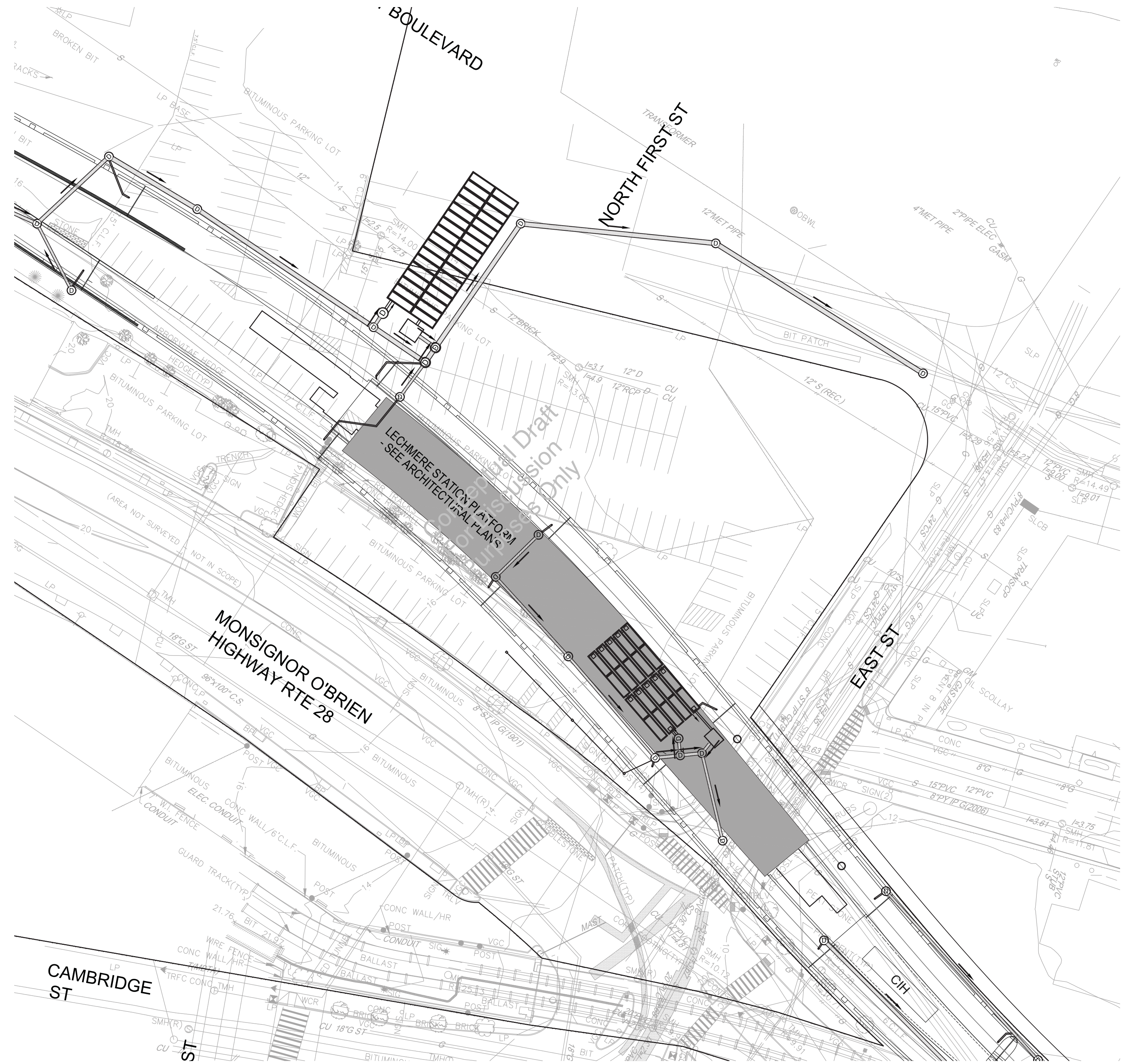

PLAN

40 0 40 80

SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

STORM SEWER SYSTEM
CORRIDOR PLAN

STV 100 Years

massDOT Massachusetts Department of Transportation

GLX CONSTRUCTORS

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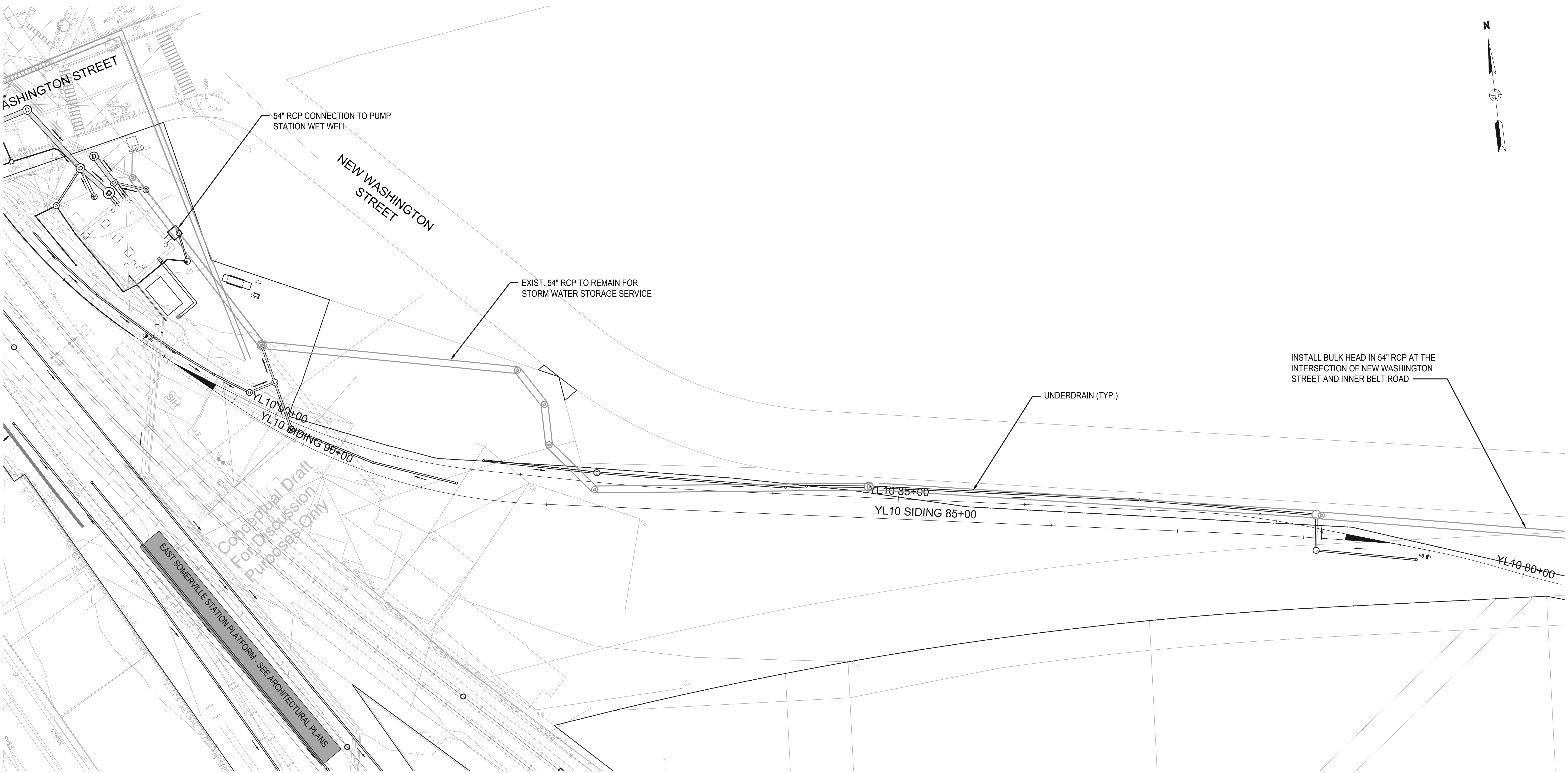

PLAN

40 0 40 80
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

STORM SEWER SYSTEM
CORRIDOR PLAN
YARD LEAD 10

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> “
> **Water quality and quantity are two important aspects of the Green Line Extension DB Project. There is a substantial history of flooding in locations within and adjacent to the limits of work, resulting in disruption of commuter rail services. Effective stormwater management is critical to the Project to prevent flooding and to meet the water quality criteria of the regulatory authority.**

4.7 DRAINAGE AND STORMWATER MANAGEMENT

Integrating rail construction with the MBTA's existing drainage facilities through the Project will require considerable effort to maintain the existing, positive drainage and improve potential flood areas as necessary. GLX Constructors' design solution will continue the MBTA's efforts to mitigate flood issues via intentional pump station design, larger drainage lines, and overall improved drainage systems. Our intent is to support the MBTA's sustainability goals, reduce the need for costly excavation, and address the long-standing flood issues that have burdened the alignment and the surrounding areas in the past.

An extensive network of drainage systems exists within the Project corridor. These systems are owned and operated by several entities, including the various municipalities, MassDOT, Massachusetts Water Resources Authority (MWRA), and Boston Water and Sewer Commission (BWSC). Project improvements will need to connect to these boundary conditions and identify acceptable discharge locations. Considering the various site constraints is the key to success.

The corridor drainage and, where possible, stormwater from adjacent offsite areas will be directed into the track's underdrain system and redirected. Larger carrier pipes will carry overflow downstream to an outfall location. GLX Constructors will design around community path and convey flows to the collection system. Constructing each of the seven stations includes platforms and associated structures that will potentially impact the existing drainage conditions. We will evaluate these impacts to determine if detention is needed to meet regulatory agency requirements.

4.7.A APPROACH TO ENSURING THE DESIGN CONFORMS TO STORMWATER MANAGEMENT REQUIREMENTS

Our work will be in strict compliance with Technical Provisions, including Massachusetts Department of Environmental Protection's (MassDEP) stormwater management standards and other applicable standards for a redevelopment project. Measures to control water quality, flow rates, and volumes will be implemented. Specific requirements established by the United States Environmental Protection Agency (USEPA) for Total Maximum Daily Load (TMDL) for phosphorus discharging to the Charles River will be considered for the design of discharge to North Point Development, as established by the City of Cambridge.

We will provide temporary stormwater management systems as necessary, during construction of the Project. We will relocate or abandon existing utilities in conflict with storm management systems. Where existing trunk lines are used, the pipes will be relined or rehabilitated to prevent contaminated groundwater from entering into the conveyance system.

Approach to Stormwater Management Plans

Our Stormwater Management Plans will include best management practices (BMPs) to address water quality and groundwater recharge. This includes hydrodynamic separators for Total Suspended Solids (TSS) and oil removal, infiltration trenches, and detention systems to capture the first inch of runoff from large roof areas to address water quality and groundwater recharge. See Figure 4.7-1.

The USEPA has established a TMDL for phosphorus discharging into Charles River. We will accomplish the TMDL by treating the first half-inch of runoff from impervious areas for phosphorus. According to the *Final Nutrient TMDL Development for the Lower Charles River Basin, Massachusetts* treating the first half-inch of runoff by infiltration will eliminate approximately 65 percent of phosphorus, meeting TMDL requirements.

Areas located within the viaduct dripline, above grade viaduct drainage and building roof, are considered clean, and no treatment is required for phosphorus removal in these areas. To meet requirements, we will use infiltration trenches or filter units to treat the remaining impervious areas before discharging to the Divco Development drainage system.

Detentions systems will be sized to store and control runoff rates to meet allowable peak development rates and volumes due to the increase in impervious area per cities of Medford, Somerville, and Cambridge requirements at outfalls. Because of the increase in impervious areas in these cities, design requirements for the increase in flow at the outfalls have to be met.

GLX Constructors will manage contaminated groundwater resulting from dewatering operations associated with stormwater pipe installation. We will provide a stormwater management plan that prevents contaminated materials from entering existing and proposed drainage systems.

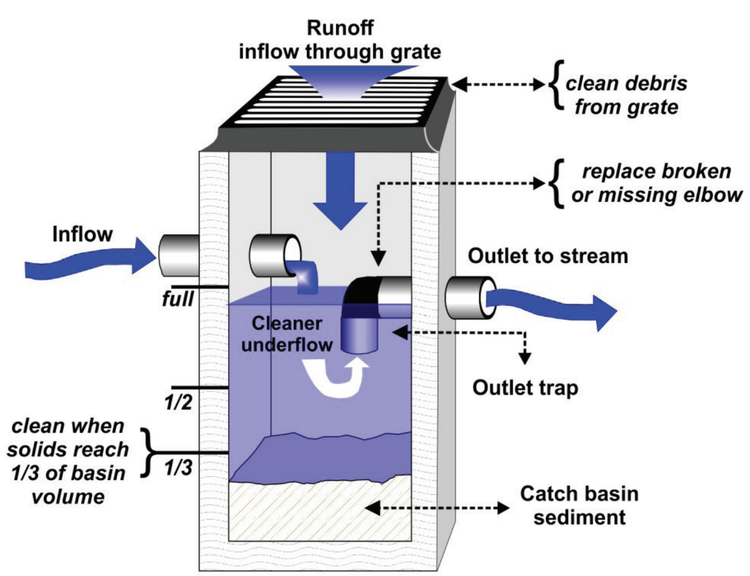
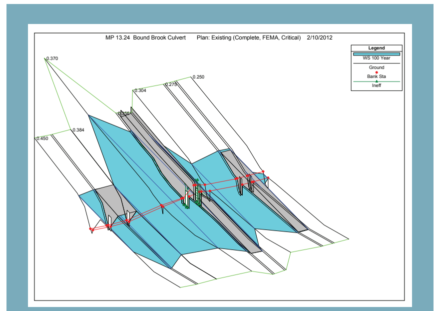


Figure 4.7-1. Hydrodynamic Separator. *The separators will be used for Total Suspended Solids (TSS) and oil removal in order to address water quality and groundwater recharge.*

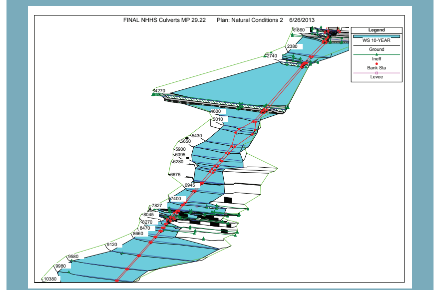
Design Standards and Criteria for Drainage Elements

GLX Constructors will coordinate with pertinent authorities to make certain that all official requirements and permits are cleared in advance. We will also fully evaluate all requirements to ensure compliance with existing permits, regulatory requirements, and agency guidelines.

Quantity. Stormwater quantity control criteria protects downstream properties due to upstream development. The municipalities have defined the



GLX Constructors' Lead Designer, STV, has completed stormwater control projects across the country, including projects for the MBTA such as the Bound Brook Flood Plain Analysis, which verified that an MBTA-proposed bridge structure in Scituate, Massachusetts, would not negatively affect flooding in the area.



outfall peak flow rate and volume control criteria to make certain pre-development flow targets are met. Typically, criteria is met by providing detention prior to outfall. The hydrograph in Figure 4.7-2 illustrates the process by which we have reduced water runoff by incorporating detention into our design.

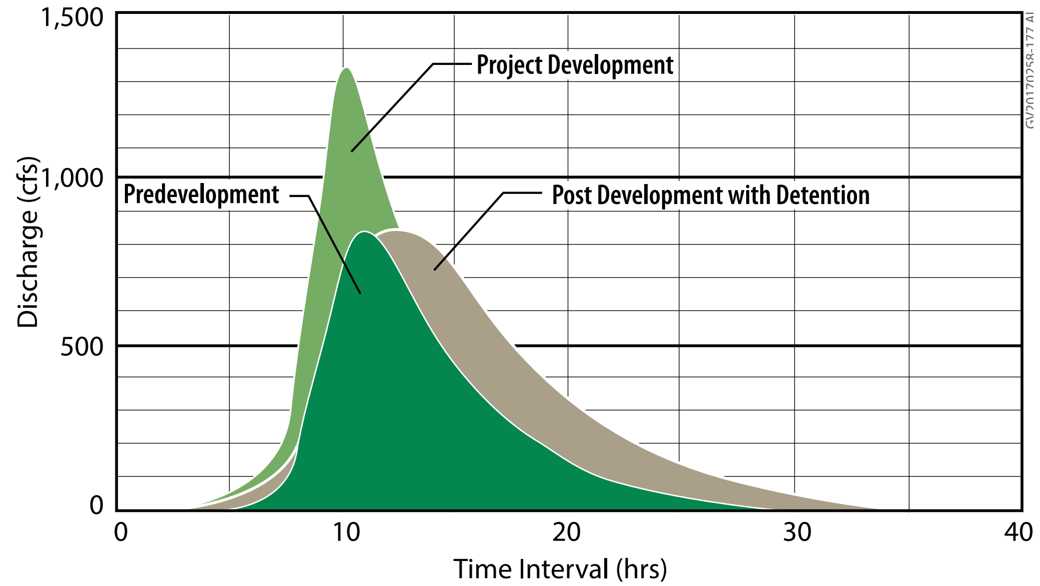


Figure 4.7-2. Project-Wide Stormwater Runoff Hydrograph. *By developing and implementing detentions, we will reduce stormwater discharge, reducing the potential for flooding along the alignment.*

Quality. Stormwater quality control protects bodies of water from potential water quality degradation that may result from development and urbanization. MassDEP Stormwater Management Standards regulate water quality treatment levels and remove a percentage of TSS from runoff before it discharges to a receiving body of water. The stormwater management criterion stipulates that 80 percent of the average annual post-construction load of TSS will be removed. We will achieve this by using structural and non-structural BMPs.

TMDL requirements for the lower Charles River watershed stipulate stormwater management systems be designed to reduce the stormwater phosphorous baseline load by at least 65 percent. For determining the size of infiltration trenches, above-grade viaducts and building roofs are excluded from the calculation of impervious areas. For typical commercial and high-density residential areas, storing approximately a half inch of runoff from the impervious portions of the areas would capture the required amount.

Erosion Control. We will implement erosion control measures during construction to avoid water quality deterioration. Such measures include silt sacks and sedimentation control devices, such as silt bags for catch basins.

Water Balance. Balancing the infiltration, runoff, and evapotranspiration that exists in natural settings, coupled with the imbalance that results from introducing impervious surfaces during urbanization, are key factors in protecting groundwater and resource areas. Managing the water balance will require incorporating infrastructure that matches the pre-development proportions of infiltration and runoff. We will propose low-impact developments, such as infiltration trenches, to achieve the goal to enhance water quality.

Storm Runoff Management

Water resources computer models are an important tool in evaluating the difference in pre-development and post-development conditions, both uncontrolled and with stormwater management controls in place. The primary hydrology and hydraulic components of the model will use USEPA's Stormwater Management Model (SWMM) to generate the runoff and route the flow through collection systems. This approach builds upon the previous modeling conducted for the Project and further develops the model using software PCSWMM 2D, an advanced graphic interface of the USEPA SWMM. We will use PCSWMM to analyze the hydraulic grade line (HGL) with respect to top of tie at any location during the peak flow from a 50-year rainfall, reported in a Stormwater Report. See Figure 4.7-3 for a demonstration of a typical graphical representation of the data.

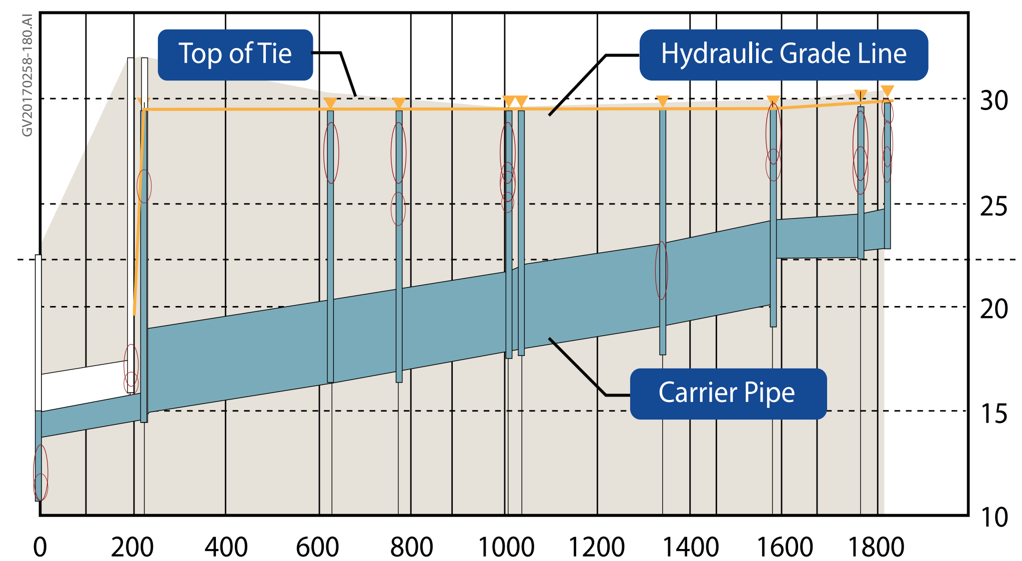


Figure 4.7-3. Hydraulic Grade Line Profile. *The 50-year stormwater hydraulic grade line does not exceed the top of tie elevation.*

We will incorporate accepted temporary stormwater detention practices during construction. We will comply with all federal, state, and local permit requirements during construction, with heightened attention focused on the City of Cambridge requirements for the Cambridge Department of Public Works, and cities of Somerville and Medford Stormwater Management Policy/Program.

Description of Key Drainage Issues

We will consider the drainage issues in the five separate areas and sub-areas within the corridor. Figure 4.7-4 defines the sub-watershed areas and lists their specific characteristics.

These areas will be analyzed for the design criteria in the Technical Provisions.

Millers River Drainage area is partially constructed and will be incorporated into the design of the rest of the system. The remaining work includes:

- Installing pumps
- Activating the pump at the Washington Street pump station (WSPS)
- Activating the pump at the Red Bridge pump station (RBPS)

College Avenue Area (North of Harvard Street to Winthrop Street)	Ball Square –Gilman Square Station – Washington Street Area (North of Washington Street to Harvard Street)	Union Square Branch Area (West of Medford Street to Prospect Street)	Lechmere/North Point Development Area (North of Edwin H. Land Boulevard to Red Bridge area.)	Millers River Drainage Area (South of Washington Street to Miller's River Outfall)
Watershed Area: ~45 Acres	**Watershed Area:** ~206 Acres	**Watershed Area:** ~18 Acres	**Watershed Area:** ~5 Acres	**Watershed Area:** ~40 Acres
Outfall: Winthrop Street Tufts University Athletic Fields, Two Penny Brook Culvert	**Outfall:** Granville Avenue (Ball Square). Medford Street (Gilman Square Station) & Washington Street	**Outfall:** Charlestown Street	**Outfall:** North Point Street (Lot Q), East Street (Lot R), Millers River & Lechmere Canal Outfall (viaduct)	**Outfall:** Millers River Outfall
Jurisdiction: City of Medford	**Jurisdiction:** City of Medford (Ball Square) & City of Somerville (Gilman & Washington Street Area)	**Jurisdiction:** City of Somerville	**Jurisdiction:** City of Cambridge	**Jurisdiction:** City of Somerville & City of Cambridge

Figure 4.7-4. Watershed Characteristics. *Each of these five watershed areas have drainage issues that GLX Constructors will consider in our design.*

Work will be completed to convey stormwater flows from Washington Street area to Red Bridge area.

The Washington Street roadway underpass is prone to chronic flooding. WSPS will convey flows from the Washington Street area to the Red Bridge area. We will provide a high-water control signal from a sensor at the outlet control structure of the WSPS, which will transmit to the RBPS control panel to control high flows to the detention basin. The Washington Street underpass' low area will be designed so the maximum 100-year flood elevation does not exceed 12 inches above the roadway surface at the low point along the gutter. We will design and construct a temporary drainage system to address flooding problems during reconstruction.

Some of the existing New Hampshire Mainline drainage, extending both north and south of Washington Street on east side of the track, may need to be relocated because of the proposed retaining wall location, but certain portions can be reused. When existing pipes are reused, they will be rehabilitated using lining methods or others identified by a Licensed Site Professional (LSP).

We will adhere to recommendations from the LSP to prevent contaminated groundwater, soils, and vapors from entering the drainage system. The minimum extent of rehabilitation will be as specified in the Technical Provisions. We will operate and maintain a temporary treatment facility that will treat contaminated water from dewatering pipe trenches, excavated during the Washington Street construction, affected by the contaminated site at 50 Tufts Street.

The 66-inch drain was relocated from the east side of the corridor to under the west-bound track. This supports a better construction sequence, allowing the maintenance of New Hampshire mainline tracks to remain active at all times.

Red Bridge Area is prone to chronic flooding. The low point is the Fitchburg Mainline tracks, between the RBPS and an offline detention basin. Directing peak flows to the detention basin at RBPS, which is already in place, alleviates flooding. We will complete the design and construction of RBPS so the 48" Fitchburg Main Drain (FMD) HGL does not cause surface flooding within the track.

The proposed VMF site is located in an area prone to flooding. Currently, the site contains extensive impervious surface treatments. In response, our design raises the VMF by approximately five feet and the impervious areas will be reduced, thereby eliminating flooding issues onsite and creating more area for stormwater management. These flooding concerns will be coordinated with the project-wide model. The drainage in the VMF is routed to two existing discharge points. The southern section discharges to RBPS, and the northern section discharges into an existing system along the tracks near the west edge of the commuter rail facility. As part of our VMF design, we will provide detention systems for the VMF so the proposed stormwater runoff volume and rate does not increase the existing runoff and rate for all design storms. We will further evaluate water quality improvements, including deep sump catch basins, oil water separators, grit removal, and detentions systems, during final design development after consulting with the MBTA and the City of Somerville. Figure 4.7-5 shows the type of deep sump catch basin used to catch surface water drainage or runoffs.

The drainage from 200 Innerbelt Road, in the Millers River area, is adjacent to the MBTA's ROW and tied into the MBTA's drainage system. We will evaluate the capacity of the MBTA's system to handle stormwater flows from this offsite property and test for water quality and potential contamination. We will obtain the necessary license agreements to make certain currently-existing discharge is accepted by the MBTA.

There is an existing 54-inch drain that diverges away from the track corridor along New Washington Street. This pipe will act as a supplemental wet well storage in the final design. To prevent contributing stormwater flows from the MBTA's property, to divert flows away from Old Stone Culvert and thereby prevent flooding, a bulkhead will be located at a point between the WSPS and the intersection of New Washington Street and Inner Belt Road.

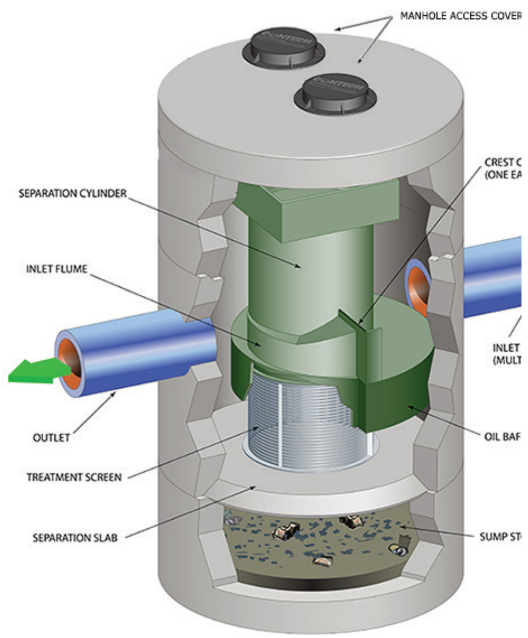


Figure. 4.7-5. Deep Sump Catch Basin. *The basins that catch surface water drainage or runoff will be used to evaluate water quality improvements.*

Description of Drainage System and Appurtenances Involved

The primary collection system in the track area is the underdrain system, and the key component within this system is the ballast storage. The ballast infiltrates the flows collected in the track bed. The perforated pipe in the ballast collects excess flows in the track, and conveys the flows to carrier pipes or trunk lines, and ultimately to the approved municipal outlets.

Detention and infiltration systems store peak runoff and prevent any increase in peak flows to municipal stormwater drainage systems, improving water quality prior to discharge at outfall locations. Hydrodynamic separators will be installed to treat pavement runoff. Low impact development (LID) practices, such as rain gardens and bio retention areas, will be implemented, where feasible to maintain natural hydrology and treat impervious areas. Infiltration facilities and LIDs are typically designed to manage more frequent and lower magnitude rainfall events.

The trunk lines dually act as carrier pipes and storage conduits to attenuate peak flows. We will also attenuate peak flows by using outlet control structures such as weirs and orifices. All outfall locations will be analyzed for the pre- and post-development peak flows, and they will be controlled to meet the requirement of the authority having jurisdiction. Figure 4.7-6 shows a comparison of the outfall node at Medford Street. This will be further revised to capture design changes and decreases in impervious areas.

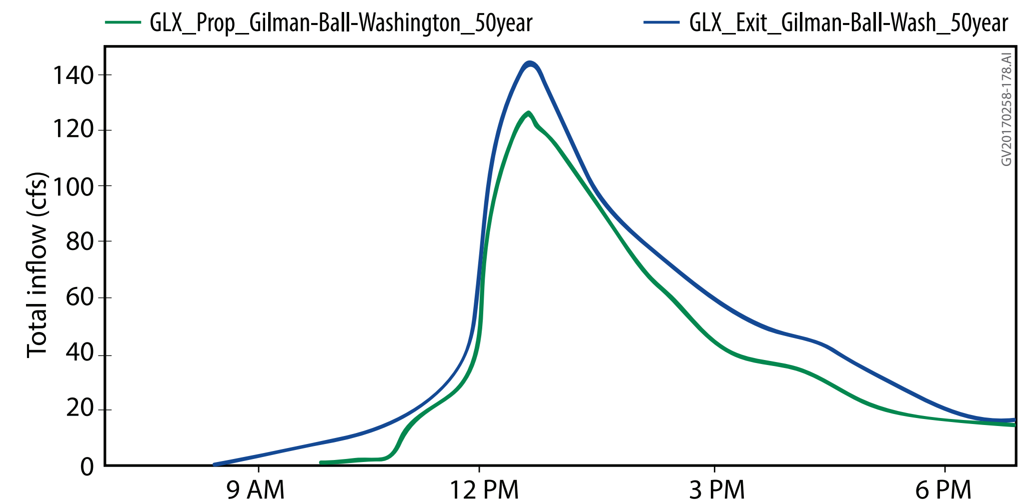


Figure 4.7-6. Outfall at Medford Street. *Outfall nodes will be designed such that existing inflow is less than the proposed conditions*

Within the Ball Square system, a storage conduit is proposed that empties into the existing system at Granville Avenue. Alternative approaches may be considered where the difference in grades requires uplift of the stormwater to a downstream conveyance system at higher elevation.

GLX Constructors proposes enhancing the existing ROW drainage for adequate rainwater runoff and flooding prevention. Specific improvements are proposed for track drainage, new stations, and the community path. We will comply with all stormwater standards, and we will optimize where possible.

We will coordinate with municipalities to demonstrate that the proposed drainage improvements meet the design criteria established for the Project. Any variations will be thoroughly discussed and documented during weekly TWG meetings, included in the Design Submittal, and submitted to the MBTA for acceptance prior to final design development.

ITP Request	RFP		
	Drawing Number	Drawing Title	Reference Section or Drawing
A5.2.7.B			4.6 (C-003 to C-024; C-026 to C-031; C-033 to C049; C-056 to C-057) For a description of Major and Minor Overland Flows see the narrative of Section 4.7.

Technical Solutions Drawing Matrix.

4.8 ENVIRONMENTAL MANAGEMENT STRATEGY

Employing sustainable design and construction best practices, GLX Constructors has completed extensive due diligence and has identified potential environmental issues and corresponding mitigations to prevent schedule creep, unforeseen costs, and further environmental issues, such as noise pollution, hazardous materials, and unwanted dust residues. Environmental awareness and sensitivity is key to helping the MBTA achieve its overall sustainability goals, and GLX Constructors' solution will reduce costs and extinguish the MBTA's exposure to long-term liability associated with environmental neglect.

GLX Constructors is committed to conserving the Boston area's natural and cultural resources by making certain the Green Line Extension DB Project is designed, constructed, commissioned, and operated in full compliance with applicable environmental and permitting requirements. Our goal is zero environmental violations. To obtain our goal, we will employ a detailed Environmental Management Strategy that identifies the potential environmental impacts, develops best management practices (BMPs) for each impact, and assigns responsibility and timetables for the management and control of impacts, particularly handling stormwater, process waters, and contaminated materials.

4.8.A ROLES, RESPONSIBILITIES, AUTHORITY, AND REPORTING STRUCTURE WITHIN THE ENVIRONMENTAL TEAM

To develop an effective Environmental Management Strategy, we will establish a direct working relationship between our Management Team, Design Team, and Construction Execution Team. As illustrated in Figure 4.8-1, the PE Environmental will be supplemented by two local consultants: TRC Environmental Corporation (TRC) and Tetra Tech, Inc. (Tetra Tech). To communicate thoroughly, GLX Constructors' Environmental Team will have frequent meetings both internally and with our Management Team.

TRC will be responsible for compliance and management of hazardous materials during the Project.

Tetra Tech will lead the stormwater permitting, planning, and compliance efforts.

4.8.B SUMMARY OF ENVIRONMENTAL PROTECTION AND CONTINGENCY PLANS

GLX Constructors will develop a Spill Response Plan to be fully prepared in the event of an accidental oil and/or hazardous materials (OHM) spill, and a Stormwater Pollution Prevention Plan (SWPPP), to identify and protect against conditions that occur during construction. The SWPPP will be developed under the National Pollution Discharge Elimination System (NPDES) program, administered by the Environmental Protection Agency (EPA). It will include BMPs for controlling erosion, treating and discharging stormwater from the site, and preventing pollution.

We have identified the locations and regulatory status under the MCP of all known Release Tracking Numbers (RTNs) within the Project corridor and will coordinate with the MBTA's LSP on the closure of these RTNs.

GLX Constructors will establish an Equipment Maintenance Program, which will be used to prevent OHM spills. This Equipment Maintenance Program will make certain that we are prepared to handle any accidental OHM spills resulting from refueling or normal equipment maintenance such as fluid change, hydraulic hose breaks, etc.

4.8.C APPROACH FOR COMPLIANCE WITH REQUIREMENTS OF THE ENVIRONMENTAL COMMITMENTS AND AGREEMENTS

We will develop a database of all of the key commitments and constraints resulting from the various permits, approvals, and submittals required by regulatory agencies. Upon selection, we will meet with MassDOT Environmental Staff and the Owner's Representative team to review all of the requirements and gain an understanding of the background behind the requirements, the history of discussions with regulatory agencies, and other intangible yet critical information that contributes to various requirements. Based on this collaboration, we will annotate and complete our database which will serve as a basis for evaluating the final design.

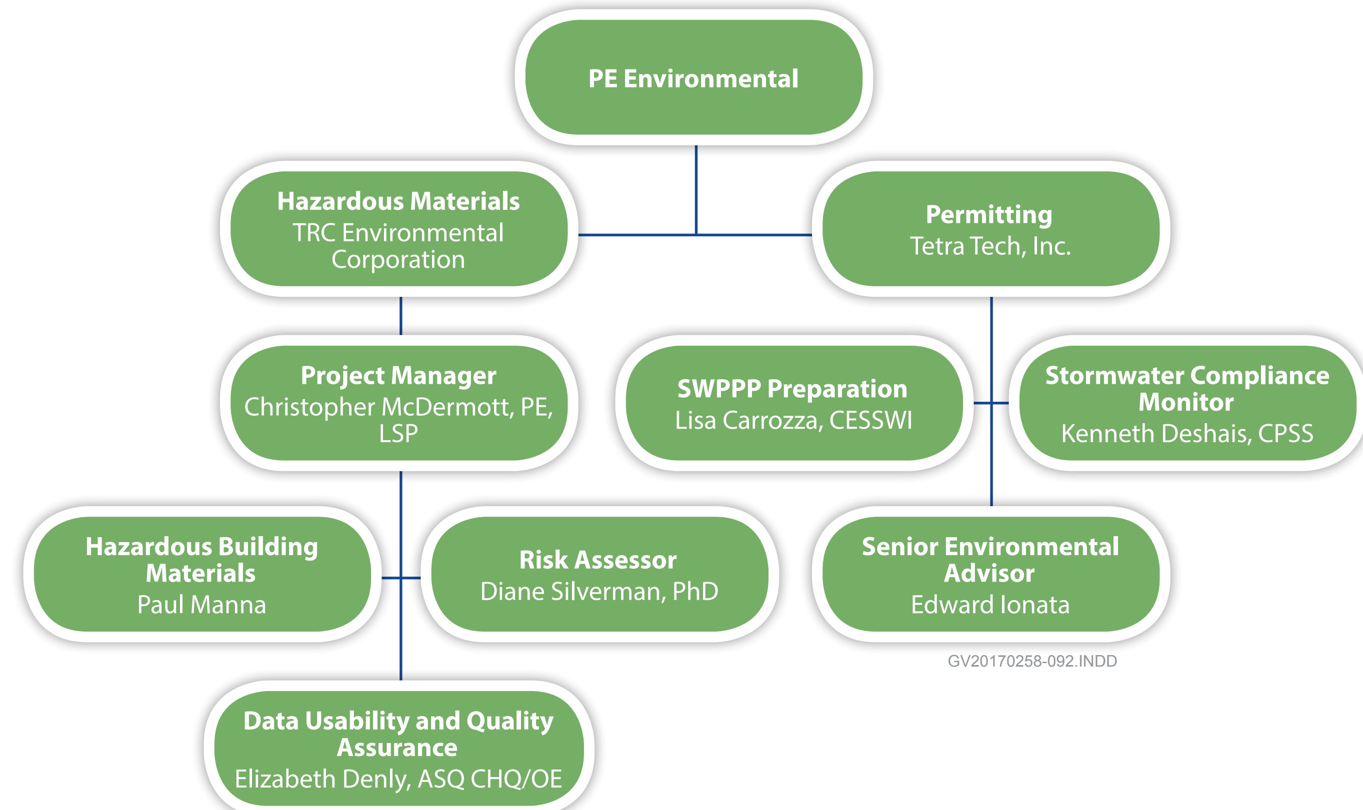


Figure 4.8-1. GLX Constructors' Environmental Team Structure. *We have identified local experts that will be engaged in performing tasks associated with environmental matters.*

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TRC has vast experience working on active railroads and will formulate sampling plans accordingly. For Amtrak, TRC performed a detailed site investigation and collected samples during geotechnical and environmental sub surface investigations. The environmental borings were conducted adjacent to Amtrak's high speed track while maintaining passenger and freight service throughout the entire process.

GLX Constructors will work directly with construction field crews to maintain BMPs throughout construction.

4.8.D APPROACH TO ENVIRONMENTAL MONITORING, INSPECTION, AND REPORTING

We will prepare and implement soil and groundwater characterization sampling plans and coordinate with approved disposal facilities for properly disposing all excavated material that cannot be reused on-site. GLX Constructors' team member, TRC, has conducted numerous sampling events in areas with various levels of contamination, and have established relationships and knowledge of local soil transporters and disposal facilities.

We will prepare the soil and groundwater sampling plans in accordance with the MBTA's rules and regulations. The soil and groundwater characterization sampling plans will utilize the construction schedule and proposed excavation locations to identify sampling points along the corridor that best represent the current conditions in the proposed excavation or dewatering areas.

We will analyze laboratory results from the soil and groundwater characterization sampling events to determine which materials will be suitable for reuse on-site and which disposal facility can best accept non-usable excavated material. In the event that contamination is discovered above regulatory standards, our LSP will comply with all laws under the MCP and implement all necessary reporting.

Field engineers overseeing subcontractors drilling environmental borings and taking soil samples along a railroad Right of Way.

After soil and groundwater sampling plans have been implemented, we will prepare all necessary permits needed to properly disposal of excess soil and other wastes produced during the Project. We will also advise the Health and Safety Team about proper personal protective equipment for the expected conditions throughout the Project corridor. To ensure our processes remain compliant with MassDEP requirements during construction, our LSP or a qualified GLX Constructors' representative will be present on-site during all excavations and loading of hazardous materials.

We will also regularly inspect the construction site for compliance with our SWPPP, direct the construction organization on maintaining management practices, and regularly update the SWPPP in relation to ongoing construction means and methods.

4.8.E APPROACH TO THE HANDLING AND MANAGEMENT OF WASTE AND CONTAMINATED MATERIALS

GLX Constructors will analyze soils and groundwater throughout the Project corridor to determine proper management practices.

Our team has already performed hazardous materials due diligence for the Project and has created an online Hazardous Materials Interactive Map, Figure 4.8-2 on the following page, which displays all previously sampled soil and groundwater along and adjacent to the Project corridor. We will continue to use this map to organize collected data and hazardous materials disposal throughout construction. To organize any excess soils into disposal categories, we will tabulate the data collected during the soil and groundwater-sampling events and compare it against regulatory standards and disposal requirements. We will also use the interactive map to identify and track where excavated soils were relocated or disposed of off-site.

To prevent the potential spread of contamination, our LSP will make certain that all equipment and personnel in contact with hazardous materials are properly decontaminated prior to exiting the Project corridor.

4.8.F APPROACH TO EXCAVATED SOIL MANAGEMENT

GLX Constructors will prepare design specifications that will be both cost efficient and environmentally compliant. We have incorporated the proposed excavation areas into the Hazardous Materials Interactive Map to aid in predicting soil conditions in those areas based on previously sampled data. After the soil sampling plan has been implemented, our team will be able to determine which soils can be reused on-site and which must be taken off-site for disposal. We will incorporate suitable excavated material from required cut areas to required fill areas within the Project limits. We will use the results of our sampling as an aid to determine which soils should be reused as backfill.

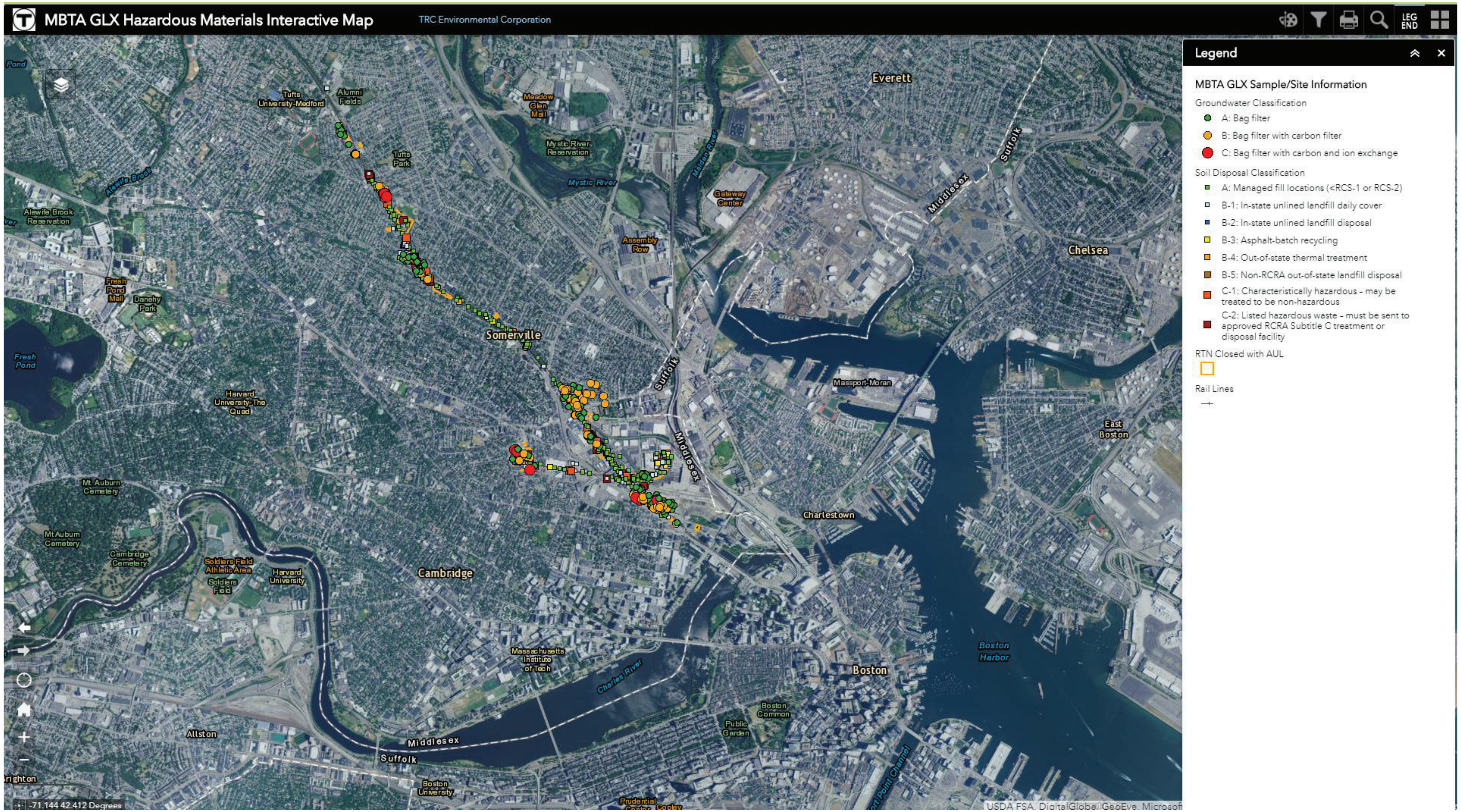

Figure 4.8-2. Hazardous Materials Interactive Map. *GLX Constructors performed extensive hazardous materials due diligence during the proposal phase. As lead of our Environmental TWG, TRC was tasked to identify all recorded soil and groundwater contamination along the entire project corridor. They then developed an interactive web mapping tool of all data points to show probable soil conditions linked to associated disposal categories across the entire Project corridor. This information was then incorporated into our design to maximize use of excavated contaminated material on-site versus off-site; thereby, reducing both costs and risks of unnecessary transport of material for off-site disposal.*

GLX Constructors' team member, TRC, was tasked with assessing and remediating hazardous materials at the WRTA New Vehicle Storage and Maintenance Facility Project, which was constructed over a former manufactured gas plant site in Worcester, Massachusetts. During initial sampling, TRC identified asbestos-containing materials and worked directly with the MassDEP to obtain approval for on-site capping of asbestos wastes, which saved WRTA more than $40,000,000 in potential off-site disposal costs. Our team will endeavor to provide similar cost savings to the Green Line Extension DB Project.

4.8.G APPROACH TO MINIMIZING NOISE AND VIBRATION IMPACTS

If there are locations where we exceed maximum parameters, we will install temporary noise barriers during construction as appropriate, such as excavated materials piles, temporary enclosures, or temporary barriers.

GLX Constructors will prepare and submit a project-specific Noise Control Plan prior to construction activities. To comply with federal and state guidelines and limits, the Noise Control Plan will outline methods to minimize noise and vibration, which will lessen impacts to potentially affected receptors along the alignment. At a minimum, the Noise Control Plan will require:

- Using specially quieted equipment with enclosed engines, high-performance mufflers, or both
- Construction equipment noise certification testing
- Ambient adjusting, or manually adjusted backup alarms set to 5 dBA over background noise levels
- A program for the minimization of truck and equipment idling
- Acoustic shields for jackhammers, chain saws, pavement breakers, and other exceptionally loud equipment
- An approach for responding to community complaints
- A protocol for reporting noise monitoring results, noise reduction initiatives, and responses to the community

Wherever possible, GLX Constructors will select equipment and techniques that generate the least overall noise including:

- Sound insulated compressors, generators, and power-driven equipment to limit excess noise during construction
- Mufflers and silencers where applicable
- Electric equipment in lieu of gasoline-powered equipment where feasible
- Well-maintained equipment, operated at normal manufacturer's operating specifications

We will construct the Project in a manner that minimizes noise and vibration, including but not limited to the following best practices:

- Structure work flow to minimize the need for vehicles to back up
- Turn off idling equipment when not in use
- Avoid revving engines
- Minimize material drop height to the extent possible to avoid excess noise from soil, rock, and debris impacting truck beds
- Provide sound deadening material as liner for all dump trucks, hoppers, and storage bins

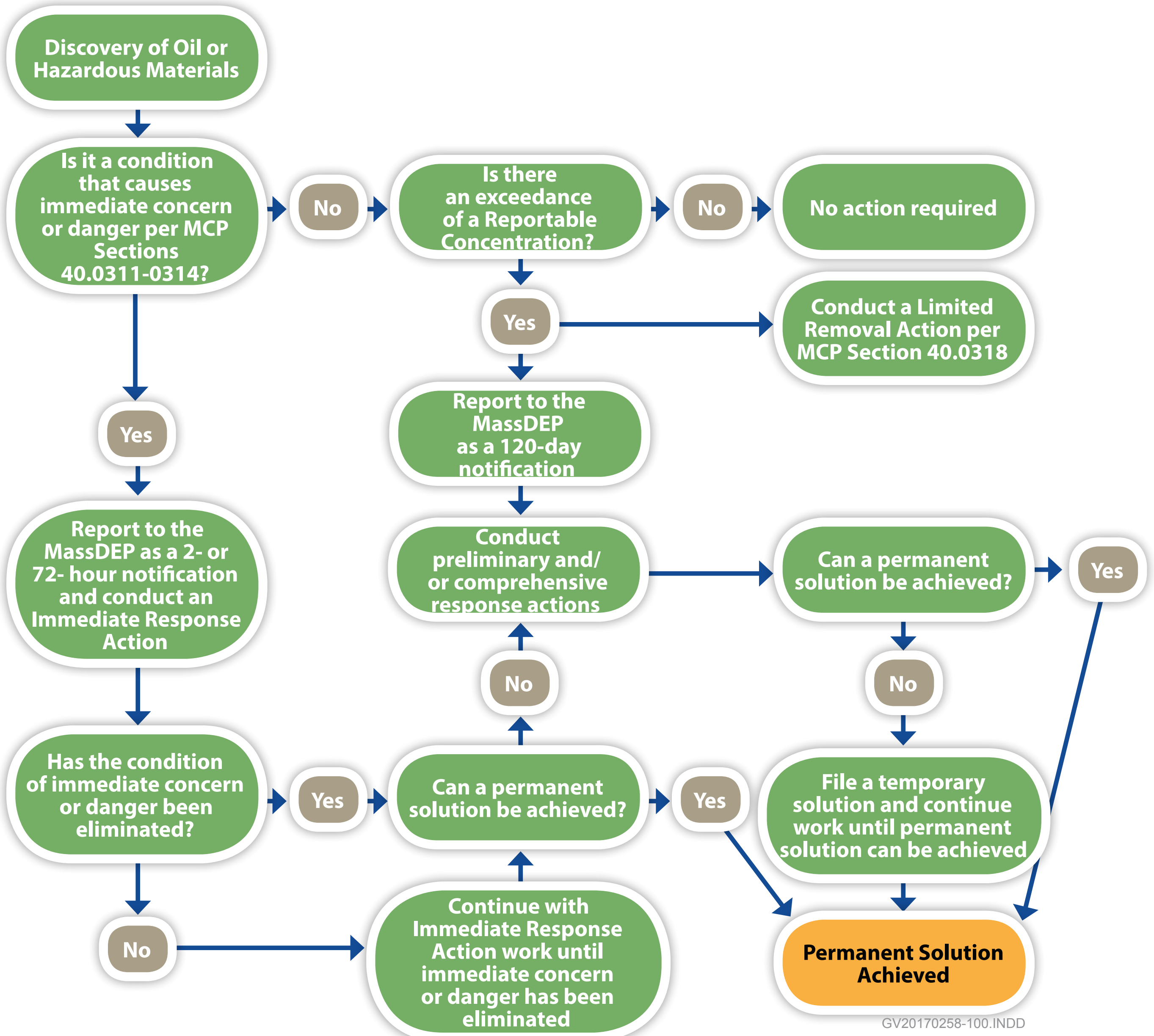

Figure 4.8-3. MassDEP Compliance Flow Chart. *The process that GLX Constructors will undertake to properly comply with MassDEP Plans in the case of oil or hazardous materials discovery.*

- Maximize source-receptor distances wherever possible
- Locate stationary equipment away from noise-sensitive sites

We will conduct equipment noise certification testing to verify noise levels from equipment used on-site and identify loud equipment that may require additional pathway attenuation.

In the event of a complaint regarding noise or vibration, we will submit a Noise and Vibration Complaint Report within seven days to document the equipment or activity used at the time of the complaint, monitoring results and subsequent actions taken to control noise or vibration.

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GLX Constructors team member, TRC, has worked on contaminated urban construction projects with close abutting residential properties, including the Kiley Barrel Site. TRC worked closely with the City of Somerville and the abutting residents to ensure the community was involved and not impacted with any airborne contamination throughout the construction process. This relevant experience will be incorporated into our approach on the Green Line Extension DB Project.

4.8.H APPROACH TO MINIMIZING THE GENERATION AND DISPERSION OF AIRBORNE PARTICULATE MATTER AND MITIGATION OF POTENTIAL IMPACTS

GLX Constructors will use perimeter dust monitoring equipment to make certain that dust produced during construction does not leave the project corridor. In contaminated areas, we will perform site and perimeter air sampling to make sure that any dust produced in the contaminated areas does not adversely affect personnel and abutters.

GLX Constructors will evaluate all existing structures to be demolished for asbestos, lead, mercury, PCBs, etc. prior to construction to determine if any additional personal protective equipment will be needed. Our team member, TRC, has experience working with MassDOT on numerous on-call contracts for Industrial Hygiene Services, which have included indoor air quality monitoring as well as asbestos and lead abatement during demolition activities.

4.8.I APPROACH TO TARGETING FOR SALVAGE/RECYCLING

GLX Constructors will develop and implement a Construction and Demolition Waste Management Plan. The plan will include waste identification, anticipated percentage breakdown of materials, and a Waste Reduction Work Plan. Details of our approach include:

Waste Identification. We will indicate anticipated types and quantities/percentages by weight or volume of demolition, site-clearing, and construction waste generated by the work. It is our goal to target end-of-Project rates for salvage/recycling of at least 90 percent by weight of total nonhazardous solid construction and demolition waste and at least 80 percent of all hazardous or contaminated waste material that is able to be recycled. We will practice efficient waste management in using materials and use all reasonable means to divert construction and demolition waste from landfills and incinerators.

Waste Reduction Work Plan. This plan will list each type of waste and whether it will be salvaged, recycled, or disposed of in a landfill or incinerator. The types of waste will include wood, paper and cardboard, concrete, metals, and mixed construction and demolition waste. The plan will include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

Construction and Demolition Waste Management Plan. This plan will provide details of how to separate recyclable waste from other waste materials, trash, and waste. It will also incorporate services of local solid waste handlers to make certain construction waste is separated, handled, and disposed.

Hazardous Waste Management Plan. We will identify how hazardous waste will be recycled or disposed of via proper handling procedures.

Structural steel from the existing Lechmere Viaduct is a Historic Element. GLX Constructors will salvage structural steel sections in accordance with Section 106. In addition, at the Holman's Building, 350 Medford Street, GLX Constructors will salvage the lions' heads per agreement with the City of Somerville.

GLX Constructors will salvage all Lechmere yard, viaduct, and lead track rail; all switch machines and signals; and all fare gates. All salvaged items will be delivered to the MBTA Railroad Operations material yard in Charlestown, Massachusetts, unless otherwise directed by the MBTA. The items to salvage include:

- OCS poles
- Trolley wire splices, 2/0
- Special track work including 4 RH point/mate turnouts
- Switch boxes with power craft switches
- Switches in chamber under the viaduct at Lechmere Station
- Balance weights
- Greaser equipment

We may reuse track materials that meet the requirements of the Contract Documents. We will coordinate with the MBTA to identify material that is salvageable. All material identified by the MBTA as salvageable will be delivered to the MBTA rail shop at 21 Arlington Avenue. All material determined to be non-salvageable by the MBTA, such as railroad ties, track bolts, nuts, washers, spikes, anchors, and lags, will become the property of GLX Constructors, and it will be disposed of off-site.

We will use soil recycling facilities as a means of soil disposal as appropriate. Such facilities include asphalt batch plants, where lightly contaminated soils are combined with asphalt binder to produce paving, and thermal processing facilities, where contaminants are removed from soil or rendered inert, creating a marketable product.

We will use the results from a soil characterization sampling and screen soils during construction to maximize our ability to salvage and recycle all acceptable hazardous and non-hazardous soils.

4.8.J APPROACH TO DIVERTING LANDSCAPING WASTE FROM LANDFILLS AND INCINERATORS

We will develop and implement a Construction and Demolition Waste Management Plan. As part of the plan, a minimum of 50 percent of all non-hazardous soil will be reused and where appropriate for planting. Any soil proposed for on-site reuse will meet the Contract requirements. In addition, GLX Constructors will achieve end-of-Project rates for reusing/composting at least 90 percent by weight of total nonhazardous landscaping waste. We will incorporate the following procedures in the Construction and Demolition Waste Management Plan:

- Strip topsoil from required excavation and stockpile for future use to landscape within the Project limits.
- Process all clearing and grubbing waste into mulch. Mulch can be incorporated into the work, made commercially available to outside consumers, or composted for the amending of soils.
- If possible, soils may be amended and retested to meet the requirements. Soils not meeting these standards will not be allowed in planting areas.

4.8.K APPROACH TO TRAINING WORKERS, SUBCONTRACTORS, AND SUPPLIERS ON PROPER WASTE MANAGEMENT PROCEDURES

GLX Constructors will train workers, subcontractors, and suppliers on proper waste management procedures as appropriate for the work by:

- Incorporating its salvage and recycling commitments, along with the Construction and Demolition Waste Management Plan, into all subcontracts for work. See Section 4.8.I for more information.
- Incorporating our Construction and Demolition Waste Management Plan into the overall Training Plan for new employees. See Section 4.8.I.

4.8.L APPROACH TO MEETING RECOMMENDED CONTROL MEASURES FOR CONSTRUCTION INDOOR AIR QUALITY

Prior to construction, GLX Constructors will analyze historic data and conduct sampling in indoor areas during construction. We will use this information to determine what measures must be best implemented according to Sheet Metal and Air Conditioning National Contractors Association IAQ Guidelines for Occupied Buildings Under Construction, ANSI/SMACNA 008-2008 (Chapter 3). If we encounter contaminated air, we will advise the Health and Safety Team of the appropriate personal protective equipment needed during construction and will continue to test during construction to ensure that the practices are performing.

4.8.MAPPROACH TO PROVIDING ACCEPTABLE INDOOR AIR QUALITY IN ALL NEW BUILDINGS

GLX Constructors will analyze historic releases, current use limitations, and conduct sampling in the areas of proposed structures to determine any potential need for indoor air quality measures.

TRC has worked on many contaminated sites that were redeveloped to protect human health and the environment, including schools and passive/active recreational parks that now safely host children and has the requisite knowledge and experience to ensure the appropriate level of air quality is attained.

4.8.N APPROACH TO USING/RE-USING PRE-PURCHASED EQUIPMENT AND MATERIALS

Pre-Purchased Equipment

GLX Constructors will have a joint inspection with our Testing and Inspection Agency's engineering and technical personnel to determine the condition and usability of the MBTA's pre-purchased power equipment for the Project. From these inspections, we will generate, grade in various inspection categories, and file the inspection reports and photos.

We will then study and evaluate the existing power equipment's original submittals, approvals, and factory acceptance tests and their results. We will also study and evaluate the FTA's safety certification plan and check-offs of the plan lines pertaining to the existing power equipment up to the point when the contract was terminated. After reviewing these documents, we will generate a report with the results of the evaluation, which will be filed accordingly.

We will then study and evaluate the power equipment reports and photos gathered from the aforementioned tasks to determine a go/no-go for each piece of power equipment. New power equipment pieces will fill any voids. The power equipment will then be integrated with the new power equipment as one, overall functioning and operational power system.

Pre-Purchased Materials

Washington Street Bridge. Our design at the Washington Street Bridge will be similar to the structure from the RIDS Plans. As described in Section 4.2.B, our design proposes a through girder structure. The through girders will be set on a closer spacing than in the previous design, which will generate slightly shorter floor beams. The proposed design will reuse the previously purchased plate that is available for the selected DB entity.

Viaduct. Our design will incorporate the pier structures constructed to date. Span configurations for the proposed viaduct will be compatible with the original design allowing for the pier reuse.

Similar to Washington Street Bridge, our viaduct superstructure design is based on reusing as much of the pre-purchased plate as possible. Our design uses steel welded 'I' girders in the spans that the GMP plans had called for tub girders. However, the plate purchased for the tubs can still be used. We will maintain the top flange, web, and bottom flange thicknesses, and the depth of the section will be similar, allowing reuse of the plate.

On the GMP viaduct design, where single-track viaduct structure was employed, a single tub was used in combination with a large concrete counterweight. This configuration is not workable because the counterweight, being several times stiffer than the tub, becomes the primary support system. Our design involves replacing both the single tub and counterweight with three welded 'I' shaped girders.

The girders, having a wider support footprint than the single tub, eliminate the need for the counter weight. For this case, we will cut the bottom flange plate of the single tub into thirds; these three plates will form the bottom flanges of the proposed three girders.

4.8.O APPROACH TO PROVIDING BUILDING COMMISSIONING IN COORDINATION AND UNDER MBTA MANAGEMENT

The VMF building and station commissioning process is provided through the GLX Construction Execution Team and interfaces with the Quality Manager and Testing and Commissioning Manager. Cutler, our dedicated subcontractor responsible for construction of the VMF and Stations, will provide the dedicated Commissioning Agent (CA) to lead the commissioning process. The CA will report through the Quality Manager and direct the Design Discipline Leads and Construction Superintendents during performance of the interim and final testing and commissioning of the buildings and station facilities in preparation for approval to occupy.

To provide documented confirmation that the facility fulfills the functional and performance requirements of the occupants and operators, the CA will establish and document the Owner's Project Requirements (OPR) and criteria for system function, performance, and maintainability and prepare a final testing and commissioning checklist for execution of the final facility commissioning. The MBTA's Project Requirements will form the basis from which we make our design, construction, acceptance, and operational decisions. These requirements include accessibility, acoustics, comfort, communications, energy efficiency, fire protection, life safety, flexibility health, hygiene, indoor environment, lighting, maintenance requirements, security, and structural safety.

During the construction phase, the CA will confirm and verify that systems and assemblies operate in a manner that will achieve the MBTA's Project Requirements and coordinate the training of Operating Personnel in the required care, adjustment, maintenance, and operation of the new facility equipment and systems. To facilitate the commissioning process, copies of approved submittals critical to the commissioning process are provided to the CA as they are received. The CA develops construction checklists for our team to implement and for documentation and verification of accepted construction.

Functional performance testing occurs as construction verification is completed. Where components require factory acceptance testing, the CA and/or QA personnel will travel to the manufacturing facility to witness the factory acceptance testing that occurs prior to shipment of the components to the construction site for installation. Functional testing of the system/building provides confirmation of the components' ability to work together as a system to achieve the MBTA's Project Requirements. For valid results, the individual components and systems must be verified as operating properly, including start-up and Testing, Adjusting, and Balancing (TAB). Test data records confirm outcomes of functional performance testing, including test data, observations, and measurements. Data may be recorded using photographs, forms, or other means appropriate.

Lighting commissioning. Will comprise up to four process phases: pre-design, design, construction, and occupancy and operations. The commissioning process will use IES recommendations as a guideline.

Pre-design phase. Our Design Team and the CA will work with the MBTA to develop the OPR document. This written document is used throughout the Project to detail the owners' expectations as to how the lighting and controls are intended to operate and includes expected illuminance levels.

Design phase. Completed design documents include details for all lighting controls and illuminance levels that meet the requirements of the OPR. The CA reviews these documents and identifies items to be included in the system manual.

Construction phase. After reviewing contractor submittals of systems under commission, the CA will develop a system manual for operating staff and confirm the training requirements the manufacturer must provide. Submittal review comments from the CA are submitted to the Engineer of Record for review and comment. The CA, along with the Engineer of Record, will verify that the correct equipment is installed and functioning in accordance with the construction documents.

Occupancy and Operations phase. After substantial completion, the CA will review the operation of the lighting system with the operations and maintenance staff and occupants and develop a plan to resolve any outstanding commissioning issues.

HVAC commissioning will be a living process over the entire duration of the Project. Commissioning of the mechanical system will start during the Design Phase with a mechanical design narrative that captures the design intent of a particular system, summarizes the system operation, and outlines the design criteria that will govern how that system is sized and operated. We will update the narratives as the design documents advance, and they will serve as a summary of each mechanical system.

Mechanical pre-functional checklists will be prepared during design to assist the contractor with installation, confirm all steps performed during start-up, and include verification checklists required to move on to functional testing. We will create functional testing documents to verify the equipment's performance. The objective of the functional testing is to measure the energy-efficient performance of each system as defined in the final design documents.

Once construction of a particular system is approaching completion, the pre-functional process will include Testing and Balancing (TAB) of the system, as shown on the design documents, and the recording measurements to be used by the controls contractor. These steps require bringing the TAB Contractor (TAB agency), Automatic Temperature Control (ATC) contractor, and Designer Engineer together during initial installations and Project start-up to ensure checklists are completed and information is available when needed. These meetings will also include project superintendents and construction managers to discuss submittal reviews, verify checklists completed, perform testing, and finally, verify all completed training.

To complete any seasonal testing of systems and components, and to sign-off on occupancy phase commissioning activities, the commissioning process of mechanical systems will continue into the early occupancy phase of the building.

The CA will hold consistent, regular commissioning meetings to maintain the progress of the Project and develop logs/reports, and checklists and issue progress reports.

4.8.P APPROACH FOR STORING COMPONENTS

For systems components, providing a secure and weather-protected storage is critical to adhere to the warranty period and meeting the anticipated life cycles. These items will be stored off the ground on pallets to protect from sudden flash flooding within the warehouse facility.

GLX Constructors will secure an adequately sized warehouse facility, which will store these electrical components and systems assemblies. This warehouse facility will be climate controlled to include correct temperature settings based on the manufacturer's recommended storage temperature range that will accommodate all system elements housed in the warehouse facility. Condensation buildup prevention is critically important, especially with electrical components and systems assemblies. In normal weather conditions, we will visually inspect our warehouse. Any anticipated, inclement severe weather conditions will be studied and processes in place will be evaluated. If additional mitigation measures are necessary, they will be initiated. Based on discussions with his team, the Project Manager, John West, will make the final decision.

Although poles and other structures will be stored outside, the specifications allow for protection against weather by paint and galvanization. The bottom layer of these structures will be stored on wood timbers above the ground. Visual inspections will occur weekly and the inspections will be documented. This includes the timber placement, the straightness of the poles/structures, and the condition of the paint and galvanized coatings.

4.8.Q PROVIDING MINIMALLY MANAGED LANDSCAPE

We will provide a minimally managed landscape through Permaculture gardening. This process begins by understanding the area's conditions, the soil type, sun or shade quantity, water availability, and the best type of plant community for a specific environment. Planting areas will be positioned to gather water appropriately.

We will select plants based on the ecological communities in which they grow in the wild. Native species are usually best adapted to any given area, though there are some hardy non-native species that are quite adaptable. When installing plants, we will amend the soil to the plant's needs. This is particularly important for tree and shrub plantings because roots will remain in the tree pit, and not expand into the existing soil, if the soil mixture is too rich.

If the plants are selected to be drought tolerant, durable, and are planted in healthy communities to establish themselves, the vegetation will be able to thrive and not rely on irrigation or fertilizer after the initial 90-day maintenance period.

4.8.R APPROACH TO CREATING AND/OR ENHANCING ACCEPTABLE WILDLIFE HABITATS

The landscape design proposed by our team includes native plants, which will flower throughout the growing season. In turn, these flowering plants will provide nectar for beneficial insects and subsequently produce seeds and berries for urban wildlife use. Non-deciduous plants will provide winter shelter for urban wildlife. We will limit clearing and trimming existing vegetation, except for the required clearance envelope or providing construction access.

4.8.S AN APPROACH FOR ACHIEVING LONG-TERM, ENVIRONMENTALLY SOUND PEST SUPPRESSION AND PREVENTION

GLX Constructors will address pest control both during construction and in the design of the permanent facilities. During construction, the SWPPP and local requirements will guide site conditions. We will avoid creating areas of untreated standing water that serve as breeding locations for insects. We will implement an integrated pest control program to control rodents in compliance with MBTA's rodent control program within the limits of construction and to avoid displacing rodents from the site to the surrounding areas. We will use a licensed pest control contractor to assess the existing rodent population and prepare a baiting program to eliminate rodent populations prior to construction on a location-by-location basis.

Perimeter baiting stations continuously control rodents for the duration of construction. The program will be supported by careful control of food wastes on the construction site including covered, rodent-proof refuse cans and regular removal of wastes.

Post-construction, our design controls pests by not creating areas of standing water to avoid insect breeding, constructing sealed building foundations to resist pest infestation, and avoiding unprotected horizontal ledges in structures to avoid creating bird-nesting areas.

4.8.T APPROACH TO PROVIDING TIME-OF-DAY LIGHTING NEEDS

GLX Constructors understands that effectively using lighting and power is of the utmost concern to the MBTA. Our proposed lighting system will use cost-effective, low-maintenance, user-friendly methods that will properly light the station during hours of operation and dial back lighting after hours or when not required.

We propose a small 4-to-8 circuit lighting control panel to control station and platform lighting, which will have fully programmable time settings for each circuit, and will operate in conjunction with an on-site photocell and occupancy sensors. These controls allow each station to be fully lit during peak hours and have the capability to reduce lighting levels when no occupants are detected.

All fixtures located on the platform and exposed to adjacent properties will be dark skies compliant, full cutoff fixtures that limit the intensity of light in the 80 to 90 degree region of the fixture. In addition, we will use shielding in the case we are concerned about light spill to adjacent properties.

4.8.U APPROACH TO PROVIDING ENERGY EFFICIENT LAMPS AT APPROPRIATE LOCATIONS

Our design incorporates lighting fixtures with LED sources in all locations in and around the stations.

Luminous efficacy is a measure of how well a light source produces visible light given the amount of power consumed. It is the ratio of luminous flux to power, measured in lumens per watt. In other words, the source uses the least amount of power to produce the most amount of light. The lighting source with the highest efficacy is an LED source. This source is also the most widely accepted by the lighting industry and has the most options with regard to fixture types available.

The dimming range of LEDs is broader than that of compact fluorescent and high-intensity discharge lamps. They can turn down to less than 1 percent of their full potential output, compared to 10 percent to 30 percent of measured light output for compact fluorescents and 30 to 60 percent of lamp power for high-intensity discharge lamps. In essence, LED sources use less power to provide more light and have much more controllability than both compact fluorescent and high intensity discharge sources.

4.8.V APPROACH TO PROVIDING WATER-EFFICIENT EQUIPMENT AND FIXTURES AT APPROPRIATE LOCATIONS

Sustainable and responsible design is rapidly becoming part of all engineering aspects. To this end, all new plumbing fixtures, where appropriate, will bear the Environmental Protection Agency's WaterSense Label. WaterSense-labeled products are certified to use at least 20 percent less water, save energy, and perform as well as or better than regular models.

During the proposal period, we thoroughly reviewed the applicable environmental approvals, permits, laws, and regulations. The key to our approach is instituting a strategy that is compliant with the requirements of the Technical Provisions. In teaming with our experienced, local subcontractors, Tetra Tech and TRC, GLX Constructors is prepared with the knowledge, resources, and experience to remain compliant and eliminate potential environmental issues before they occur.

ITP Request	RFP		
	Drawing Number	Drawing Title	Reference Section or Drawing
Drawings not required			

Technical Solutions Drawing Matrix.

4.9 UTILITIES

To reduce Project cost and provide greater schedule certainty, we have identified and created plans to avoid or adjust more than 150 utility conflicts, including electric, telecommunications, gas, water, and sanitary sewer. We are committed to developing positive working relationships with utility owners. We will be effective on day one due to our existing relationships with utilities established on the Longfellow Bridge and State Street Station Projects, communication methods, intensive interdisciplinary reviews, and careful utility coordination. Our efforts will limit design changes, uphold safety standards, and keep rework to a minimum.

Proper identification, coordination, protection, relocation, and construction of utilities will reduce Project risks while promoting a positive public perception of the Project. We will dedicate a team of design and construction experts whose sole purpose will be to identify utilities, coordinate with public and private utilities providers, accurately verify utility locations, design protections or relocations, and monitor and report progress on all utility activities. As shown in Figure 4.9-1 we have a vast amount of experience with utility construction and coordinating with utility companies. We will collaborate with the MBTA to make certain that excellent utility coordination optimizes the delivery of the Project.

4.9.A GLX CONSTRUCTORS' UTILITY INFRASTRUCTURE RELOCATION PLAN APPROACH

Utility Relocation Plans require close coordination with many third parties, including the utility owners and their customers. The key to this coordination is the early identification of all utilities within the Project limits by establishing a utility matrix that identifies the following:

- Utility type
- Location (vertically and horizontally)
- Diameter
- Material type
- Owner
- Facilities serviced
- Disposition

To meet the requirements of Volume 2 Technical Provisions, GLX Constructors' developed a Utility Matrix at the beginning of our proposal effort shown in Appendix 2. We have refined this information to identify utilities that influence the GLX Project. We have contacted a number of utility providers to confirm our concepts for protection, supports, and potential shut downs.

Identification of Existing Utility Infrastructure

To avoid potential conflicts, we will contact all utility owners within the Project limits to obtain every available record data, and confirm the MBTA provided prepared base mapping. This effort will include meetings with the utility providers' field personnel, who know where and how the utilities are constructed. This firsthand knowledge is critical in identifying access points, bends, or valves, which can expedite utility relocations or protect utilities in place.

Where utility record information is lacking or highly accurate locations are required, we will use subsurface utility location tools, including vacuum excavation, ground penetrating radar, and electromagnet locating. Because such technology will vastly increase the accuracy of utility locations, it reduces risk to both schedule and cost.

Recommended Utility Work

Through regular design coordination meetings, GLX Constructors' Utilities Technical Working Group (TWG) will be able to identify if the planned construction activities will conflict with existing utilities.

We will resolve utility conflicts with a four question approach:

- **Safety.** Can the utility safely remain in place?
- **Age and condition of the utility.** Is there a concern that the utility may already be structurally deficient?
- **Proposed construction operations.** How close will work take place to the utility?
- **Temporary works.** What other operations could affect the utility?

Our Utilities TWG will partner with the MBTA and the utility owner. We will document the review, coordination, decisions, and approval process on our Utility Matrix.

Figure 4.9-1. *The Construction of the Hingham Tunnel required coordination and relocation of numerous utilities including the 54" Town Brook Culvert. The project was successfully completed on time.*

“We were very successful in avoiding utility issues during the construction of the Town Brook Culvert, installed through downtown Hingham, Massachusetts, which had active utilities dated 80 years old.

Assumptions and Considerations

We will identify all utilities through close coordination with the utility owners and complete detailed investigations to determine their locations. We will engineer Utility Designs to protect utilities in place or relocate them out of conflict with the proposed works. We have considered and assume all Project and utility owners are listed in Figure 4.9-2.

Water	Cambridge Water
	Medford Water & Sewer
	Somerville DPW Water & Sewer
	MWRA
Sewer	Cambridge Drain & Sewer
	Somerville DPW Water & Sewer
	Medford Water & Sewer
	MBTA
Gas	Spectra Energy Algonquin
	National Grid Gas
	NSTAR Gas
	Eversource
Telecommunications	Phoenix Communications
	Zayo
	AT&T
	Comcast (Somerville, Medford, Cambridge)
	Level 3
	Lightower Fiber Networks
	Waveguide
	MCI Metro
	Crown Castle
	Poltel
	NSTAR Communications
	RCN
	Verizon (Medford, Somerville, Cambridge)
	Bell Canada
	Hibernia Networks
	XO Communications
Electric	National Grid
	Eversource

Figure 4.9-2. Green Line Extension Utility Owners. *GLX Constructors will work closely with the Utility Owners to protect or relocate impacted utilities.*

Approach to Communication and Coordination with Utility Companies

GLX Constructors has extensive experience in communicating and coordinating utility relocations with owners, including local experience with the Greenbush Line Rail Restoration DB Project. We will initiate regular coordination with each utility owner at the start of the Project. This coordination effort will be through a single point of contact, the Design Discipline Lead, Sean Barry, PE, who leads a team that has designed and coordinated utility relocations throughout the greater Boston area for more than 25 years. We will successfully coordinate with utility owners by providing appropriate attention to understand their needs. Partnering with all parties will foster Project-related pride and create positive results.

Understanding Utility Companies' Operational Constraints. The Green Line Extension DB Project is critical to regional economic growth. Utility owners must maintain service to their existing customers. Successful coordination with utility owners will be accomplished through a detailed understanding of each utility owners' operational constraints. Through regular utility coordination meetings, we will develop an understanding of each utility system's constraints and confirm that these limitations are part of the decisions made on each utility.

Approach to Managing Service Interruptions to Utilities Companies' Customers and Property Owners

We will make every effort to avoid interruptions; however, when interruptions are unavoidable we will plan and execute to minimize the interruption.

Options to minimize impacts include night work or off season work, where the demand on a utility is at its least. We will maintain positive public perception of the project by proactively communicating interruptions through email blasts, project website posting, announcements through community access channels, and publications in local newspapers. All public outreach will take place in accordance with the Technical Provisions, Section 2.9.3.

Approach to Early Identification and Mitigation of Impacts to Critical Utilities

We have already identified a number of critical utility issues throughout our proposal efforts, including the 48-inch MWRA Water Line at Medford Street, the sewer siphon at School Street, the Algonquin gas line at MB-EB Sta 266+50, and the two 12-inch gas lines in Washington Street to name a few. These issues are included in our Utility Matrix. As we continue our work, we expect to identify other critical utilities through careful coordination with utility owners.

Utility services can become critical if they provide service to critical public safety facilities, have equipment that requires long-lead time, or are not easily replaced or relocated because of system limitations. We have already initiated outreach with each utility owner, and started to develop plans with each for relocating and protecting each utility.

This effort will benefit the schedule at Notice to Proceed because we have already established relationships and understand the utility owners' needs.

Approach to Coordination with All Other Area Utility Infrastructure Relocations

Our goal is to minimize impact of utility work on the surrounding communities. Regular utility coordination meetings with utility companies and third parties will include review and discussion of other area utility infrastructure work.

This coordination effort is similar to those that we attend as part of our design and coordination efforts with the City of Cambridge. These meetings allow the Design and Construction Team to identify common elements that can be coordinated for the greater success of the Project and save schedule. Project-wide planning between GLX Constructors and all affected parties will avoid Project delays to successfully minimize impacts.

Approach to Supplying Utility Services to the Project

Each station, traction power substation, signal bungalow, the transportation building, and the vehicle maintenance facility will require water, sewer, drain, power, and telecommunication services. GLX Constructors has determined the scope of each of these services and the most efficient routing from the service provider to the appropriate service location at each facility.

As part of our utility outreach due diligence, we have verified that adequate system capacity exists to provide service to the various facilities. Where not available, we have identified needs for system upgrades to meet the Project needs. We will revisit these determinations throughout the Design Build process to make certain that each facility will provide adequate capacity.

Approach to Maintaining, Protecting, and Relocating Positive Train Control Fiber Optic Cable

We understand that the MBTA is upgrading to Positive Train Control and have selected the New Hampshire Branch of the MBTA Commuter Rail system as one of the first areas to employ this system. The system runs from the Winchester Signal Instrument House to the Commuter Rail Operating Control Center. The existing system consists of a 48-strand single mode fiber optic cable installed either on poles or within inner duct/conduit.

GLX Constructors understands that this system must remain operational. In addition, we understood that the PTC Fiber Optic is to remain operational and that any proposed relocation or replacement must be accomplished in accordance with the MBTA project specifications, which include a 30-day advanced notice and plans detailing the proposed work such as splice locations, inspection, and testing. So that the PTC cable is paramount in all design and construction considerations, the first step in its protections will be to accurately survey the locations of all poles, houses, cabinets, fiber, and ducts of the PTC system. This information will be accurately located and annotated as PTC CABLE – Do Not Disturb on the project-wide mapping to reflect its importance. Once located and accurately reflected on the project mapping and similar to other critical utilities, GLX Constructors will ensure that the system is protected and maintained during all design and construction reviews.

When construction activities require the PTC Cable to be relocated, our first consideration will be to place the PTC fiber into a secure and final location. It is our goal to make certain that relocation of any section of fiber only happens once, which should limit the impact to MBTA operation and costs to the Project.

4.9.B BENEFITS OF GLX CONSTRUCTORS' APPROACH TO UTILITIES FOR OWNERS AND USERS DURING THE CONSTRUCTION PERIOD

GLX Constructors has a proven record of identifying critical utilities, coordinating with affected utility companies, and designing for utility protection or relocation. These same skills were employed for the MBTA's Greenbush Line Rail Restoration DB Project with recognized success. We will use the same utility coordination that led utility management on the Greenbush Project. They will employ their lessons learned from working with various impacted utilities to develop a spirit of partnership with each utility owner, identify critical issues, and develop design solutions to solve each.

Additionally, GLX Constructors Team Member, Middlesex, routinely performs work for several local utilities, including major projects for Eversource, and will incorporate the knowledge gained of their requirements into the design, relocation, and negotiation processes.

Our team's combined working knowledge with the local utilities will have the following positive benefits for utility owners and users:

- Safely planned and executed utility work
- Advanced notice of planned interruptions
- Shorter construction disruptions
- Work that is completed correctly the first time
- Preservation of critical utility services.

4.9.C PERMANENT AND TEMPORARY RELOCATION/PROTECTION PLANS

Figure 4.9-3 is an example of one utility relocation plan that will continue to be coordinated with a local utility who was willing to work with us before NTP. Because most of our utility partners are interested in reviewing and talking to the team that has been awarded the Project, our ability to provide complete relocation and protection drawings for the entire Project is limited by where we are in the proposal process. Working with MWRA, we coordinated and planned ATC 36 which raised the community path to avoid this critical 48" water line. Our Utility Matrix has captured every potential issue that we have been able to identify from the MBTA's provided documents and includes proposed solutions, site conditions, and proposed works.

Through careful coordination with the many public and private utilities, the GLX Constructors' Utilities Team will be the face of the Green Line Extension DB Project for many of the project stakeholders. This team will lead the effort in identifying all utilities within the project limits and be responsible for identifying those critical utilities that could affect Project schedule. Our Team will maintain frequent and regular coordination with the effected utilities, serving as a conduit for information to keep the utilities appraised of the Project schedule, and keep their attention on the needs of the Project. We have an experienced DB utility coordination team that well lower Project costs while shortening the construction duration.

"To mitigate the impact to abutters and many important businesses around the Green Line, we will employ a philosophy of avoid, minimize, or mitigate.

ITP Request	RFP		
	Drawing Number	Drawing Title	Reference Section or Drawing
A5.2.9.C.1			Drawings are as described by Section 4.9.C
A5.2.9.C.2			Drawings are as described by Section 4.9.C
A5.2.9.C.3			Drawings are as described by Section 4.9.C

Technical Solutions Drawing Matrix.

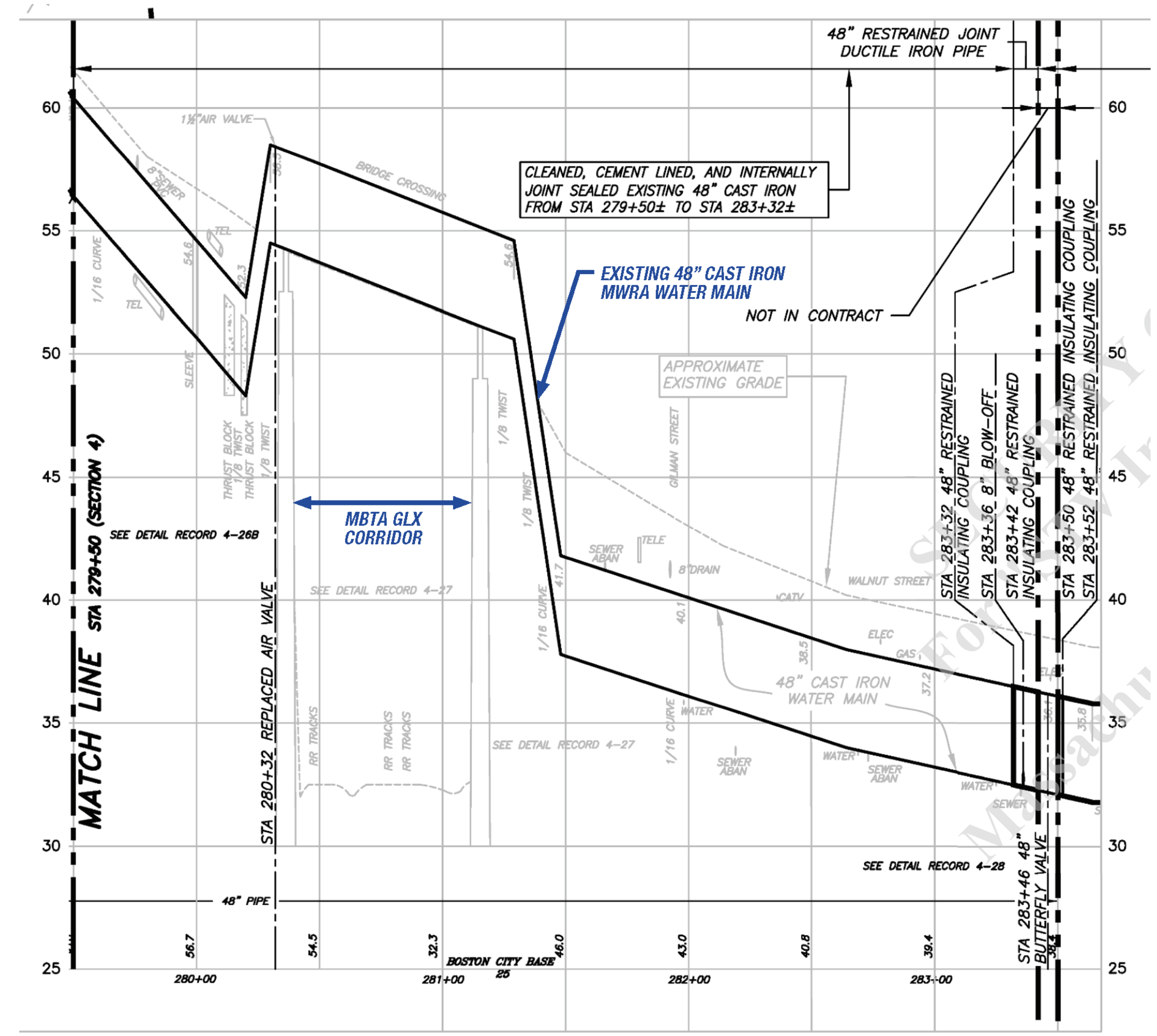

Figure 4.9-3. 48" Cast Iron Water Main at Walnut Bridge. *GLX Constructors approved ATC 36 which raises the community path and significantly reduces impact to the critical MWRA utility.*

APPENDIX 2

Utility Matrix

PRELIMINARY UTILITY MATRIX

SIZE AND MATERIALS	TYPE	STATION (MB-WB)			UTILITY CROSSES RR				UTILITY LOCATED PARALLEL AND BETWEEN RR					OVERHEAD	OWNER/ POTENTIAL OWNER	BRIDGE OR STREET	ON BRIDGE	DISPOSITION (TO BE REPLACED/ RELOCATED/ REMAIN/ ABANDONED ETC.)
		CROSSING	PARALLEL FROM	PARALLEL TO	MB-WB	MB-EB	NH-T2	NH-T1	MB-WB	MB-EB	NH-T2	NH-T1	YL-10					
MEDFORD BRANCH																		
24"	SEWER	188+00														East Street		TO REMAIN
8"	WATER	188+00													CAMBRIDGE WATER DEPT			TO REMAIN
16"	WATER	188+00													CAMBRIDGE WATER DEPT	East Street		TO REMAIN
8" ST IP	GAS	188+00			X	X									EVERSOURCE	East Street		TO REMAIN
2-4" TELE	TELE	188+00														East Street		TO REMAIN
GAS ABANDONED	GAS	188+00			X	X									EVERSOURCE	East Street		TO REMAIN
UNKNOWN	ELEC	191+50			X	X								x	EVERSOURCE			UNKNOWN
WATER PIPE	WATER	192+00													MWRA/ CAMBRIDGE WATER DEPT			TO REMAIN
TELE	TELE	195+75			X	X									VERIZON	Water Street		TO REMAIN
8" PIPE	WATER	196+00													CAMBRIDGE DPW	Water Street		TO REMAIN
12" BRICK	SANITARY	196+00			X	X									CAMBRIDGE DPW	Water Street		TO REMAIN
3" GAS	GAS	196+00			X	X									EVERSOURCE	Water Street		TO REMAIN
GAS ABANDONED	GAS	196+00			X	X									EVERSOURCE	Water Street		TO REMAIN
UNKNOWN	TELE	196+25			X	X								X	VERIZON	Water Street		UNKNOWN - TO REMAIN
UNKNOWN	TELE	196+25			X	X								X	VERIZON	Water Street		UNKNOWN - TO REMAIN
UNKNOWN	ELEC	196+50												X	EVERSOURCE	Water Street		UNKNOWN - TO BE RELOCATED?
24" CI SALT W	WATER	208+00													CAMBRIDGE WATER DEPT			TO REMAIN
UNKNOWN	ELEC	208+25			X	X								X	EVERSOURCE			UNKNOWN - RELOCATE?
UNKNOWN	ELEC	208+50												X				UNKNOWN - RELOCATE?
MBTA Signal	ELEC	209+00																TO REMAIN
12" W ABANDONED	WATER	209+00			X	X									MBTA			ABANDONED
2- 4" DUCT	ELEC	209+50			X	X									MBTA			TO REMAIN
12" W ABANDONED	WATER	209+50			X	X									MBTA			ABANDONED
9-4" DUCT	ELEC	210+00			X	X									MBTA			TO BE RELOCATED
5'-9"X6'-6" SEWER MAIN	SANITARY	226+00													MWRA	JOY STREET		TO REMAIN
10" V.C	SANITARY	226+01													CAMBRIDGE			TO REMAIN
(36) -1-1/4" Level 3 T QL-B	TELE	225+50			X	X									LEVEL 3			TO REMAIN
UNKNOWN	ELEC	233+50				X	X	X						X	EVERSOURCE			MULTIPLE OVERHEAD LINES CROSSES AROUND 233+50 TO BE RELOCATED
68-1-1/4 PVC & 4- 4" PVC	TELE	237+25													VERIZON	WASHINGTON ST	X	TO REMAIN

PRELIMINARY UTILITY MATRIX

SIZE AND MATERIALS	TYPE	STATION (MB-WB)			UTILITY CROSSES RR				UTILITY LOCATED PARALLEL AND BETWEEN RR					OVERHEAD	OWNER/ POTENTIAL OWNER	BRIDGE OR STREET	ON BRIDGE	DISPOSITION (TO BE REPLACED/ RELOCATED/ REMAIN/ ABANDONED ETC.)
		CROSSING	PARALLEL		MB-WB	MB-EB	NH-T2	NH-T1	MB-WB	MB-EB	NH-T2	NH-T1	YL-10					
			FROM	TO														
10- 4" FIBER OPTIC	TELE	237+25													VERIZON	WASHINGTON ST	X	TO REMAIN
UNID-UTIL	ELEC	253+50													EVERSOURCE	McGrath HWAY	X	TO REMAIN
8" SANITARY	SANITARY	262+00														WALNUT ST	X	TO REMAIN
TELE	TELE	262+50													VERIZON	WATNUT ST	X	TO REMAIN
48" MDC	WATER	262+50													MWRA	WALNUT ST	X	TO REMAIN
14" Gas in 42" sleeve Transmission	GAS	266+50			X	X	X	X							SPECTRA ENERGY ALGONQUIN			VERTICAL GAS PIPE VENT ON BOTH ENDS NEAR ROW LINE - To be relocated to accommodate wall construction
12" W	WATER	268+00													SOMERVILLE DPW-WATER & SEWER	MEDFORD ST	X	new water line installed on opposite side of bridge, this may be abandoned
16-4" FRP TELECOME DUCTS (ZAYO)	TELE	268+00														MEDFORD ST UTILITY BRIDGE		To remain, bridge to be modified to provide underpass, protect
24-4" FRP TELECOME DUCTS (VERIZON)	TELE	268+00														MEDFORD ST UTILITY BRIDGE		To remain, bridge to be modified to provide underpass, protect
2-4" FRP FIRE ALARM DUCTS	ELEC	268+00														MEDFORD ST UTILITY BRIDGE		To remain, bridge to be modified to provide underpass, protect
TELE	TELE	269+00			X	X	X	X							VERIZON	MEDFORD ST	X	To remain, bridge to be modified to provide underpass, protect
(60) 4" T & FA	TELE	271+00			X	X	X	X							VERIZON			MBTA reported that this was abandoned
15" PVC	SANITARY	272+00				X	X	X							SOMERVILLE DPW-WATER & SEWER			To be relocated
ELEC	ELEC	272+28				X	X	X							Eversource			Already abandoned - To be relocated?
RELOCATED WATER LINE	WATER	275+00														SCHOOL ST UTILITY BRDIGE		IS THIS ACTIVE?
RELOCATED 6-5" PVC ELEC DUCT	ELEC	275+00														SCHOOL ST UTILITY BRDIGE		IS THIS ACTIVE?
12" CI	SANITARY	275+25			X	X	X	X							To be replaced	SCHOOL ST		TO BE RELOCATED BECAUSE OF UNDERPASS
10"	WATER	275+50													SOMERVILLE DPW-WATER & SEWER	SCHOOL ST	X	Limited replacement required by underpass
8 - 4" DUCT	TELE	275+50													VERIZON	SCHOOL ST	X	Limited replacement required by underpass
2-4" MBTA	ELEC	275+50													EVERSOURCE	SCHOOL ST	X	Limited replacement required by underpass
UNID-UTIL	ELEC	275+50													EVERSOURCE	SCHOOL ST	X	Limited replacement required by underpass
UNID-UTIL	ELEC	284+50												X	EVERSOURCE	SYCAMORE ST	X	TO REMAIN
ELEC	ELEC	289+50												X	EVERSOURCE	CENTRAL ST	X	TO REMAIN

PRELIMINARY UTILITY MATRIX

SIZE AND MATERIALS	TYPE	STATION (MB-WB)			UTILITY CROSSES RR				UTILITY LOCATED PARALLEL AND BETWEEN RR					OVERHEAD	OWNER/ POTENTIAL OWNER	BRIDGE OR STREET	ON BRIDGE	DISPOSITION (TO BE REPLACED/ RELOCATED/ REMAIN/ ABANDONED ETC.)
		CROSSING	PARALLEL FROM	PARALLEL TO	MB-WB	MB-EB	NH-T2	NH-T1	MB-WB	MB-EB	NH-T2	NH-T1	YL-10					
UNID-UTIL	ELEC	304+50													EVERSOUCRE	LOWELL ST	X	Limited replacement required by abutment work
8" VC	SANITARY	313+00			X	X	X	X							SOMERVILLE DPW-WATER & SEWER			to be replaced with sewer siphon
UNKNOWN	ELEC	313+75						X						X	EVERSOURCE			Relocate if in conflict with proposed work.
UNID-UTIL	ELEC	321+00												X	EVERSOURCE	CEDAR ST	X	TO REMAIN
TEMPORARY ELEC	ELEC	329+50														BROADWAY UTILITY BRDIGE		To remain and be protected
TEMPORARY TELE	TELE	329+50														BROADWAY UTILITY BRDIGE		To remain and be protected
TEMPORARY 12" WATER LINE	WATER	329+50														BROADWAY UTILITY BRDIGE		To remain and be protected
12" W	WATER	330+00													SOMERVILLE DPW-WATER & SEWER	BRAODWAY	X	ABANDONED
ELEC	ELEC	330+00													EVERSOURCE	BROADWAY	X	ABANDONED
TELE ABANDONED	TELE	330+01													VERIZON	BROADWAY	X	ABANDONED
ELEC ABANDONED	ELEC	330+25													EVERSOURCE	BROADWAY	X	ABANDONED
ELEC	ELEC	330+50													EVERSOURCE	BROADWAY	X	ABANDONED
2-30" 345 KV PTC (RECORDS AVAILABLE)	ELEC	331+50			X	X	X	X							NATIONAL GRID			TO REMAIN AND BE PROTECTED, CHECK FOR DRAINAGE CONFLICT
24" CI IN 42" CMP SLEEVE	WATER	332+50			X	X	X	X							MWRA			TO BE RELCOATED ACCORDNG TO DOCUMENTS AS I RECALL THIS NEEDS TO BE VERIFIED
2" W	WATER	332+50				X	X	X							MBTA			to be relocated
FIBER OPTICS	TELE	335+00				X	X	X							VERIZON/MCI-VERIZON			RELOCATE
8" G	GAS	345+25													NATIONAL GRID/ EVERSOURCE	HARVARD ST		TO REMAIN
12" G	GAS	345+25													NATIONAL GRID/ EVERSOURCE	HARVARD ST		TO REMAIN
TELE	TELE	345+25													VERIZON	HARVARD ST		TO REMAIN
16" MDC	WATER	345+50													MWRA	HARVARD ST		TO REMAIN
10"	WATER	345+50													MWRA	HARVARD ST		TO REMAIN
10" ABANDONED	WATER	345+50													MWRA	HARVARD ST		TO REMAIN
TELE	TELE	345+50													VERIZON/MCI-VERIZON	HARVARD ST		TO REMAIN
ELEC	ELEC	345+50													NATIONAL GRID	HARVARD ST		TO REMAIN
ELEC	ELEC	345+50													NATIONAL GRID	HARVARD ST		TO REMAIN

PRELIMINARY UTILITY MATRIX

SIZE AND MATERIALS	TYPE	STATION (MB-WB)			UTILITY CROSSES RR				UTILITY LOCATED PARALLEL AND BETWEEN RR					OVERHEAD	OWNER/ POTENTIAL OWNER	BRIDGE OR STREET	ON BRIDGE	DISPOSITION (TO BE REPLACED/ RELOCATED/ REMAIN/ ABANDONED ETC.)
		CROSSING	PARALLEL															
			FROM	TO	MB-WB	MB-EB	NH-T2	NH-T1	MB-WB	MB-EB	NH-T2	NH-T1	YL-10					
12" MET	SANITARY	345+50													MBTA	HARVARD ST		TO REMAIN
4" FIBER OPTIC	TELE	357+00			X	X	X	X							AT&T			TEMPORARY LINE
24" MDC C/W ABANDONED	WATER	358+50			X	X	X	X							MWRA			DEMOLISH AND CAP
30" MDC C/W ABANDONED	WATER	358+50			X	X	X	X							MWRA			DEMOLISH AND CAP
48" MDC	WATER	363+50													MWRA	COLLEGE AVE	X	TO REMAIN
20" MDC	WATER	363+50													MWRA	COLLEGE AVE	X	TO REMAIN
8" PL 25 PSIG	GAS	363+50													NATIONAL GRID/ EVERSOURCE	COLLEGE AVE	X	TO REMAIN
ELEC	ELEC	363+50												X	NATIONAL GRID	COLLEGE AVE	X	RELOCATE
ELEC	ELEC	363+50													NATIONAL GRID	COLLEGE AVE	X	RELOCATE
GAS ABANDONED	GAS		187+00	188+00					X	X					EVERSOURCE			TO REMAIN
4-4" PVC	TELE		188+50	196+00											VERIZON			TO REMAIN
6" PL ABANDONED GAS (1996)	GAS		196+00	196+50											EVERSOURCE			TO REMAIN
UNKNOWN	ELEC		232+25	233+50		X	X	X						X	EVERSOURCE			RELOCATE - MULTIPLE OVERHEAD LINES CROSSES AROUND 233+50.
ELEC	ELEC		272+00	275+00					X	X					EVERSOURCE			RELOCATE
9-4" DUCT	ELEC		274+00	275+50														MAINTAIN AND PROTECT (PER REDEF DRAWING)
UNKNOWN	ELEC		280+50	291+00										X	EVERSOURCE			UNKNOWN - TO BE REMOVED?
UNKNOWN	ELEC		290+00	300+00										X	EVERSOURCE			UNKNOWN - TO BE REMOVED?
12" VC	SANITARY		312+00	314+50											MBTA			TO REMAIN
SEWER LINE	SANITARY		312+00	314+50			X	X							MBTA			TO REMAIN
18" PVC	COMBINED STORM /SEWER AS PER REDEF DRAWING		314+50	320+25											MBTA			NO PIPE VISIBLE AT 314+50 - TO BE REMOVED?
4" STEEL FIBER OPTIC	TELE		329+00	335+00							X	X			AT&T			MAINTAIN AND PROTECT
UNKNOWN	ELEC		330+00	343+00					X	X				X	NATIONAL GRID			UNKNOWN - RELOCATE?
4" FIBER OPTIC	TELE		335+00	357+00											AT&T			RELOCATE
4-1.5" FIBER OPTIC ABANDONED	TELE		335+00	357+00							X	X			AT&T			To remain
FIBER OPTICS	TELE		357+25	375+00							X	X			AT&T			RELOCATE

PRELIMINARY UTILITY MATRIX

SIZE AND MATERIALS	TYPE	STATION (MB-WB)			UTILITY CROSSES RR				UTILITY LOCATED PARALLEL AND BETWEEN RR					OVERHEAD	OWNER/ POTENTIAL OWNER	BRIDGE OR STREET	ON BRIDGE	DISPOSITION (TO BE REPLACED/ RELOCATED/ REMAIN/ ABANDONED ETC.)
		CROSSING	PARALLEL		MB-WB	MB-EB	NH-T2	NH-T1	MB-WB	MB-EB	NH-T2	NH-T1	YL-10					
			FROM	TO														
UNID-UTIL	ELEC				X	X	X	X						X	TUFTS			UNKNOWN - RELOCATE?
14" Gas	GAS														ALOGONQUIN	ATTACHED TO McGrath		MAINTAIN AND PROTECT
20" WATER	WATER															WASHINGTON ST	X	TO REMAIN
36" CI G QL- B (SEE RECORDS)	GAS															WASHINGTON ST		TO REMAIN
12-4"	ELEC															WASHINGTON ST	X	TO REMAIN
2- 6 5/8" E (SEE RECORDS)	ELEC															WASHINGTON ST	X	TO REMAIN
UNION SQUARE BRANCH																		
UNKNOWN	ELEC		27+50	44+00											UNKNOWN			UNKNOWN / TO REMAIN
UNKNOWN	ELEC	41+50												X	UNKNOWN			UNKNOWN / TO REMAIN
UNKNOWN	ELEC	22+00													EVERSOURCE	MEDFORD ST		TO REMAIN
45" X 30" BRK	SANITARY	22+00													MWRA	MEDFORD ST		TO REMAIN
14'	WATER	28+50													CAMBRIDGE WATER DEPT	MEDFORD ST		TO REMAIN
20"	WATER	28+50													CAMBRIDGE WATER DEPT	MEDFORD ST		TO REMAIN
10 "	WATER		28+50	28+50											CAMBRIDGE WATER DEPT	MEDFORD ST		TO REMAIN
69" X 62" BRK	SANITARY	22+00													MWRA	MEDFORD ST		TO REMAIN
4" ABANDONED	GAS	22+00													SPECTRA / EVERSOURCE	MEDFORD ST		TO REMAIN
14" ALGONQUIN D	GAS	22+00													SPECTRA / EVERSOURCE	MEDFORD ST		TO REMAIN
14" ST IP ABANDONED	GAS	22+00													SPECTRA / EVERSOURCE	MEDFORD ST		TO REMAIN
UNKNOWN	GAS		22+00	22+00											SPECTRA / EVERSOURCE	MEDFORD ST		TO REMAIN
T & FA	TELE	22+00													VERIZON	MEDFORD ST		TO REMAIN
4-4" DUCT	ELEC		20+00	23+50											UNKNOWN			TO BE REPLACED
6-4" DUCT	ELEC	19+00													UNKNOWN			TO BE REPLACED
4-4" DUCT	ELEC	19+00													UNKNOWN			TO BE REPLACED
6-4" DUCT	ELEC		13+00	17+50											UNKNOWN			TO BE REPLACED
6- 4" DUCT	ELEC	13+00													UNKNOWN			TO BE REPLACED
2-4" DUCT	ELEC	20+50													UNKNOWN			TO BE REPLACED
SM 1- 4" DUCT	ELEC														UNKNOWN			TO REMAIN
S&C 3 -4" DUCT	ELEC														UNKNOWN			TO BE REPLACED

PRELIMINARY UTILITY MATRIX

SIZE AND MATERIALS	TYPE	STATION (MB-WB)			UTILITY CROSSES RR				UTILITY LOCATED PARALLEL AND BETWEEN RR					OVERHEAD	OWNER/ POTENTIAL OWNER	BRIDGE OR STREET	ON BRIDGE	DISPOSITION (TO BE REPLACED/ RELOCATED/ REMAIN/ ABANDONED ETC.)
		CROSSING	PARALLEL		MB-WB	MB-EB	NH-T2	NH-T1	MB-WB	MB-EB	NH-T2	NH-T1	YL-10					
			FROM	TO														
S&H 4-4 " DUCT	ELEC		18+50	17+50											UNKNOWN			TO REMAIN
S&C 4-4" DUCT	ELEC	18+00													UNKNOWN			TO REMAIN
12" ABANDONED	WATER	19+50													CAMBRIDGE WATER DEPT	McGRATH HWY	X	TO BE REPLACED
UNKNOWN	WATER	19+50													CAMBRIDGE WATER DEPT	McGRATH HWY		TO BE REPLACED
8" BRK CHANNEL	SANITARY	19+50													CAMBRIDGE	McGRATH HWY		TO BE REPLACED
8"	SANITARY	19+50													CAMBRIDGE DPW	McGRATH HWY		TO BE REPLACED
UNKNOWN	ELEC	19+50													EVERSOURCE	McGRATH HWY		
UNKNOWN ABANDONED	TELE	19+50													VERIZON	McGRATH HWY		
6-4" DUCT	ELEC		17+50	13+00						X					UNKNOWN			TO REMAIN
6-4" DUCT	ELEC	12+50													UNKNOWN			TO BE REPLACED
S&C (2- 4" DUCT)	ELEC		12+50	7+00						X					UNKNOWN			ABANDONED, DEMOLISHED AND CAPPED
4" PL	GAS		15+00	17+50											SPECTRA / EVERSOURCE			TO REMAIN
4" PL ABANDONED	GAS	15+00													SPECTRA / EVERSOURCE			TO REMAIN
4-E" DUCT	ELEC		20+00	24+00											UNKNOWN			
GAS	GAS		-	10+50														
12" CLDI WATER IN 24" STEE	WATER		8+75	11+00														
8" ABANDONED	WATER		17+00	12+00											UNKNOWN			
24" CI SALT AND 6" STEAM A	SALT WATER														UNKNOWN			
12" ABANDONED	WATER		17+00	5+00 +											UNKNOWN			
12"	WATER	14+-00													UNKNOWN			
1" COPPER	WATER	7+50													UNKNOWN			
ABANDONED	WATER		12+00	10+00											UNKNOWN			
ABANDONED	WATER		8+00	5+50											UNKNOWN			

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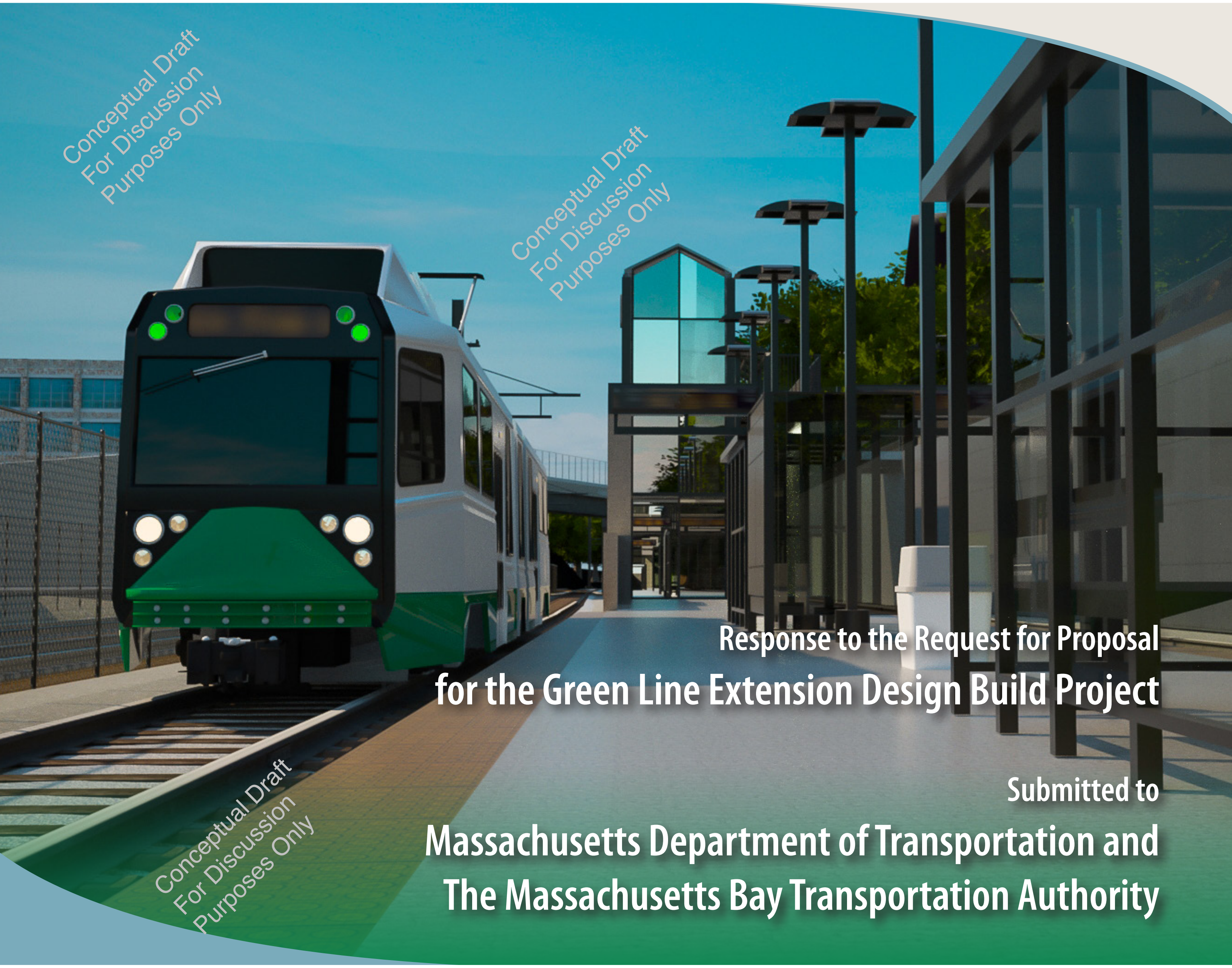


Response to the Request for Proposal for the Green Line Extension Design Build Project

Submitted to

Massachusetts Department of Transportation and The Massachusetts Bay Transportation Authority

Part 5 – Key Personnel and Experience Qualitative Evaluation Criteria Information

GLX CONSTRUCTORS

TABLE OF CONTENTS

PART 5

5. KEY PERSONNEL AND EXPERIENCE

GLX Constructors team members and key personnel have experience working together on large, complex transportation projects and with the MBTA. Our team was specifically formed to bring the best personnel together to design and build the Green Line Extension DB Project.

GLX Constructors has assembled a team of top industry professionals for the key positions needed to design and build the Green Line Extension DB Project. Our dedicated key personnel will work together to manage all aspects of the Project in a quality, timely, and effective manner to deliver the Project to the MBTA and stakeholders.

“GLX Constructors brings a senior DB management team with an average of 38 years of relevant experience.

The majority of this team, including John West, Jamie Doyle, Clyde Joseph, Mark Pelletier, Aaron Neely, and Lloyd Lovell have been working on the pursuit of this project since shortly after submission of our Letter Of Interest, with several having been dedicated full time since shortlisting. They have developed the necessary project knowledge, synergy and inter-personal relationships necessary in all successful teams, and will undoubtedly provide the MBTA with an outstanding combination of dedication, professional knowledge, experience and the partnering approach needed to make this project a success for all.

Each of the identified resources have demonstrated experience and expertise in producing quality work on large DB and/or light rail transit projects both locally and nationally. In addition, many of our key personnel have individually and collectively delivered rail projects in dense urban environments including active rail and integration with new and existing systems.

Highlights of our proposed key personnel and why their experience will bring value to GLX Constructors follow.

John West, Project Manager

- Extensive DB experience in the transportation industry
- Active rail corridor experience
- Experience working with proposed DBE Compliance Lead, Lloyd Lovell
- Stakeholder coordination
- Start-up, commissioning, and systems integration
- Title VI Program implementation

Percentage of Time Dedicated to the Project: **100%**

Chris Poe, Project Safety and Security Manager

- DB experience
- Urban transit experience
- Track record in safety improvement during construction
- Expert in development of large, complex projects with multiple stakeholders

Percentage of Time Dedicated to the Project: **100%**

Jamie Doyle, Construction Manager

- DB experience
- Local knowledge
- Experience working with MBTA
- Experience working with proposed Design Manager, Mark Pelletier
- Urban transit experience
- Large complex project experience

Percentage of Time Dedicated to the Project: **100%**

Mark Pelletier, PE, Design Manager

- Experience working with MBTA
- Local knowledge
- Experience managing large design teams
- Extensive rail transit experience
- Systems integration
- Start-up, testing, and commissioning experience

Percentage of Time Dedicated to the Project: **100%**

Bob Horn, Project Controls Manager

- DB experience in the transportation industry
- Experience working with proposed Design Build Coordinator, Michael Hoitink
- Rail transit experience
- 36 years of project controls experience

Percentage of Time Dedicated to the Project: **100%**

Aaron Neeley, Systems Integration Manager and Testing and Commissioning Manager

- DB experience
- Testing, commissioning
- Systems integration
- Tie in to existing systems
- Heavy rail mass transit and LRT systems installation

Percentage of Time Dedicated to the Project: **100%**

Sandro Plutino, Quality Manager

- DB experience in the transportation industry
- Experience working with proposed Design Build Coordinator, Michael Hoitink
- Rail transit experience
- Heavy civil construction experience

Percentage of Time Dedicated to the Project: **100%**

Hannah Brockhaus, Title VI Program Lead

- Title IV Program compliance
- Public involvement and public outreach specialist
- Experience with MassDOT
- Coordinates project meetings and community briefings

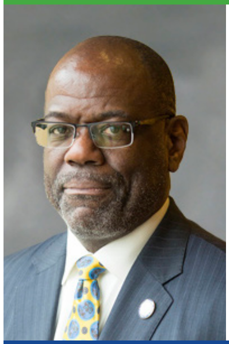
Percentage of Time Dedicated to the Project: **100%**

Hannah Carmical, EEO Compliance Lead

- Experience managing compliance with:
  - EEO Affirmative Action reporting
  - OFCCP
  - FHWA regulations for Federally assisted projects
- DB project experience

Percentage of Time Dedicated to the Project: **100%**

Lloyd Lovell, DBE Compliance Lead



- Experience working with proposed Project Manager, John West
- Title VI program compliance
- Alternative delivery experience
- DBE program development and implementation
- Rail transit experience
- Community outreach

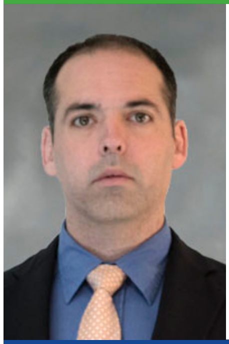
Percentage of Time Dedicated to the Project: **100%**

Clyde Joseph, Project Executive

- Extensive heavy civil engineering and construction experience
- Extensive project management experience
- Extensive DB experience
- Experience with rail construction – heavy and light rail
- Quality management and strong safety management experience
- Stakeholder coordination

Percentage of Time Dedicated to the Project: **100%**

Michael Hoitink, Design Build Coordinator



- DB experience in the rail/transit industry
- Systems integration
- Experience working with proposed Project Controls Manager, Bob Horn
- Start-up, testing, and commissioning
- Urban environment
- Stakeholder coordination

Percentage of Time Dedicated to the Project: **100%**

STATEMENT OF COMMITMENT

GLX Constructors commits that the individuals designated as key personnel shall be available onsite in Boston for the duration of their work assignments to the extent within GLX Constructors' control.

FORM T – KEY PERSONNEL INFORMATION AND RÉSUMÉS

Please see attached Form T – Key Personnel Information and Résumés for GLX Constructors' proposed Key Personnel.

Form T

Key Personnel Information

FORM T

KEY PERSONNEL INFORMATION

Name of Proposer: GLX Constructors

Position	Name	Years of Applicable Experience	Education/ Registration	Parent Firm Name	Percent of Time Dedicated to Project
Project Manager	John West	45 years	B.S., Construction Management, Colorado State University	Herzog	100%
Project Safety and Security Manager	David (Chris) Poe	29 years	B.S., Occupational Safety and Health, Columbia Southern University A.S., Electrical Design/CAD Electronics, Eastfield College	Fluor	100%
Construction Manager	Jamie Doyle	35 years	MSCE, Construction Engineering and Management, Stanford University B.S., Mechanical Engineering and Architecture (Double Major), Yale University	Middlesex	100%
Design Manager	Mark Pelletier	34 years	B.S., Civil Engineering, University of Massachusetts	STV Incorporated	100%
Project Controls Manager	Robert (Bob) Horn	36 years	B.S., Industrial Management, Colorado State University	Fluor	100%

Position	Name	Years of Applicable Experience	Education/ Registration	Parent Firm Name	Percent of Time Dedicated to Project
Systems Integration Manager	Aaron Neeley	24 years	Business Financial Management, Cincinnati State University Theology, Old Testament History, Cincinnati Bible College Construction Estimating/Management, Red Rocks Community College Business Management/Law, Indiana University East Management Certification, Collin College, Frisco, Texas	Balfour Beatty Infrastructure, Inc.	100%
Quality Manager	Sandro Plutino	42 years	B.S., Construction Engineering, Italian Technical Institute, Vittorio Bottego	Fluor	100%
Title VI Program Lead	Hannah Brockhaus	4 years	B.S., Urban and Regional Studies/ Landscape Studies, Cornell University	Howard Stein Hudson Associates	100%
EEO Compliance Lead	Hannah Carmical	8 years	B.A., Art History, College of Charleston	Fluor	100%
DBE Compliance Lead	Lloyd E. Lovell	20 years	B.S., Business Administration, University of Phoenix A.A.S., Science/Industrial Management, NCC NY	Herzog	100%

Position	Name	Years of Applicable Experience	Education/ Registration	Parent Firm Name	Percent of Time Dedicated to Project
Testing and Commissioning Manager	Aaron Neeley	24 years	Business Financial Management, Cincinnati State University Theology, Old Testament History, Cincinnati Bible College Construction Estimating/Management, Red Rocks Community College Business Management/Law, Indiana University East Management Certification, Collin College, Frisco, Texas	Balfour Beatty Infrastructure, Inc.	100%
***Project Executive**	Clyde L. Joseph, PE	37 years	B.S., Civil Engineering, University of Washington	Fluor	100%
***Design Build Coordinator**	Michael Hoitink	15 years	B.S., Civil Engineering, Clarkson University	Fluor	100%

* Additional Committed Key Personnel

Use additional sheets when needed.

Key Personnel Résumés

JOHN WEST

Project Manager

Valuable Experience:
- ✓ Design-Build
- ✓ Light Rail
- ✓ Active Rail Corridor
- ✓ Large Project

Years of Experience:	45
Education:	B.S., Construction Management, Colorado State University
Professional License/ Certification:	Registered Professional Mechanical Engineer, California

John has extensive experience in the heavy/civil and track construction industry. As a project manager, he has overseen all aspects of nearly $3 billion in construction and transit projects. He is currently closing out the $876 million Silicon Valley Berryessa Light Rail Extension project in Milpitas, California. This DB project entails 10 miles of double track. He also completed the $438 million RTD West Rail Line project in Denver, Colorado, providing our team with a wealth of alternative delivery knowledge and leadership. He worked in close cooperation with the owner, designers, stakeholders, and other project members to deliver this project 8 weeks ahead of schedule.

DESCRIPTION OF COMPARABLE PROJECTS

Massachusetts Bay Transportation Authority, Green Line Extension CM/GC Project, Boston, Massachusetts. John served as the proposed project manager on the initial Green Line Extension CM/GC project. He was responsible for leading the proposal effort including refinement of project scope, budget, and schedule. John was responsible for selecting the best project team emphasizing critical aspects of the project. He also prepared for the project by quantifying work, developing design and construction alternatives, supporting DBE outreach efforts, soliciting subcontractors, and identifying potential risks.

Santa Clara Valley Transportation Authority, Silicon Valley Berryessa Extension, Milpitas, California. John served as project manager responsible for all design and construction coordination with the designer, owner, and the Bay Area Rapid Transit (BART) on this complex $867 million, design-build project. His primary responsibility was overseeing the trackwork and utility disciplines. The scope consisted of constructing 10 miles of double track, demolition of existing track, third-party relocates, and two stations. He was also responsible for coordinating the overall budget of the discipline and organizing constructability and value engineering concepts to better the project and the final product for the client.

Regional Transportation District, West Rail Line, Denver, Colorado. John served as project manager responsible for coordinating the proposal

REFERENCES

Jim Starling, PE
Former Project Manager
Regional Transportation District
Jacobs, 401 B Street, Suite 920,
San Diego, California 92101
303.819.4281
jim.starling@jacobs.com

Rick Clarke
Former Executive Director
Regional Transportation District
One Gateway Plaza, MS99-17,
Los Angeles, California 90012-2952,
303.299.218
clarker@metro.net

estimate, negotiating contract terms and conditions, leading preconstruction efforts, and managing the $370 million, 12.1-mile, LRT project through final completion. The project corridor was through a heavy urban area requiring extensive utility relocation and road re-routing. He managed successful project delivery, completing the project ahead of schedule and within budget, while overseeing a project staff of more than 300 employees and 100 subcontractors, including trucking. Mentored numerous DBE firms throughout the project making them stronger firms to build future projects.

Dallas Area Rapid Transit, Dallas Urban Circulator Streetcar System, Dallas, Texas. John served as project manager for this streetcar project centered in a heavily urban area of downtown Dallas, Texas. He held overall responsibility for acquiring temporary right of entry access for project activities on public and privately held owner property. Oversaw the day-to-day coordination with, and notification to adjacent property owners and businesses regarding the disruption due to the work scheduled. Many of the underground utilities were unknown or not marked in the correct locations, making this project more challenging. Herzog built the fixed trackwork, traction-power substations, OCS, and signaling systems. The extension was designed and built to allow the operability of the modern streetcars. The extension was a feeder line improving transit integration between the streetcar and light-rail system in downtown.

E-470 Tollway, Segments 2 and 3 Structures Design-Build, Aurora and Commerce City, Colorado. John provided executive oversight for the construction of all long span bridges on segments 2 and 3 of the tollway with an initial value of $63 million. Through the course of 3 years, John worked to develop a budget that would fit within the owner's revised bonding constraints. Once the project was funded, his team constructed 16 bridges in less than 2 years through a process of industrializing crews in specialized functions.

Colorado DOT, US 50 @ Salt Creek Bridge, Pueblo, Colorado. This was a 2-year project consisting of construction of four precast concrete girder bridges on US 50 over Salt Creek and the Union Pacific Railroad, which also included numerous cast-in-place and precast retaining-walls, storm drainage, creek channelization, roadway construction, water lines, electrical improvements, and signalization. As Operations Manager, John coordinated construction workers, subcontractors, general contractors, and architects. Prepared contracts and bids, estimated costs, made schedules, and ensured the project stayed within budget.

TARCO, Inc., US Highway 36/96th Street Interchange CM/GC, Broomfield, Colorado. Construction included a park-n-ride facility, bus lanes ZIP shuttle transit bridges, retaining walls, storm drainage, storm water-detention reservoirs, roadway construction, cast-in-place concrete-guardrail, new vehicular bridges, pedestrian underpass, lighting, and signalization. John worked with designers on constructability reviews and prepared preliminary estimates for design alternates. As the EVP, John mentored and managed team members, while developing client relationships.

DAVID (CHRIS) POE

Project Safety and Security Manager

Valuable Experience:
- ✓ Design-Build
- ✓ Urban Transit
- ✓ Development of large complex projects

Years of Experience:	29
Education:	B.S., Occupational Safety and Health, Columbia Southern University A.S., Electrical Design/CAD Electronics, Eastfield College
Professional Licenses/ Certifications:	Certified Safety Professional – CSP Certified Healthcare Safety Professional Commercial Driver's License – A CDL Virginia Master Electrician American Society of Safety Engineers

Chris has more than 29 years of health, safety and environmental (HSE) experience. His project experience includes heavy industrial construction, light rail/tunneling, track maintenance, and corporate experience as a vice president of safety and risk. Industries supported include highway, light ail, tunneling, power generation, chemical, petrochemical, telecommunications, manufacturing, and commercial construction. Chris has developed a people based safety program achieving zero harm for craft and subcontractor employees. He has experience with mining and tunneling projects for some of the world's leading mining companies such as Phelps Dodge and Barrick Gold and also for many light rail and subways projects for clients such as Los Angeles MTA; Washington Metropolitan Area Transit Authority (WMATA), Washington, D.C.; Sun Coast Parkway, Tampa, Florida; DART, Dallas, Texas, and I-895, Richmond, Virginia.

DESCRIPTION OF COMPARABLE PROJECTS

Mona Electric Group, Various Projects and Locations, Safety Director. As safety director clients include DOD, Baltimore MTA, WMATA, Capital One, DC Water Authority, Amazon, and various other private clients. Assignment activities include managing two field safety managers, implementing fire protection and safety programs, developing training, and delivering statistical analysis to the principal ownership. Developed and implemented safety metrics that incorporated leading/lagging indicators, communication, and people based safety. Develop, implement, and review fire protection and HSE programs for continuous company improvement. Evaluate loss analysis trends to forecast anticipated future results. Develop operating budgets for fleet, safety, and claims and establish company goals to measure impact on implemented safety and risk programs.

REFERENCES

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Jordan Foster Construction/Four Hats Inc., Various Projects and Locations, Vice President of Safety and Risk Management. Clients included CSX Railroad, Amtrac, UTEP, Texas DOT, El Paso Air Port Authority, Customs and Boarder Protection, and Department of Homeland Security. Supervised 16 remotely located safety professionals and one claims administrative assistant within the Jordan Foster and Four Hats operating districts. Responsible for auditing all federal, state, and local documentation requirements insurance lines and CCIP program for the company including purchasing insurance, broker/carrier relations, closure/subrogation of claims and assessment of financial risk, auditing placement and removal of traffic control devices on a daily basis, establishing lane shifts as directed client, and providing all equipment and devices for client worker protection while working in roadways. Conducted ATTSA certified Flagger training. Designed, implemented, and rolled out new safety programs designed to minimize risk and eliminate exposure for railroad, high rise, highway, refinery, pipeline, highway, and commercial/residential construction projects. Developed, organized, and monitored safety department operating budgets.

Fluor Barrick Gold, Pascua-Lama Gold/Silver/Copper Mine Project, Chile, Argentina, Senior Safety Manager. Managed up to 28 staff members and was responsible for the implementation of the HSE program for 3,000 Fluor and contractor personnel located at the project site. Developed and implemented safety metrics that incorporated leading/lagging indicators, communication, and people based safety. Developed, implemented, and ensured delivery of project required OSHA, MSHA, and Chilean law required training. Conducted "Tap Root" incident analysis for all near miss and incidents occurring on the project. Performed process/job hazard analyses, fire protection surveys, and environmental impact and storm water assessments and performed analysis of regulations against project needs so that designs complied with HSE and environmental regulations.

Hensel Phelps Construction Co, Various Projects and Locations in the Mid-Atlantic District, Safety Director. Clients included Baltimore MTA, WMATA, the Department of Defense, the U.S. Department of State, Digital Reality, Marriott, National Security Agency, and the U.S. Army Corp of Engineers. Supervised eight safety professionals on large, complex city infrastructure and transit projects. Responsibilities included assessment, development, and execution of risk management and fire protection programs. Performed planning and annual goal setting related to risk management and incurred claims (work comp, auto, general liability, and builders risk coverage). Managed and directed the day-to-day activities of the risk management effort to achieve strategic goals. Supported risk reporting for craft personnel and project teams. Developed and delivered fire protection and safety training for various aspects of construction and insurance risks.

JAMIE DOYLE

Construction Manager

Valuable Experience:
- ✓ MBTA
- ✓ Light Rail
- ✓ Large Construction Site

Years of Experience:	35
Education:	MSCE, Construction Engineering and Management, Stanford University B.S., Mechanical Engineering and Architecture (Double Major), Yale University
Professional License/ Certification:	Massachusetts Board of Building – Licensed Construction Supervisor (CS-023550)

Jamie has 35 years of construction experience, the majority of which has been in transportation and infrastructure construction project management.

His previous experience was as the joint venture Project Manager for the Massachusetts Bay Transportation Authority (MBTA) – Greenbush Commuter Railroad Design-Build (DB) Project. In addition to having completed a DB project with the MBTA, he also worked previously with the GLX Constructors' designer, STV, and partner, Balfour Beatty. In particular, Jamie has worked directly with proposed Design Manager, Mark Pelletier, and GLX Constructors' Executive Committee member, Roger Wilson.

In addition to his extensive civil and structural construction experience, he has a strong background in building work and harmonizing architectural requirements with the construction process. His transportation and infrastructure project management experience includes working in environmentally sensitive construction sites and within urban communities under tight schedules.

DESCRIPTION OF COMPARABLE PROJECTS

MBTA – Greenbush Commuter Railroad DB Project, Braintree to Scituate, Massachusetts, Project Manager. Jamie was responsible for design and construction of the Greenbush section of the Old Colony Railroad Rehabilitation Project. He managed construction of 18 miles of track and signal, including two cut-and-cover tunnel sections, five railroad and eight highway bridges (including three river crossings), 24 grade crossings, a maintenance facility, and seven stations through extensive wetland and suburban environments. This $338 million project was completed on schedule.

REFERENCES

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Joe Allegro, P.E.
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Massachusetts Highway Department – Central Artery I-93 North Station Tunnel, Boston, Massachusetts, Project Manager. Jamie estimated and site managed the construction of the CA/T North Station Tunnel and Charles River Bridge south approach (C15A2). The project included construction of 1,100 feet of cut-and-cover tunnel sections and a 10 lane bridge approach through Boston's urban environment. The work included utility relocations, 420,000 square feet of slurry wall, drilled caissons, underpinning 1,600 feet of existing elevated I-93, installation of temporary traffic decks, support of excavation, 520,000 cubic yards (CY) of excavation, and 150,000 CY of CIP concrete.

Massachusetts Department of Transportation, Drawbridge Replacement Bridge – Beach Road over Lagoon Pond, Oak Bluffs-Tisbury, Massachusetts, Project Manager. Jamie oversaw the construction of replacement bascule bridge, including in-water installation of cofferdams, 10,000 linear feet (LF) of driven pipe pile, 8,000 CY of CIP concrete and erection of six fixed-structural-steel spans and one bascule span. Scope included installation and commissioning of a bridge machinery system. His responsibilities included logistic coordination (barge and tug transport) for all crews, materials, and equipment to off shore project site. This $40 million project was completed on schedule.

Massachusetts Highway Department – Central Artery Tunnel North Point Park Infrastructure Project, Cambridge, Massachusetts. Jamie managed all construction work on the Charles River including 100,000 CY of excavation (80,000 CY contaminated); construction of 1,000 LF of water features (dredge, liners, and rip rap); five bridges over the Charles River water feature; and 2,500 LF of pile supported granite masonry which relieved platform seawall, utilities, and roadway and park improvements. This $33 million project was completed on schedule.

Massachusetts Highway Department – Logan Airport I-90 Egress Ramps, Boston, Massachusetts, Project Manager. Jamie estimated and completed site management for construction of egress ramps at Logan Airport. This project included construction of a 2,000 foot CIP concrete post/tensioned viaduct, installation of utilities, and driven pile foundations and roadwork. This $36 million project was completed on schedule.

General Electric – Hudson River Sediment Remediation Phase I, Fort Edward, New York, Project Manager. Jamie was responsible for the dredging of hazardous materials from the Hudson River and associated canals. The project included mobilizing and demobilizing 17 dredges, 27 hopper barges, and 24 tug and crew boats, installing 4 miles of shoreline protection, driving and removing 120,000 square feet of sheet pile wall, dredging 302,000 CY of hazardous materials, and capping 460,000 SY. This $97 million project was completed on schedule.

MARK W. PELLETIER, PE

Design Manager

Valuable Experience:

- ✓ Experience working with the MBTA
- ✓ Local knowledge
- ✓ Experience managing large design teams
- ✓ Extensive rail transit experience
- ✓ Systems integration
- ✓ Start-up, testing, and commissioning experience
- ✓ Coordination with design build teams

Years of Experience:	34
Education:	B.S., Civil Engineering; University of Massachusetts
Professional Licenses/ Certifications:	Professional Civil Engineer: MA #34750 Professional Structural Engineer: MA #37343

Mark has spent the better part of his 34-year career at STV helping improve service for MBTA customers, particularly along the Green Line. He has overseen the North Station Transportation Improvement, Green Line Light Rail Accessibility Program, and Copley Station Accessibility Improvements, all of which were complex, multidisciplinary efforts that helped make the nation's busiest light rail system better. Mark is well-versed in all facets of engineering, including feasibility studies, design, permitting, and construction staging, but his greatest skill is his ability to communicate client goals to stakeholders and design teams. This quality made him well-suited to serve as design manager for the Greenbush Line Rail Restoration Design-Build, a challenging, 5-year assignment requiring day-to-day oversight of 100 design professionals and 15 subconsultant firms. Mark's on-site leadership was integral to Greenbush's 2007 launch and helped win STV the 2010 Gold Award for professional design excellence from the American Council of Engineering Companies of Massachusetts. He will commit to the same level of dedication for the duration of the Project.

DESCRIPTION OF COMPARABLE PROJECTS

MBTA, Greenbush Line Rail Restoration Design Build, Braintree, Weymouth, Hingham, Cohasset, and Scituate, Massachusetts, Design Manager. Mark oversaw the $320 million complete design, including engineering services and management of all design consultants, for the reconstruction of the out-of-service railroad ROW. He led the design for the 18-mile ROW construction and oversaw the design for a five-legged roundabout, the rehabilitation of 10 railroad bridges, and eight highway bridges, including substructure and superstructure replacement, as well as seven stations and 28 grade crossings.

MassDOT, Longfellow Bridge Rehabilitation Design Build, Boston and Cambridge, Massachusetts, Principal-in-charge. Mark is overseeing the $255 million design build effort to rehabilitate the Longfellow Bridge, a 2,135-foot structure that carries Route 3 and the MBTA's Red Line over the Charles River. As the lead designer, STV provided multidisciplinary design

REFERENCES

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services for the bridge, as well as plans for trackwork, traction power, communications, and signals for the Red Line. When complete, the bridge will be AASHTO compliant and ADA compliant. The design phase is complete and the firm is providing construction support services for the contractor.

MassDOT, Fore River Bridge Replacement Design-Build, Quincy and Weymouth, Massachusetts, Project Manager/Principal-in-Charge. Mark was responsible for the alternatives analysis, permitting, achievement of 60% design, and preparation of bridging documents for design-build procurement for the $245-million vertical-lift bridge of Route 3A over the Fore River. He is currently overseeing construction-phase services and design peer reviews on behalf of MassDOT.

MBTA, Wellington Carhouse Expansion and Improvements, Medford, Massachusetts, Principal-in-Charge. Mark oversaw the design development and final design services for the MBTA's $80 million expansion of the Wellington Carhouse. The firm designed a 12,000-sf single-bay addition to the east side of the building, as well as upgrades to safety and security, and the MEP/fire protection systems.

WRTA, Bus Maintenance, Operations, and Storage Facility, Worcester, Massachusetts, Principal-in-Charge. Mark oversaw the design and construction of a two-story, 150,000 sf operations and maintenance facility for the Worcester Regional Transit Authority (WRTA). The firm provided architectural, structural, MEP, fire protection, industrial, traffic, and civil design services for the $75-million facility. STV also assisted WRTA and their owner's project manager with the RFQ preparation and selection process to secure a CMR for this project, in accordance with Massachusetts General Law Chapter 149A.

MBTA, Green Line Copley Station Accessibility Improvements, Boston, Massachusetts, Project Manager/Project Director. Mark directed the $20 million accessibility improvements and general renovation of historic underground Copley Station. The improvements included rehabilitation of historic head houses, raising station platforms by 8 inches to accommodate the MBTA's new low-floor vehicles, adding ADA-compliant elevators at station platforms, and installing CCTV systems.

ROBERT (BOB) M. HORN

Project Controls Manager

Valuable Experience:

- ✓ Design Build
- ✓ Rail Transit
- ✓ Project Controls

Years of Experience:	36
Education:	B.S., Industrial Management, Colorado State University
Professional License/ Certification:	Association for the Advancement of Cost Engineering International (AACEI)

Robert has more than 36 years of experience in project controls including 30 years specific to projects in infrastructure and telecommunications. His responsibilities have included all planning, scheduling, estimating, and cost control functions over a wide range of infrastructure, telecommunications, petrochemical, and oil and gas projects including, commuter light rail, public safety emergency communications (911), and wireless and wireline networks.

DESCRIPTION OF COMPARABLE PROJECTS

Denver Regional Transportation District, Eagle P3 Commuter Rail Line, Denver, Colorado, United States. Robert was responsible for all project controls functions inclusive of cost management, schedule, progress, and change management for Denver Transit Partners. This P3 project has a complex structure with multiple LLC joint ventures supporting the design-build, rolling stock vehicle procurement, and operation and maintenance of 40 miles of a commuter light rail system. The project schedule was resource and cost loaded to support client billing and progress on an earned value basis. The cost control system (Timberline) was resource loaded for use in evaluating earned value to manage the work and produce weekly and monthly reporting. Monthly schedule and cost reporting responsibility included the client, LLC Boards, and project management.

Minera Yanacocha SRL, Conga Earthworks Project, Cajamarca, Peru, Project Controls Cost Lead. Robert served as the Project Controls Cost Lead in the front-end/set-up phase for the Conga Earthworks Team (CET), a Fluor-led joint venture formed to perform the heavy civil works for the Conga mining project. Overall scope consisted of permanent and temporary access roads, retention dams, and multiple platforms for the construction of the processing plant. He developed the work breakdown structure (WBS) and cost coding structure to manage the cost of the project and support reporting requirements of the client. This SAP based coding structure was used to convert and load the estimate from HCSS estimating software into the cost control system (FDCost). The progress system (MileMarker℠) was used to

REFERENCES

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provide production reporting to the field based on the quantities moved, and in using this information, the forecast for each area would be updated in the cost system. He established the invoice billing format and process, set up weekly and monthly cost related reporting, and prepared the cost sections of the PEP and PPM.

London Underground Limited, London Underground Connect, London, England, Cost Control and Estimating Lead. Robert provided lead cost control and estimating responsibilities from the project tender phase through project execution and closeout on the London Underground Connect project, a 20-year joint venture contract with EPCM responsibility for upgrading the radio and transmission networks throughout the London subway system. He developed and coordinated the estimate, program, and commercial and risk assessment input during the project tender phase. After award, he implemented and managed the cost control system and reporting process. He prepared periodic project detail estimates and provided estimating support and reviews. Robert also performed statistical risk and contingency assessments and participated in financial and commercial evaluations.

Fluor, Telecommunications Support, Irvine/Aliso Viejo, California, United States, Principal Project Controls Specialist. Robert served as the Principal Project Controls Specialist supporting the telecom business line/ unit as project controls manager, lead estimator, and in general support of project controls execution on various projects and proposals. As Project Controls Manager, he was responsible for establishing and maintaining the project controls baseline, processes, and reporting for the following:

- City of Los Angeles, Public Safety System project, telecom engineering consulting services
- City of Los Angeles, Emergency Operations Center, architectural design services
- Nortel, Bell Mobility Canada project, project management oversight
- AT&T Wireless Services, Fixed wireless base station build out for 1,300 sites in six markets
- WorldCom, outside plant services
- Qwest, A&E design at 10 central office sites

He also served as Lead Estimator responsible for proposal estimating, scheduling, and pricing model support. Proposals of significant award included the Level 3 Network Expansion program, EPCM responsibility for fiber optic infrastructure to various sites within the United States, and the United Kingdom Highways Agency NRTS project which was a 10-year joint venture contract with EPCM responsibility for an integrated smart highway communications system across the United Kingdom road network.

AARON Q. NEELEY

Systems Integration Manager and Testing Commissioning Manager

Valuable Experience:

- ✓ Design-Build
- ✓ Large Light Rail
- ✓ System and Testing

Years of Experience:	24
Education:	Business Financial Management, Cincinnati State University Construction Estimating/Management, Red Rocks Community College Business Management/Law, Indiana University East Management Certification, Collin College, Frisco, Texas
Professional Licenses/ Certifications:	IBEW member. Journeyman Line Tech Classification through IBEW Local 71 Columbus, Ohio IMSA Level I, Level II and Work Zone Safety Project Manager Training, 6-month program, with Aldridge Electric Leadership Training, Giant Leap Consulting 30-hour OSHA Certification OST Crane and Rigging certification Completed training in NFPA 70, Excavation Competent Person, Confined Space, Railroad Safety, First Aid CPR, Cable Splicing, Fiber Splicing.

Aaron has 24 years of experience focused on heavy rail mass transit and LRT systems installation and rehabilitation. He has experience in design and design verification, procurement, installation, testing, and integration of overhead catenary, overhead conductor bar, third rail traction power, traction power substations, automated train control (relay and microprocessor based), and communications/SCADA (fiber and copper networks). Aaron has served as systems integration manager on several design build LRT projects including the Regional Transportation District's 2.3-mile, double track Southeast Rail Extension project.

DESCRIPTION OF COMPARABLE PROJECTS

Denver RTD, Southeast Rail Extension, Denver, Colorado, System Integration Manager. Aaron served as Systems Integration Manager for this $138 million, 2.3-mile, double track, design-build, LRT extension that connects three existing lines in metropolitan Denver. This project is a combination of aerial direct fixation track and at-grade ballasted track. The project includes

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three aerial structures (including on bridge over Interstate-25); three at-grade stations; a parking structure; OCS, a traction power substation, communications and signal systems.

Los Angeles County Metropolitan Transportation Authority (Metro) Crenshaw, LAX Project, Los Angeles, California. This is a $1.3 billion, 8.5-mile, double track, design-build, light rail connecting to the existing Green Line and terminating underground beneath the Exposition Station on the Blue Line. Aaron provided systems integration oversight. The $120 million systems subcontract consist of overhead catenary (SCAT and conductor rail), traction power substations, automated train control, and communications/SCADA systems.

Metro Westside Phase I Purple Line, Los Angeles, California, System Construction Manager. Aaron was responsinble for the $1.3 billion, 3.9-mile design-build subway extension from Wilshire/ Western Station to the new Wilshire/La Cienega Station. The systems subcontract included, traction power substations, connections to third rail, automated train control, and communications/SCADA systems.

Sound Transit Seattle S440 South Link Extension, Seattle, Washington. This was a $169 million project ($15.4 million systems) design-build contract providing a 1.8-mile aerial guideway extension south from SEATAC International Airport. The systems subcontract included two new traction power substations, new OCS (SCAT), automated train control, and communications/SCADA. Aaron was assigned as Interim Project Manager for seven months until the Tucson project staff completed their work.

Dallas Area Rapid Transportation (DART) Blue Line Expansion, Dallas, Texas, System Construction Manager. The project was a $188 million ($21 million systems) 4.8-mile design-build expansion of DART's Blue Line from Garland to Rowlett. The new line is comprised of double LRT track incorporating four at grade road crossings; one interlocking, block signal indicators; approximately 4500 feet of aerial structures; and one new light rail station. Aaron served as the Systems Construction Manager with responsibility for the installation and testing of the automated train control, communications, OCS (SCAT), and traction power substation systems.

SANDRO PLUTINO

Quality Manager

Valuable Experience:

- ✓ Extensive DB
- ✓ Urban Transportation
- ✓ Experience Implementing Quality Programs for Large, Heavy Civil Construction Projects

Years of Experience:	42
Education:	B.S., Construction Engineering, Italian Technical Institute, Vittorio Bottego
Professional Licenses/ Certifications:	NICET IV – Highway Construction (#74648) NJDOT Certificate of Completion – Traffic Control for Streets and Highway Construction and Maintenance Operations ATSSA – Traffic Control Supervisor (#00174457) NJ Society of Asphalt Technologists – Asphalt Paving Technologist VDOT Pavement Marking VDOT HCC Field VDOT Asphalt Concrete Field VDOT Slurry Surfacing VDOT Surface Treatment VDOT Soil and Aggregate Compaction DCR – Erosion & Sediment Control LADOTD – Structural Concrete Inspector LADOTD – Cement Concrete Pavement Inspector ISO 9001/2008: BSI/Internal Quality System Auditor (#7524990-83787)

Sandro possesses 42 years of quality control, field engineering, and construction management experience on major public projects involving all aspects of heavy civil construction. His most recent experience as Quality Manager and Quality Assurance Manager on the 95 and 495 Express Lanes, both large scale urban P3 projects, demonstrates his extensive knowledge of roadway and structure's construction methods, project controls techniques, procedures and practices, materials use and performance, environmental, and safety responsibilities related to transportation facilities.

DESCRIPTION OF COMPARABLE PROJECTS

Purple Line, Bethesda, Maryland, 95 Express Lanes, Fairfax County, Northern Virginia, Quality Assurance Manager. The I-95 Express Lanes is a design-build project to modify existing High Occupancy Vehicle (HOV) lanes into new High-Occupancy Toll (HOT) lanes on a 23 mile segment of I 95, with an additional eight miles of new extension. As the quality manager, Sandro has the overall responsibility for the implementation and management of

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the quality process as defined in the project Quality Management System Plan (QMSP) for both quality control (QC) and quality assurance (QA). Sandro manages all quality functions on the project, internal and external audits, statistical summaries of testing results, implementation of training programs, development, and implementation of specific project procedures to assure that contract requirements are met. Sandro is also accountable for the monthly status report of construction quality, report of deficiencies, and non conformances, and promoting awareness of the program.

I-495 Express Lanes, Fairfax County, Northern Virginia, Quality Assurance Manager. This design-build project introduced new high-occupancy toll (HOT) lanes to 14-mile segment of Capital Beltway (I 495). As the QA manager, Sandro led the QA effort to insure that the minimum QC/QA requirements established by the Virginia Department of Transportation (VDOT) for design-build and Private Public Transportation Act (PPTA) projects were met. Sandro was additionally responsible for managing the QA inspection, testing, and controlling, maintaining the QMSP and VDOT materials notebook, preparing audit checklists and reports, weekly and monthly status reports of construction quality, deficiencies and non-conformances, as well as promoting awareness of the program.

Pocahontas Parkway, Richmond, Virginia, Quality Assurance Manager. Sandro was responsible for providing the overall quality assurance and compliance of construction activities related to the approved drawings, specifications, and other similarly related documents. Additional responsibilities included management of two independent materials testing agencies, review of materials test requirements, and his recommendation to accept or reject materials and constructed elements. Sandro was responsible from time of discovery to resolution, of all materials and finished elements incorporated in the project and identified as a deficiency by Non Conformance Reports (NCRs).

Routes 40 and 322, Section 3K, Egg Harbor Township, New Jersey, Resident Engineer. Sandro is responsible for this $7 million reconstruction and widening effort. As Resident engineer, he coordinated the extensive utilities relocation effort and the new utility installation work, with full authority to provide plan changes for unexpected utility conflicts, and for the resolution of field construction problems and design issues. The project encompassed wide-ranging coordination of utility companies to minimize impact to residents and businesses along Routes 40 and 322, Section K.

HANNAH BROCKHAUS

Title VI Program Lead

Valuable Experience:
- ✓ Local
- ✓ Title VI Compliance
- ✓ Public Involvement

Years of Experience: 4

Education: B.S., Urban and Regional Studies/Landscape Studies, Cornell University

Hannah is a Public Involvement Specialist with project experience including the Mount Auburn Street Corridor Study, Allston I-90 Interchange Improvement Project, and the Casey Arborway Project. She has worked in active transportation, affordable housing, and community development; and she is able to effectively communicate complex project details to the broader public. Hannah's work shepherding projects, from conceptual design through construction, ensure a public process that can move forward in a timely and efficient manner.

DESCRIPTION OF COMPARABLE PROJECTS

Massachusetts Department of Transportation, I-90 Toll Plaza Demolition and Roadway Reconstruction Project, Massachusetts. In providing meeting presentations for the project website of this high-profile project, Hannah ensures Title VI compliance as well as web accessibility. The stakeholder notification process ensures full notice to local community groups, including groups with limited to no English proficiency, across the state.

Department of Conservation and Recreation (DCR), Mount Auburn Street Corridor Study, Cambridge/Watertown, Massachusetts. The objectives of this study are to identify improvements to safety, comfort, and operations for all modes of transportation that use the roadways in the traffic study area. Currently serving as a public involvement specialist, Hannah works closely with DCR staff and the project team to coordinate public outreach and project messaging. She also develops materials for meetings and the project website, manages public input, and manages the stakeholder database. In addition, she leads the documentation of the outreach process, including creating detailed meeting minutes, and thus has managed Title VI compliance.

Massachusetts Department of Transportation, Allston I-90 Interchange Improvement Project, Allston, Massachusetts. This multimodal transportation project will vastly improve cycling and pedestrian conditions in Allston, recreate a rail transit link to downtown Boston, and reconnect Allston to itself and the Charles River while processing vehicles effectively, ensuring that highway traffic does not leak onto residential streets. Hannah works with

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the design team to bring information to the community and coordinate input gathering as the project moves through the environmental phase. She has ensured all information presented during public and task force meetings is fully accessible, including PowerPoint presentations, draft roll plans, and draft construction staging diagrams.

Massachusetts Department of Transportation, North Washington Street Bridge Replacement Project, Boston, Massachusetts. The goal of the project is to replace the structurally deficient North Washington Street Bridge with a new structure that will create a bridge that is livable, walkable, green, and multi-modal. Hannah coordinates project meetings and community briefings, creates detailed meeting minutes, and manages the stakeholder database for the project. She also manages accessibility compliance for all presentations and minutes.

Massachusetts Department of Transportation, I-95 Add-A-Lane, Needham/Wellesley, Massachusetts. Hannah is providing public involvement support on this project, which will add an additional travel lane and shoulder to I-95 north and southbound, upgrade and create new interchanges for safer and more efficient movements on and off the highway, and provide new collector-distributor roads to minimize weaving movements. Hannah's work has included producing materials for the project website, such as graphics, briefings, and email blasts, in addition to producing detailed meeting minutes for public meetings. She has worked closely with MassDOT web services staff to ensure Title VI compliance for all information uploaded to the project website, including meeting presentations and construction detour maps.

Massachusetts Department of Transportation, Casey Arborway, Boston, Massachusetts. MassDOT gathered an interdisciplinary team of engineers, planners, and urban design professionals to determine how best to replace the structurally deficient Casey Overpass. Located in the Jamaica Plain neighborhood, the Casey Overpass carries Route 203, locally known as the Arborway, and a primary east-west connecting route in the area over Forest Hills, a commuter hub including major north-south roadway, bicycle, pedestrian, and transit connections. Hannah ensures Title VI compliance in all public outreach activities, including construction and traffic shift notices and meeting documentation. Standard practice includes providing Spanish translations of meeting notices, as well as fully accessible documents for the project website.

HANNAH CARMICAL

EEO Compliance Lead

Valuable Experience:

- ✓ EEO Compliance
- ✓ EEOC Training
- ✓ Managing Diversity

Years of Experience: 8

Education: B.A., Art History, College of Charleston

Professional License/ Certification: PHR SHRM-CP

Hannah has more than 8 years of professional experience in the Nuclear Power, Government, Commercial, and Infrastructure business lines. Most recently, Hannah served as the HR/EEO Compliance Officer for the New York State Thruway Authority's Tappan Zee Hudson River Crossing project for Fluor. Additionally, Hannah has worked as a human resources generalist for Fluor's Corporate Health, Safety and Environmental (HSE) division. Her responsibilities have included overseeing corporate and field HSE employees, both international and domestic, leading the coordination team under the Talent Acquisition Group (TAG), upholding overall work processes within the TAG coordination group with continued alignment within Fluor Human Resources (HR), developing and implementing desktop procedures, and practices pertaining to the vendor and client submittal process.

DESCRIPTION OF COMPARABLE PROJECTS

New York State Thruway Authority, Tappan Zee Hudson River Crossing Project, Tarrytown, New York, United States, Human Resources Manager. As the human resources manager, responsible for providing EEO Compliance Support and guidance to the project for all members of the LLC, their staff and direct hire union craft. Responsible for development of project specific procedures and policies for implementation (Employee Work Rules, HR Section of Project Procedures Manual, HR Management Plan, Workforce Participation Plan). Work with project management to fulfill contractual and partnering agreements related to HR, including: EEOC and Affirmative Action reporting, OFCCP and FHWA compliance for Federally Assisted Projects, Davis-Bacon requirements, staffing management, employee relations and policy implementation and enforcement. Responsible for the onboarding of craft new hires (orientation, processing paperwork, E-Verify, SAC, MVR, training documents, certification management), administering new hire orientation for Fluor employees and development and implementation of project orientation for all project hires. Work with HSE to ensure proper compliance regarding safety practices and developing project specific vehicle and motor vehicle records policies to help mitigate risk. Partner with labor relations for union hires and dispute resolution. Understanding of Project Labor Agreement (PLA)

REFERENCES

Tracey Mitchell
Diversity Compliance Manager
NYS Thruway Authority
303 S. Broadway Tarrytown, NY 10591
914.524.5482
Tracey.Mitchell@newnybridge.com

John Kowalski
Commercial & Contracts Directors
NYS Thruway Authority
555 White Plains Road, Suite 400
Tarrytown, NY 10591
914.524.5440
John.Kowalski@newnybridge.com

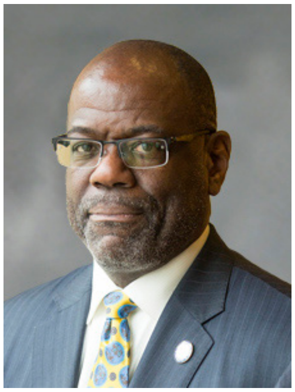
and specific Collective Bargaining Agreements (CBA) for unions present on project. Partner with project controls and business services to track and properly forecast HR specific project budgets and ensure overall compliance by member employees.

Fluor, Human Resources, Greenville, South Carolina, United States, HR Generalist and ETWeb Administrator for corporate HSE. Responsible for tracking and retaining HSE employees, international and domestic, for all SBU's, performance assessment administration, coordinating assignments and relocations, processing LOA's, separations and terminations, general recruiting duties, maintenance of internal and external bench list and weekly placement activity report and the development and implementation of the corporate HSE internship program. Supported all projects regarding HSE staffing efforts and HR issues that pertained to HSE employees. Supported corporate HSE (20) and field HSE (500) employees on all HR issues, provided problem resolution, and timely feedback. Worked with business unit leads regarding staffing augmentation and management of HSE employees and resources; including managing PA supervisors and approvers, cost center and org unit alignment, compensation reviews, out of cycles, general benefits inquiries, annual salary and hierarchy reviews, training and development, and all other general HR administrative issues.

Fluor Government Group, LOGCAP IV Overview, Greenville, South Carolina, United States. Provided home office coordination support for the LOGCAP IV Project, taking on the recruiting coordinator lead role in the summer of 2010. Responsible for work load distribution for a team of three and overall guidance and oversight for a team of eight coordinators, HR technicians and specialists working in Greenville and Houston. Worked closely with recruiting, HR, the CONUS Replacement Center (CRC), and industrial security to manage incoming candidates for the LOGCAP IV Task Orders. Responsible for tracking candidate progress and providing metrics throughout the hire process. Project Assignment Tracking System (PATS) power user for recruiting. Responsible for working with information services to develop and implement improvements to PATS, including providing guidance on recruiting work process flow to allow for a more intuitive system. Prepared weekly reports from PATS, identifying candidates cleared for hire and insuring government compliance. Worked with quality to develop the LOGCAP IV HR process flow in reference to the coordination process. Provided guidance on the background investigation process, working with legal and functional HR to maintain compliance with Fluor policy and consistency with final determinations regarding background discrepancies.

LLOYD LOVELL

DBE Compliance Lead



Valuable Experience:
- ✓ DBE Implementation
- ✓ Outreach Event
- ✓ DBE Plan Development

Years of Experience:	20
Education:	B.S., Business Administration, University of Phoenix A.A.S., Science/Industrial Management, NCC NY
Professional License/ Certification:	PHR SHRM-CP

Lloyd has 20 years of experience in designing, developing, implementing, and managing small, minority, women, and disadvantaged business enterprise programs (DBE) in the United States and the Caribbean. His experience includes administering contract compliance programs, small and local preference, vendor relations, and coordinating, supervising, and implementing comprehensive outreach and technical assistance programs that inform and prepare vendors for business opportunities. His clients include public and private sector businesses, Fortune 100 companies, local governmental agencies, housing authorities, as well as construction management and program management firms.

DESCRIPTION OF COMPARABLE PROJECTS

City of Kansas City, Kansas City, Missouri, Kansas City Downtown Streetcar CM@Risk. This starter project entailed the construction of 4 round trip miles of track for Kansas City. The project included major water and sewer relocations, 18 platform stops, traffic signal and street lighting, four TPSS substations, OCS system, and a new three-bay vehicle maintenance facility. Herzog was the Managing Partner of the joint venture for this $88 million project. The pre-construction phase lasted four months, in which multiple estimates and value engineering were performed. Lloyd was responsible for maximizing DBE and workforce participation throughout pre-construction and construction phases of the project. He coordinated technical and administrative support for DBE firms in accordance with 49 CFR Part 26 and monitored opportunities for additional DBE participation. Lloyd interfaced with KCMO City Staff, initiated, and reported on outreach activities. He provided updates on DBE participation percentages, identified additional opportunities as necessary, and monitored and managed all DBE subcontractors with regard to DBE and workforce compliance. Lloyd sees himself as an extension of every DBE Firm working on this project and stands ready to assist them with any DBE related or workforce goal questions, whether it be technical or administrative.

REFERENCES

Mr. Terry Nolan
General Manager
Highlands Ranch Metro District
62 W. Plaza Drive, Highlands Ranch
Colorado 80129
303.785.0320
tnolan@highlandsranch.org

Phillip Yelder
Director, Human Relations Department
City of Kansas City
4th Floor, City Hall, 414 East 12th Street
Kansas City, Missouri 64106
816.513.1801
hillip.yelder@kcmo.org

Regional Transportation District, Denver, Colorado, West Rail Line CM/GC. Under the direct supervision of the CM/GC project manager (John West), Lloyd directed, developed, and administered all aspects of the disadvantaged business enterprise program and oversaw all activities of the small and local business enterprise program. He maintained ongoing relationships between the Owner, external business organizations, and community organizations, advising them of opportunities to meet and exceed the 18 percent DBE goal by 6 to 24 percent and paying out $79 million to 90 local DBE firms. This was a $438 million CM/GC project that involved the construction of a 12.1-mile light rail extension with 12 stations and numerous bridge structures from Denver westward to Golden in Jefferson County.

Highlands Ranch Community Association, Highlands Ranch, Colorado, Community Manager. This was one of the largest master planned communities in the United States valued at $1.5 billion. It includes home ownership units, market rate rental, retail, commercial, office development, cultural centers, a town center, schools, RTD park-n-ride facilities, RTD bus shelters, libraries, parks and open-space trails, and recreation facilities. Lloyd served as Community Manager and was responsible for working with the Colorado Department of Transportation, the Denver Regional Council of Governments, the RTD board of directors and staff, the Douglas County School Board, the Master Developer (Mission Viejo Company, later Shea Homes), the Highlands Ranch Community Association board of directors, community residents, and groups, vendors, builders, and other stakeholders. He was responsible for managing the Highlands Ranch Community Association consisted of 20,000 units (47,000 residents) and four facilities. Additionally, Lloyd met with community residents, groups, vendors, and contractors to interpret, clarify, and discuss HRCA policies, goals, and objectives. Further, he was responsible for interfacing with HRCA finance, architectural, development, future facilities, vendor/contractor management groups, management information systems, and recreational advisory committees on all related development activities.

Ben & Jerry's Ice Cream, Caribbean, International. Responsible for all aspects of the design, development, implementation, and administration of disadvantaged business development programs, including vendor relations, community outreach, and using radio and newspapers to prepare vendor(s) for business opportunities in the distribution and marketing of Dreyer's/Edy's/Ben & Jerry's Ice Cream products throughout 21 Caribbean countries.

CLYDE L. JOSEPH, PE

Project Executive

Valuable Experience:

- ✓ Heavy Civil Project
- ✓ Railroad, Bridge, and Tunnel
- ✓ Project Management

Years of Experience: 37

Education: B.S., Civil Engineering, University of Washington

Professional Licenses/ Certifications: PE in Idaho (#5564 July 1987)
PE in Tennessee (#19957 July 1988)

Clyde has more than 37 years of project engineering, project management, construction, and design management experience in heavy civil infrastructure projects, including railroad construction, tunnel construction, bridge and highway construction, and all types of utility construction. The majority of this time has been spent with railroad, bridge, and tunnel construction which will provide valuable experience and leadership to the Green Line Extension Project. He has a proven record of people management and mentorship, schedule and cost management, quality management, and strong safety management and results. The variety of his experience in all aspects of infrastructure projects will provide valuable capabilities to the management and execution of the Project.

Much of Clyde's experience has been in the proposal and procurement of heavy civil projects followed by management of those projects from start-up to completion. This management experience has included the design, estimating, construction, client approvals, public and local municipality outreach, contract modifications and negotiations, contract plans, and submittals and final acceptance documents.

DESCRIPTION OF COMPARABLE PROJECTS

Fluor, Infrastructure, Aliso Viejo, California, Senior Project Director. His current responsibilities include proposal preparation and review, estimate review, and executive management review for design build projects in excess of $1 billion in value.

Tutor Saliba/Tutor Perini Corp., Various Projects and Locations, Engineering Manager. As engineering manager on the SR99 Bored Tunnel Project in Seattle, Washington, responsible for project start-up, all engineering operations for the project, management of the designer on behalf of the design-build joint venture. Supervised a staff of 20 engineers and oversaw the design staff of 90 design professionals (50%). Served as operations manager/ lead senior estimator on successful proposals for construction of the Caldecott Tunnel 4th Bore, the New Irvington Water Tunnel, and the SR99 Bored Tunnel Alternative Project in Seattle, Washington. Support Senior Estimator on I

REFERENCES

Patrick McCormick
Construction Manager
Sound Transit Center
13427 NE 16th Street,
Bellevue, Washington 98005
206.903.7338
pat.mccormick@soundtransit.org

Matt Preedy
Deputy Director – Construction Management
Sound Transit Center
625 Union Station
Seattle, Washington 98104
206.398.5438
matt.preedy@soundtransit.org

215 Beltway Project, Warm Springs Cut and Cover Tunnels, JFK Runway reconstruction, I-5 Bridge Replacement over Lake Shasta, LAX Crossfield Taxi Way Construction, and the Transbay Terminal Support of Excavation Project.

American Civil Constructors, Various Projects and Locations, Vice President and Regional Manager. Vice President and Regional Manager VP/GM requiring transition from management change out, managing existing $65 million budget, staff reorganization, change in corporate organization, procurement of new works to support ongoing operations, and profit/loss responsibility.

P&L responsibility included the following:

- Locate, estimate, bid, and procure process of 145+ projects with hit ratio of one in 5. Procured over $60 million in new projects in 14-month time frame with anticipated margin of $11 million.
- Work concentration of 60 percent marine works and 40 percent inland foundations and structures.
- Geographical area covered Washington, Alaska, British Columbia, and Idaho.

Merco, Various Projects and Locations, Vice President and Chief Engineer. Mr. Joseph is responsible for all engineering and estimating functions of company. Estimated/bid on 60+ projects on yearly basis while managing or overseeing project execution.

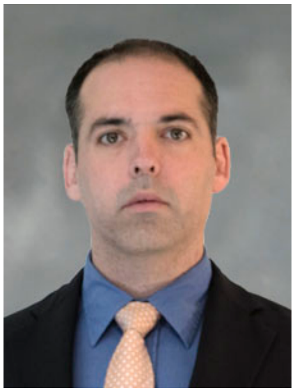
Kern River PH1 Tunnel Rehabilitation Project, Bakersfield, California, Project Executive. Mr. Joseph is project executive on rehabilitation of 10 miles of water tunnel and reconstruction of Intake structure on 4 unit, 36 MW power plant.

- Project executive on drainage tunnel rehabilitation project under N/S railroad.
- Project executive on NJDOT Bridge at Hope Road including redesign of precast structure to cast in place concrete arch bridge to match adjacent historic concrete arch bridge. Initial precast design was not feasible to construct. Negotiated major change to the contract including outside design services.

Project executive on the New Jersey Transit Bergen Tunnel. This $67 million project required enlarging the existing tunnel and new concrete liner and major electrical installation.

MICHAEL L. HOITINK, PE

DB Coordinator



Valuable Experience:

- ✓ Design Build in the Rail/Transit Industry
- ✓ Systems Integration
- ✓ Stakeholder Coordination

Years of Experience: 15

Education: B.S., Civil Engineering, Clarkson University

Professional License/ Certification: Registered Professional Civil Engineer, Maryland

Michael has 15 years of experience in the management and design of transit, highway, drainage, and utility projects in locations across the country for various government and public agencies and institutions. His responsibilities have included design management, planning, geometric and project development, preparation of design documents including specifications, as well as coordination of diverse engineering disciplines, third parties, and offices. Since joining Fluor 4 years ago, Michael has served as the design-build coordinator and engineering manager for the design build of a new 36-mile commuter rail system in an urban area with heavy traffic congestion, two operating railroads, and more than 900 utilities requiring relocation. Currently, he is the engineering manager on the design build of a 22-mile freeway project for a state department of transportation.

DESCRIPTION OF COMPARABLE PROJECTS

Arizona Department of Transportation, Loop 202 South Mountain Freeway (Phoenix, Arizona). Michael serves as Engineering Manager for the Design Build of a 22-mile freeway that will complete the Loop 202 and Loop 101 freeway system, provide a direct link between the East Valley and West Valley, and an alternative to Interstate 10 through downtown Phoenix. He is responsible for managing the completion of the base scope design, as well as planning and implementation of the design services during construction scope. He serves as the primary point of contact for the client and any third parties to manage any design-related items. The project includes construction of a 15 foot wide multi-use trail along a portion of the existing alignment.

Regional Transportation District, Eagle P3 Commuter Rail Line (Denver, Colorado). Michael served as Engineering Manager and Design Build Coordinator for a new 36 mile system comprised of three separate commuter rail lines, 14 stations, 66 rail cars, and a 230,000-square-foot LEED certified maintenance facility. Project elements included installation and integration of infrastructure elements (roadway, track, stations, and structures), system elements (traction power, power supply, train control, signals,

REFERENCES

John Moore, PE
Construction Manager
CH2M
16363 Walker Lane, Suite 500,
Alexandria, Virginia 22310
703.269.8166
John.morse@CH2M.com

Garrett W. Moore, PE
Chief Engineer
Virginia Department of Transportation
14975 Alliance Drive
Fairfax, Virginia 22030
804.786.4798
Garrett.moor@VDOT.virginia.gov

communications, and SCADA), and rolling stock. It is the first commuter rail system in the United States to have positive train control built into it from the ground up and not retrofitted.

Virginia Department of Transportation, 495 Express Lanes (Fairfax, Virginia). Michael served as Post Design Services Manager leading the engineering team responsible for budget forecasts, staffing estimates and scheduling, contract modifications, and providing engineering solutions to the field for the Design Build of high occupancy toll lanes along 14 miles of the Capital Beltway. He also served as the deputy design manager, lead signing engineer, and production center deputy manager. He coordinated and scheduled 60 design packages for area one that included three major arterial-to-interstate interchanges, 28 lane miles of new highway, and 22 bridges. Among his responsibilities were the ITS infrastructure and electronic tolling design on freeway and arterial routes, including detailed layout of ITS power distribution and communication network. He prepared Design Build engineering plans for traffic management, electronic tolling based on real-time traffic conditions, and ITS equipment power distribution. For 2 years, he led ITS subdisciplines in post design services and was responsible for quality management of ITS design changes during construction.

Virginia Department of Transportation, I 66 Spot Improvements (Northern Virginia). Michael served as Project Engineer responsible for supporting the widening of 2 miles of interstate highway, performing design calculations including super elevation, gore design, horizontal and vertical alignments, and cross section design.

Utility Distribution and Site Work Engineering Projects (Multiple Locations, United States). As project engineer, Michael was responsible for planning, design, and construction oversight on institutional campuses for varied projects, such as chilled water upgrades, campus-wide gas upgrade, parking garage expansion, master utility plans, and storm water management plans.

Technical Proposal • Original • September 2017

Response to the Request for Proposal

for the Green Line Extension Design Build Project

Submitted to

Massachusetts Department of Transportation and The Massachusetts Bay Transportation Authority

Part 7– Appendix A – Alternative Technical Concepts

GLX CONSTRUCTORS

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PART 7 →

ATC No. 12

ATC No. 12

Preliminary Submission

COVER SHEET

GLX CONSTRUCTORS

MBTA CONTRACT NO. E22CN07

GREEN LINE EXTENSION DESIGN BUILD PROJECT

CONFIDENTIAL ATCs

PRELIMINARY

ALTERNATIVE TECHNICAL CONCEPTS

("ATCs")

JUNE 9, 2017 (First Round)

JUNE 22, 2017 (Second Round)

GLX CONSTRUCTORS PRELIMINARY ATC FORM

ATC 12 – USE OF TWO OCS POLES ON VIADUCT

Sections A though E below must be completed to submit a Preliminary ATC for the Green Line Extension Design Build Project as specified in Section 3.2.1 of the Instructions to Proposers. This Preliminary ATC must be submitted to the MBTA's Designated Representative as specified in Section 2.4.1 of the Instructions to Proposers via the Project Management Information System.

A. General Description

A general description (not to exceed two pages) of the Preliminary ATC, how the ATC will be used on the Project, the proposed location of the ATC, and any other pertinent information that would provide a clear understanding of the potential ATC;

The Contract Documents specify a single OCS Pole between the tracks on the new viaduct structure which result in a wider deck structure.   By using two OCS Poles on the outside of the tracks on the viaduct structure, viaduct deck width will be reduced and result in decreased deep foundation dead loads.

B. References to Contract Documents

References to requirements of the Contract Documents that are inconsistent with the proposed ATC and an explanation of the nature of the deviations from said requirements;

The tracked changes below, are our explanation of the changes that would be required for this ATC.

Volume 2, Technical Provisions, Section 11.2.3.4 Poles and Foundations "OCS poles shall be located between **or on the outside** of the tracks on the new viaduct structure~~**, except at junctions where they may be located at the sides of the track.**~~ On single track curves on the viaduct structure, the poles shall be located on the outside of the curve."

C. Benefits

Any potential benefits or implications of incorporating the Preliminary ATC into the Project, including in right-of-way acquisitions, rail operations, and routine or capital maintenance, and other Project risks;

A reduction in the new viaduct deck width will reduce the substructure foundation dead loads. This reduction will maximize the use of the early works substructure foundations (drilled shafts) to reduce cost. Removing the OCS Poles from between the tracks on the new viaduct structure will also eliminate obstructions in the access walkway.

D. Conceptual Drawings

Any conceptual drawings (if applicable) of the configuration of the potential ATC or other appropriate descriptive information that provides an understanding of the Preliminary ATC; and

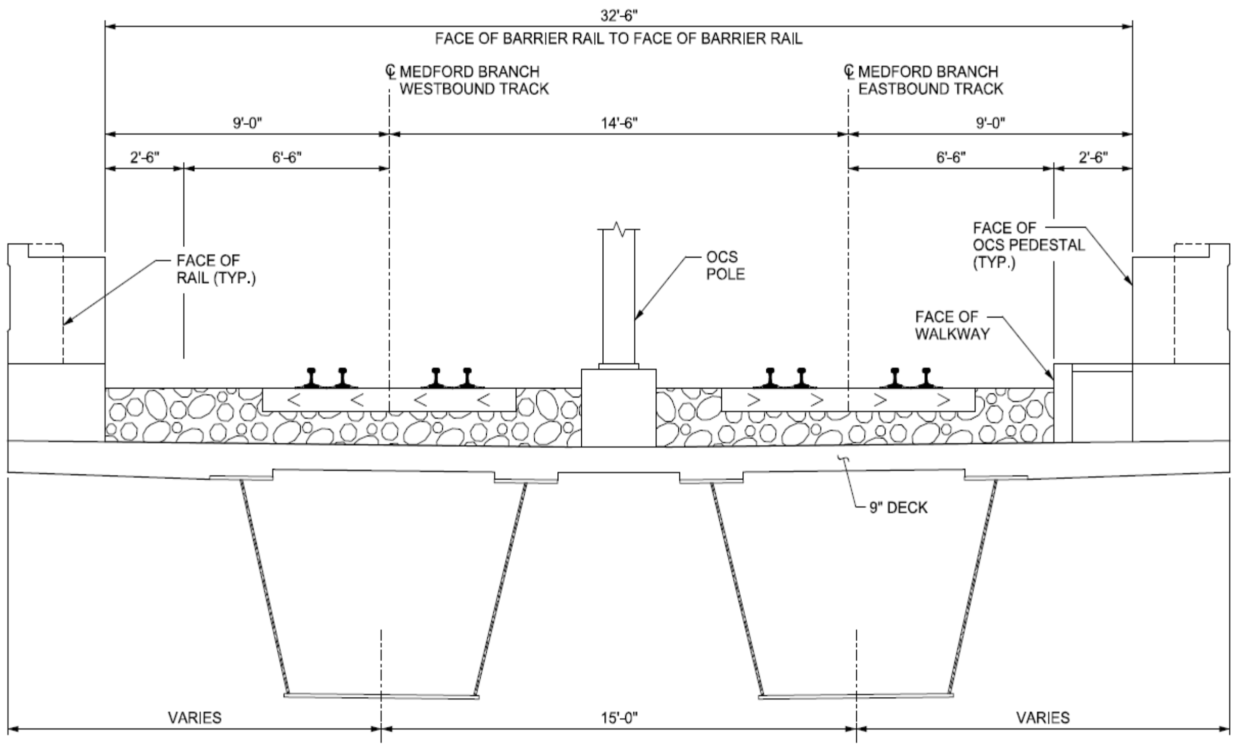
Please refer to Figures ATC 12-1 "Typical Section – Design Concept", ATC 12-2 "Typical Section Alterative Technical Concept", ATC 12-3 " Deck Plan – Design Concept", and ATC 12-4 "Deck Plan – Alternative Technical Concept" below.

E. Cost Estimate and Schedule Impacts

An order of magnitude cost estimate and a preliminary analysis of schedule impacts associated with the Preliminary ATC.

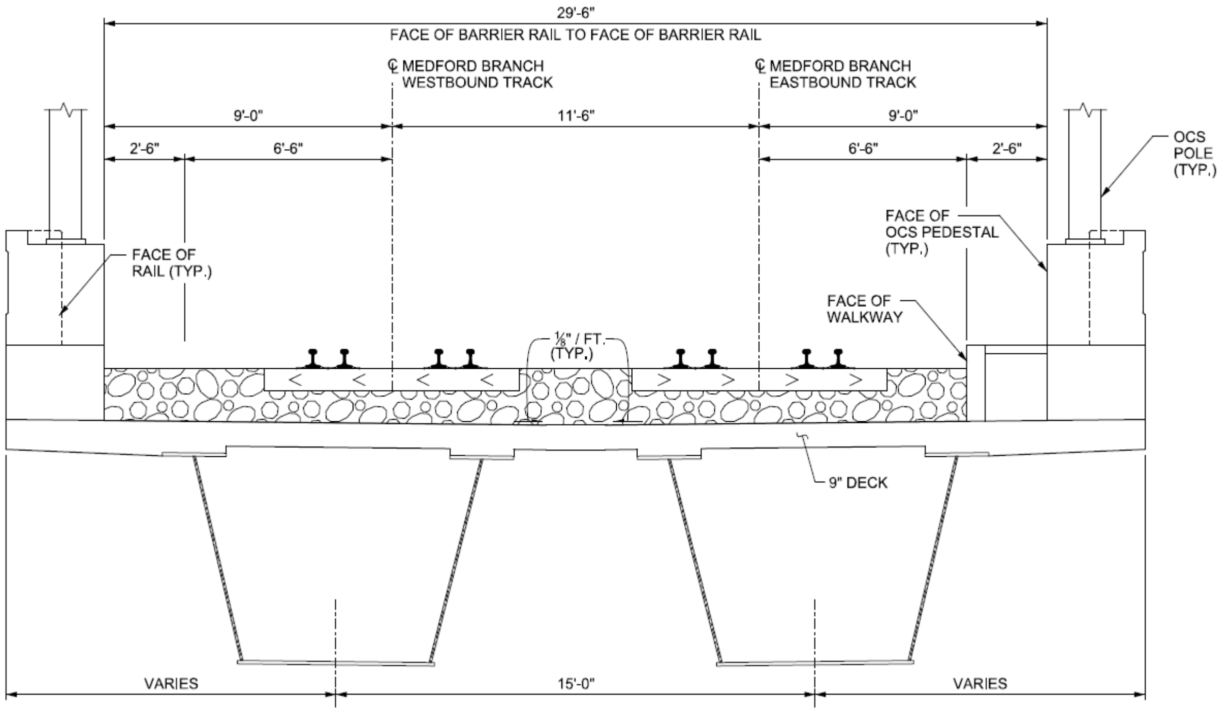
This ATC will result in an estimated cost saving of $6 M. Our preliminary analysis indicates no impact to schedule milestones.

Figure ATC 12-1: Typical Section – Design Concept



TYPICAL SECTION - DESIGN CONCEPT

Figure ATC 12-2: Typical Section - Alterative Technical Concept



TYPICAL SECTION - ALTERNATIVE TECHNICAL CONCEPT

Figure ATC 12-3: Deck Plan – Design Concept

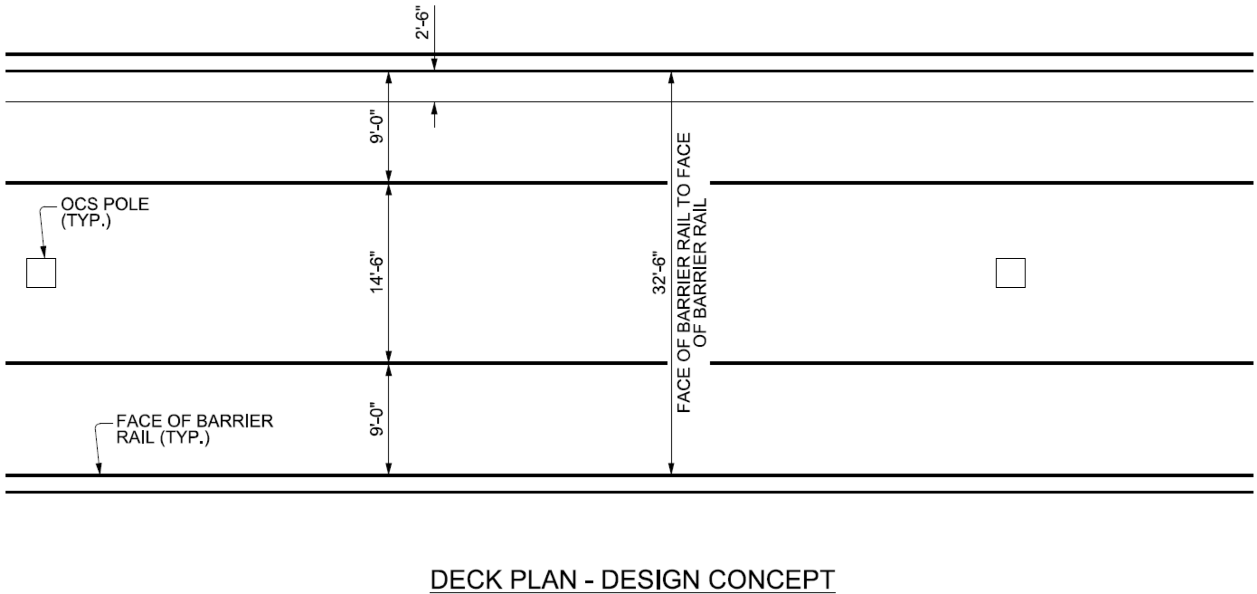
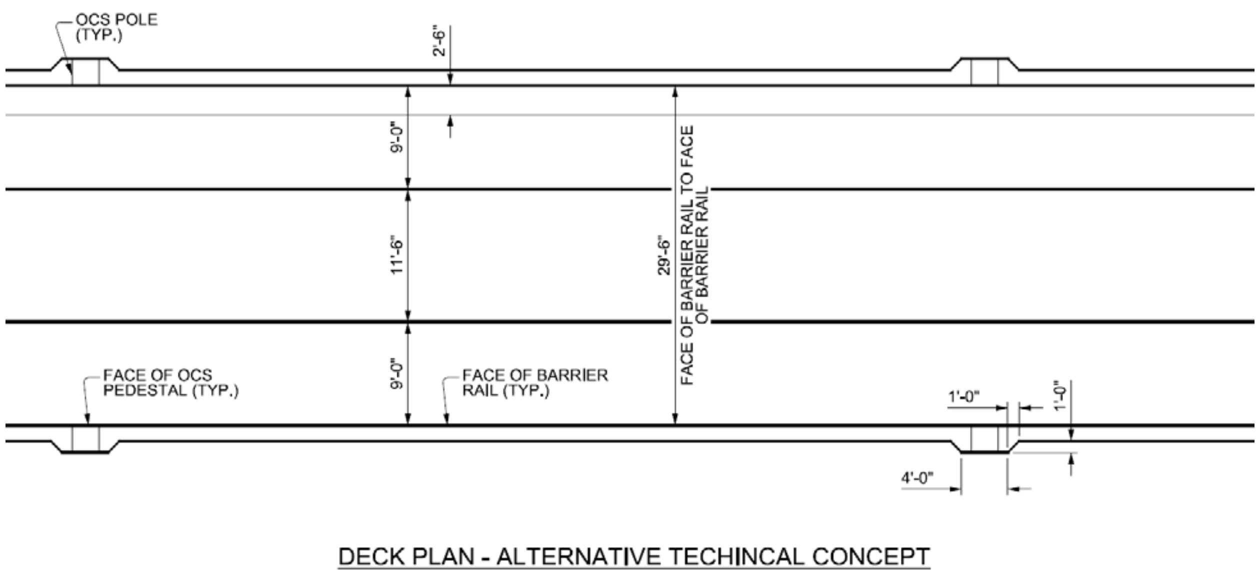


Figure ATC 12-4: Deck Plan – Alternative Technical Concept



ATC No. 12

MBTA Acceptance of Preliminary Submission

Massachusetts Bay Transportation Authority

ATC Information:

Type of ATC:	Preliminary
Title:	GLX Constructors ATC 05 - Use of Two OCS Poles on Viaduct
Proposer Company:	GLX Constructors

Final Disposition:

Sent on behalf of Yvelisse Duvergé. The Preliminary ATC can be formally submitted for MBTA review as an ATC Submittal, subject to further refinement and submission of supporting information pursuant to Section 3.3.1 of the Instructions to Proposers.

COVER SHEET

GLX CONSTRUCTORS

MBTA CONTRACT NO. E22CN07

GREEN LINE EXTENSION DESIGN BUILD PROJECT

CONFIDENTIAL ATCs

PRELIMINARY

ALTERNATIVE TECHNICAL CONCEPTS

("ATCs")

JUNE 9, 2017 (First Round)

JUNE 22, 2017 (Second Round)

GLX CONSTRUCTORS PRELIMINARY ATC FORM

ATC 12 – USE OF TWO OCS POLES ON VIADUCT

Sections A though E below must be completed to submit a Preliminary ATC for the Green Line Extension Design Build Project as specified in Section 3.2.1 of the Instructions to Proposers. This Preliminary ATC must be submitted to the MBTA's Designated Representative as specified in Section 2.4.1 of the Instructions to Proposers via the Project Management Information System.

A. General Description

A general description (not to exceed two pages) of the Preliminary ATC, how the ATC will be used on the Project, the proposed location of the ATC, and any other pertinent information that would provide a clear understanding of the potential ATC;

The Contract Documents specify a single OCS Pole between the tracks on the new viaduct structure which result in a wider deck structure.   By using two OCS Poles on the outside of the tracks on the viaduct structure, viaduct deck width will be reduced and result in decreased deep foundation dead loads.

B. References to Contract Documents

References to requirements of the Contract Documents that are inconsistent with the proposed ATC and an explanation of the nature of the deviations from said requirements;

The tracked changes below, are our explanation of the changes that would be required for this ATC.

Volume 2, Technical Provisions, Section 11.2.3.4 Poles and Foundations "OCS poles shall be located between **<u>or on the outside</u>** of the tracks on the new viaduct structure~~, except at junctions where they may be located at the sides of the track.~~ On single track curves on the viaduct structure, the poles shall be located on the outside of the curve."

C. Benefits

Any potential benefits or implications of incorporating the Preliminary ATC into the Project, including in right-of-way acquisitions, rail operations, and routine or capital maintenance, and other Project risks;

A reduction in the new viaduct deck width will reduce the substructure foundation dead loads. This reduction will maximize the use of the early works substructure foundations (drilled shafts) to reduce cost. Removing the OCS Poles from between the tracks on the new viaduct structure will also eliminate obstructions in the access walkway.

D. Conceptual Drawings

Any conceptual drawings (if applicable) of the configuration of the potential ATC or other appropriate descriptive information that provides an understanding of the Preliminary ATC; and

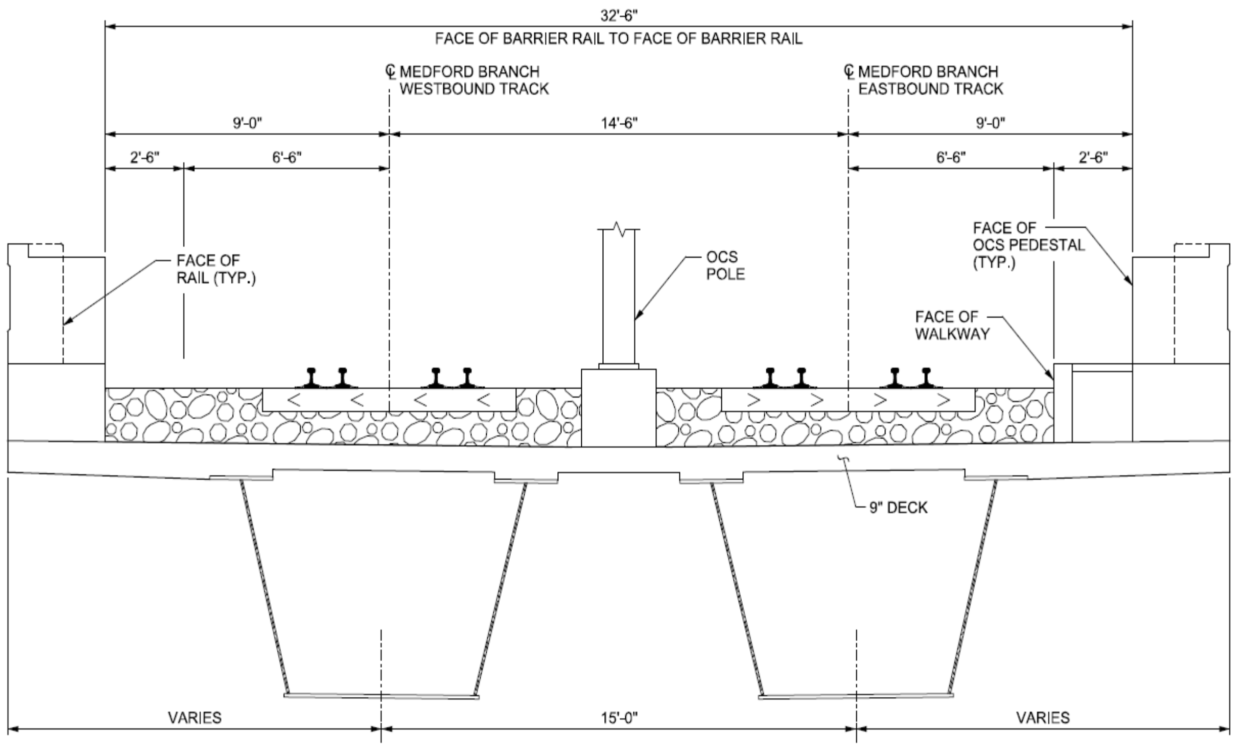
Please refer to Figures ATC 12-1 "Typical Section – Design Concept", ATC 12-2 "Typical Section Alterative Technical Concept", ATC 12-3 " Deck Plan – Design Concept", and ATC 12-4 "Deck Plan – Alternative Technical Concept" below.

E. Cost Estimate and Schedule Impacts

An order of magnitude cost estimate and a preliminary analysis of schedule impacts associated with the Preliminary ATC.

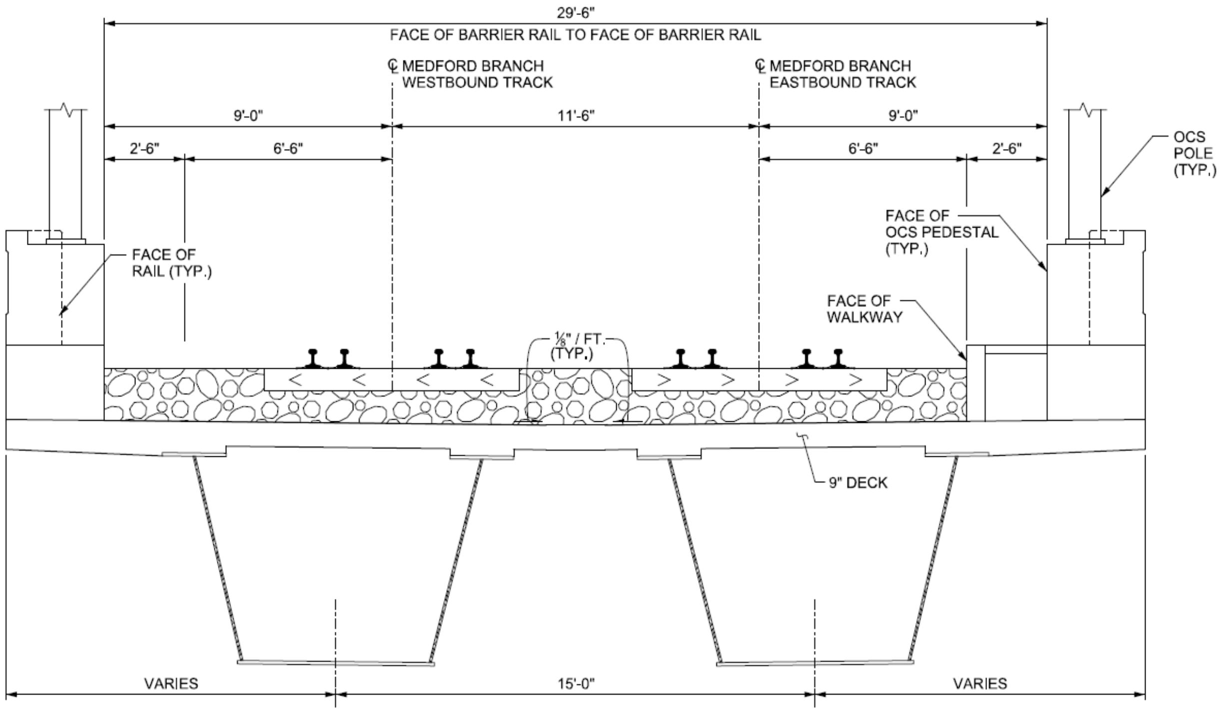
This ATC will result in an estimated cost saving of $6 M. Our preliminary analysis indicates no impact to schedule milestones.

Figure ATC 12-1: Typical Section – Design Concept



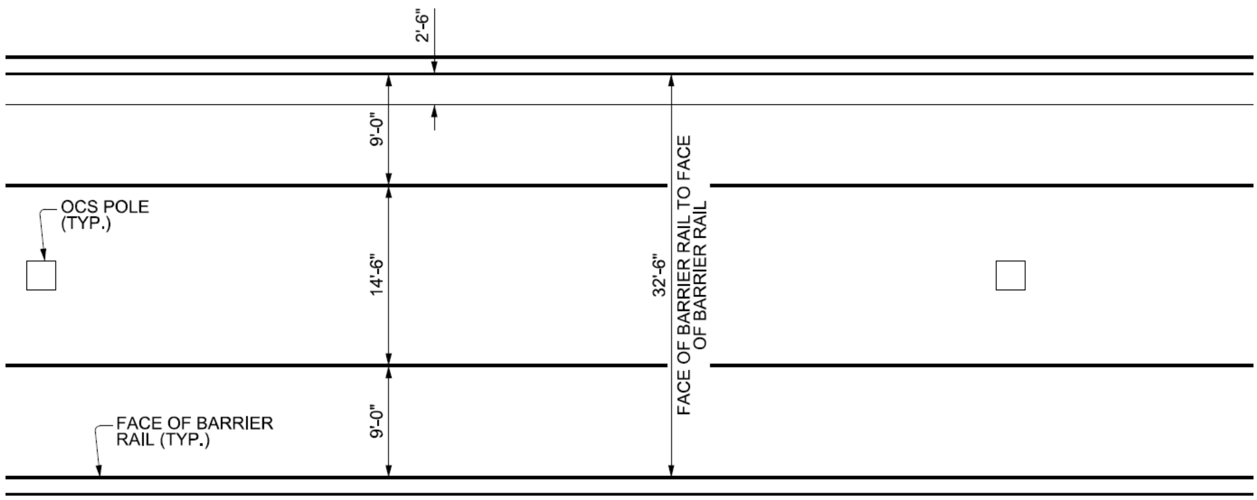
TYPICAL SECTION - DESIGN CONCEPT

Figure ATC 12-2: Typical Section - Alterative Technical Concept



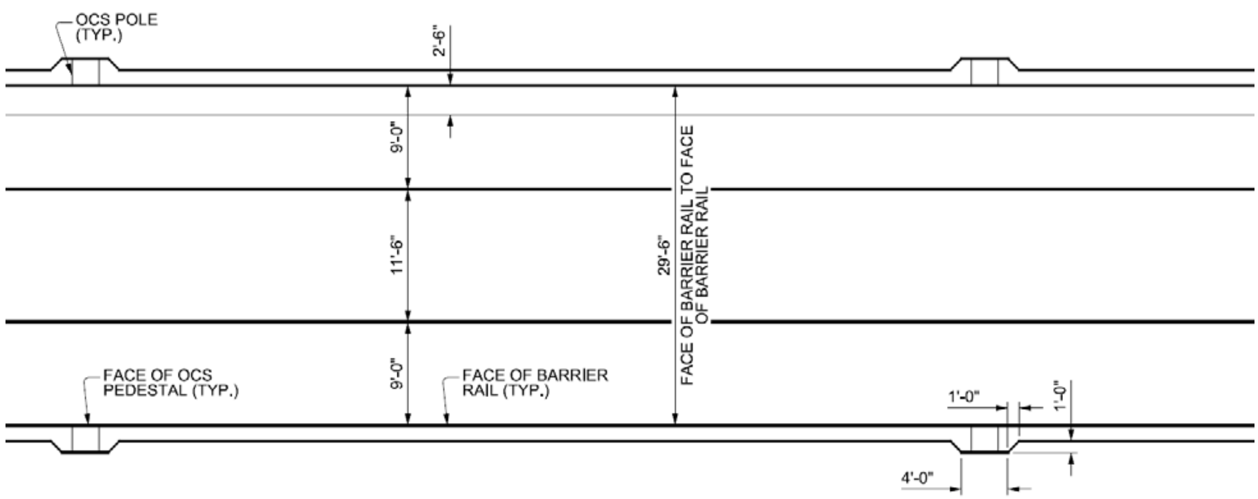
TYPICAL SECTION - ALTERNATIVE TECHNICAL CONCEPT

Figure ATC 12-3: Deck Plan – Design Concept



DECK PLAN - DESIGN CONCEPT

Figure ATC 12-4: Deck Plan – Alternative Technical Concept



DECK PLAN - ALTERNATIVE TECHINCAL CONCEPT

ATC No. 12

Formal Submission

COVER SHEET

GLX CONSTRUCTORS

MBTA CONTRACT NO. E22CN07

GREEN LINE EXTENSION DESIGN BUILD PROJECT

CONFIDENTIAL ATCs

FORMAL

ALTERNATIVE TECHNICAL CONCEPTS ("ATCs")

JUNE 9, 2017 (First Round)

JUNE 22, 2017 (Second Round)

JULY 11, 2017 (Final Round)

GLX CONSTRUCTORS FORMAL ATC FORM

USE OF TWO OCS POLES ON VIADUCT

Sections A though P below shall be completed to submit a Formal ATC for the Green Line Extension Design Build Project as specified in Section 3.2.1 of the Instructions to Proposers. This Formal ATC must be submitted to the MBTA's Designated Representative as specified in Section 2.4.1 of the Instructions to Proposers via the Project Management Information System.

A. ATC Number

A sequential ATC number identifying the Proposer and the ATC number. (Multi-part or multi-option ATCs shall be submitted as separate individual ATCs with unique sequential numbers.);

ATC 12

MBTA Preliminary ATC File Number: ATC-000011 – GLX Constructors ATC 05

B. Description and Conceptual Drawings

A description and conceptual drawings of the configuration of the ATC or other appropriate descriptive information;

The Contract Documents specify a single OCS Pole between the tracks on the new viaduct structure which result in a wider deck structure.   By using two OCS Poles on the outside of the tracks on the viaduct structure, viaduct deck width will be reduced and result in decreased deep foundation dead loads. Please refer to Figures ATC 12-1 "Typical Section – Design Concept", ATC 12-2 "Typical Section Alterative Technical Concept", ATC 12-3 " Deck Plan – Design Concept", and ATC 12-4 "Deck Plan – Alternative Technical Concept" below.

C. Locations and How Used

The locations where, and an explanation of how, the ATC will be used on the Project;

This ATC will be used on the viaduct structure to reduce deck structure.

D. Changes in Rail or Transit Operations

Any changes in rail or transit operations requirements associated with the ATC, including ease of operations;

No changes in operations are anticipated as a result of this ATC.

E. Changes in Routine or Capital Maintenance

Any changes in routine or capital maintenance requirements associated with the ATC, including ease of maintenance;

This ATC will improve routine or capital maintenance access by removing the OCS Poles from between the tracks on the new viaduct structure will eliminating obstructions in the access walkway.

F. Changes in Anticipated Service Life

Any changes in the anticipated service life of the item(s) comprising the ATC or affected by the ATC;

This ATC will result in no change to anticipated service life

G. References to Contract Documents

References to requirements of the Contract Documents that are inconsistent with the proposed ATC, an explanation of the nature of the deviations from said requirements, and a request for approval of such deviations;

Volume 2 Technical Provisions – Subsection 11.2.3.4 Poles and Foundations "OCS poles shall be located between the tracks on the new viaduct structure except at junctions where they may be located at the sides of the track. On single track curves on the viaduct structure, the poles shall be located on the outside of the curve."

H. Justification of Use

An analysis justifying use of the ATC and why the deviation, if any, from the requirements of the Contract Documents should be allowed;

A reduction in the New Viaduct deck width will reduce the substructure foundation dead loads and the result will maximize the use of the early works substructure foundations (drilled shafts), which is a Cost Savings. Additionally, removing the OCS Poles from between the tracks on the new viaduct structure will eliminate obstructions in the access walkway.

I. Preliminary Analysis and Quantitative Discussion

A preliminary analysis and quantitative discussion of potential impacts on rail or transit operations (both during and after construction), environmental permitting, community impact, safety, and life-cycle Project and infrastructure costs, including impacts on the cost of repair, replacement, maintenance, and operation;

No impacts on rail or transit operations are anticipated as a result of this ATC.

J. Impacts on Third Parties

A description of any impacts on the land or facilities of third parties, including private owners, governmental entities, utility owners, and railroads, and identification of specific additional right of way required to implement the ATC. Proposers are advised that they may (i) be solely responsible for the cost and schedule impacts of the acquisition of any such Additional Properties, including the cost thereof and obtaining any necessary environmental approvals; (ii) not be entitled to any change order for time or money as a result of site conditions (i.e., hazardous materials, differing site conditions, geotechnical issues, or utilities) on such Additional Properties; and (iii) not be entitled to any change order for time or money as a result of any delay, inability, or cost associated with the acquisition of such Additional Properties;

No impacts to third parties are anticipated as a result of this ATC.

K. History of Use and References

A description of any other projects where the ATC has been used, the degree of success or failure of such usage, and names and contact information, including phone numbers and E-mail addresses, for project owner representatives that can confirm such statements;

The MBTA currently has this two pole design concept in active service as can be seen on the Green Line between North Station and Science Park.

Joe Vassalo, MBTA, 617.222.1818, Jvassalo@MBTA.com

L. Additional Risks

A description of added risks to the MBTA or third parties associated with implementing the ATC;

No additional risks to the MBTA or to third parties are anticipated as a result of this ATC.

M. Additional Costs

An estimate of any additional MBTA, DB Entity, and third-party costs associated with implementation of the ATC;

Additional costs to the MBTA, DB Entity and third parties will not result from this ATC. One of the primary purposes of this ATC is cost reduction.

N. Estimated Price Adjustment

An estimate of the price adjustment (i.e., cost savings), should the ATC be approved and implemented;

This ATC will result in an estimated savings of $1,800,000. The ATC pricing as shown in this proposal is an all inclusive price. All price deducts and/or adds have been considered, and the resulting price adjustment is offered as shown.

O. Schedule Adjustment

An estimate of the schedule adjustment, should the ATC be approved and implemented; and

This ATC does not require any schedule adjustment.

P. Analysis of Quality, Performance, and Reliability

An analysis of how the ATC is equal to or better in quality, performance, and reliability than the requirements of the Contract Documents.

This ATC will provide equal quality, performance and reliability than the specified pole locations on the viaduct. Removing the OCS Poles from between the tracks on the new viaduct structure will eliminate obstructions in the access walkway, increasing safety.

Figure ATC 12-1: Typical Section – Design Concept

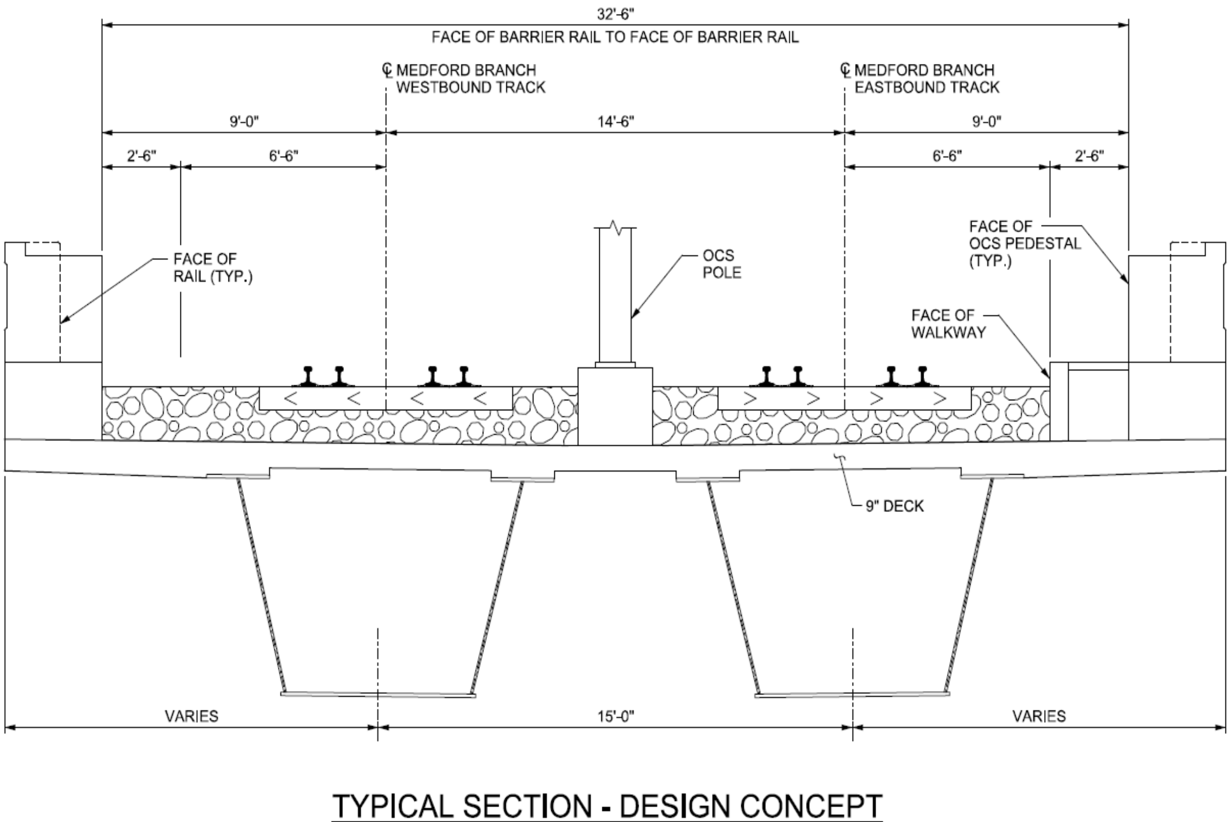


Figure ATC 12-2: Typical Section - Alterative Technical Concept

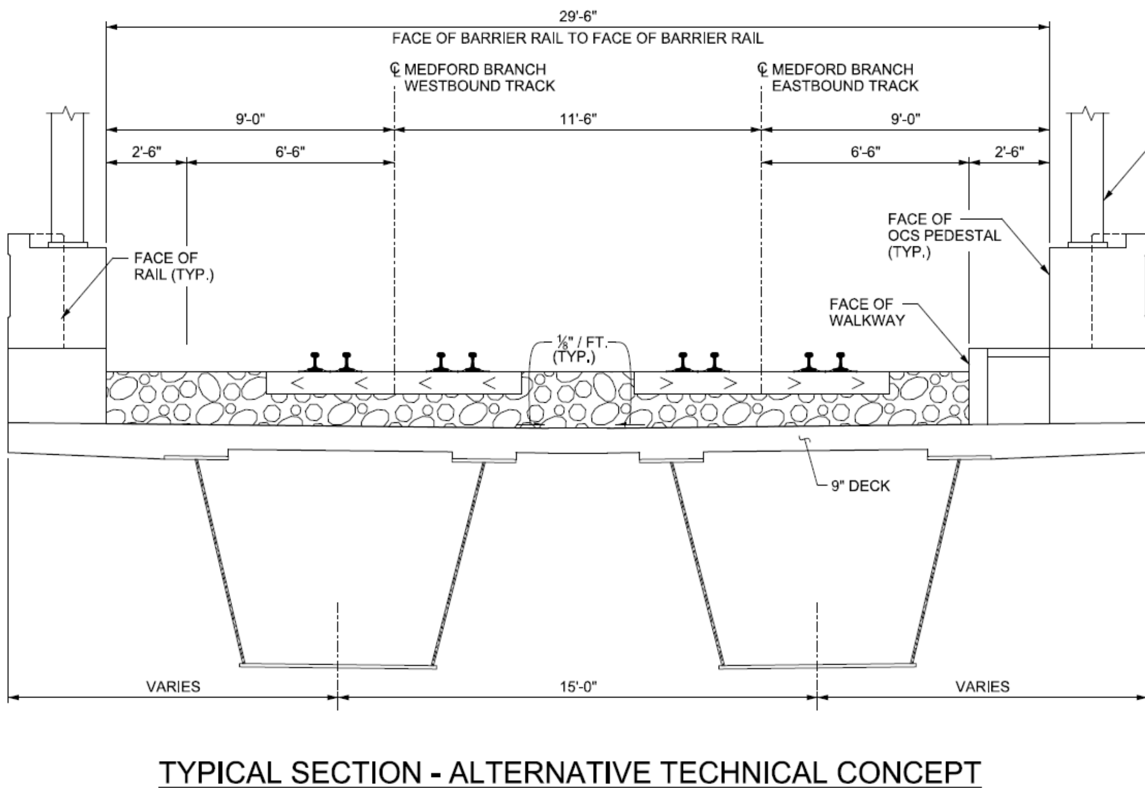
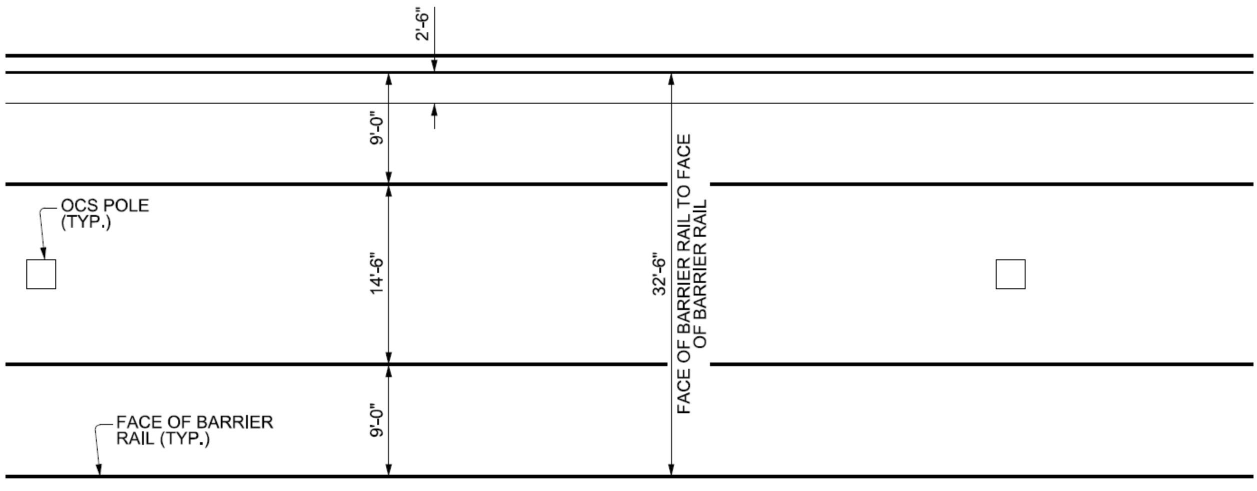
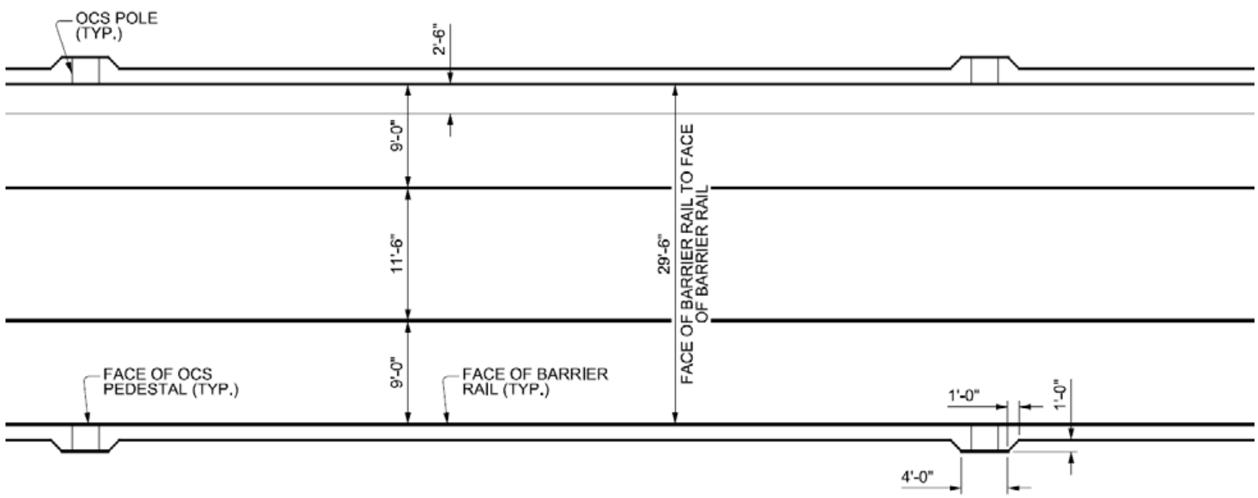


Figure ATC 12-3: Deck Plan – Design Concept



DECK PLAN - DESIGN CONCEPT

Figure ATC 12-4: Deck Plan – Alternative Technical Concept



DECK PLAN - ALTERNATIVE TECHINCAL CONCEPT

ATC No. 12

MBTA Acceptance of Formal Submission

ATC Information:

Type of ATC:	Formal
Title:	GLX Constructors ATC 05 - Use of Two OCS Poles on Viaduct
Proposer Company:	GLX Constructors

Final Disposition:

Sent on behalf of Yvelisse Duvergé. The ATC Submittal is acceptable for inclusion in the Proposal

COVER SHEET

GLX CONSTRUCTORS

MBTA CONTRACT NO. E22CN07

GREEN LINE EXTENSION DESIGN BUILD PROJECT

CONFIDENTIAL ATCs

FORMAL

ALTERNATIVE TECHNICAL CONCEPTS ("ATCs")

JUNE 9, 2017 (First Round)

JUNE 22, 2017 (Second Round)

JULY 11, 2017 (Final Round)

GLX CONSTRUCTORS FORMAL ATC FORM

USE OF TWO OCS POLES ON VIADUCT

Sections A though P below shall be completed to submit a Formal ATC for the Green Line Extension Design Build Project as specified in Section 3.2.1 of the Instructions to Proposers. This Formal ATC must be submitted to the MBTA's Designated Representative as specified in Section 2.4.1 of the Instructions to Proposers via the Project Management Information System.

A. ATC Number

A sequential ATC number identifying the Proposer and the ATC number. (Multi-part or multi-option ATCs shall be submitted as separate individual ATCs with unique sequential numbers.);

ATC 12

MBTA Preliminary ATC File Number: ATC-000011 – GLX Constructors ATC 05

B. Description and Conceptual Drawings

A description and conceptual drawings of the configuration of the ATC or other appropriate descriptive information;

The Contract Documents specify a single OCS Pole between the tracks on the new viaduct structure which result in a wider deck structure. By using two OCS Poles on the outside of the tracks on the viaduct structure, viaduct deck width will be reduced and result in decreased deep foundation dead loads. Please refer to Figures ATC 12-1 "Typical Section – Design Concept", ATC 12-2 "Typical Section Alterative Technical Concept", ATC 12-3 " Deck Plan – Design Concept", and ATC 12-4 "Deck Plan – Alternative Technical Concept" below.

C. Locations and How Used

The locations where, and an explanation of how, the ATC will be used on the Project;

This ATC will be used on the viaduct structure to reduce deck structure.

D. Changes in Rail or Transit Operations

Any changes in rail or transit operations requirements associated with the ATC, including ease of operations;

No changes in operations are anticipated as a result of this ATC.

E. Changes in Routine or Capital Maintenance

Any changes in routine or capital maintenance requirements associated with the ATC, including ease of maintenance;

This ATC will improve routine or capital maintenance access by removing the OCS Poles from between the tracks on the new viaduct structure will eliminating obstructions in the access walkway.

F. Changes in Anticipated Service Life

Any changes in the anticipated service life of the item(s) comprising the ATC or affected by the ATC;

This ATC will result in no change to anticipated service life

G. References to Contract Documents

References to requirements of the Contract Documents that are inconsistent with the proposed ATC, an explanation of the nature of the deviations from said requirements, and a request for approval of such deviations;

Volume 2 Technical Provisions – Subsection 11.2.3.4 Poles and Foundations "OCS poles shall be located between the tracks on the new viaduct structure except at junctions where they may be located at the sides of the track. On single track curves on the viaduct structure, the poles shall be located on the outside of the curve."

H. Justification of Use

An analysis justifying use of the ATC and why the deviation, if any, from the requirements of the Contract Documents should be allowed;

A reduction in the New Viaduct deck width will reduce the substructure foundation dead loads and the result will maximize the use of the early works substructure foundations (drilled shafts), which is a Cost Savings. Additionally, removing the OCS Poles from between the tracks on the new viaduct structure will eliminate obstructions in the access walkway.

I. Preliminary Analysis and Quantitative Discussion

A preliminary analysis and quantitative discussion of potential impacts on rail or transit operations (both during and after construction), environmental permitting, community impact, safety, and life-cycle Project and infrastructure costs, including impacts on the cost of repair, replacement, maintenance, and operation;

No impacts on rail or transit operations are anticipated as a result of this ATC.

J. Impacts on Third Parties

A description of any impacts on the land or facilities of third parties, including private owners, governmental entities, utility owners, and railroads, and identification of specific additional right of way required to implement the ATC. Proposers are advised that they may (i) be solely responsible for the cost and schedule impacts of the acquisition of any such Additional Properties, including the cost thereof and obtaining any necessary environmental approvals; (ii) not be entitled to any change order for time or money as a result of site conditions (i.e., hazardous materials, differing site conditions, geotechnical issues, or utilities) on such Additional Properties; and (iii) not be entitled to any change order for time or money as a result of any delay, inability, or cost associated with the acquisition of such Additional Properties;

No impacts to third parties are anticipated as a result of this ATC.

K. History of Use and References

A description of any other projects where the ATC has been used, the degree of success or failure of such usage, and names and contact information, including phone numbers and E-mail addresses, for project owner representatives that can confirm such statements;

The MBTA currently has this two pole design concept in active service as can be seen on the Green Line between North Station and Science Park.

Joe Vassalo, MBTA, 617.222.1818, Jvassalo@MBTA.com

L. Additional Risks

A description of added risks to the MBTA or third parties associated with implementing the ATC;

No additional risks to the MBTA or to third parties are anticipated as a result of this ATC.

M. Additional Costs

An estimate of any additional MBTA, DB Entity, and third-party costs associated with implementation of the ATC;

Additional costs to the MBTA, DB Entity and third parties will not result from this ATC. One of the primary purposes of this ATC is cost reduction.

N. Estimated Price Adjustment

An estimate of the price adjustment (i.e., cost savings), should the ATC be approved and implemented;

This ATC will result in an estimated savings of $1,800,000. The ATC pricing as shown in this proposal is an all inclusive price. All price deducts and/or adds have been considered, and the resulting price adjustment is offered as shown.

O. Schedule Adjustment

An estimate of the schedule adjustment, should the ATC be approved and implemented; and

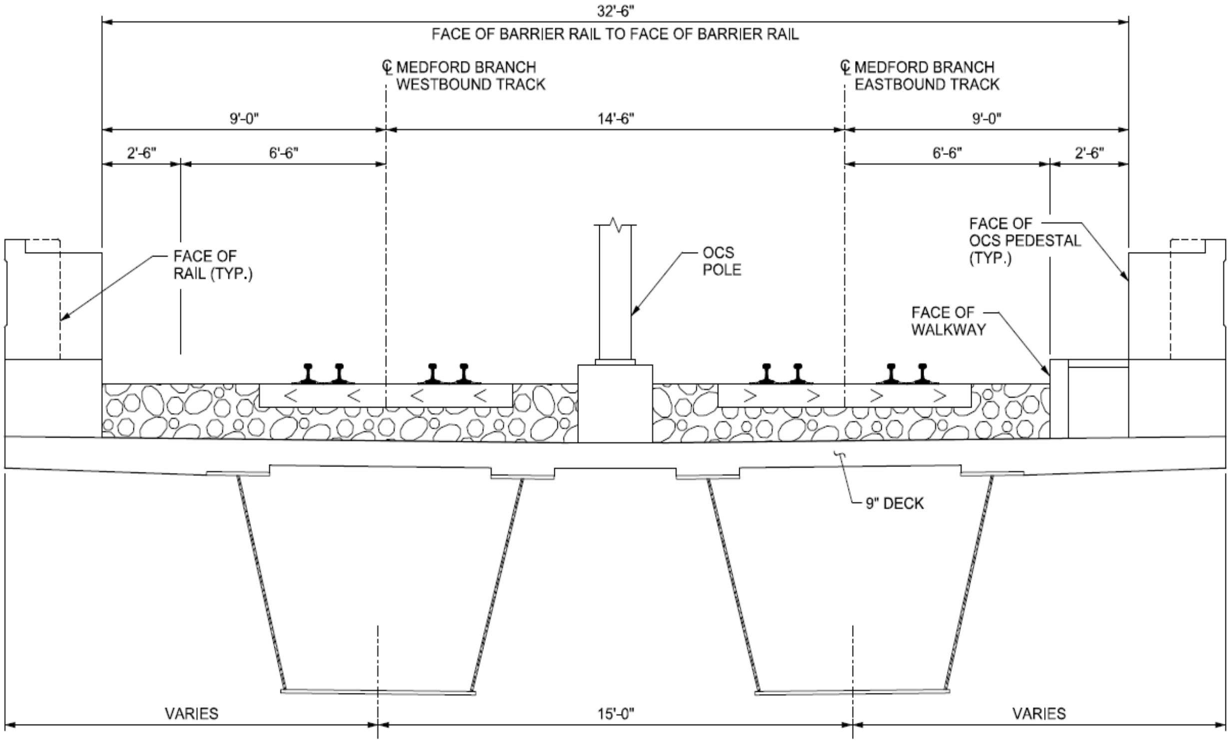
This ATC does not require any schedule adjustment.

P. Analysis of Quality, Performance, and Reliability

An analysis of how the ATC is equal to or better in quality, performance, and reliability than the requirements of the Contract Documents.

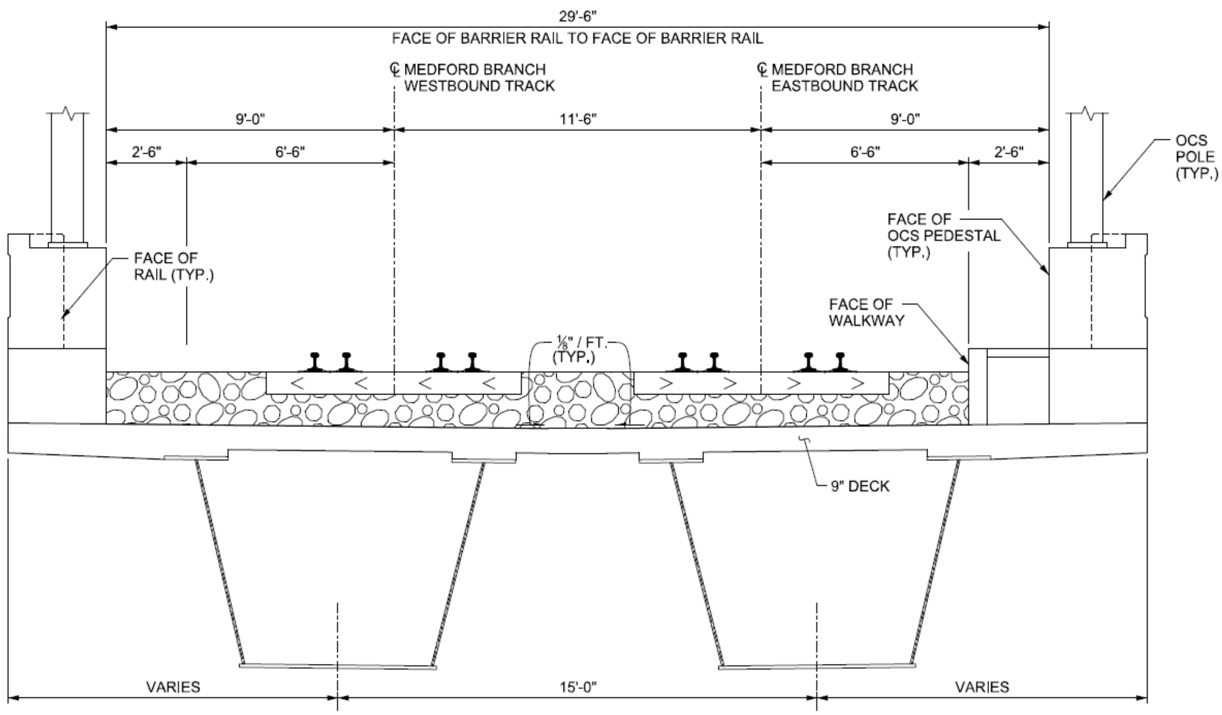
This ATC will provide equal quality, performance and reliability than the specified pole locations on the viaduct. Removing the OCS Poles from between the tracks on the new viaduct structure will eliminate obstructions in the access walkway, increasing safety.

Figure ATC 12-1: Typical Section – Design Concept



TYPICAL SECTION - DESIGN CONCEPT

Figure ATC 12-2: Typical Section - Alterative Technical Concept



TYPICAL SECTION - ALTERNATIVE TECHNICAL CONCEPT

Figure ATC 12-3: Deck Plan – Design Concept

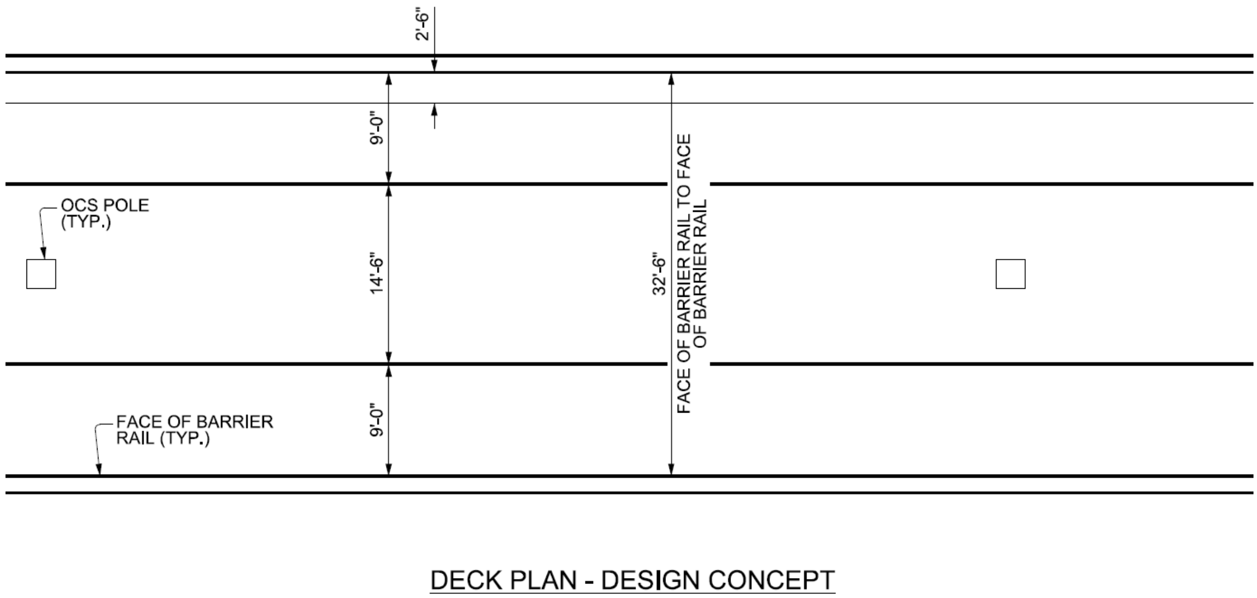
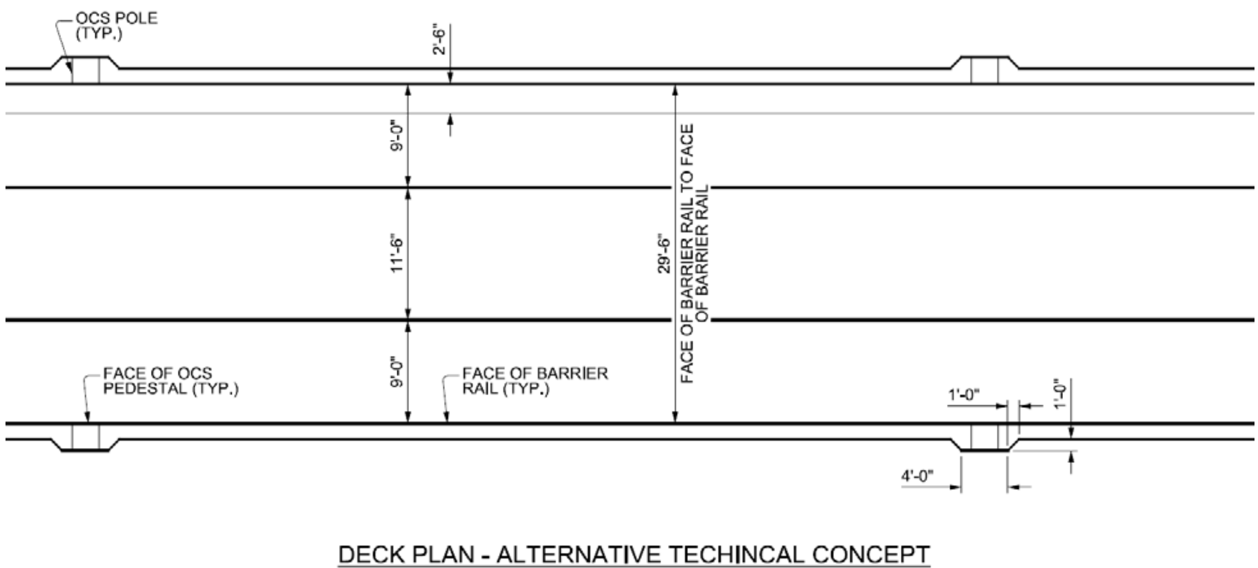


Figure ATC 12-4: Deck Plan – Alternative Technical Concept



ATC No. 35

ATC No. 35

Preliminary Submission

COVER SHEET

GLX CONSTRUCTORS

MBTA CONTRACT NO. E22CN07

GREEN LINE EXTENSION DESIGN BUILD PROJECT

CONFIDENTIAL ATCs

PRELIMINARY

ALTERNATIVE TECHNICAL CONCEPTS

(“ATCs”)

JUNE 9, 2017 (First Round)

JUNE 22, 2017 (Second Round)

GLX CONSTRUCTORS PRELIMINARY ATC FORM

ATC 35 – VIADUCT OPTIMIZATION

Sections A though E below must be completed to submit a Preliminary ATC for the Green Line Extension Design Build Project as specified in Section 3.2.1 of the Instructions to Proposers. This Preliminary ATC must be submitted to the MBTA's Designated Representative as specified in Section 2.4.1 of the Instructions to Proposers via the Project Management Information System.

A. General Description

A general description (not to exceed two pages) of the Preliminary ATC, how the ATC will be used on the Project, the proposed location of the ATC, and any other pertinent information that would provide a clear understanding of the potential ATC;

This ATC replaces three sections of elevated track with MSE walls as follows:

1.) Replace a section of elevated track from approximate Sta. MB-EB 196+00 to Sta. MB-EB 202+00 required on viaduct with an elevated section of track on MSE wall
2.) Replace a section of elevated track from approximate Sta. US-WB 7+75 to Sta. US-WB 11+50 required on viaduct with an elevated section of track on MSE wall
3.) Replace a section of elevated track from approximate Sta. MB-EB 214+00 to Sta. MB-EB 220+00 required on viaduct with an elevated section of track on MSE wall

B. References to Contract Documents

References to requirements of the Contract Documents that are inconsistent with the proposed ATC and an explanation of the nature of the deviations from said requirements;

Volume 2, Technical Provisions, Section 1.2.1 General (a) and (b). Volume 2, Exhibit 2B, Project Definition plan sheets: UEV-S-2001, and UWV-S-2000. This ATC replaces sections of elevated concrete structure shown on the Project Definition plans with an MSE wall structure.

C. Benefits

Any potential benefits or implications of incorporating the Preliminary ATC into the Project, including in right-of-way acquisitions, rail operations, and routine or capital maintenance, and other Project risks;

This ATC will provide the following benefits:

- Reduced contaminated excavation and export off site while eliminating contaminated deep foundation spoils
- Mitigated deep foundation risks
- MSE wall will have lower maintenance cost
- Reduced noise and vibration during construction
- Reduced square footage of bridge deck
- Decrease in maintenance cost due to decrease in bridge deck area

D. Conceptual Drawings

Any conceptual drawings (if applicable) of the configuration of the potential ATC or other appropriate descriptive information that provides an understanding of the Preliminary ATC; and

Please reference Figures ATC-35-1 “Plan View of Proposed MSE Wall Sections” and ATC-35-2 “Profile Views of Proposed MSE Wall Sections”

E. Cost Estimate and Schedule Impacts

An order of magnitude cost estimate and a preliminary analysis of schedule impacts associated with the Preliminary ATC.

This ATC will result in an estimated cost savings of $10 M. Our preliminary analysis indicates no impact to schedule milestones.

Figure ATC-35-1: Plan View of Proposed MSE Wall Sections

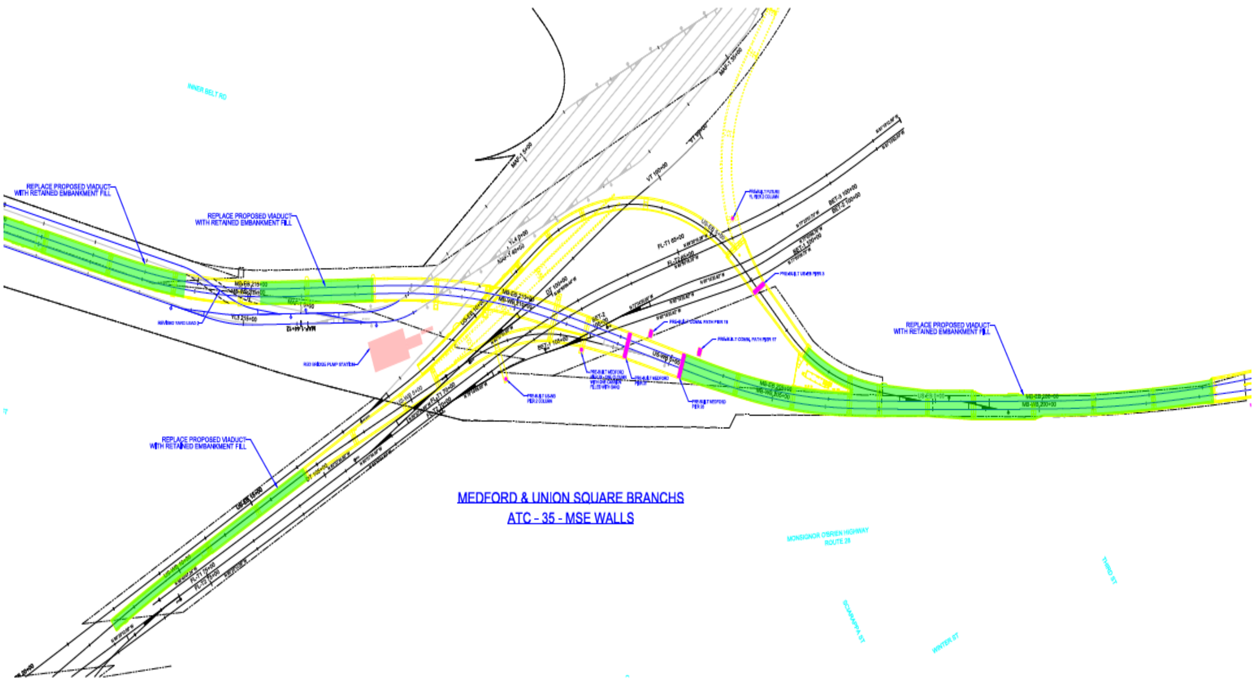
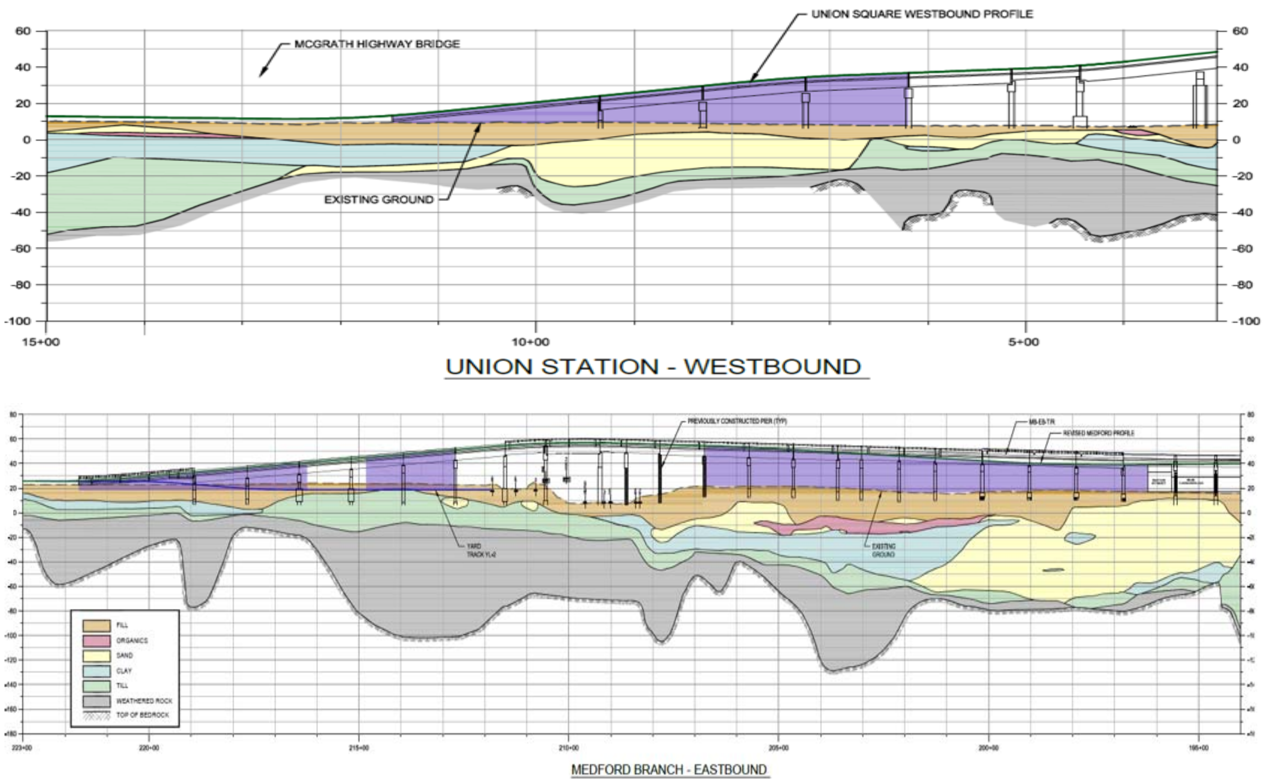


Figure ATC-35-2: Profile Views of Proposed MSE Wall Sections



ATC No. 35

Acceptance of Preliminary Submission

Massachusetts Bay
Transportation Authority

GLX Procurement

ATC Review

ATC Information:

Type of ATC: Preliminary
Title: GLX Constructors ATC 07 - Viaduct Optimization
Proposer Company: GLX Constructors

Final Disposition:

Sent on behalf of Yvelisse Duvergé. The Preliminary ATC can be formally submitted for MBTA review as an ATC Submittal, subject to further refinement and submission of supporting information pursuant to Section 3.3.1 of the Instructions to Proposers.

COVER SHEET

GLX CONSTRUCTORS

MBTA CONTRACT NO. E22CN07

GREEN LINE EXTENSION DESIGN BUILD PROJECT

CONFIDENTIAL ATCs

PRELIMINARY ALTERNATIVE TECHNICAL CONCEPTS ("ATCs")

JUNE 9, 2017 (First Round)

JUNE 22, 2017 (Second Round)

GLX CONSTRUCTORS PRELIMINARY ATC FORM

ATC 35 – VIADUCT OPTIMIZATION

Sections A though E below must be completed to submit a Preliminary ATC for the Green Line Extension Design Build Project as specified in Section 3.2.1 of the Instructions to Proposers. This Preliminary ATC must be submitted to the MBTA's Designated Representative as specified in Section 2.4.1 of the Instructions to Proposers via the Project Management Information System.

A. General Description

A general description (not to exceed two pages) of the Preliminary ATC, how the ATC will be used on the Project, the proposed location of the ATC, and any other pertinent information that would provide a clear understanding of the potential ATC;

This ATC replaces three sections of elevated track with MSE walls as follows:

1.) Replace a section of elevated track from approximate Sta. MB-EB 196+00 to Sta. MB-EB 202+00 required on viaduct with an elevated section of track on MSE wall
2.) Replace a section of elevated track from approximate Sta. US-WB 7+75 to Sta. US-WB 11+50 required on viaduct with an elevated section of track on MSE wall
3.) Replace a section of elevated track from approximate Sta. MB-EB 214+00 to Sta. MB-EB 220+00 required on viaduct with an elevated section of track on MSE wall

B. References to Contract Documents

References to requirements of the Contract Documents that are inconsistent with the proposed ATC and an explanation of the nature of the deviations from said requirements;

Volume 2, Technical Provisions, Section 1.2.1 General (a) and (b). Volume 2, Exhibit 2B, Project Definition plan sheets: UEV-S-2001, and UWV-S-2000. This ATC replaces sections of elevated concrete structure shown on the Project Definition plans with an MSE wall structure.

C. Benefits

Any potential benefits or implications of incorporating the Preliminary ATC into the Project, including in right-of-way acquisitions, rail operations, and routine or capital maintenance, and other Project risks;

This ATC will provide the following benefits:

- Reduced contaminated excavation and export off site while eliminating contaminated deep foundation spoils
- Mitigated deep foundation risks
- MSE wall will have lower maintenance cost
- Reduced noise and vibration during construction
- Reduced square footage of bridge deck
- Decrease in maintenance cost due to decrease in bridge deck area

D. Conceptual Drawings

Any conceptual drawings (if applicable) of the configuration of the potential ATC or other appropriate descriptive information that provides an understanding of the Preliminary ATC; and

Please reference Figures ATC-35-1 “Plan View of Proposed MSE Wall Sections” and ATC-35-2 “Profile Views of Proposed MSE Wall Sections”

E. Cost Estimate and Schedule Impacts

An order of magnitude cost estimate and a preliminary analysis of schedule impacts associated with the Preliminary ATC.

This ATC will result in an estimated cost savings of $10 M. Our preliminary analysis indicates no impact to schedule milestones.

Figure ATC-35-1: Plan View of Proposed MSE Wall Sections

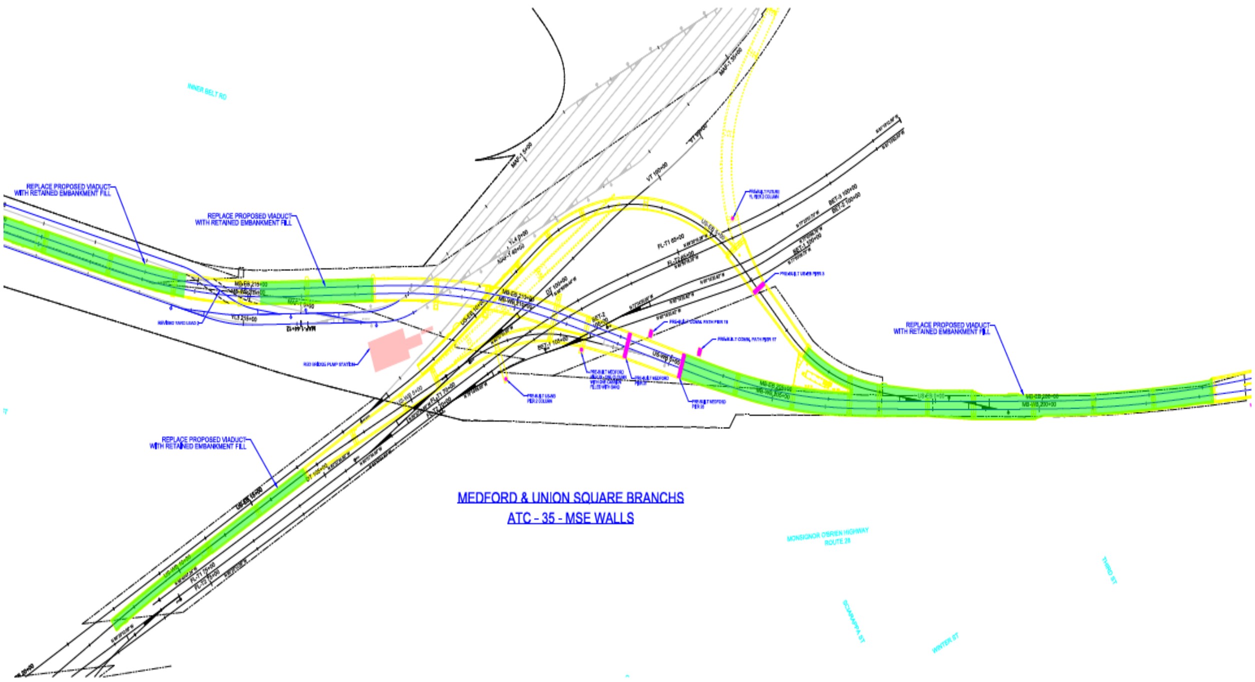
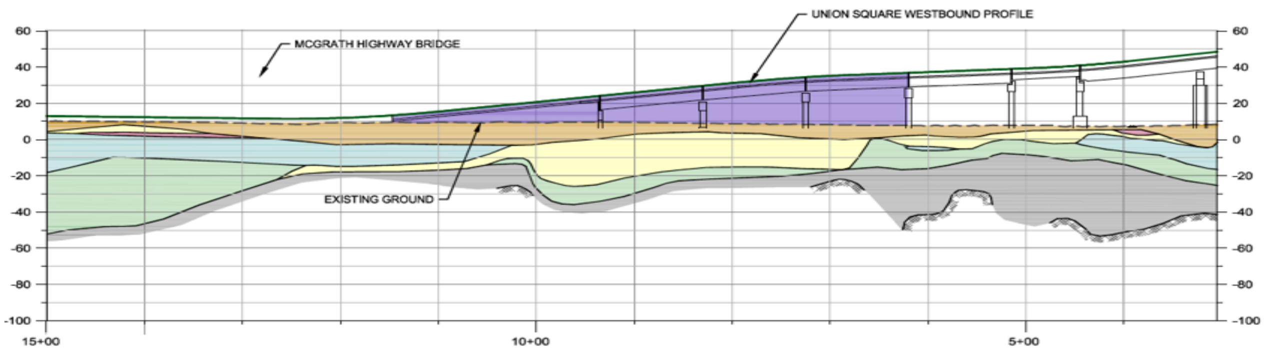
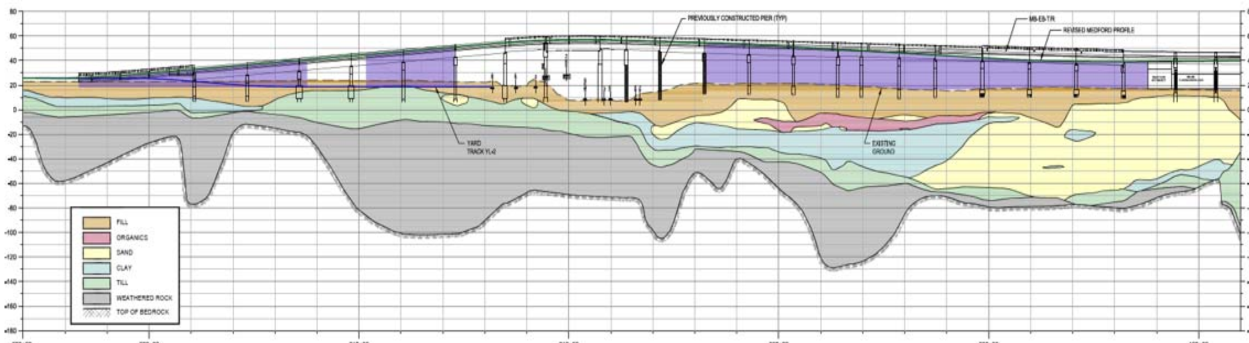


Figure ATC-35-2: Profile Views of Proposed MSE Wall Sections





ATC No. 35

Formal Submission

COVER SHEET

GLX CONSTRUCTORS

MBTA CONTRACT NO. E22CN07

GREEN LINE EXTENSION DESIGN BUILD PROJECT

CONFIDENTIAL ATCs

FORMAL

ALTERNATIVE TECHNICAL CONCEPTS ("ATCs")

JUNE 9, 2017 (First Round)

JUNE 22, 2017 (Second Round)

JULY 11, 2017 (Final Round)

GLX CONSTRUCTORS FORMAL ATC FORM

VIADUCT OPTIMIZATION

Sections A though P below shall be completed to submit a Formal ATC for the Green Line Extension Design Build Project as specified in Section 3.2.1 of the Instructions to Proposers. This Formal ATC must be submitted to the MBTA's Designated Representative as specified in Section 2.4.1 of the Instructions to Proposers via the Project Management Information System.

A. ATC Number

A sequential ATC number identifying the Proposer and the ATC number. (Multi-part or multi-option ATCs shall be submitted as separate individual ATCs with unique sequential numbers.);

ATC 35

MBTA Preliminary ATC File Number: ATC-000013 – GLX Constructors ATC 07

B. Description and Conceptual Drawings

A description and conceptual drawings of the configuration of the ATC or other appropriate descriptive information;

This ATC replaces three sections of elevated track with MSE walls as follows:

1.) Replace a section of elevated track from approximate Sta. MB-EB 196+00 to Sta. MB-EB 202+00 required on viaduct with an elevated section of track on MSE wall
2.) Replace a section of elevated track from approximate Sta. US-WB 7+75 to Sta. US-WB 11+50 required on viaduct with an elevated section of track on MSE wall
3.) Replace a section of elevated track from approximate Sta. MB-EB 214+00 to Sta. MB-EB 220+00 required on viaduct with an elevated section of track on MSE wall

Please reference Figures ATC-35-1 "Plan View of Proposed MSE Wall Sections" , ATC-35-2 "Profile Views of Proposed MSE Wall Sections" and ATC-35-3 "MSE Wall At Viaduct"

C. Locations and How Used

The locations where, and an explanation of how, the ATC will be used on the Project;

This ATC will be used at approximate Sta. MB-EB 196+00 to Sta. MB-EB 202+00, US-WB 7+75 to Sta. US-WB 11+50, and Sta. MB-EB 214+00 to Sta. MB-EB 220+00 to replace sections of elevated track with MSE walls.

D. Changes in Rail or Transit Operations

Any changes in rail or transit operations requirements associated with the ATC, including ease of operations;

No changes in operations are anticipated as a result of this ATC.

E. Changes in Routine or Capital Maintenance

Any changes in routine or capital maintenance requirements associated with the ATC, including ease of maintenance;

This ATC will include MSE walls that require less maintenance than an elevated structure and associated bridge deck area.

F. Changes in Anticipated Service Life

Any changes in the anticipated service life of the item(s) comprising the ATC or affected by the ATC;

MSE wall sections will have a longer service life than the specified bridge sections. This is mainly due to alleviated corrosion or stray current issues associated with elevated bridge structures.

G. References to Contract Documents

References to requirements of the Contract Documents that are inconsistent with the proposed ATC, an explanation of the nature of the deviations from said requirements, and a request for approval of such deviations;

Volume 2, Technical Provisions, Section 1.2.1 General (a) and (b). Volume 2, Exhibit 2B, Project Definition plan sheets: UEV-S-2001, and UWV-S-2000. This ATC replaces sections of elevated concrete structure shown on the Project Definition plans with an MSE wall structure.

H. Justification of Use

An analysis justifying use of the ATC and why the deviation, if any, from the requirements of the Contract Documents should be allowed;

This ATC will reduce contaminated excavation and export off site while eliminating contaminated deep foundation spoils. The deep foundations required for an elevated structures are eliminated, thus reducing the deep foundation risk associated with unforeseen conditions. MSE wall construction has lower noise and vibration than elevated structure construction. The reduction in bridge deck provides a significant cost savings to the project.

I. Preliminary Analysis and Quantitative Discussion

A preliminary analysis and quantitative discussion of potential impacts on rail or transit operations (both during and after construction), environmental permitting, community impact, safety, and life-cycle Project and infrastructure costs, including impacts on the cost of repair, replacement, maintenance, and operation;

No impacts on rail or transit operations are anticipated as a result of this ATC.

J. Impacts on Third Parties

A description of any impacts on the land or facilities of third parties, including private owners, governmental entities, utility owners, and railroads, and identification of specific additional right of way required to implement the ATC. Proposers are advised that they may (i) be solely responsible for the cost and schedule impacts of the acquisition of any such Additional Properties, including the cost thereof and obtaining any necessary environmental approvals; (ii) not be entitled to any change order for time or money as a result of site conditions (i.e., hazardous materials, differing site conditions, geotechnical issues, or utilities) on such Additional Properties; and (iii) not be entitled to any change order for time or money as a result of any delay, inability, or cost associated with the acquisition of such Additional Properties;

No impacts to third parties are anticipated as a result of this ATC.

K. History of Use and References

A description of any other projects where the ATC has been used, the degree of success or failure of such usage, and names and contact information, including phone numbers and E-mail addresses, for project owner representatives that can confirm such statements;

MSE Walls have been used successfully as a part of the Charlotte Area Transit System in Charlotte, North Carolina.

John Mrzygod, City of Charlotte Engineering and Property Management – Charlotte Area Transit System, 704.336.2245, jmrzygod@ci.charlotte.nc.us

L. Additional Risks

A description of added risks to the MBTA or third parties associated with implementing the ATC;

No additional risks to the MBTA or to third parties are anticipated as a result of this ATC.

M. Additional Costs

An estimate of any additional MBTA, DB Entity, and third-party costs associated with implementation of the ATC;

Additional costs to the MBTA, DB Entity and third parties will not result from this ATC. One of the primary purposes of this ATC is cost reduction.

N. Estimated Price Adjustment

An estimate of the price adjustment (i.e., cost savings), should the ATC be approved and implemented;

This ATC will result in an estimated savings of $10,000,000. The ATC pricing as shown in this proposal is an all inclusive price. All price deducts and/or adds have been considered, and the resulting price adjustment is offered as shown.

O. Schedule Adjustment

An estimate of the schedule adjustment, should the ATC be approved and implemented; and

This ATC does not require any schedule adjustment.

P. Analysis of Quality, Performance, and Reliability

An analysis of how the ATC is equal to or better in quality, performance, and reliability than the requirements of the Contract Documents.

This ATC will provide an equal quality, performance, and reliability than the specified elevated track section. This ATC would increase the service life while reducing maintenance costs associated with

maintaining corrosion resistance.

Figure ATC-35-1: Plan View of Proposed MSE Wall Sections

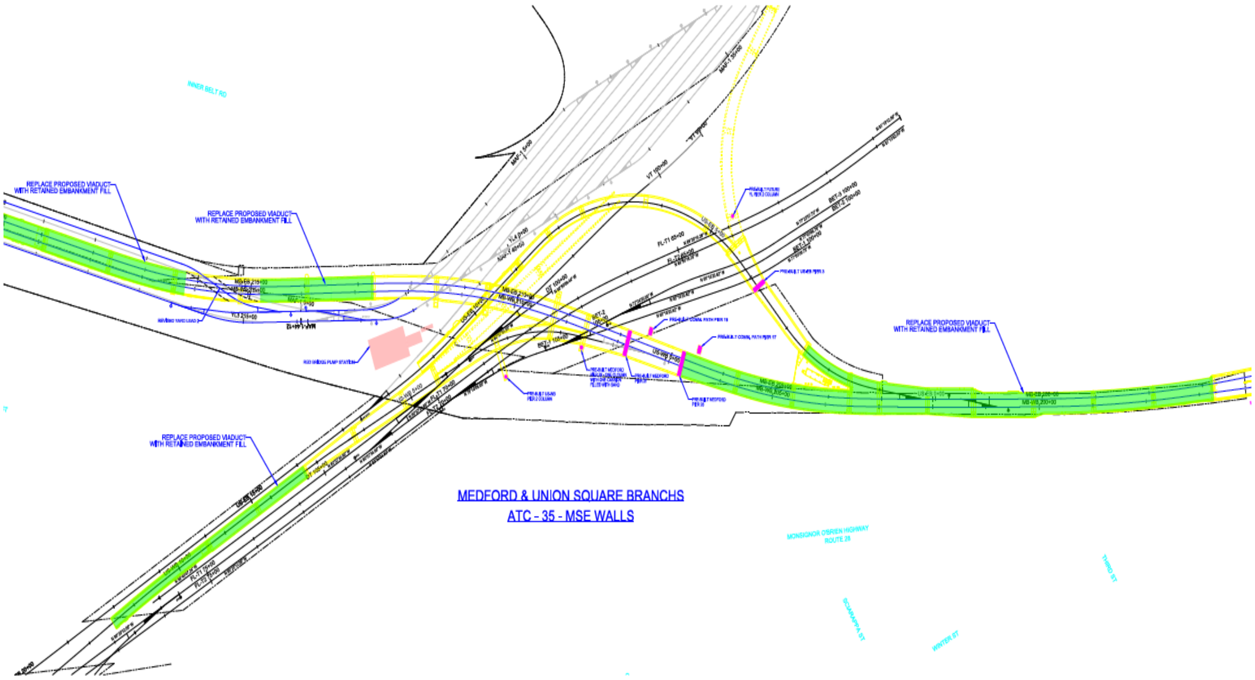


Figure ATC-35-2: Profile Views of Proposed MSE Wall Sections

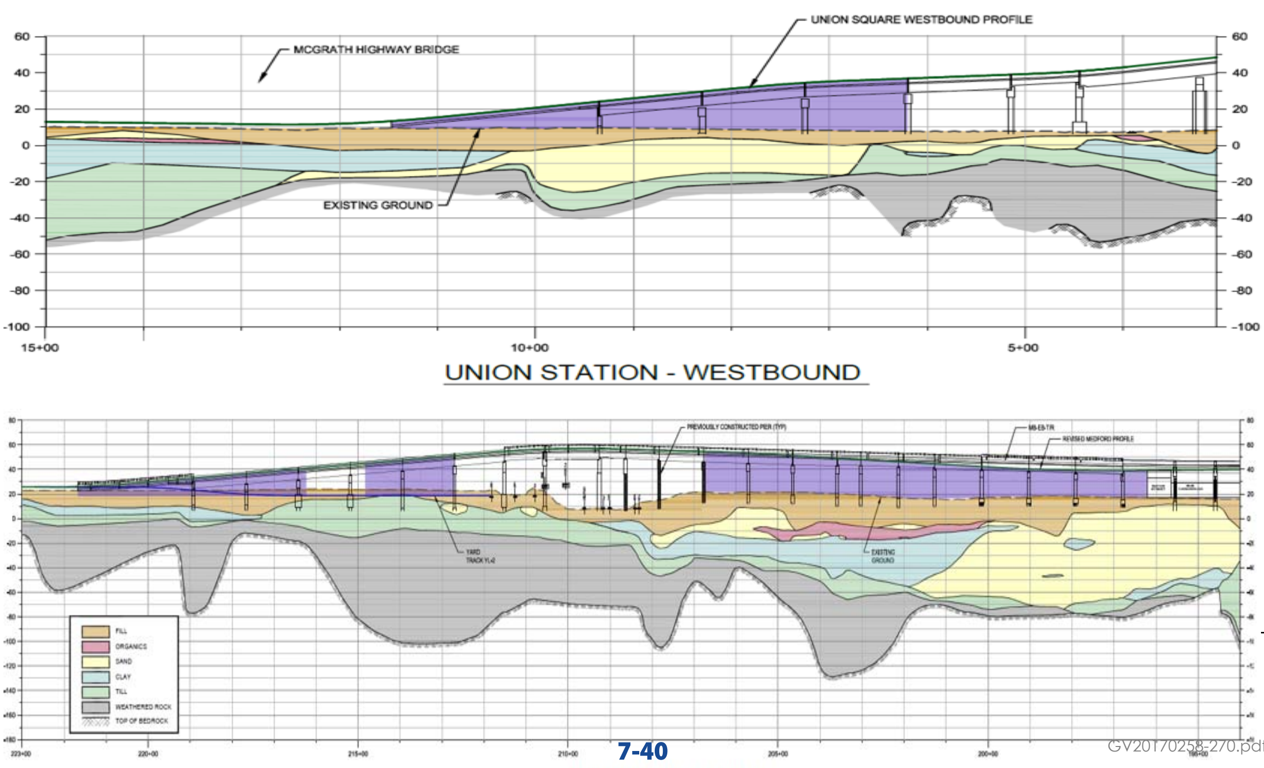
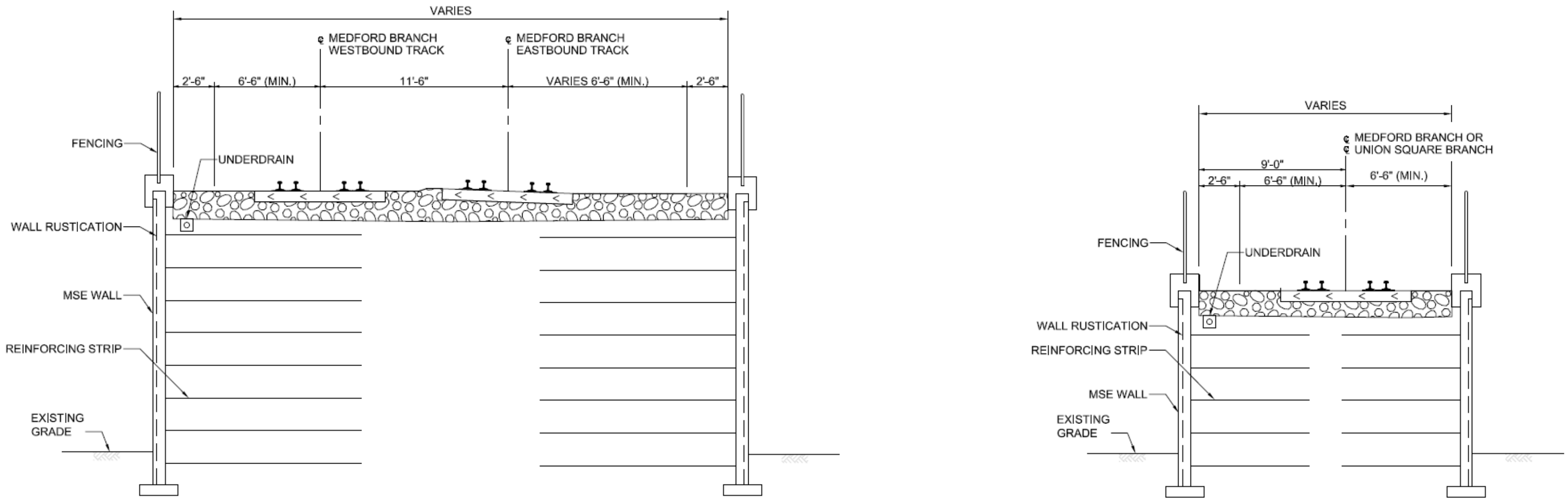


Figure ATC-35-3: MSE Wall at Viaduct



MSE WALL AT VIADUCT

ATC No. 35

MBTA Request for Clarification

Massachusetts Bay Transportation Authority

ATC Information:

Type of ATC:	Formal
Title:	GLX Constructors ATC 06 - Viaduct Optimization
Proposer Company:	GLX Constructors

Clarification Needed:

The following is MBTA's written request for additional information regarding the ATC Submittal, consistent with Section 3.4 of the Instructions to Proposers. MBTA requests Proposer's prompt response.

Please provide:

- further information regarding how the proposed solution will affect daylight/shadow conditions with respect to the Brick Bottom Condominiums.
- further information regarding routing of Eversource power supply if this proposed solution were accepted and implemented. Please note Eversource's access requirements with respect to in-ground Eversource cables.
- further information (by way of a plan or otherwise) on proposed driving and walking routes to access the signal bungalow, were this proposed solution accepted and implemented.
- information regarding the frequency, methods for ballast tamping and other preventative maintenance due to settlement, with examples of other comparable projects' use and settlement/mitigation/corrective measures taken and procedures in place.

Sent on behalf of Yvelisse Duvergé.

COVER SHEET

GLX CONSTRUCTORS

MBTA CONTRACT NO. E22CN07

GREEN LINE EXTENSION DESIGN BUILD PROJECT

CONFIDENTIAL ATCs

FORMAL

ALTERNATIVE TECHNICAL CONCEPTS ("ATCs")

JUNE 9, 2017 (First Round)

JUNE 22, 2017 (Second Round)

JULY 11, 2017 (Final Round)

GLX CONSTRUCTORS FORMAL ATC FORM

VIADUCT OPTIMIZATION

Sections A though P below shall be completed to submit a Formal ATC for the Green Line Extension Design Build Project as specified in Section 3.2.1 of the Instructions to Proposers. This Formal ATC must be submitted to the MBTA's Designated Representative as specified in Section 2.4.1 of the Instructions to Proposers via the Project Management Information System.

A. ATC Number

A sequential ATC number identifying the Proposer and the ATC number. (Multi-part or multi-option ATCs shall be submitted as separate individual ATCs with unique sequential numbers.);

ATC 35

MBTA Preliminary ATC File Number: ATC-000013 – GLX Constructors ATC 07

B. Description and Conceptual Drawings

A description and conceptual drawings of the configuration of the ATC or other appropriate descriptive information;

This ATC replaces three sections of elevated track with MSE walls as follows:

1.) Replace a section of elevated track from approximate Sta. MB-EB 196+00 to Sta. MB-EB 202+00 required on viaduct with an elevated section of track on MSE wall
2.) Replace a section of elevated track from approximate Sta. US-WB 7+75 to Sta. US-WB 11+50 required on viaduct with an elevated section of track on MSE wall
3.) Replace a section of elevated track from approximate Sta. MB-EB 214+00 to Sta. MB-EB 220+00 required on viaduct with an elevated section of track on MSE wall

Please reference Figures ATC-35-1 "Plan View of Proposed MSE Wall Sections" , ATC-35-2 "Profile Views of Proposed MSE Wall Sections" and ATC-35-3 "MSE Wall At Viaduct"

C. Locations and How Used

The locations where, and an explanation of how, the ATC will be used on the Project;

This ATC will be used at approximate Sta. MB-EB 196+00 to Sta. MB-EB 202+00, US-WB 7+75 to Sta. US-WB 11+50, and Sta. MB-EB 214+00 to Sta. MB-EB 220+00 to replace sections of elevated track with MSE walls.

D. Changes in Rail or Transit Operations

Any changes in rail or transit operations requirements associated with the ATC, including ease of operations;

No changes in operations are anticipated as a result of this ATC.

E. Changes in Routine or Capital Maintenance

Any changes in routine or capital maintenance requirements associated with the ATC, including ease of maintenance;

This ATC will include MSE walls that require less maintenance than an elevated structure and associated bridge deck area.

F. Changes in Anticipated Service Life

Any changes in the anticipated service life of the item(s) comprising the ATC or affected by the ATC;

MSE wall sections will have a longer service life than the specified bridge sections. This is mainly due to alleviated corrosion or stray current issues associated with elevated bridge structures.

G. References to Contract Documents

References to requirements of the Contract Documents that are inconsistent with the proposed ATC, an explanation of the nature of the deviations from said requirements, and a request for approval of such deviations;

Volume 2, Technical Provisions, Section 1.2.1 General (a) and (b). Volume 2, Exhibit 2B, Project Definition plan sheets: UEV-S-2001, and UWV-S-2000. This ATC replaces sections of elevated concrete structure shown on the Project Definition plans with an MSE wall structure.

H. Justification of Use

An analysis justifying use of the ATC and why the deviation, if any, from the requirements of the Contract Documents should be allowed;

This ATC will reduce contaminated excavation and export off site while eliminating contaminated deep foundation spoils. The deep foundations required for an elevated structures are eliminated, thus reducing the deep foundation risk associated with unforeseen conditions. MSE wall construction has lower noise and vibration than elevated structure construction. The reduction in bridge deck provides a significant cost savings to the project.

I. Preliminary Analysis and Quantitative Discussion

A preliminary analysis and quantitative discussion of potential impacts on rail or transit operations (both during and after construction), environmental permitting, community impact, safety, and life-cycle Project and infrastructure costs, including impacts on the cost of repair, replacement, maintenance, and operation;

No impacts on rail or transit operations are anticipated as a result of this ATC.

J. Impacts on Third Parties

A description of any impacts on the land or facilities of third parties, including private owners, governmental entities, utility owners, and railroads, and identification of specific additional right of way required to implement the ATC. Proposers are advised that they may (i) be solely responsible for the cost and schedule impacts of the acquisition of any such Additional Properties, including the cost thereof and obtaining any necessary environmental approvals; (ii) not be entitled to any change order for time or money as a result of site conditions (i.e., hazardous materials, differing site conditions, geotechnical issues, or utilities) on such Additional Properties; and (iii) not be entitled to any change order for time or money as a result of any delay, inability, or cost associated with the acquisition of such Additional Properties;

No impacts to third parties are anticipated as a result of this ATC.

K. History of Use and References

A description of any other projects where the ATC has been used, the degree of success or failure of such usage, and names and contact information, including phone numbers and E-mail addresses, for project owner representatives that can confirm such statements;

MSE Walls have been used successfully as a part of the Charlotte Area Transit System in Charlotte, North Carolina.

John Mrzygod, City of Charlotte Engineering and Property Management – Charlotte Area Transit System, 704.336.2245, jmrzygod@ci.charlotte.nc.us

L. Additional Risks

A description of added risks to the MBTA or third parties associated with implementing the ATC;

No additional risks to the MBTA or to third parties are anticipated as a result of this ATC.

M. Additional Costs

An estimate of any additional MBTA, DB Entity, and third-party costs associated with implementation of the ATC;

Additional costs to the MBTA, DB Entity and third parties will not result from this ATC. One of the primary purposes of this ATC is cost reduction.

N. Estimated Price Adjustment

An estimate of the price adjustment (i.e., cost savings), should the ATC be approved and implemented;

This ATC will result in an estimated savings of $10,000,000. The ATC pricing as shown in this proposal is an all inclusive price. All price deducts and/or adds have been considered, and the resulting price adjustment is offered as shown.

O. Schedule Adjustment

An estimate of the schedule adjustment, should the ATC be approved and implemented; and

This ATC does not require any schedule adjustment.

P. Analysis of Quality, Performance, and Reliability

An analysis of how the ATC is equal to or better in quality, performance, and reliability than the requirements of the Contract Documents.

This ATC will provide an equal quality, performance, and reliability than the specified elevated track section. This ATC would increase the service life while reducing maintenance costs associated with

maintaining corrosion resistance.

Figure ATC-35-1: Plan View of Proposed MSE Wall Sections

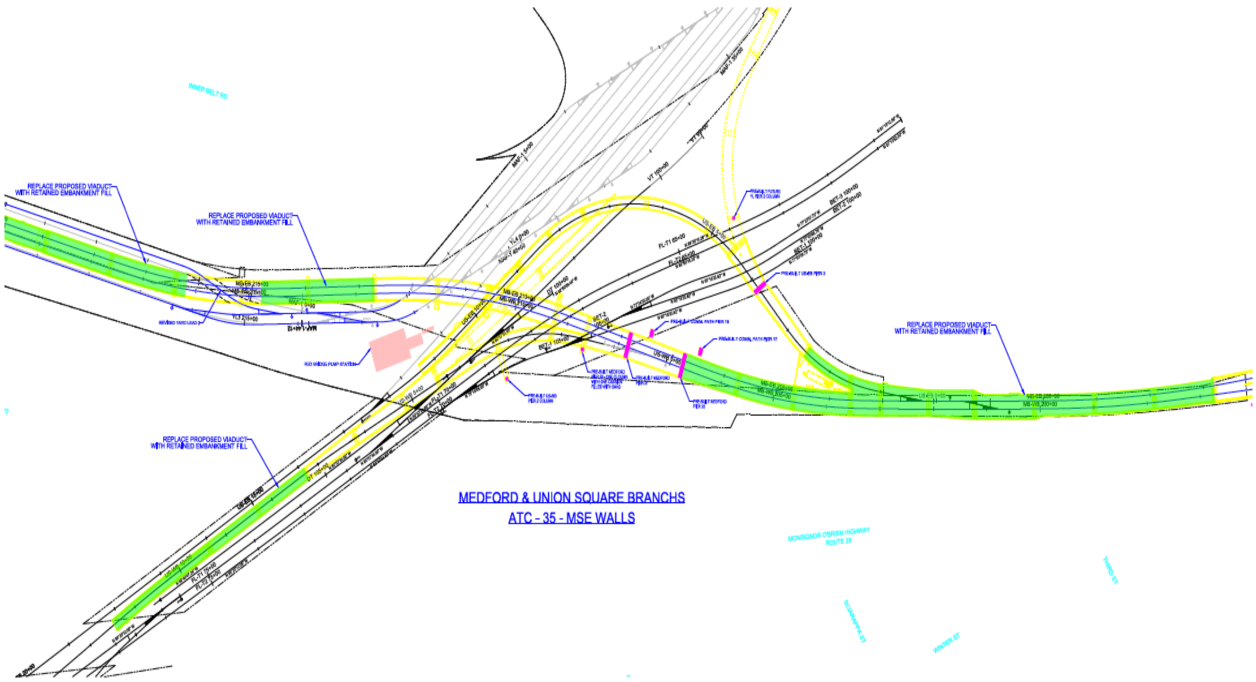


Figure ATC-35-2: Profile Views of Proposed MSE Wall Sections

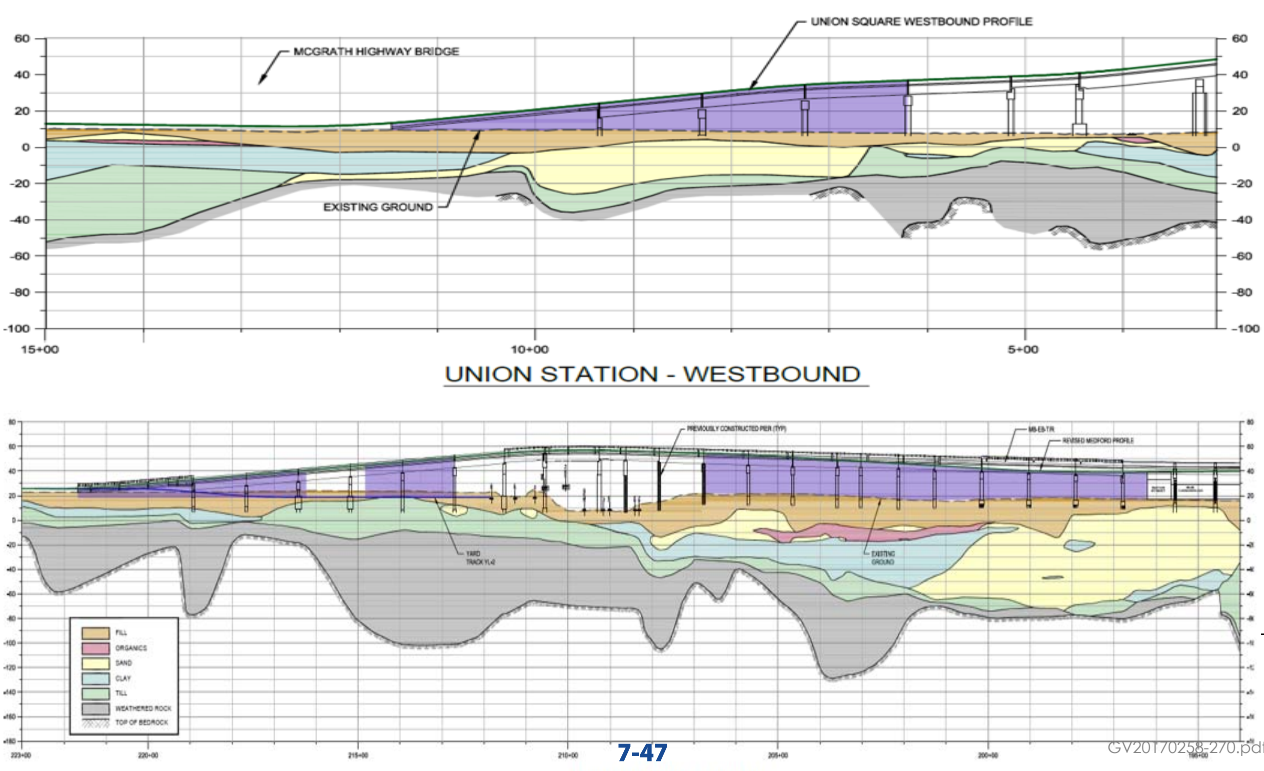
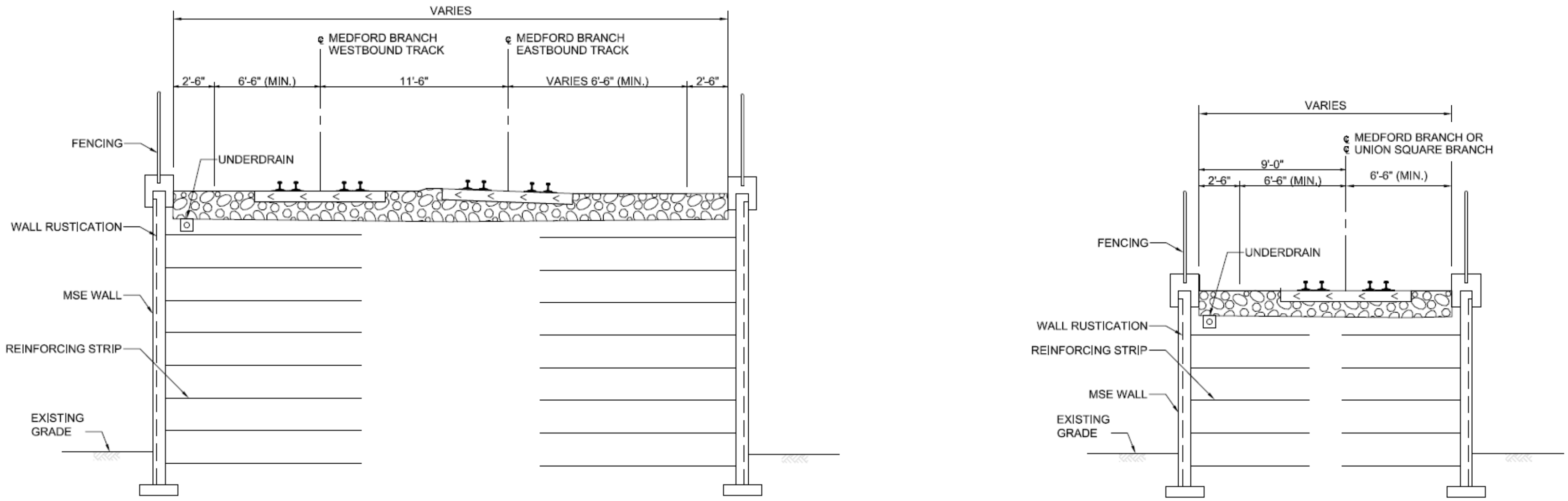


Figure ATC-35-3: MSE Wall at Viaduct



MSE WALL AT VIADUCT

Massachusetts Bay Transportation Authority

GLX

Green Line Extension
Formal Alternative Technical Concept (ATC)
Eligibility Checklist

Date: 07-13-2013

Reviewer: Hemal Patel

Proposal Team: GLX Constructors

ATC Number: GLXC ATC 06-GLX Constructors_ATC 35_Formal_17071

Eligibility Determination

	Yes	No
A. Identification: Includes a sequential ATC number identifying the Proposer and the ATC number. (Multi-part or multi-option ATCs shall be submitted as separate individual ATCs with unique sequential numbers.)	✔	
B. General Description: Includes a description and conceptual drawings of the configuration of the ATC or other appropriate descriptive information	✔	
C. Information: Identifies the locations where, and an explanation of how, the ATC will be used on the Project	✔	
D. Changes to Operations Requirements: Identifies any changes in rail or transit operations requirements associated with the ATC, including ease of operations	✔	
E. Changes to Maintenance Requirements: Identifies any changes in routine or capital maintenance requirements associated with the ATC, including ease of maintenance	✔	
F. Service Life 1. Identifies any changes in the anticipated service life of the item(s) comprising the ATC or affected by the ATC	✔	
G. Requirements References: Identifies references to requirements of the Contract Documents that are inconsistent with the proposed ATC, an explanation of the nature of the deviations from said requirements, and a request for approval of such deviations	✔	
H. Justifications: Includes an analysis justifying use of the ATC and why the deviation, if any, from the requirements of the Contract Documents should be allowed	✔	

		Yes	No
I.	**Internal Impacts**: Includes a preliminary analysis and quantitative discussion of potential impacts on rail or transit operations (both during and after construction), environmental permitting, community impact, safety, and life-cycle Project and infrastructure costs, including impacts on the cost of repair, replacement, maintenance, and operation	✔	
J.	**External Impacts**: Includes a description of any impacts on the land or facilities of third parties, including private owners, governmental entities, utility owners, and railroads, and identification of specific additional right of way required to implement the ATC	✔	
K.	**Previous Use of ATC:** Includes a description of any other projects where the ATC has been used, the degree of success or failure of such usage, and names and contact information, including phone numbers and E-mail addresses, for project owner representatives that can confirm such statements	✔	
L.	**Additional Risks**: Includes a description of added risks to the MBTA or third parties associated with implementing the ATC	✔	
M.	**Additional Cost**: Includes an estimate of any additional MBTA, DB Entity, and third-party costs associated with implementation of the ATC	✔	
N.	**Cost Savings**: Includes an estimate of the price adjustment (i.e., cost savings), should the ATC be approved and implemented	✔	
O.	**Schedule**: Includes an estimate of the schedule adjustment, should the ATC be approved and implemented	✔	
P.	**Equal or Better**: Includes an analysis of how the ATC is equal to or better in quality, performance, and reliability than the requirements of the Contract Documents	✔	

Name: Hemal Patel

Signature: ____________________

ATC No. 35

Response to RFI 1

MBTA Clarification Needed – Item 1:

Please provide further information regarding how the proposed solution will affect daylight/shadow conditions with respect to the Brick Bottom Condominiums.

GLX Clarification - Item 1:

The proposed ATC 35, to use MSE walls as a substitute for certain elevated spans along the Viaduct, has no impact on the proposed track elevation, nor does the ATC impact track alignment. Furthermore, the Viaduct parapet walls and maintenance walkways shown on the MBTA Project Definition Plans in Exhibit 2B will remain with incorporation of this ATC. Consequently the extents of the shadow lines generated by this ATC will be consistent with the shadow lines generated by the Viaduct that is defined on the Project Definition Plans.

With the elevated spans of the Viaduct, there is a potential for sunlight to extend under the spans. But given the ratios of structure width to the height from grade to underside of structure, there will be minimal opportunity for sun light to extend from one side of the viaduct to the other side, beneath any span in the vicinity of the Brick Bottom Condominiums. Consequently the solid barrier generated by the MSE wall, as proposed by ATC 35, will not produce a noticeable change the levels of lighting extending from one side of the structure to the other.

Attached are figures to further show the relationship between the Brick Bottom Condominiums and the proposed Viaduct/MSE wall structure:

Figure ATC 35-RFI-1-1: Ariel view of existing conditions at Brick Bottom Condominiums.
Figure ATC 35-RFI-1-2: Plan view showing Brick Bottom Condominiums relative to the proposed track alignment and proposed Viaduct/MSE Wall structure.
Figure ATC 35-RFI-1-3: Profile of proposed Viaduct/MSE Wall structure on Medford Branch with Brick Bottom Condominiums outline highlighted.
Figure ATC 35-RFI-1-4: Profile of proposed Viaduct/MSE Wall structure on Union Square Branch with Brick Bottom Condominiums outline highlighted.

MBTA Clarification Needed – Item 2:

Please provide further information regarding routing of Eversource power supply if this proposed solution were accepted and implemented. Please note Eversource's access requirements with respect to in-ground Eversource cables.

GLX Clarification - Item 2:

STV understands the Eversource access requirements for their power lines. The approval of this ATC will require reconfiguring the power feed to the Red Bridge Sub Station. The GLX Constructors team will develop a power feed configuration that will meet Eversource access requirements.

MBTA Clarification Needed – Item 3:

Please provide further information (by way of a plan or otherwise) on proposed driving and walking routes to access the signal bungalow, were this proposed solution accepted and implemented.

GLX Clarification - Item 3:

Please reference attached **Figure ATC 35-RFI-1-5**: Concept Site Plan Demonstrating Options to Access Signal Bungalow. Please note that this site plan shows the most complex of potential conditions which includes the Additive Option of continuing the Community Path beyond Eat Somerville Station. This sketch is representative of only one such options but we are confident that an acceptable means of access the bungalow could be provided.

MBTA Clarification Needed – Item 4:

Please provide information regarding the frequency, methods for ballast tamping and other preventative maintenance due to settlement, with examples of other comparable projects' use and settlement/mitigation/corrective measures taken and procedures in place.

GLX Clarification - Item 4:

Portions of the proposed MSE embankment fill will be constructed in areas where there are compressible soil underlying the surficial fill layer. In these areas, ground improvement will be performed using deep mixing technology to transfer the weight of the embankment fill to the top of the relatively dense glacial till that underlies these compressible soils. The unconfined compressive strength of the soil mix columns will be approximately 250 psi, which is much greater than that of the glacial till. Cluster of deep mixing columns will be installed so that the spacing between them does not exceed 11 feet. Multiple layers of geogrid reinforcement will be used to transfer the weight of the embankment fill to the deep mixing columns. Therefore, there will not be any settlement associated with compression of the existing fill or underlying compressible soils.

The deep mixing methods has been adopted by the Federal Highway Administration and is described in their Publication No. FHWA-HRT-13-046 dated October 2013. Deep mixing was also used successfully in the Fort Point Channel area of the Central Artery Tunnel project with similar ground conditions.

On other portions of the alignment, the embankment fill will be placed over existing fill material that is underlain be relatively incompressible soils. Therefore, settlement should not be an issue.

GLX Constructors will install settlement monitoring points on the MSE embankment fill to confirm any ongoing ground movements prior to placement of the track ballast. Also, any possible settlement of the ballasted track after track installation can be corrected during routine maintenance surfacing.

As stated in the Formal ATC Submission, MSE Walls have been used successfully as a part of the Charlotte Area Transit System CATS) in Charlotte, North Carolina, among other location across the country. Phase 1 of CATS, known as the Blue Line Corridor, has now been in operation for about 7 years. As part of CATS, a back-to-back MSE Wall system, similar to what we are proposing and sometimes up to 50 feet high, supports light rail tracks. The light rail then transitions on to a bridge structure, again similar to our ATC proposal. This wall/viaduct system has been performing well, and is being replicated as part of Phase 2 (the Blue Line Extension) which is now in construction.

A contact reference on the project is John Mrzygod, City of Charlotte Engineering and Property Management – Charlotte Area Transit System,
704.336.2245, jmrzygod@ci.charlotte.nc.us

Figure ATC 35-RFI-1-1: Ariel view of existing conditions at Brick Bottom Condominiums.

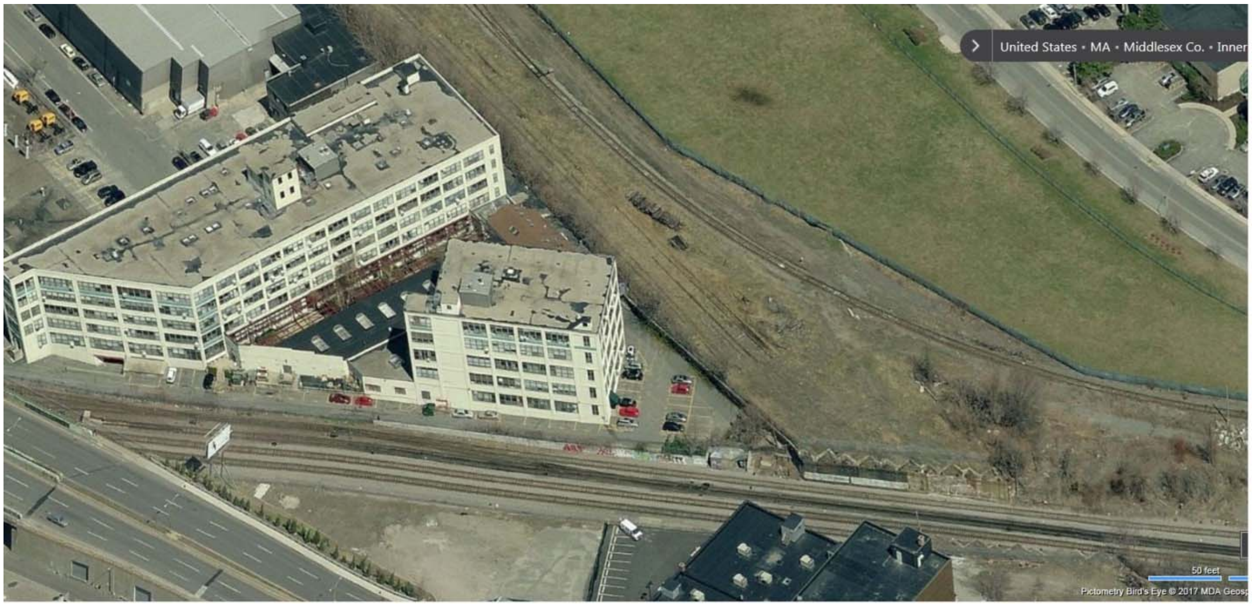


Figure ATC 35-RFI-1-2: Plan view showing Brick Bottom Condominiums relative to the proposed track alignment and proposed Viaduct/MSE Wall structure.

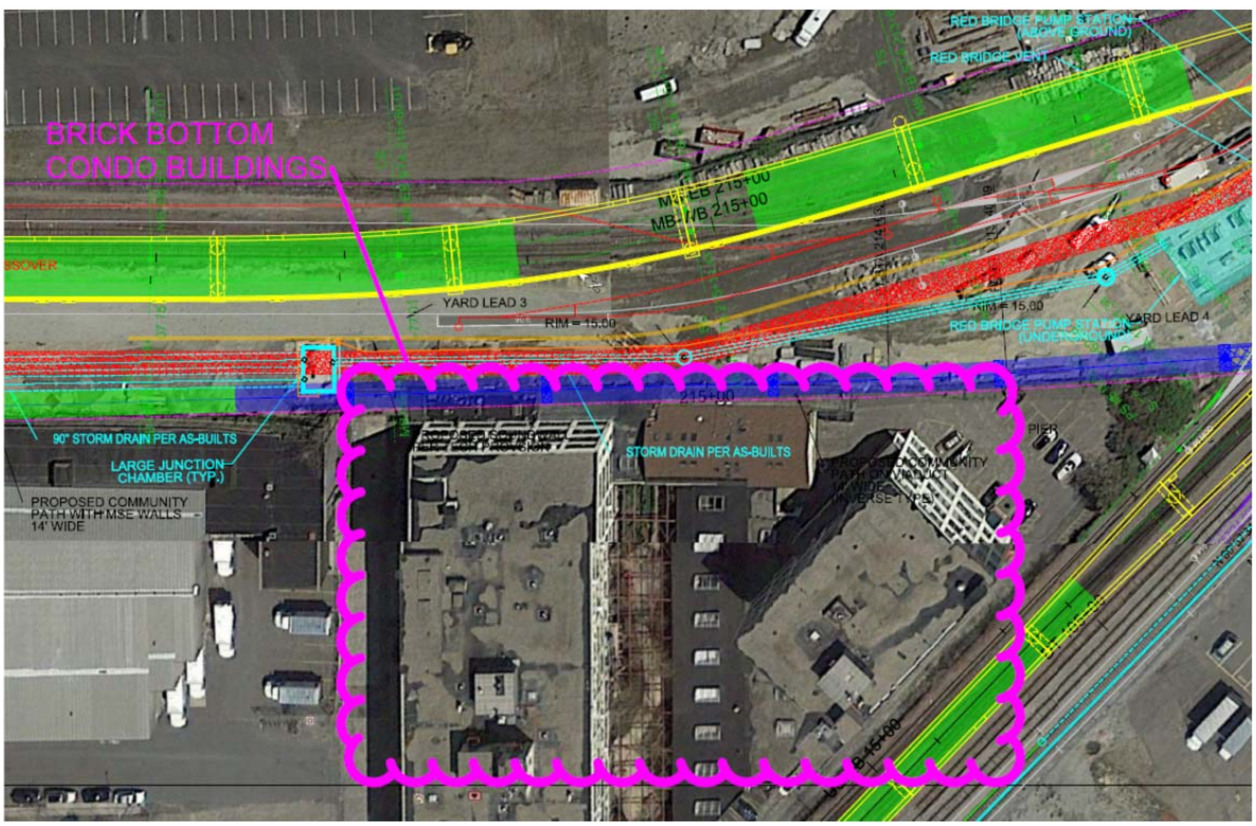


Figure ATC 35-RFI-1-3: Profile of proposed Viaduct/MSE Wall structure on Medford Branch with Brick Bottom Condominiums outline highlighted.

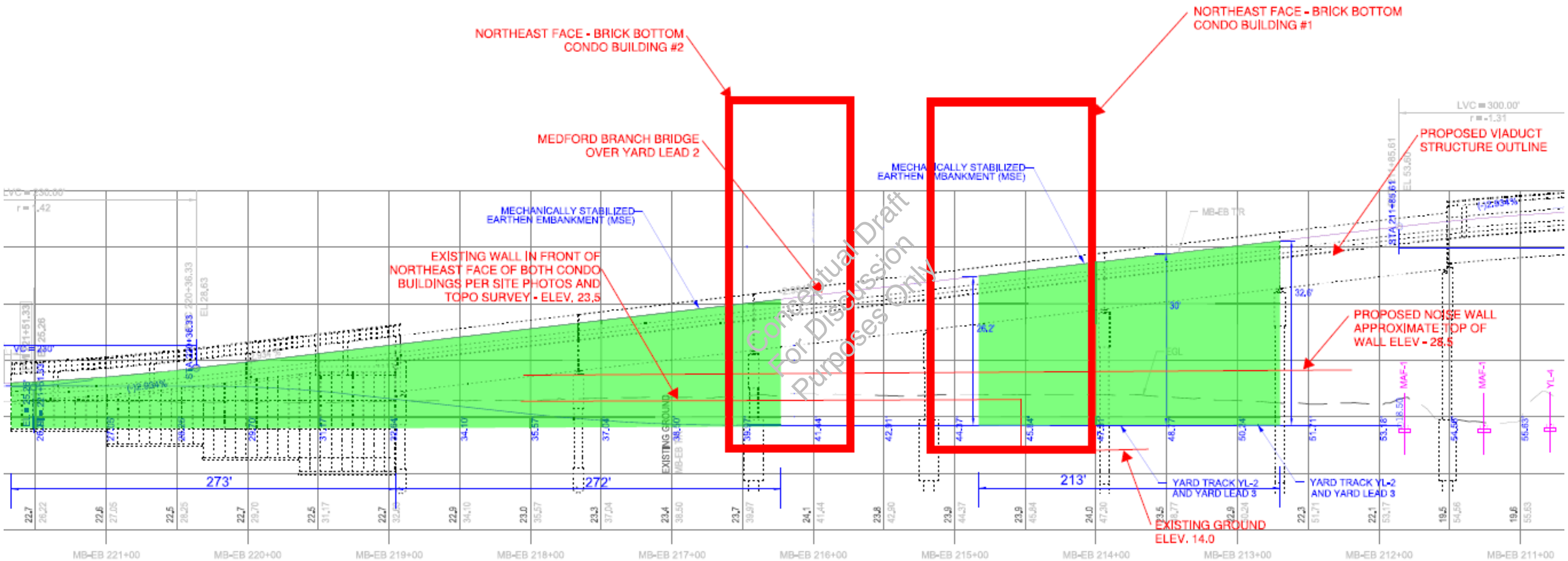


Figure ATC 35-RFI-1-4: Profile of proposed Viaduct/MSE Wall structure on Union Square Branch with Brick Bottom Condominiums outline highlighted.

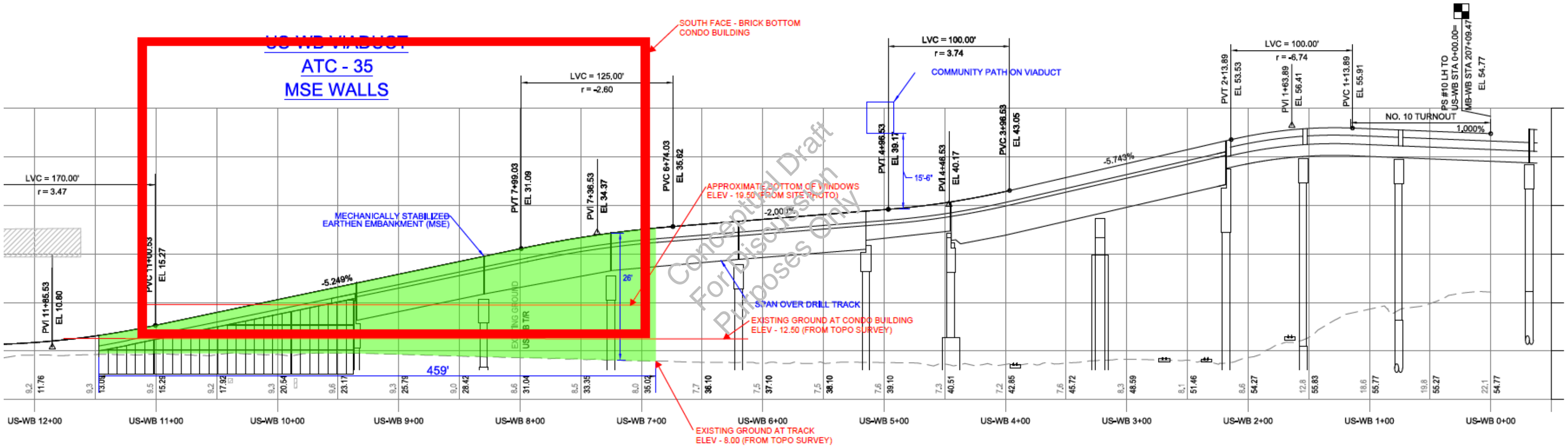
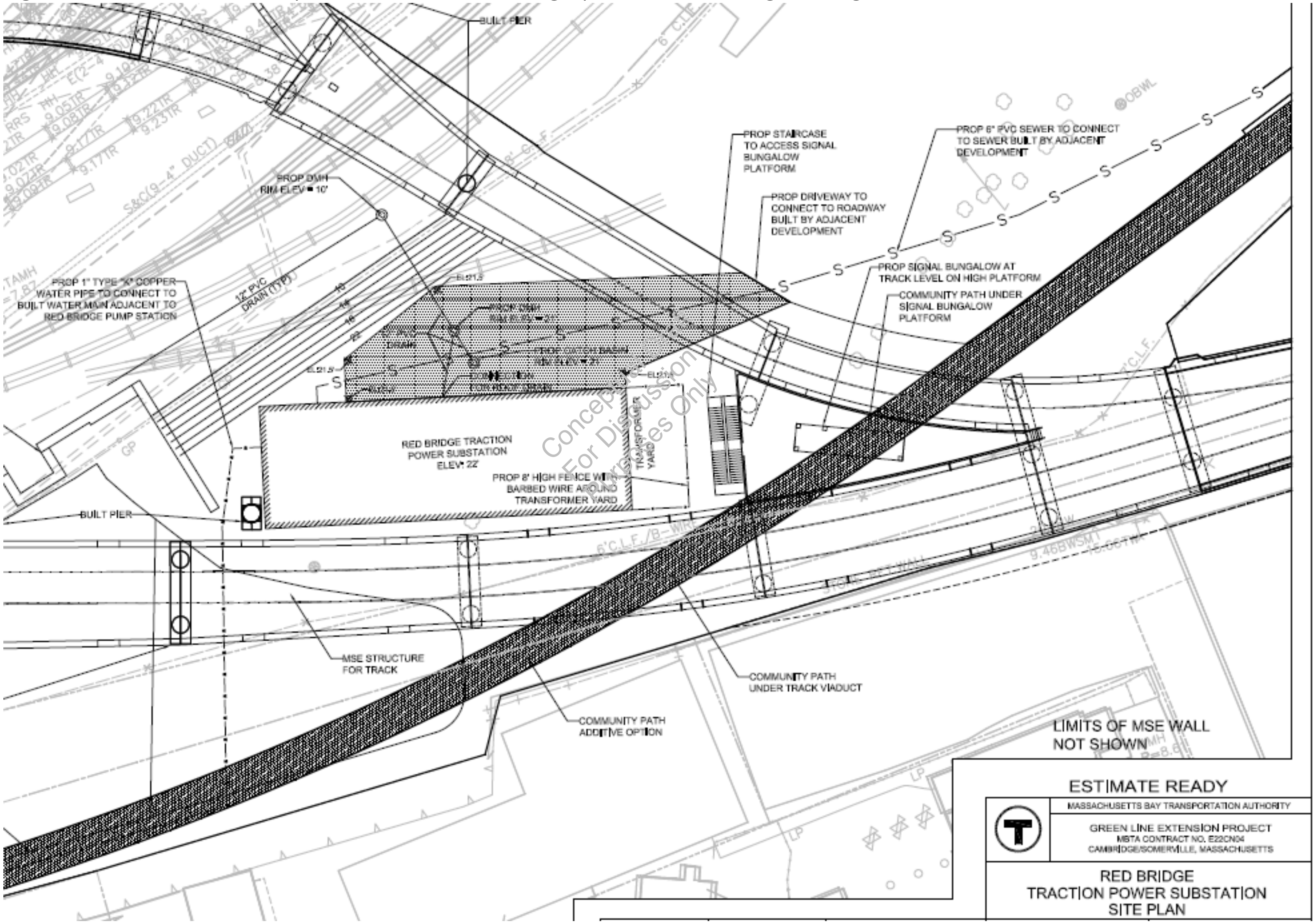


Figure ATC 35-RFI-1-5: Concept Site Plan Demonstrating Options to Access Signal Bungalow



Massachusetts Bay
Transportation Authority

ATC Information:

Type of ATC: Formal
Title: GLX Constructors ATC 06 - Viaduct Optimization
Proposer Company: GLX Constructors

Clarification Needed:

The following is MBTA's written request for additional information regarding the ATC Submittal, consistent with Section 3.4 of the Instructions to Proposers. MBTA requests Proposer's prompt response.

Please provide:

- further information regarding how the proposed solution will affect daylight/shadow conditions with respect to the Brick Bottom Condominiums.
- further information regarding routing of Eversource power supply if this proposed solution were accepted and implemented. Please note Eversource's access requirements with respect to in-ground Eversource cables.
- further information (by way of a plan or otherwise) on proposed driving and walking routes to access the signal bungalow, were this proposed solution accepted and implemented.
- information regarding the frequency, methods for ballast tamping and other preventative maintenance due to settlement, with examples of other comparable projects' use and settlement/mitigation/corrective measures taken and procedures in place.

Sent on behalf of Yvelisse Duvergé.

COVER SHEET

GLX CONSTRUCTORS

MBTA CONTRACT NO. E22CN07

GREEN LINE EXTENSION DESIGN BUILD PROJECT

CONFIDENTIAL ATCs

FORMAL

ALTERNATIVE TECHNICAL CONCEPTS ("ATCs")

JUNE 9, 2017 (First Round)

JUNE 22, 2017 (Second Round)

JULY 11, 2017 (Final Round)

GLX CONSTRUCTORS FORMAL ATC FORM

VIADUCT OPTIMIZATION

Sections A though P below shall be completed to submit a Formal ATC for the Green Line Extension Design Build Project as specified in Section 3.2.1 of the Instructions to Proposers. This Formal ATC must be submitted to the MBTA's Designated Representative as specified in Section 2.4.1 of the Instructions to Proposers via the Project Management Information System.

A. ATC Number

A sequential ATC number identifying the Proposer and the ATC number. (Multi-part or multi-option ATCs shall be submitted as separate individual ATCs with unique sequential numbers.);

ATC 35

MBTA Preliminary ATC File Number: ATC-000013 – GLX Constructors ATC 07

B. Description and Conceptual Drawings

A description and conceptual drawings of the configuration of the ATC or other appropriate descriptive information;

This ATC replaces three sections of elevated track with MSE walls as follows:

1.) Replace a section of elevated track from approximate Sta. MB-EB 196+00 to Sta. MB-EB 202+00 required on viaduct with an elevated section of track on MSE wall
2.) Replace a section of elevated track from approximate Sta. US-WB 7+75 to Sta. US-WB 11+50 required on viaduct with an elevated section of track on MSE wall
3.) Replace a section of elevated track from approximate Sta. MB-EB 214+00 to Sta. MB-EB 220+00 required on viaduct with an elevated section of track on MSE wall

Please reference Figures ATC-35-1 "Plan View of Proposed MSE Wall Sections" , ATC-35-2 "Profile Views of Proposed MSE Wall Sections" and ATC-35-3 "MSE Wall At Viaduct"

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The locations where, and an explanation of how, the ATC will be used on the Project;

This ATC will be used at approximate Sta. MB-EB 196+00 to Sta. MB-EB 202+00, US-WB 7+75 to Sta. US-WB 11+50, and Sta. MB-EB 214+00 to Sta. MB-EB 220+00 to replace sections of elevated track with MSE walls.

D. Changes in Rail or Transit Operations

Any changes in rail or transit operations requirements associated with the ATC, including ease of operations;

No changes in operations are anticipated as a result of this ATC.

E. Changes in Routine or Capital Maintenance

Any changes in routine or capital maintenance requirements associated with the ATC, including ease of maintenance;

This ATC will include MSE walls that require less maintenance than an elevated structure and associated bridge deck area.

F. Changes in Anticipated Service Life

Any changes in the anticipated service life of the item(s) comprising the ATC or affected by the ATC;

MSE wall sections will have a longer service life than the specified bridge sections. This is mainly due to alleviated corrosion or stray current issues associated with elevated bridge structures.

G. References to Contract Documents

References to requirements of the Contract Documents that are inconsistent with the proposed ATC, an explanation of the nature of the deviations from said requirements, and a request for approval of such deviations;

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An analysis justifying use of the ATC and why the deviation, if any, from the requirements of the Contract Documents should be allowed;

This ATC will reduce contaminated excavation and export off site while eliminating contaminated deep foundation spoils. The deep foundations required for an elevated structures are eliminated, thus reducing the deep foundation risk associated with unforeseen conditions. MSE wall construction has lower noise and vibration than elevated structure construction. The reduction in bridge deck provides a significant cost savings to the project.

I. Preliminary Analysis and Quantitative Discussion

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J. Impacts on Third Parties

A description of any impacts on the land or facilities of third parties, including private owners, governmental entities, utility owners, and railroads, and identification of specific additional right of way required to implement the ATC. Proposers are advised that they may (i) be solely responsible for the cost and schedule impacts of the acquisition of any such Additional Properties, including the cost thereof and obtaining any necessary environmental approvals; (ii) not be entitled to any change order for time or money as a result of site conditions (i.e., hazardous materials, differing site conditions, geotechnical issues, or utilities) on such Additional Properties; and (iii) not be entitled to any change order for time or money as a result of any delay, inability, or cost associated with the acquisition of such Additional Properties;

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K. History of Use and References

A description of any other projects where the ATC has been used, the degree of success or failure of such usage, and names and contact information, including phone numbers and E-mail addresses, for project owner representatives that can confirm such statements;

MSE Walls have been used successfully as a part of the Charlotte Area Transit System in Charlotte, North Carolina.

John Mrzygod, City of Charlotte Engineering and Property Management – Charlotte Area Transit System, 704.336.2245, jmrzygod@ci.charlotte.nc.us

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An estimate of any additional MBTA, DB Entity, and third-party costs associated with implementation of the ATC;

Additional costs to the MBTA, DB Entity and third parties will not result from this ATC. One of the primary purposes of this ATC is cost reduction.

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An estimate of the price adjustment (i.e., cost savings), should the ATC be approved and implemented;

This ATC will result in an estimated savings of $10,000,000. The ATC pricing as shown in this proposal is an all inclusive price. All price deducts and/or adds have been considered, and the resulting price adjustment is offered as shown.

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This ATC does not require any schedule adjustment.

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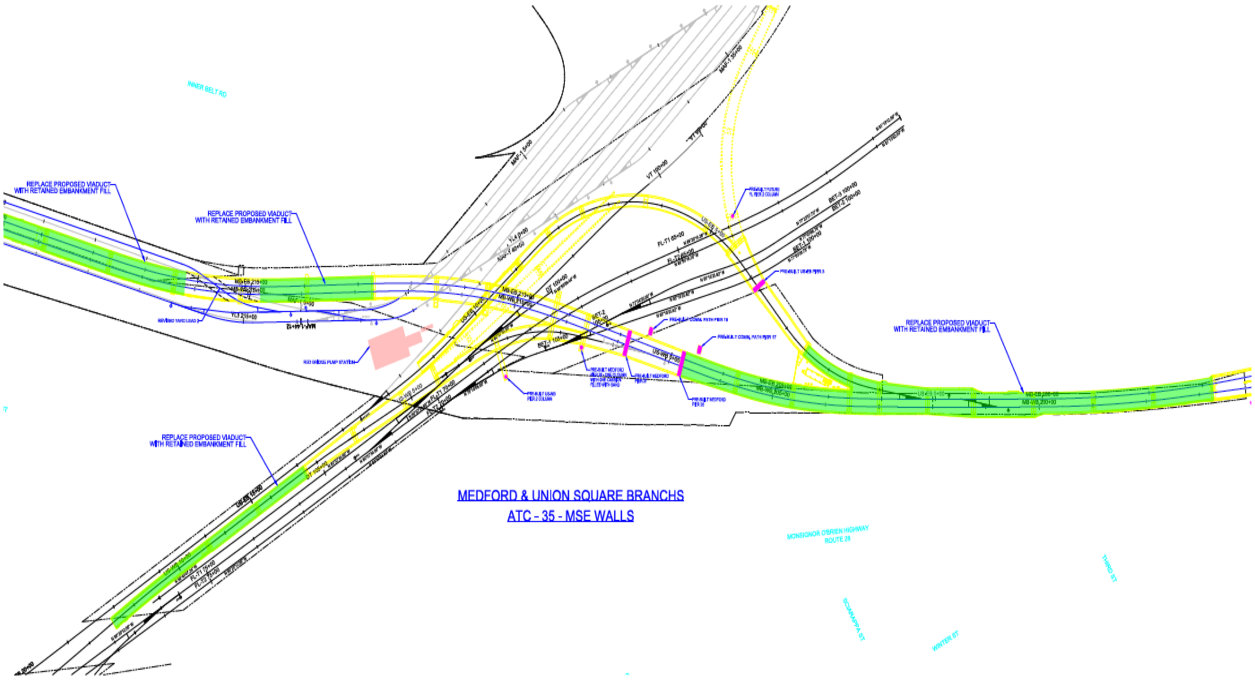

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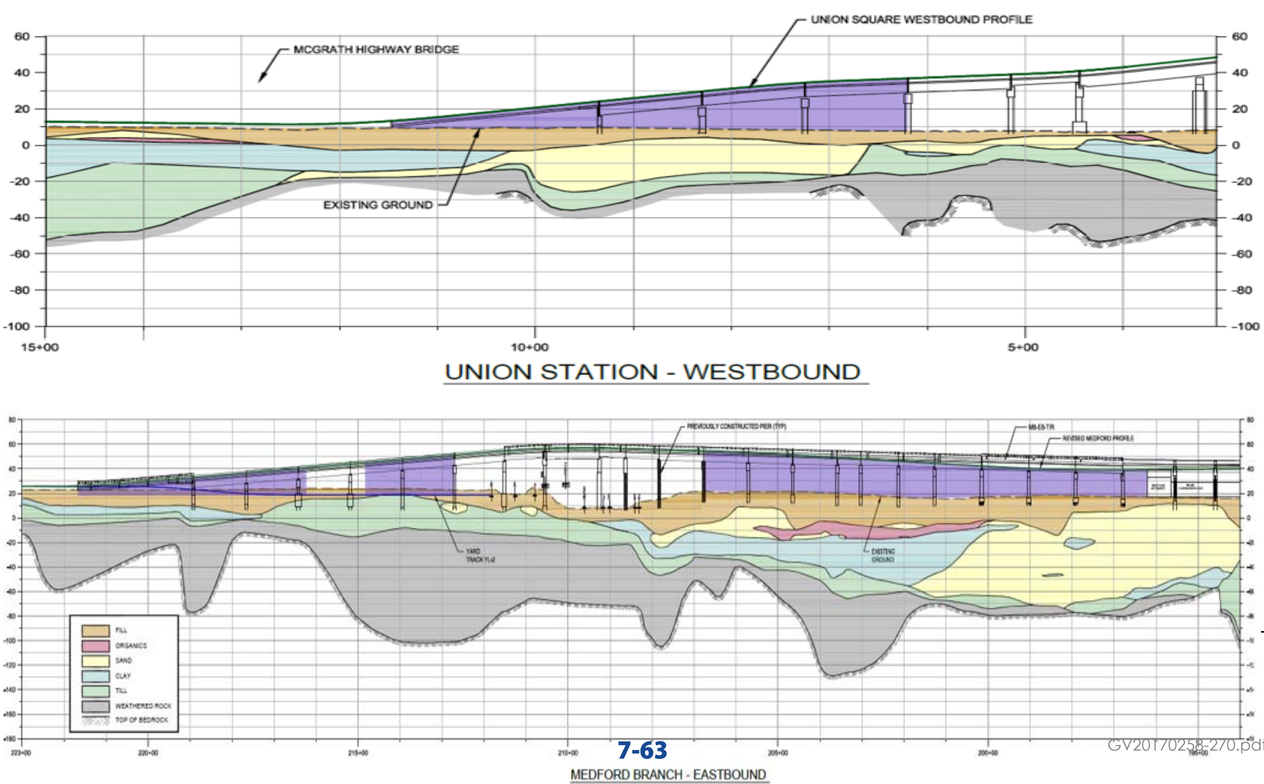
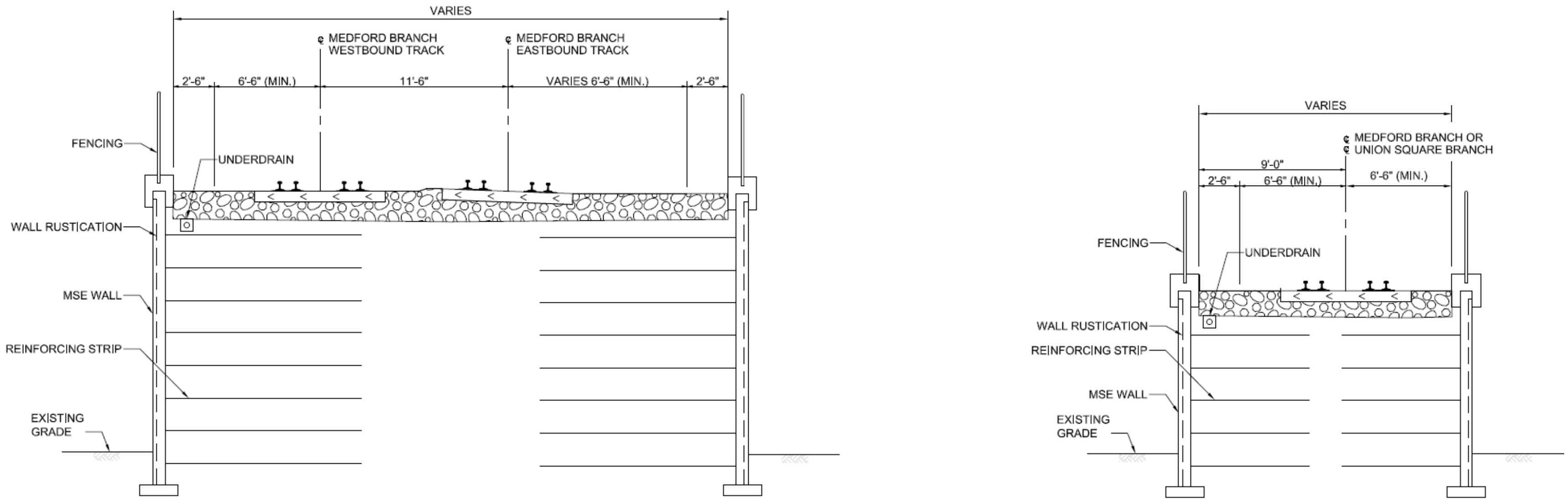


Figure ATC-35-3: MSE Wall at Viaduct



MSE WALL AT VIADUCT

Massachusetts Bay Transportation Authority

GLX

Green Line Extension
Formal Alternative Technical Concept (ATC)
Eligibility Checklist

Date: 07-13-2013

Reviewer: Hemal Patel

Proposal Team: GLX Constructors

ATC Number: GLXC ATC 06-GLX Constructors_ATC 35_Formal_17071

Eligibility Determination

	Yes	No
A. Identification: Includes a sequential ATC number identifying the Proposer and the ATC number. (Multi-part or multi-option ATCs shall be submitted as separate individual ATCs with unique sequential numbers.)	✔	
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P.	**Equal or Better**: Includes an analysis of how the ATC is equal to or better in quality, performance, and reliability than the requirements of the Contract Documents	✔	

Name: Hemal Patel

Signature: ______________________

ATC No. 35

MBTA Conditional Acceptance of Formal Submission

Massachusetts Bay
Transportation Authority

ATC Information:

Type of ATC:	Formal
Title:	GLX Constructors ATC 06 - Viaduct Optimization
Proposer Company:	GLX Constructors

Final Disposition:

Sent on behalf of Yvelisse Duvergé. The MBTA accepts this ATC Submittal for inclusion in the Proposal so long as Proposer, as DB Entity, meets the following conditions as part of the performance of the Work under the Contract Documents:

- MSE walls must be designed for adequate bearing capacity and settlement of foundation soils beneath the embankment in accordance with Sections 8 and 15 of the Technical Provisions, as evidenced during the detailed design review submissions per Section 2.7 of the Technical Provisions. If required in design, soil mixed columns are acceptable, but only if the conditions that warrant them apply, and use is in accordance with the Contract Documents.
- MSE wall design shall also comply with other applicable MassDOT/MBTA requirements (e.g., aesthetics) listed in the Contract Documents.
- MSE walls shall be limited to heights not exceeding the width of the structure. Where guideway height and site conditions require height to exceed width, then DB Entity may not use MSE walls but instead viaduct-type structures as required under the unmodified Technical Provisions.
- MSE walls shall not be used in the vicinity of the Brickbottom development (ca. 1 Fitchburg St., Somerville, MA). DB Entity shall design and construct viaduct type structures in such location. The "vicinity" of the Brickbottom development is as depicted in the modified ATC figure 35-1 provided with this response.

Consistent with Section 3 of the ITP, if implementation of this ATC will require approval by a third party (e.g., a governmental entity), Proposer will have full responsibility for, and bear the full risk of, obtaining any such approvals after execution of the DB Contract and submission of data, provided, however, that the MBTA shall retain its role as liaison with any governmental entities as more particularly described in the Contract Documents. If any required third-party approval is not subsequently granted with the result that the Proposer must comply with the requirements of the original Contract Documents, the Proposer will not be entitled to additional compensation or time under the DB Contract.

Figure ATC-35-1: Plan View of Proposed MSE Wall Sections

GV20170258-270.pdf

COVER SHEET

GLX CONSTRUCTORS

MBTA CONTRACT NO. E22CN07

GREEN LINE EXTENSION DESIGN BUILD PROJECT

CONFIDENTIAL ATCs

FORMAL

ALTERNATIVE TECHNICAL CONCEPTS ("ATCs")

JUNE 9, 2017 (First Round)

JUNE 22, 2017 (Second Round)

JULY 11, 2017 (Final Round)

GLX CONSTRUCTORS FORMAL ATC FORM

VIADUCT OPTIMIZATION

Sections A though P below shall be completed to submit a Formal ATC for the Green Line Extension Design Build Project as specified in Section 3.2.1 of the Instructions to Proposers. This Formal ATC must be submitted to the MBTA's Designated Representative as specified in Section 2.4.1 of the Instructions to Proposers via the Project Management Information System.

A. ATC Number

A sequential ATC number identifying the Proposer and the ATC number. (Multi-part or multi-option ATCs shall be submitted as separate individual ATCs with unique sequential numbers.);

ATC 35

MBTA Preliminary ATC File Number: ATC-000013 – GLX Constructors ATC 07

B. Description and Conceptual Drawings

A description and conceptual drawings of the configuration of the ATC or other appropriate descriptive information;

This ATC replaces three sections of elevated track with MSE walls as follows:

1.) Replace a section of elevated track from approximate Sta. MB-EB 196+00 to Sta. MB-EB 202+00 required on viaduct with an elevated section of track on MSE wall
2.) Replace a section of elevated track from approximate Sta. US-WB 7+75 to Sta. US-WB 11+50 required on viaduct with an elevated section of track on MSE wall
3.) Replace a section of elevated track from approximate Sta. MB-EB 214+00 to Sta. MB-EB 220+00 required on viaduct with an elevated section of track on MSE wall

Please reference Figures ATC-35-1 "Plan View of Proposed MSE Wall Sections" , ATC-35-2 "Profile Views of Proposed MSE Wall Sections" and ATC-35-3 "MSE Wall At Viaduct"

C. Locations and How Used

The locations where, and an explanation of how, the ATC will be used on the Project;

This ATC will be used at approximate Sta. MB-EB 196+00 to Sta. MB-EB 202+00, US-WB 7+75 to Sta. US-WB 11+50, and Sta. MB-EB 214+00 to Sta. MB-EB 220+00 to replace sections of elevated track with MSE walls.

D. Changes in Rail or Transit Operations

Any changes in rail or transit operations requirements associated with the ATC, including ease of operations;

No changes in operations are anticipated as a result of this ATC.

E. Changes in Routine or Capital Maintenance

Any changes in routine or capital maintenance requirements associated with the ATC, including ease of maintenance;

This ATC will include MSE walls that require less maintenance than an elevated structure and associated bridge deck area.

F. Changes in Anticipated Service Life

Any changes in the anticipated service life of the item(s) comprising the ATC or affected by the ATC;

MSE wall sections will have a longer service life than the specified bridge sections. This is mainly due to alleviated corrosion or stray current issues associated with elevated bridge structures.

G. References to Contract Documents

References to requirements of the Contract Documents that are inconsistent with the proposed ATC, an explanation of the nature of the deviations from said requirements, and a request for approval of such deviations;

Volume 2, Technical Provisions, Section 1.2.1 General (a) and (b). Volume 2, Exhibit 2B, Project Definition plan sheets: UEV-S-2001, and UWV-S-2000. This ATC replaces sections of elevated concrete structure shown on the Project Definition plans with an MSE wall structure.

H. Justification of Use

An analysis justifying use of the ATC and why the deviation, if any, from the requirements of the Contract Documents should be allowed;

This ATC will reduce contaminated excavation and export off site while eliminating contaminated deep foundation spoils. The deep foundations required for an elevated structures are eliminated, thus reducing the deep foundation risk associated with unforeseen conditions. MSE wall construction has lower noise and vibration than elevated structure construction. The reduction in bridge deck provides a significant cost savings to the project.

I. Preliminary Analysis and Quantitative Discussion

A preliminary analysis and quantitative discussion of potential impacts on rail or transit operations (both during and after construction), environmental permitting, community impact, safety, and life-cycle Project and infrastructure costs, including impacts on the cost of repair, replacement, maintenance, and operation;

No impacts on rail or transit operations are anticipated as a result of this ATC.

J. Impacts on Third Parties

A description of any impacts on the land or facilities of third parties, including private owners, governmental entities, utility owners, and railroads, and identification of specific additional right of way required to implement the ATC. Proposers are advised that they may (i) be solely responsible for the cost and schedule impacts of the acquisition of any such Additional Properties, including the cost thereof and obtaining any necessary environmental approvals; (ii) not be entitled to any change order for time or money as a result of site conditions (i.e., hazardous materials, differing site conditions, geotechnical issues, or utilities) on such Additional Properties; and (iii) not be entitled to any change order for time or money as a result of any delay, inability, or cost associated with the acquisition of such Additional Properties;

No impacts to third parties are anticipated as a result of this ATC.

K. History of Use and References

A description of any other projects where the ATC has been used, the degree of success or failure of such usage, and names and contact information, including phone numbers and E-mail addresses, for project owner representatives that can confirm such statements;

MSE Walls have been used successfully as a part of the Charlotte Area Transit System in Charlotte, North Carolina.

John Mrzygod, City of Charlotte Engineering and Property Management – Charlotte Area Transit System, 704.336.2245, jmrzygod@ci.charlotte.nc.us

L. Additional Risks

A description of added risks to the MBTA or third parties associated with implementing the ATC;

No additional risks to the MBTA or to third parties are anticipated as a result of this ATC.

M. Additional Costs

An estimate of any additional MBTA, DB Entity, and third-party costs associated with implementation of the ATC;

Additional costs to the MBTA, DB Entity and third parties will not result from this ATC. One of the primary purposes of this ATC is cost reduction.

N. Estimated Price Adjustment

An estimate of the price adjustment (i.e., cost savings), should the ATC be approved and implemented;

This ATC will result in an estimated savings of $10,000,000. The ATC pricing as shown in this proposal is an all inclusive price. All price deducts and/or adds have been considered, and the resulting price adjustment is offered as shown.

O. Schedule Adjustment

An estimate of the schedule adjustment, should the ATC be approved and implemented; and

This ATC does not require any schedule adjustment.

P. Analysis of Quality, Performance, and Reliability

An analysis of how the ATC is equal to or better in quality, performance, and reliability than the requirements of the Contract Documents.

This ATC will provide an equal quality, performance, and reliability than the specified elevated track section. This ATC would increase the service life while reducing maintenance costs associated with

maintaining corrosion resistance.

Figure ATC-35-1: Plan View of Proposed MSE Wall Sections

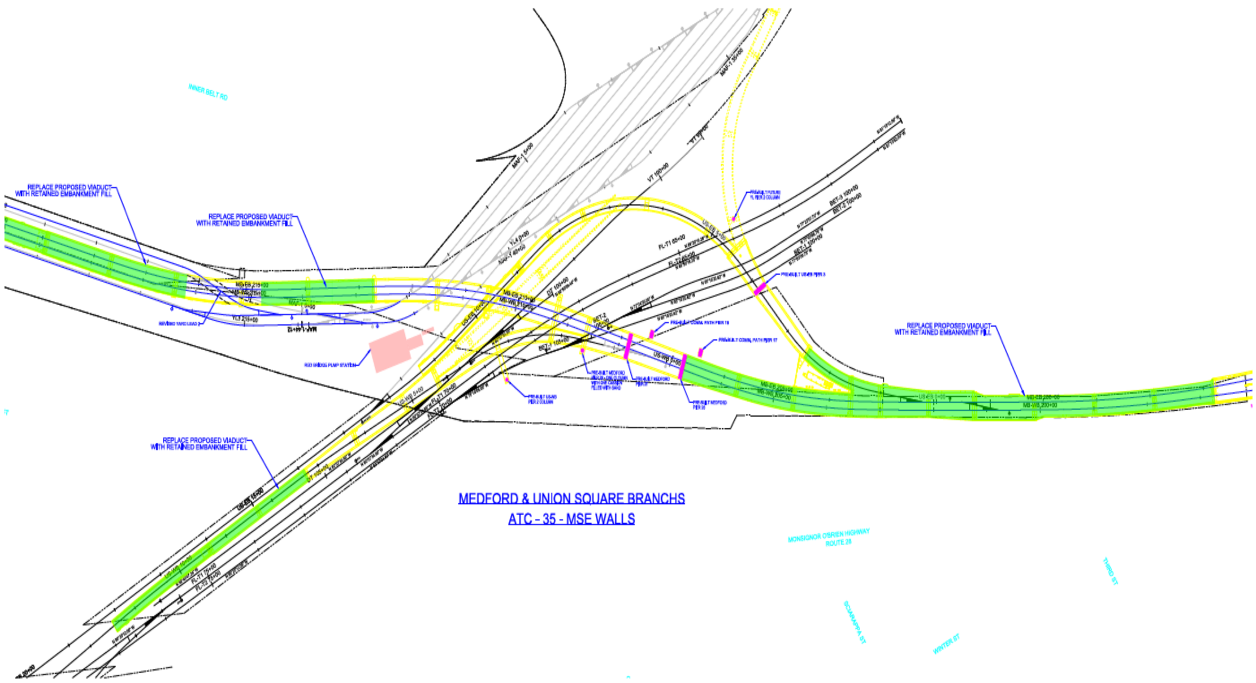


Figure ATC-35-2: Profile Views of Proposed MSE Wall Sections

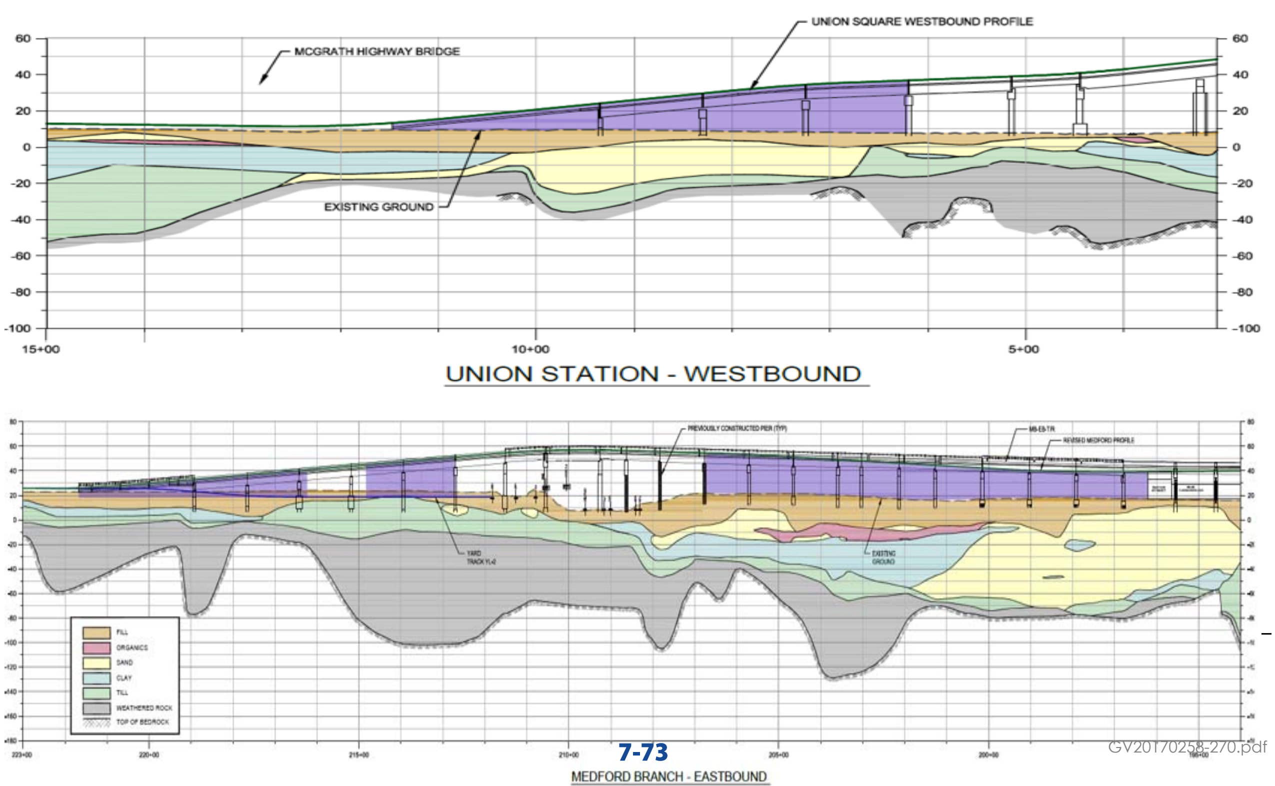
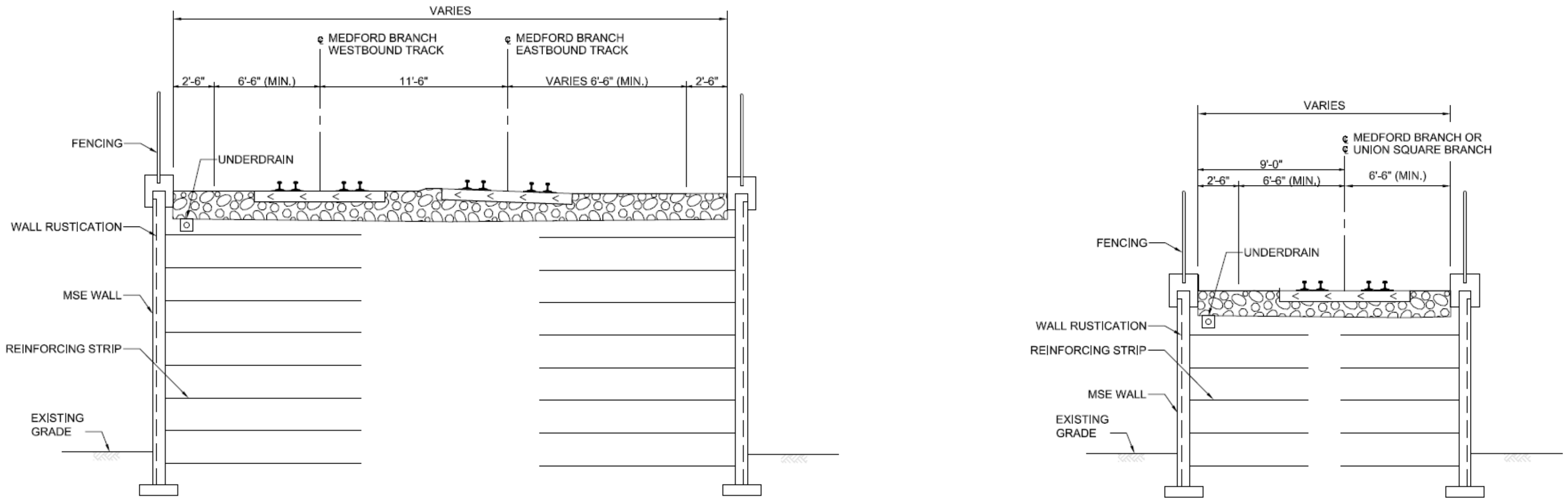


Figure ATC-35-3: MSE Wall at Viaduct



MSE WALL AT VIADUCT

Massachusetts Bay
Transportation Authority

GLX

Green Line Extension
Formal Alternative Technical Concept (ATC)
Eligibility Checklist

Date: 07-13-2013

Reviewer: Hemal Patel

Proposal Team: GLX Constructors

ATC Number: GLXC ATC 06-GLX Constructors_ATC 35_Formal_17071

Eligibility Determination

	Yes	No
A. **Identification**: Includes a sequential ATC number identifying the Proposer and the ATC number. (Multi-part or multi-option ATCs shall be submitted as separate individual ATCs with unique sequential numbers.)	✔	
B. **General Description**: Includes a description and conceptual drawings of the configuration of the ATC or other appropriate descriptive information	✔	
C. **Information**: Identifies the locations where, and an explanation of how, the ATC will be used on the Project	✔	
D. **Changes to Operations Requirements**: Identifies any changes in rail or transit operations requirements associated with the ATC, including ease of operations	✔	
E. **Changes to Maintenance Requirements**: Identifies any changes in routine or capital maintenance requirements associated with the ATC, including ease of maintenance	✔	
F. **Service Life** 1. Identifies any changes in the anticipated service life of the item(s) comprising the ATC or affected by the ATC	✔	
G. **Requirements References**: Identifies references to requirements of the Contract Documents that are inconsistent with the proposed ATC, an explanation of the nature of the deviations from said requirements, and a request for approval of such deviations	✔	
H. **Justifications**: Includes an analysis justifying use of the ATC and why the deviation, if any, from the requirements of the Contract Documents should be allowed	✔	

		Yes	No
I.	**<u>Internal Impacts</u>:** Includes a preliminary analysis and quantitative discussion of potential impacts on rail or transit operations (both during and after construction), environmental permitting, community impact, safety, and life-cycle Project and infrastructure costs, including impacts on the cost of repair, replacement, maintenance, and operation	✔	
J.	**<u>External Impacts</u>:** Includes a description of any impacts on the land or facilities of third parties, including private owners, governmental entities, utility owners, and railroads, and identification of specific additional right of way required to implement the ATC	✔	
K.	**Previous Use of ATC:** Includes a description of any other projects where the ATC has been used, the degree of success or failure of such usage, and names and contact information, including phone numbers and E-mail addresses, for project owner representatives that can confirm such statements	✔	
L.	**<u>Additional Risks</u>:** Includes a description of added risks to the MBTA or third parties associated with implementing the ATC	✔	
M.	**<u>Additional Cost</u>:** Includes an estimate of any additional MBTA, DB Entity, and third-party costs associated with implementation of the ATC	✔	
N.	**<u>Cost Savings</u>:** Includes an estimate of the price adjustment (i.e., cost savings), should the ATC be approved and implemented	✔	
O.	**<u>Schedule</u>:** Includes an estimate of the schedule adjustment, should the ATC be approved and implemented	✔	
P.	**<u>Equal or Better</u>:** Includes an analysis of how the ATC is equal to or better in quality, performance, and reliability than the requirements of the Contract Documents	✔	

Name: Hemal Patel

Signature: ______________________

ATC No. 36

ATC No. 36

Preliminary Submission

COVER SHEET

GLX CONSTRUCTORS

MBTA CONTRACT NO. E22CN07

GREEN LINE EXTENSION DESIGN BUILD PROJECT

CONFIDENTIAL ATCs

PRELIMINARY

ALTERNATIVE TECHNICAL CONCEPTS

("ATCs")

JUNE 9, 2017 (First Round)

JUNE 22, 2017 (Second Round)

GLX CONSTRUCTORS PRELIMINARY ATC FORM

ATC 36 – ELEVATED COMMUNITY PATH

Sections A though E below must be completed to submit a Preliminary ATC for the Green Line Extension Design Build Project as specified in Section 3.2.1 of the Instructions to Proposers. This Preliminary ATC must be submitted to the MBTA's Designated Representative as specified in Section 2.4.1 of the Instructions to Proposers via the Project Management Information System.

A. General Description

A general description (not to exceed two pages) of the Preliminary ATC, how the ATC will be used on the Project, the proposed location of the ATC, and any other pertinent information that would provide a clear understanding of the potential ATC;

This ATC will eliminate the underpass at Walnut Street and reduce the underpass width at Medford Street by elevating the Community Path starting at grade from School Street. The Community Path would continue near cross-street grade along the west side of the ROW to Medford Street. After crossing Medford Street at grade, the Community Path will continue near cross-street grade to Walnut Street. After crossing Walnut Street at grade, the Community Path then progressively declines to track grade south of Walnut Street.

B. References to Contract Documents

References to requirements of the Contract Documents that are inconsistent with the proposed ATC and an explanation of the nature of the deviations from said requirements;

Volume 2, Exhibit 2B, Project Definition Plan Sheets: WLN-S-2002, MEB-S-2002, 000-K-2012, 000-K-2010, and 000-K-2011. This ATC eliminates underpasses shown on these Project Definition Plans.

C. Benefits

Any potential benefits or implications of incorporating the Preliminary ATC into the Project, including in right-of-way acquisitions, rail operations, and routine or capital maintenance, and other Project risks;

This ATC provides the following benefits:

- Reduces significant impacts to the 48" MWRA waterline at Walnut Street
- Increases safety and security of pedestrians and cyclists through the elimination of pedestrian underpasses at Walnut and Medford Streets.
- Fire and Life Safety features are eliminated for underpasses at Walnut and Medford Streets.
- Provides two additional access points to the community path.
- Provides improved access to community path for maintenance and emergencies.
- Eliminates ventilation requirement for the 200' long Medford Street underpass.
- Potential to eliminate replacement of the Walnut Street bridge west abutment.

D. Conceptual Drawings

Any conceptual drawings (if applicable) of the configuration of the potential ATC or other appropriate descriptive information that provides an understanding of the Preliminary ATC; and

Please reference the attached Figures ATC 36-1 “Elevated Community Path Plan and Cross Section 1” and ATC-36-2 “Elevated Community Path Plan and Cross Section 2”

E. Cost Estimate and Schedule Impacts

An order of magnitude cost estimate and a preliminary analysis of schedule impacts associated with the Preliminary ATC.

This ATC will result in an estimated cost savings of $3 M. Our preliminary analysis indicates no impact to schedule milestones.

Figure ATC 36-1: Elevated Community Path Plan and Cross Section 1

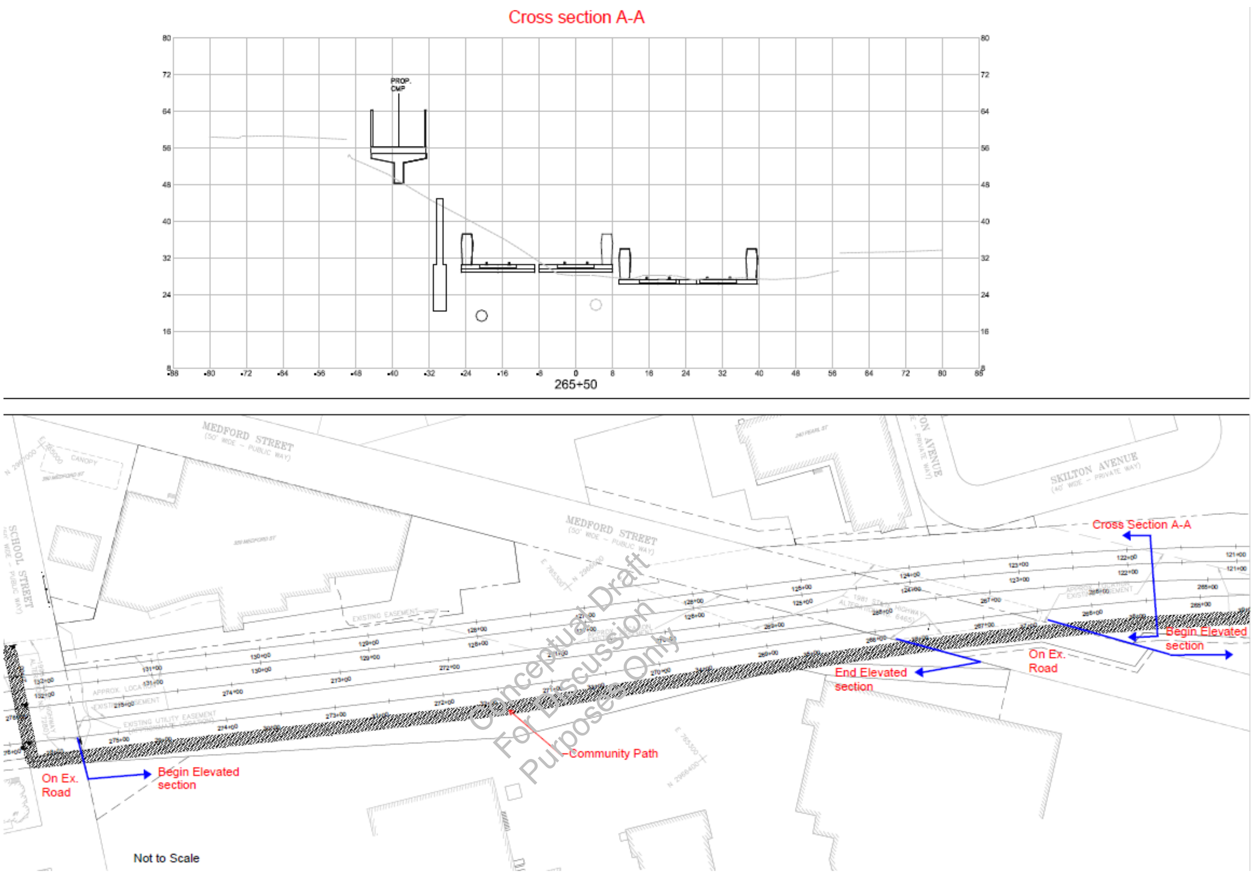
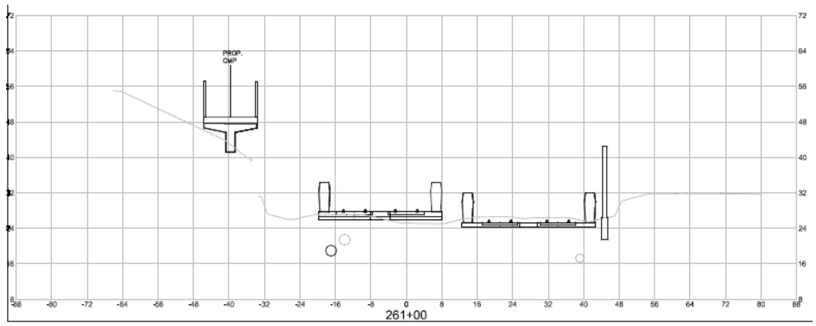
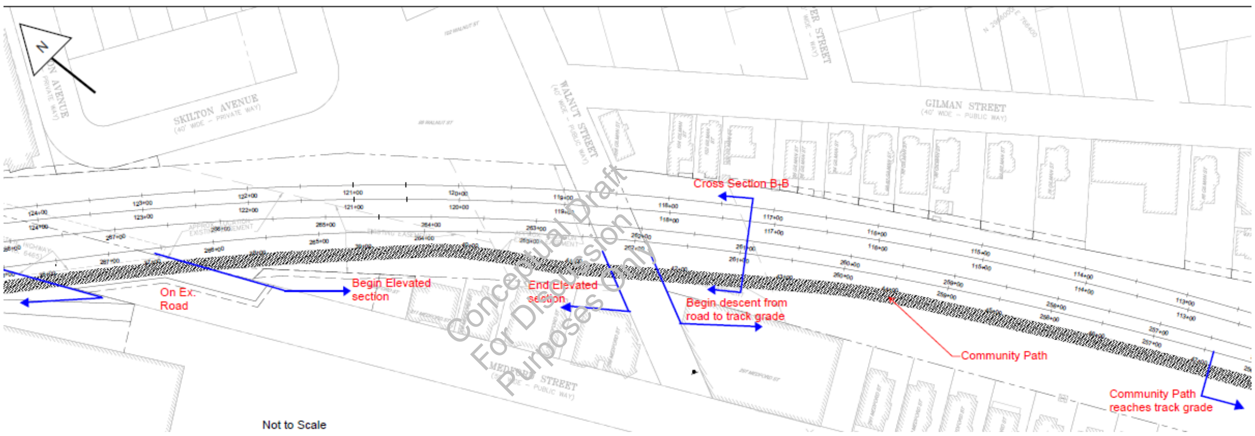


Figure ATC-36-2: Elevated Community Path Plan and Cross Section 2





ATC No. 36

MBTA Acceptance of Preliminary Submission

Massachusetts Bay
Transportation Authority

ATC Information:

Type of ATC: Preliminary
Title: GLX Constructors ATC 08 - Elevated Community Path
Proposer Company: GLX Constructors

Final Disposition:

Sent on behalf of Yvelisse Duvergé. The Preliminary ATC can be formally submitted for MBTA review as an ATC Submittal, subject to further refinement and submission of supporting information pursuant to Section 3.3.1 of the Instructions to Proposers.

COVER SHEET

GLX CONSTRUCTORS

MBTA CONTRACT NO. E22CN07

GREEN LINE EXTENSION DESIGN BUILD PROJECT

CONFIDENTIAL ATCs

PRELIMINARY
ALTERNATIVE TECHNICAL CONCEPTS
("ATCs")

JUNE 9, 2017 (First Round)

JUNE 22, 2017 (Second Round)

GLX CONSTRUCTORS PRELIMINARY ATC FORM

ATC 36 – ELEVATED COMMUNITY PATH

Sections A though E below must be completed to submit a Preliminary ATC for the Green Line Extension Design Build Project as specified in Section 3.2.1 of the Instructions to Proposers. This Preliminary ATC must be submitted to the MBTA's Designated Representative as specified in Section 2.4.1 of the Instructions to Proposers via the Project Management Information System.

A. General Description

A general description (not to exceed two pages) of the Preliminary ATC, how the ATC will be used on the Project, the proposed location of the ATC, and any other pertinent information that would provide a clear understanding of the potential ATC;

This ATC will eliminate the underpass at Walnut Street and reduce the underpass width at Medford Street by elevating the Community Path starting at grade from School Street. The Community Path would continue near cross-street grade along the west side of the ROW to Medford Street. After crossing Medford Street at grade, the Community Path will continue near cross-street grade to Walnut Street. After crossing Walnut Street at grade, the Community Path then progressively declines to track grade south of Walnut Street.

B. References to Contract Documents

References to requirements of the Contract Documents that are inconsistent with the proposed ATC and an explanation of the nature of the deviations from said requirements;

Volume 2, Exhibit 2B, Project Definition Plan Sheets: WLN-S-2002, MEB-S-2002, 000-K-2012, 000-K-2010, and 000-K-2011. This ATC eliminates underpasses shown on these Project Definition Plans.

C. Benefits

Any potential benefits or implications of incorporating the Preliminary ATC into the Project, including in right-of-way acquisitions, rail operations, and routine or capital maintenance, and other Project risks;

This ATC provides the following benefits:

- Reduces significant impacts to the 48" MWRA waterline at Walnut Street
- Increases safety and security of pedestrians and cyclists through the elimination of pedestrian underpasses at Walnut and Medford Streets.
- Fire and Life Safety features are eliminated for underpasses at Walnut and Medford Streets.
- Provides two additional access points to the community path.
- Provides improved access to community path for maintenance and emergencies.
- Eliminates ventilation requirement for the 200' long Medford Street underpass.
- Potential to eliminate replacement of the Walnut Street bridge west abutment.

D. Conceptual Drawings

Any conceptual drawings (if applicable) of the configuration of the potential ATC or other appropriate descriptive information that provides an understanding of the Preliminary ATC; and

Please reference the attached Figures ATC 36-1 “Elevated Community Path Plan and Cross Section 1” and ATC-36-2 “Elevated Community Path Plan and Cross Section 2”

E. Cost Estimate and Schedule Impacts

An order of magnitude cost estimate and a preliminary analysis of schedule impacts associated with the Preliminary ATC.

This ATC will result in an estimated cost savings of $3 M. Our preliminary analysis indicates no impact to schedule milestones.

Figure ATC 36-1: Elevated Community Path Plan and Cross Section 1

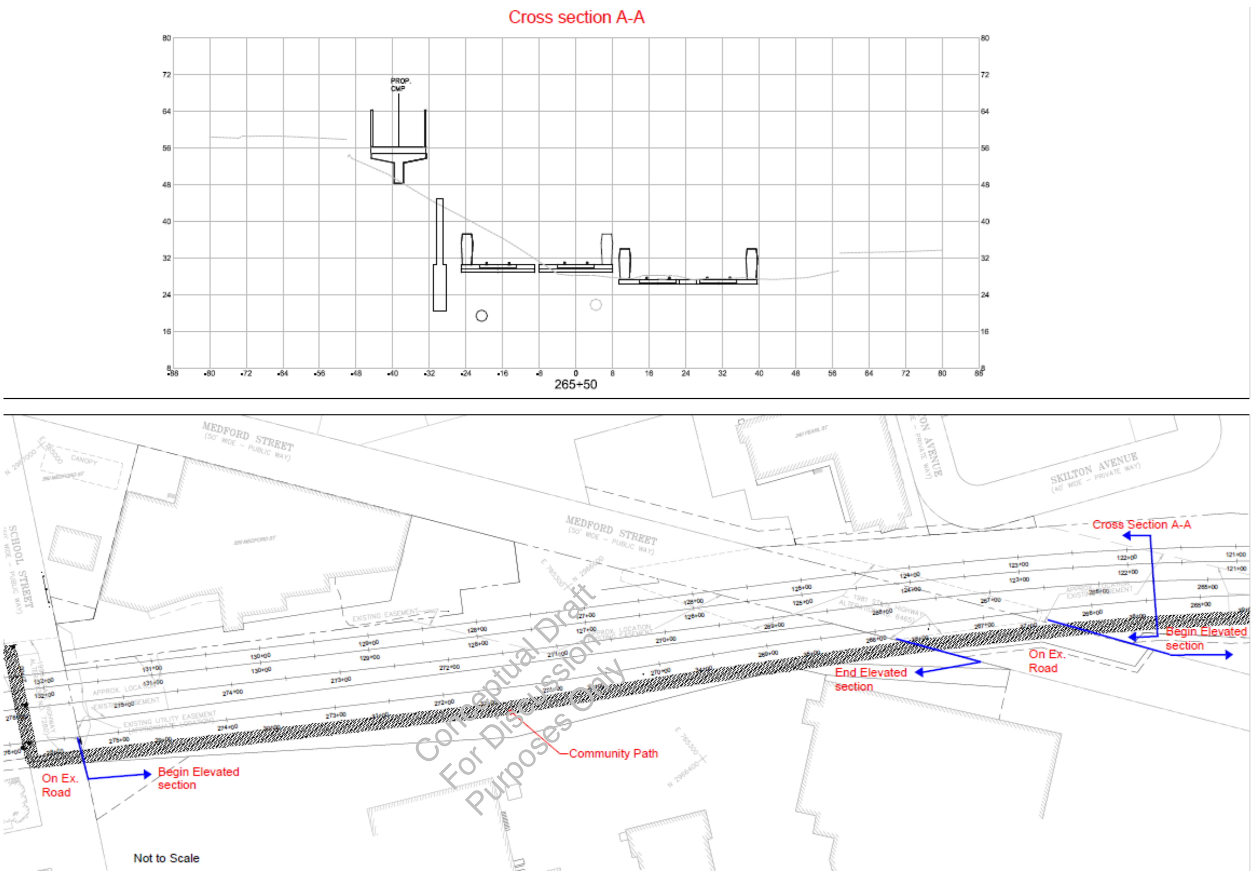
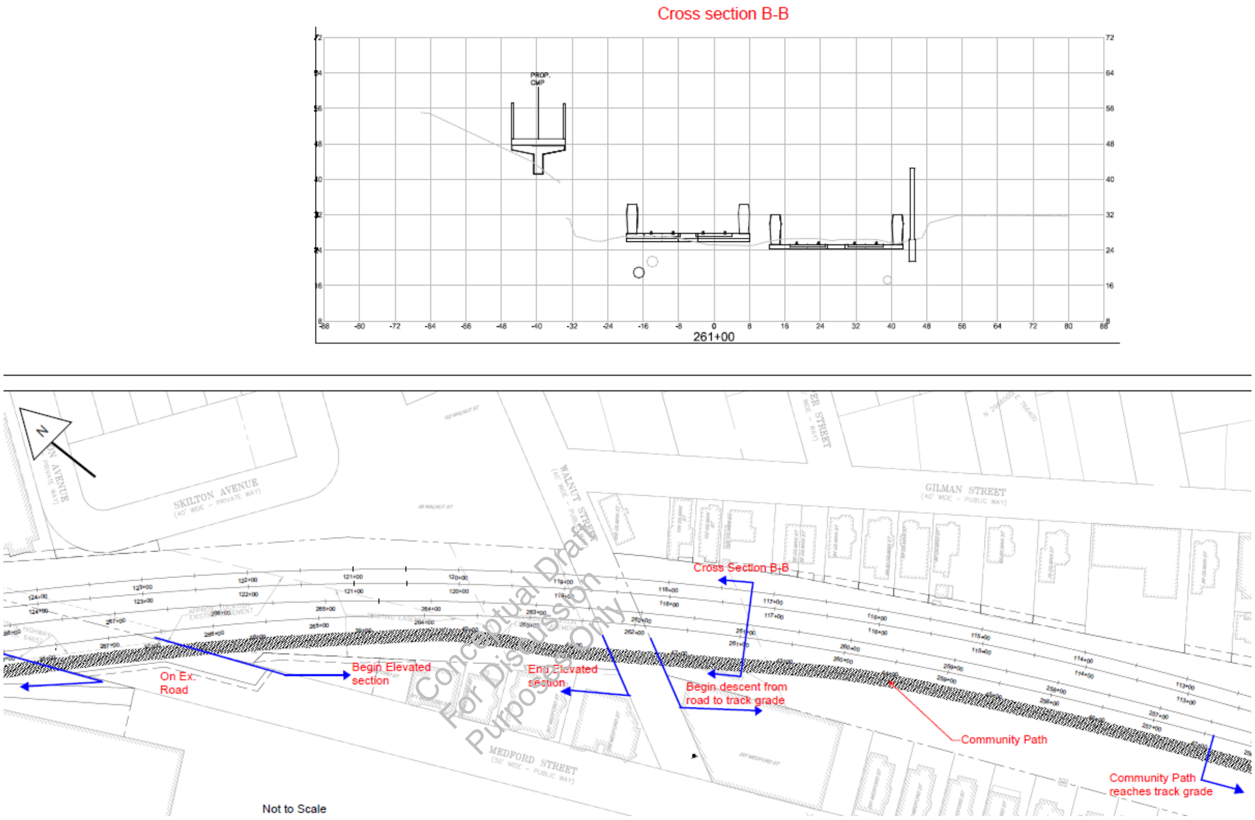


Figure ATC-36-2: Elevated Community Path Plan and Cross Section 2



Massachusetts Bay
Transportation Authority

Green Line Extension
Preliminary Alternative Technical Concept (ATC)
Eligibility Checklist

Date: 06/12/2017

Reviewer: Hemal Patel

Proposal Team: GLX Constructors

ATC Number: GLXC ATC 08-GLX Constructors_ATC 36_Preliminary_170609

Eligibility Determination

		Yes	No
A.	**General Description:** Includes a general description (not to exceed two pages) of the Preliminary ATC, how the ATC will be used on the Project, the proposed location of the ATC, and any other pertinent information that would provide a clear understanding of the potential ATC	✔	
B.	**Requirements References:** Identifies references to requirements of the Contract Documents that are inconsistent with the proposed ATC and an explanation of the nature of the deviations from said requirements	✔	
C.	**Benefits & Implications:** Identifies Any potential benefits or implications of incorporating the Preliminary ATC into the Project, including in right-of-way acquisitions, rail operations, and routine or capital maintenance	✔	
D.	**Conceptual Drawings** (if applicable)**:** Includes any conceptual drawings (if applicable) of the configuration of the potential ATC or other appropriate descriptive information that provides an understanding of the Preliminary ATC	✔	
E.	**Order of Magnitude:** Includes an order of magnitude cost estimate and a preliminary analysis of schedule impacts associated with the Preliminary ATC	✔	

Name: Hemal Patel

Signature:

ATC No. 36

Formal Submission

COVER SHEET

GLX CONSTRUCTORS

MBTA CONTRACT NO. E22CN07

GREEN LINE EXTENSION DESIGN BUILD PROJECT

CONFIDENTIAL ATCs

FORMAL

ALTERNATIVE TECHNICAL CONCEPTS ("ATCs")

JUNE 9, 2017 (First Round)

JUNE 22, 2017 (Second Round)

JULY 11, 2017 (Final Round)

GLX CONSTRUCTORS FORMAL ATC FORM

ELEVATED COMMUNITY PATH

Sections A though P below shall be completed to submit a Formal ATC for the Green Line Extension Design Build Project as specified in Section 3.2.1 of the Instructions to Proposers. This Formal ATC must be submitted to the MBTA's Designated Representative as specified in Section 2.4.1 of the Instructions to Proposers via the Project Management Information System.

A. ATC Number

A sequential ATC number identifying the Proposer and the ATC number. (Multi-part or multi-option ATCs shall be submitted as separate individual ATCs with unique sequential numbers.);

ATC 36

MBTA Preliminary ATC File Number: ATC-000014 – GLX Constructors ATC 08

B. Description and Conceptual Drawings

A description and conceptual drawings of the configuration of the ATC or other appropriate descriptive information;

This ATC will eliminate the underpass at Walnut Street and reduce the underpass width at Medford Street by elevating the Community Path starting at grade from School Street. The Community Path would continue near cross-street grade along the west side of the ROW to Medford Street. After crossing Medford Street at grade, the Community Path will continue near cross-street grade to Walnut Street. After crossing Walnut Street at grade, the Community Path then progressively declines to track grade south of Walnut Street. Please reference the attached Figures ATC 36-1 "Elevated Community Path Plan and Profile" and ATC-36-2 "Elevated Community Path Cross Sections"

C. Locations and How Used

The locations where, and an explanation of how, the ATC will be used on the Project;

The ATC will eliminate the Underpasses at Walnut Street and Medford Street by elevating the Community Path starting from approximately 38' left Sta. MB-EB 252+00 at elevation 26.00 crossing Walnut Street at Grade. The Community Path would continue to approximately 38' left Sta. MB-EB 267+00 elevation 56.00. The Community Path would cross Medford Street at Grade. The Community Path would continue to 54' left Sta .MB-EB 275+50 elevation 52.00 where it would tie into School Street. This would be the North End of the Elevated Community Path.

D. Changes in Rail or Transit Operations

Any changes in rail or transit operations requirements associated with the ATC, including ease of operations;

No changes in operations are anticipated as a result of this ATC.

E. Changes in Routine or Capital Maintenance

Any changes in routine or capital maintenance requirements associated with the ATC, including ease of maintenance;

This ATC eliminates the need for the routine and capital maintenance of lighting for the Walnut Street and Medford Street underpasses, as well as the routing and capital maintenance of the underground ventilation for the Medford Underpass as it would be over 200' long.

F. Changes in Anticipated Service Life

Any changes in the anticipated service life of the item(s) comprising the ATC or affected by the ATC;

No change in service life is anticipated as a result of this ATC.

G. References to Contract Documents

References to requirements of the Contract Documents that are inconsistent with the proposed ATC, an explanation of the nature of the deviations from said requirements, and a request for approval of such deviations;

Para 9.2.3.3 Geometry (h) Table 9.2-1 Community Path and Roadway Interfaces Medford Street and Walnut Street Underpass of the Technical Provisions.

H. Justification of Use

An analysis justifying use of the ATC and why the deviation, if any, from the requirements of the Contract Documents should be allowed;

This ATC eliminates the pedestrian underpass at Walnut Street and Medford Street which increases safety and security of Pedestrians using the Community Path. This ATC also eliminates the need for Fire and Life Safety features and lighting for underpasses at Walnut Street and Medford Street. This ATC improves accessibility for emergency and maintenance vehicles operating on the Community Path

I. Preliminary Analysis and Quantitative Discussion

A preliminary analysis and quantitative discussion of potential impacts on rail or transit operations (both during and after construction), environmental permitting, community impact, safety, and life-cycle Project and infrastructure costs, including impacts on the cost of repair, replacement, maintenance, and operation;

No impacts on rail or transit operations are anticipated as a result of this ATC.

J. Impacts on Third Parties

A description of any impacts on the land or facilities of third parties, including private owners, governmental entities, utility owners, and railroads, and identification of specific additional right of way required to implement the ATC. Proposers are advised that they may (i) be solely responsible for the cost and schedule impacts of the acquisition of any such Additional Properties, including the cost thereof and obtaining any necessary environmental approvals; (ii) not be entitled to any change order for time or money as a result of site conditions (i.e., hazardous materials, differing site conditions, geotechnical issues, or utilities) on such Additional Properties; and (iii) not be entitled to any change order for time or money as a result of any delay, inability, or cost associated with the acquisition of such Additional Properties;

This ATC eliminates the risk of relocating the 48" MWRA Waterline at Walnut Street. This ATC also reduces the footprint of the Community Path which will reduce potential ROW issues.

K. History of Use and References

A description of any other projects where the ATC has been used, the degree of success or failure of such usage, and names and contact information, including phone numbers and E-mail addresses, for project owner representatives that can confirm such statements;

This ATC uses a similar elevated community path concept that has been successfully used at the NorthPoint park. This concept is also similar to what has been called for on the Project Concept Plans from School Street to Central Street.

L. Additional Risks

A description of added risks to the MBTA or third parties associated with implementing the ATC;

No additional risks to the MBTA or to third parties are anticipated as a result of this ATC.

M. Additional Costs

An estimate of any additional MBTA, DB Entity, and third-party costs associated with implementation of the ATC;

Additional costs to the MBTA, DB Entity and third parties will not result from this ATC. One of the primary purposes of this ATC is cost reduction.

N. Estimated Price Adjustment

An estimate of the price adjustment (i.e., cost savings), should the ATC be approved and implemented;

This ATC will result in an estimated savings of $2,000,000. The ATC pricing as shown in this proposal is an all inclusive price. All price deducts and/or adds have been considered, and the resulting price adjustment is offered as shown.

O. Schedule Adjustment

An estimate of the schedule adjustment, should the ATC be approved and implemented; and

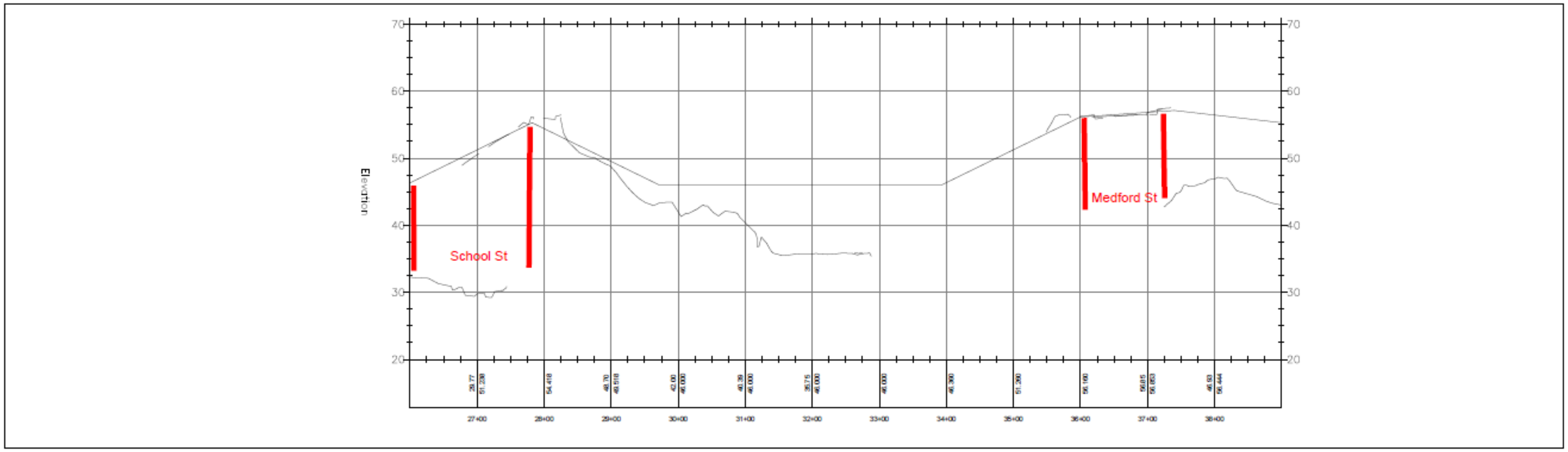
This ATC does not require any schedule adjustment.

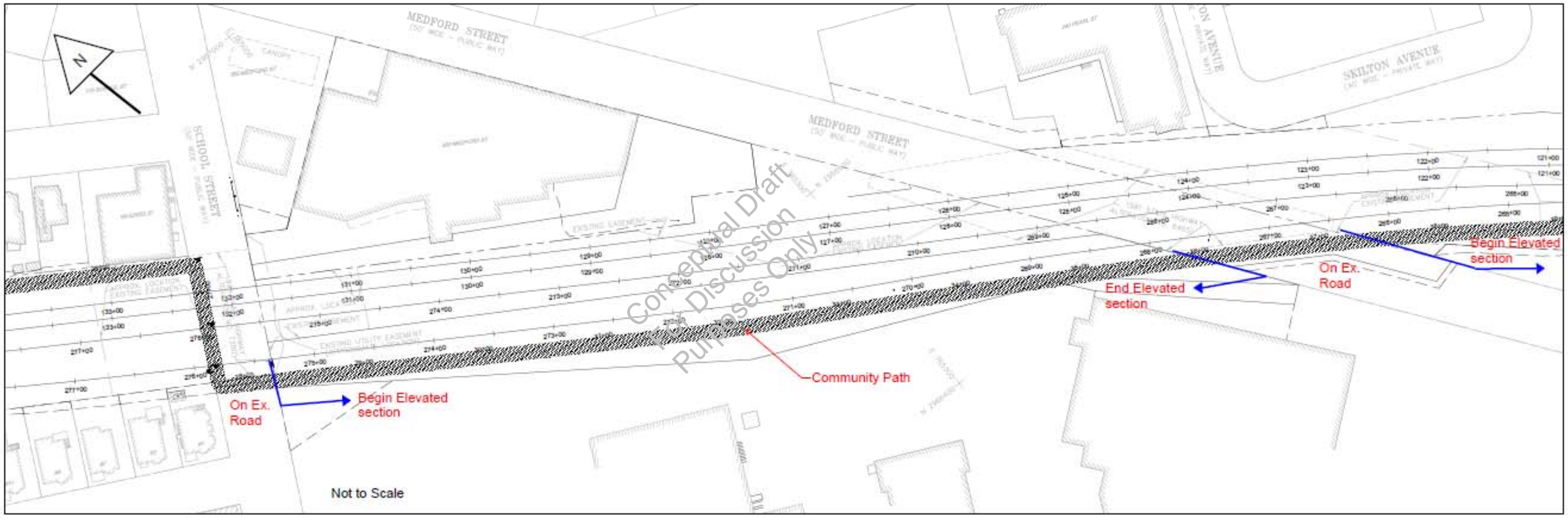
P. Analysis of Quality, Performance, and Reliability

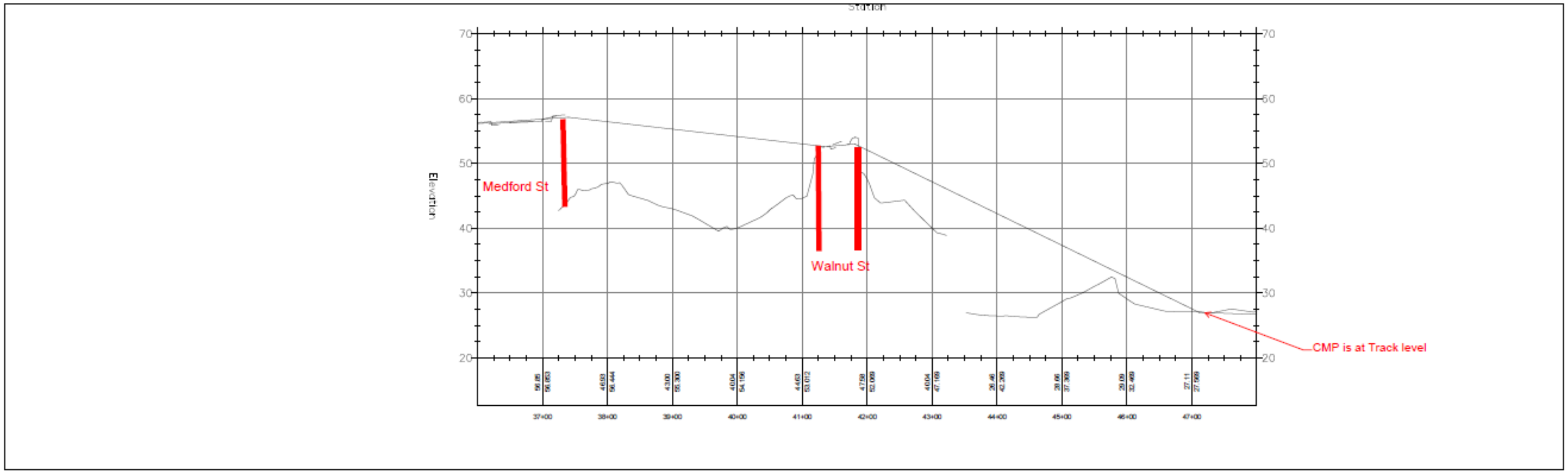
An analysis of how the ATC is equal to or better in quality, performance, and reliability than the requirements of the Contract Documents.

This ATC will provide equal quality, performance, and reliability to the specified plans. This ATC reduces maintenance cost needed to maintain performance through the elimination or reduction of ventilation and lighting requirements.

Figure ATC 36-1: Elevated Community Path Plan and Profile (2 Pages)






Station
Elevation
Medford St
Walnut St
CMP is at Track level
37+00
38+00
39+00
40+00
41+00
42+00
43+00
44+00
45+00
46+00
47+00

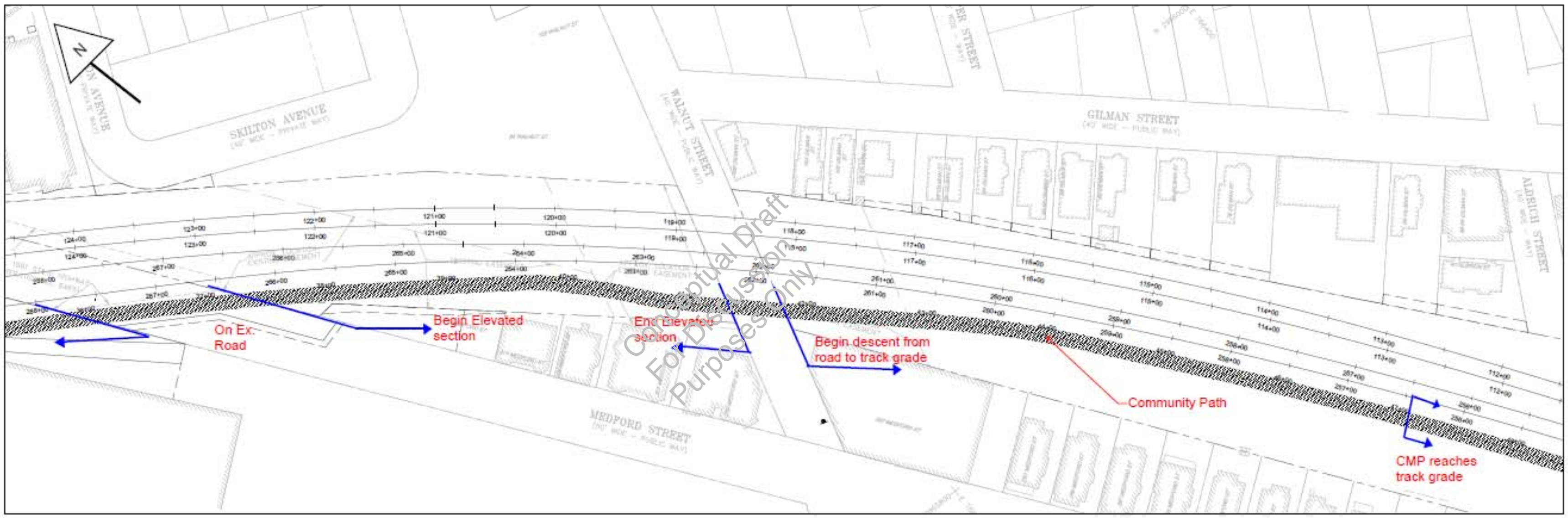
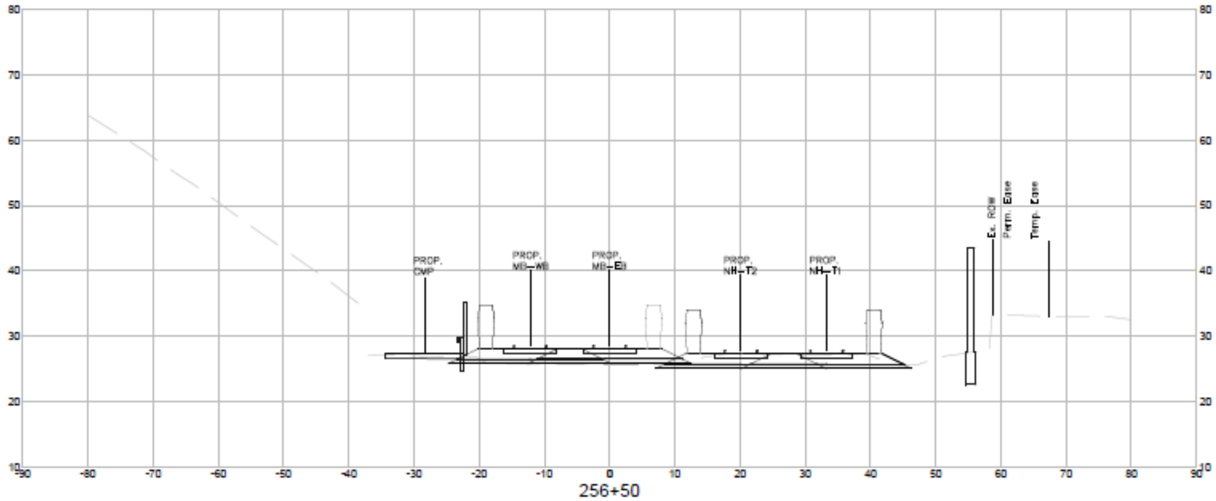
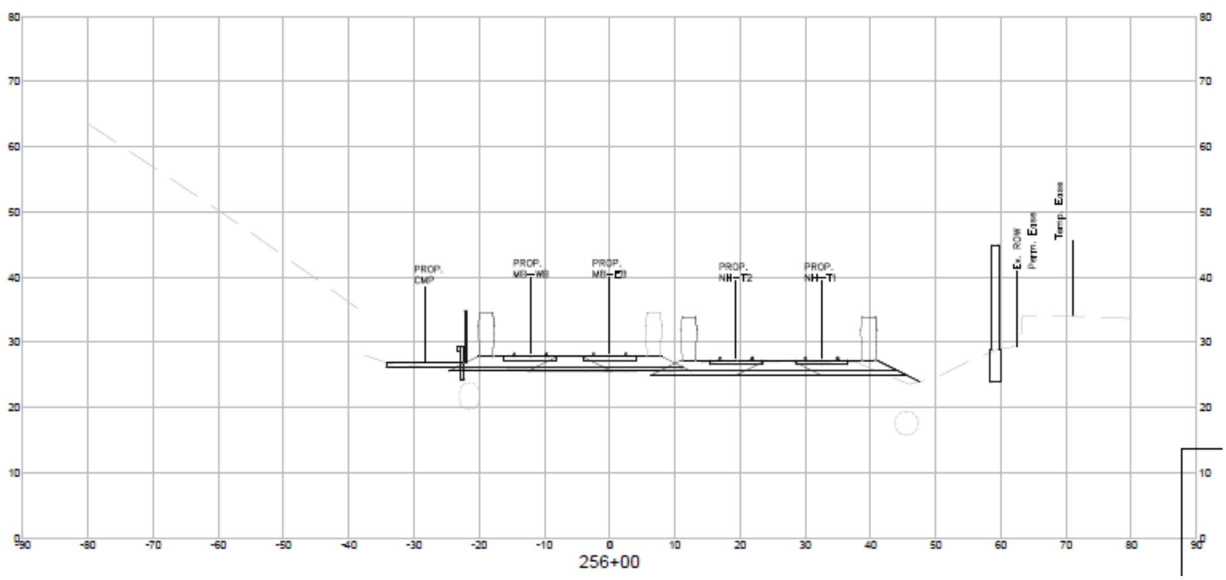
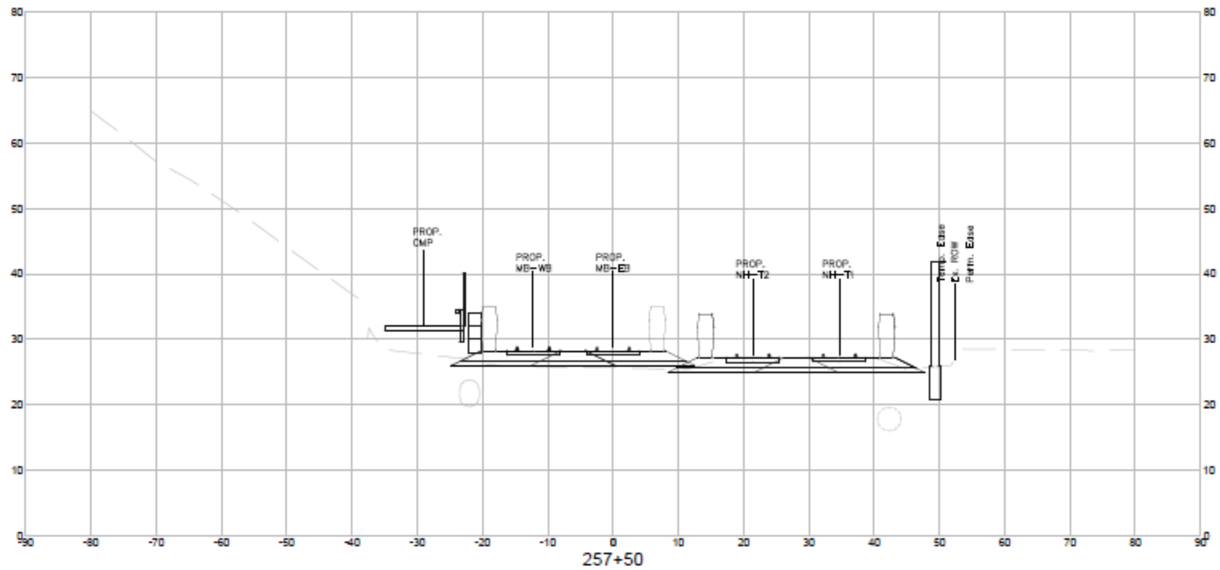
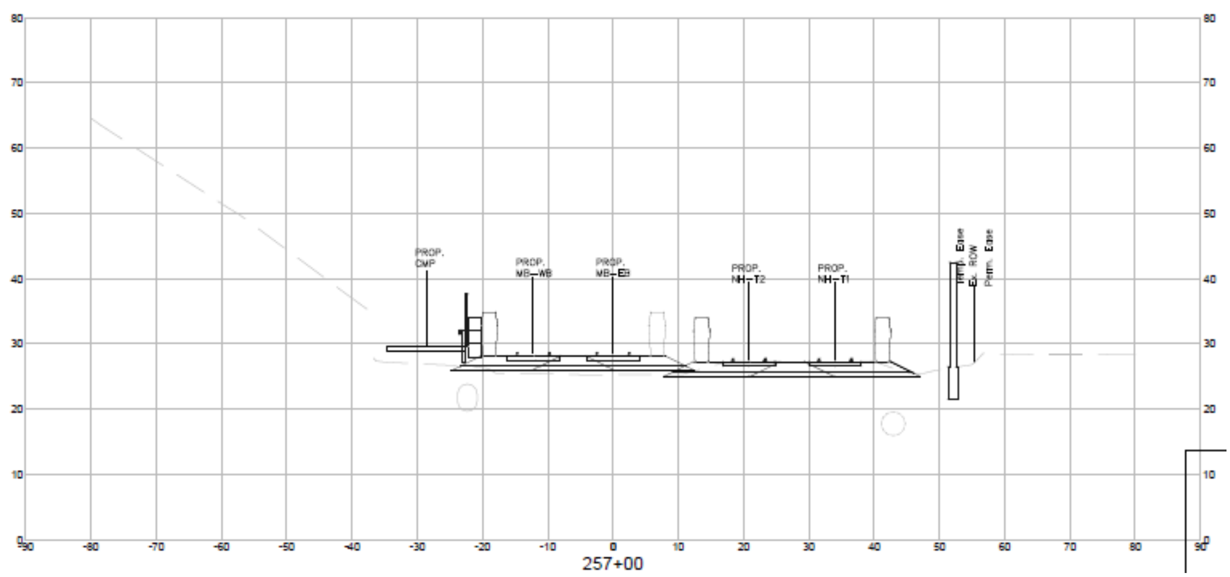

N
SKILTON AVENUE
WALNUT STREET
GILMAN STREET
ALDRICH STREET
MEDFORD STREET
On Ex. Road
Begin Elevated section
End Elevated section
Begin descent from road to track grade
Community Path
CMP reaches track grade
Conceptual Draft For Discussion Purposes Only

Figure ATC-36-2: Elevated Community Path Cross Sections (20 Pages)






PROP.
CMP
PROP.
MB—WB
PROP.
MB—EB
PROP.
NH—T2
PROP.
NH—T1
Temp. Ease
Ex. ROW
Perm. Ease
257+50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MB—WB
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NH—T2
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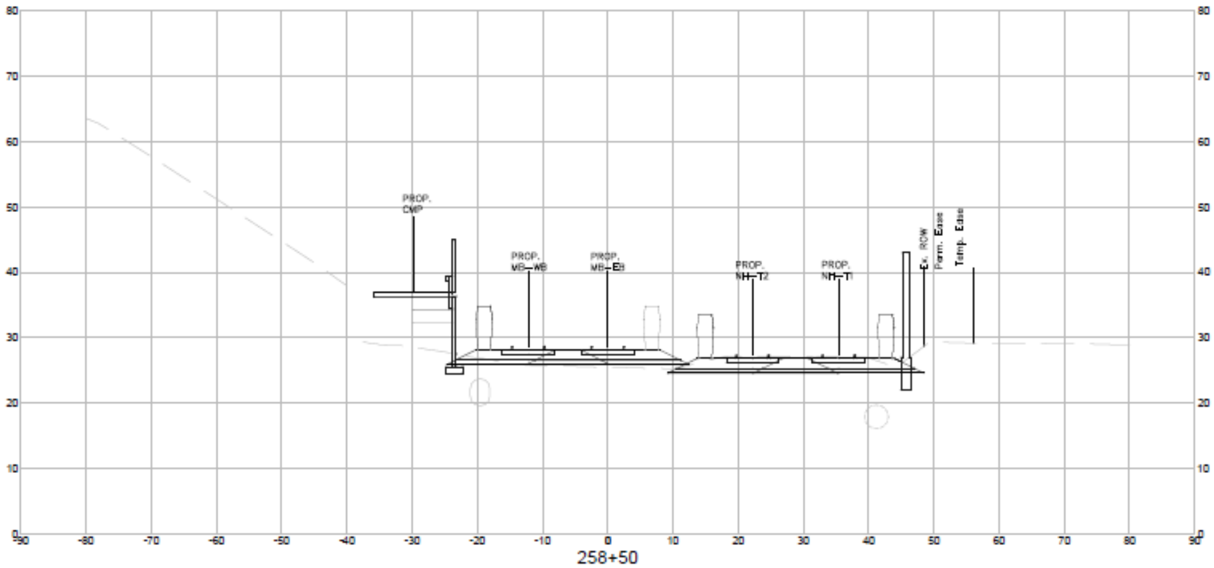
NH—T1
Temp. Ease
Ex. ROW
Perm. Ease
257+00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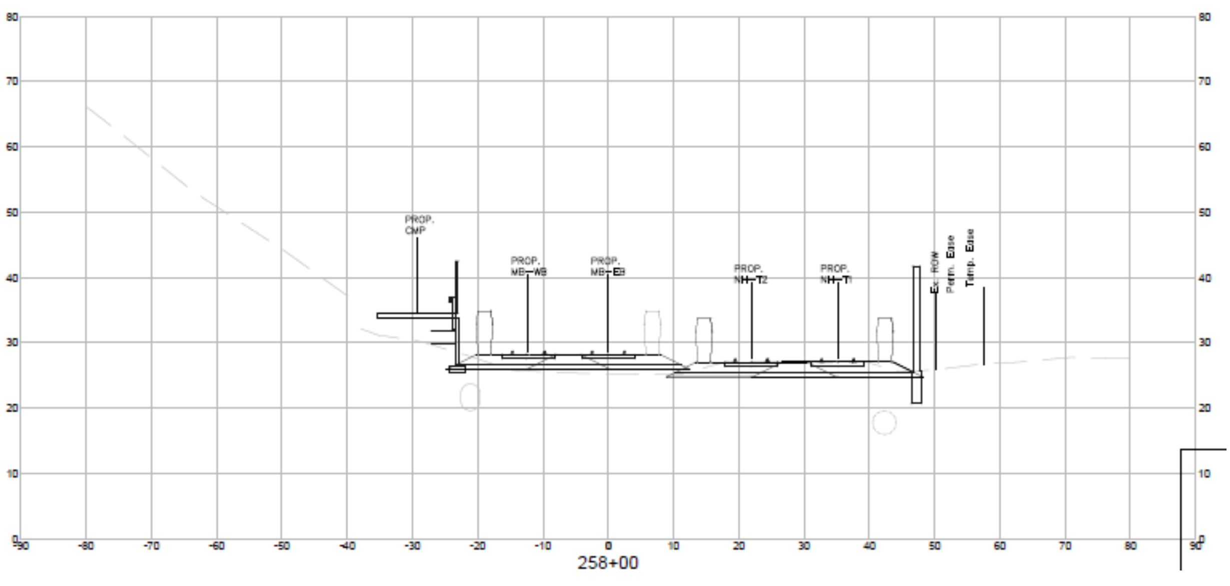
PROP. NH—T1
Ex. ROW
Perm. Ease
Temp. Ease
258+50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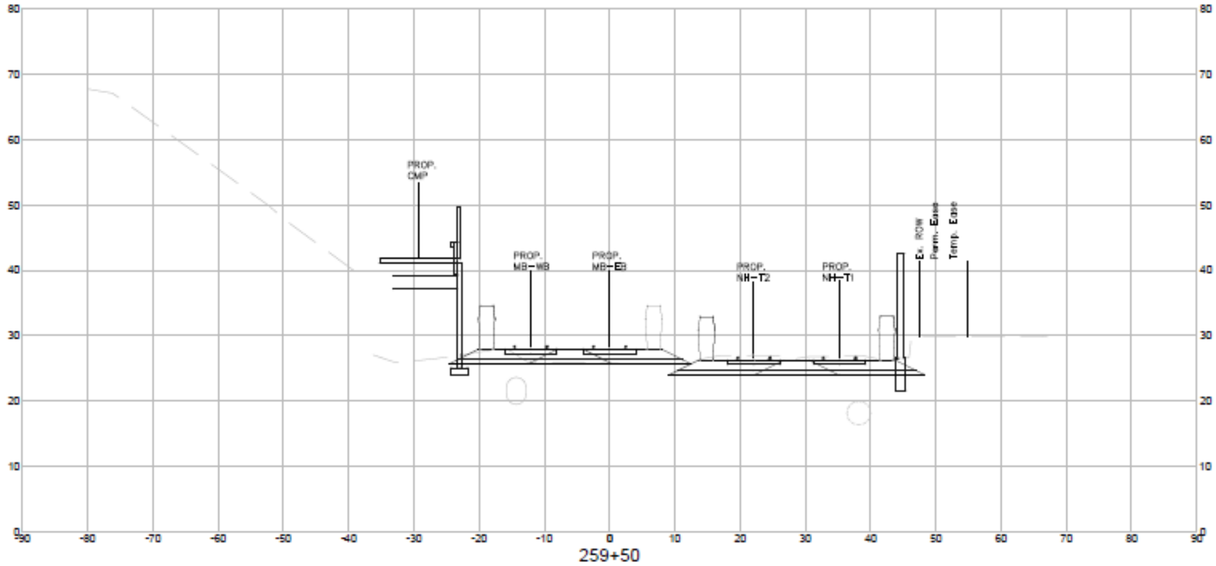
Perm. Ease
Temp. Ease
258+00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NH-T1
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Perm. Ease
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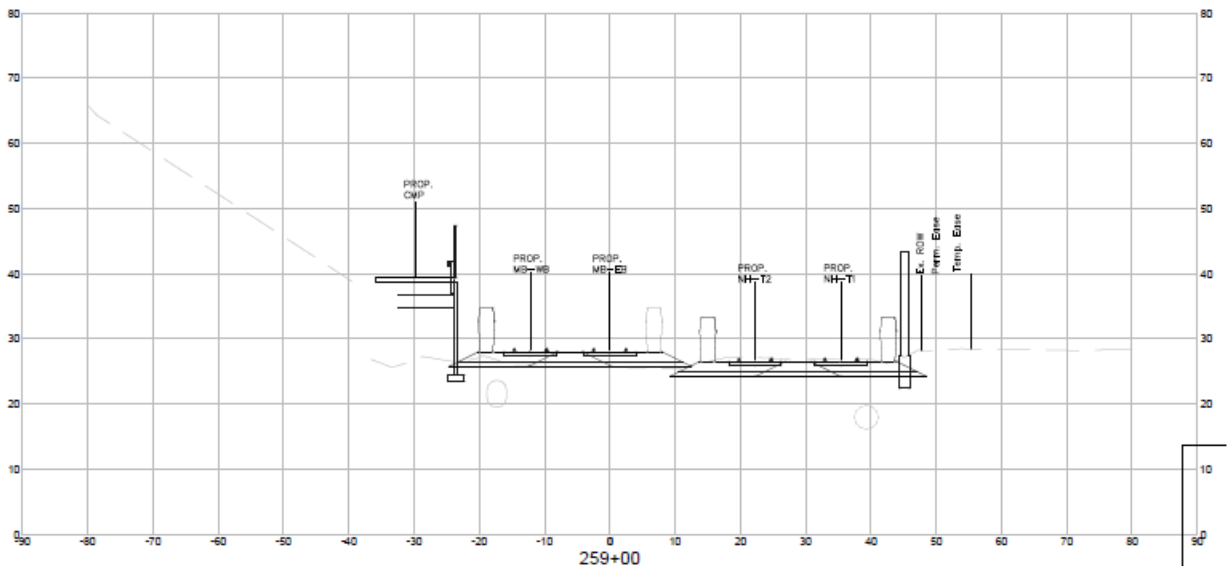
259+50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NH-T1
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Perm. Ease
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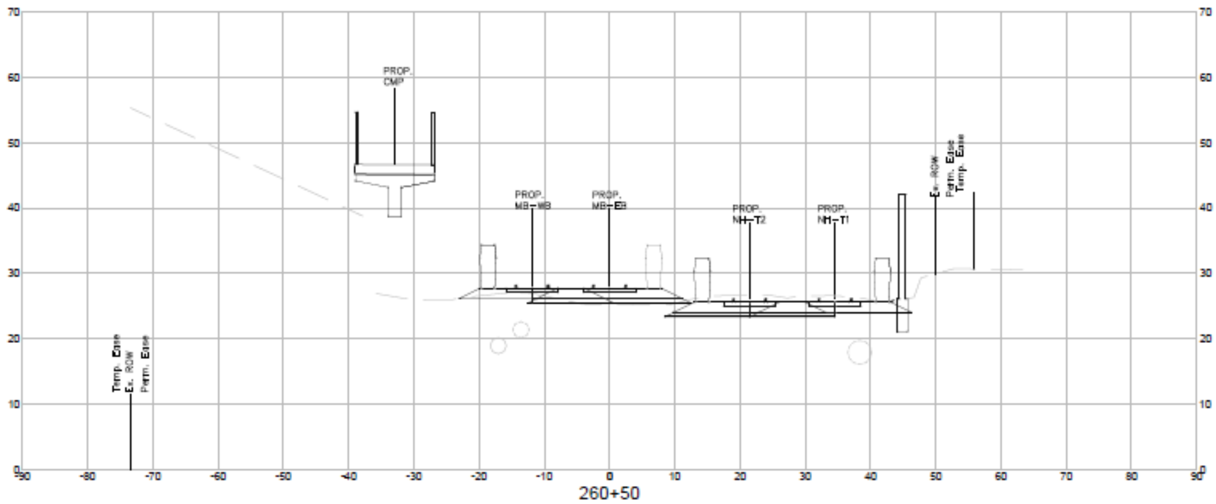
259+00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Perm. Ease
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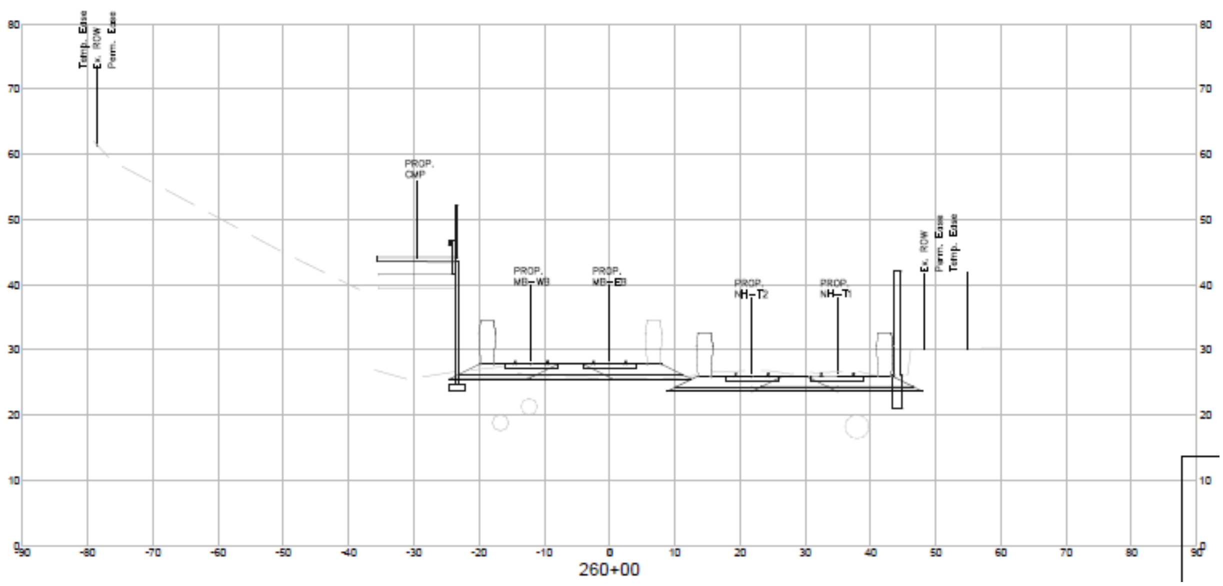
260+50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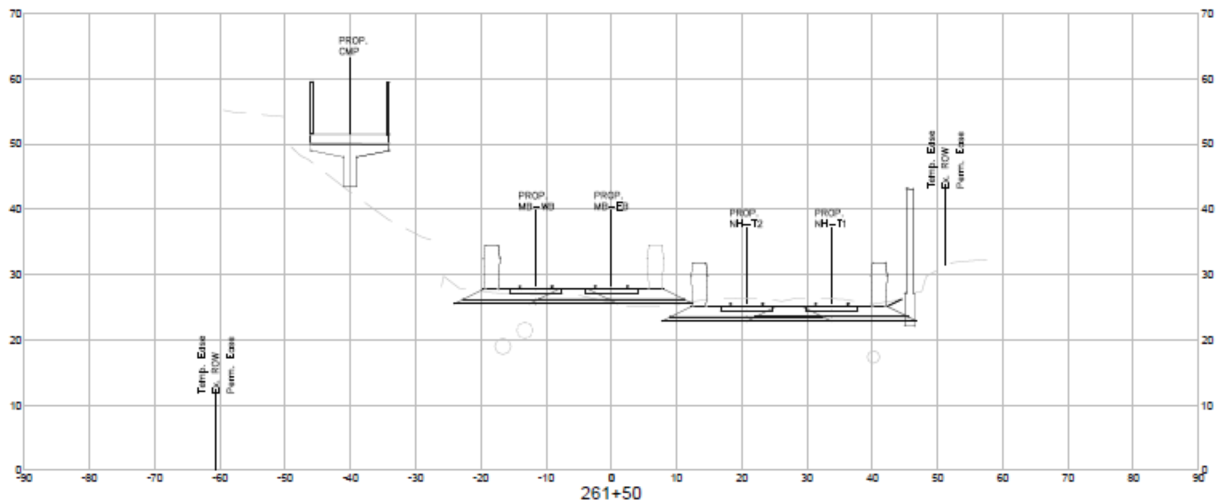
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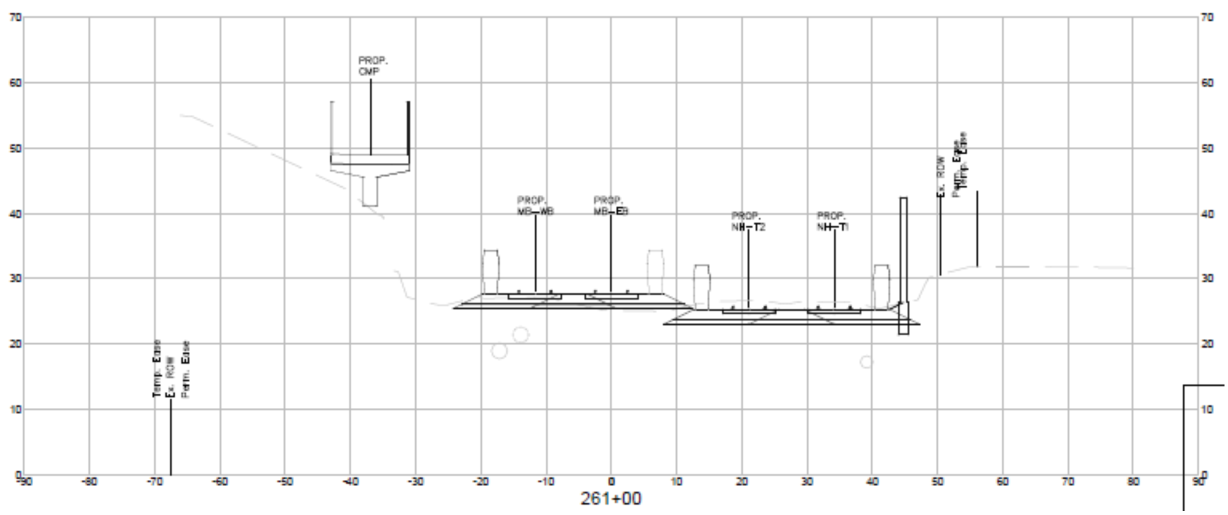
261+50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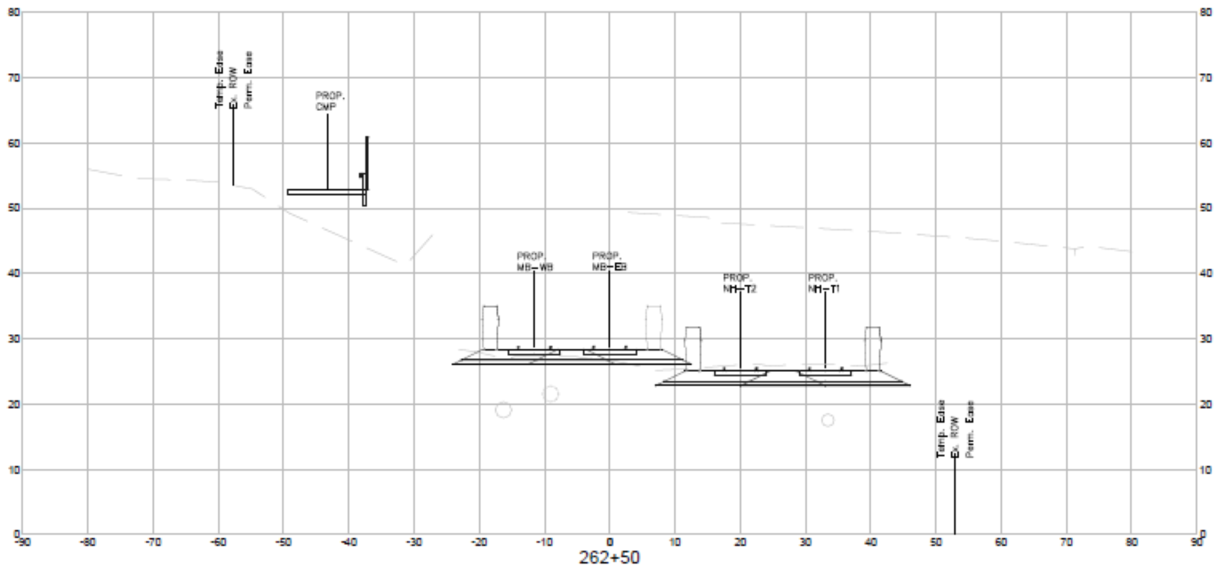
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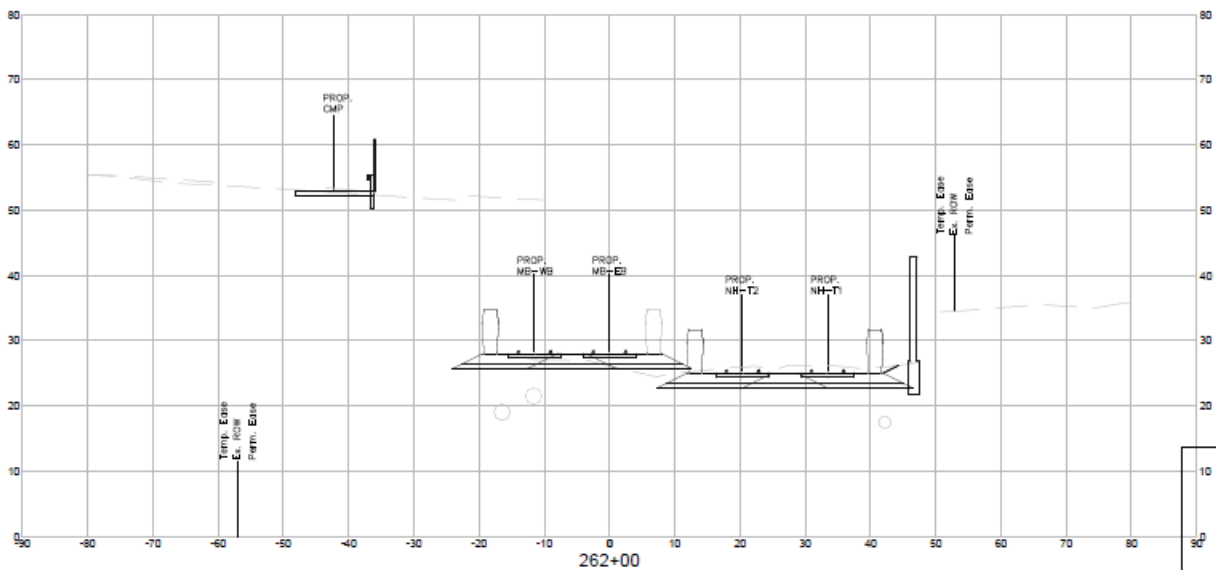
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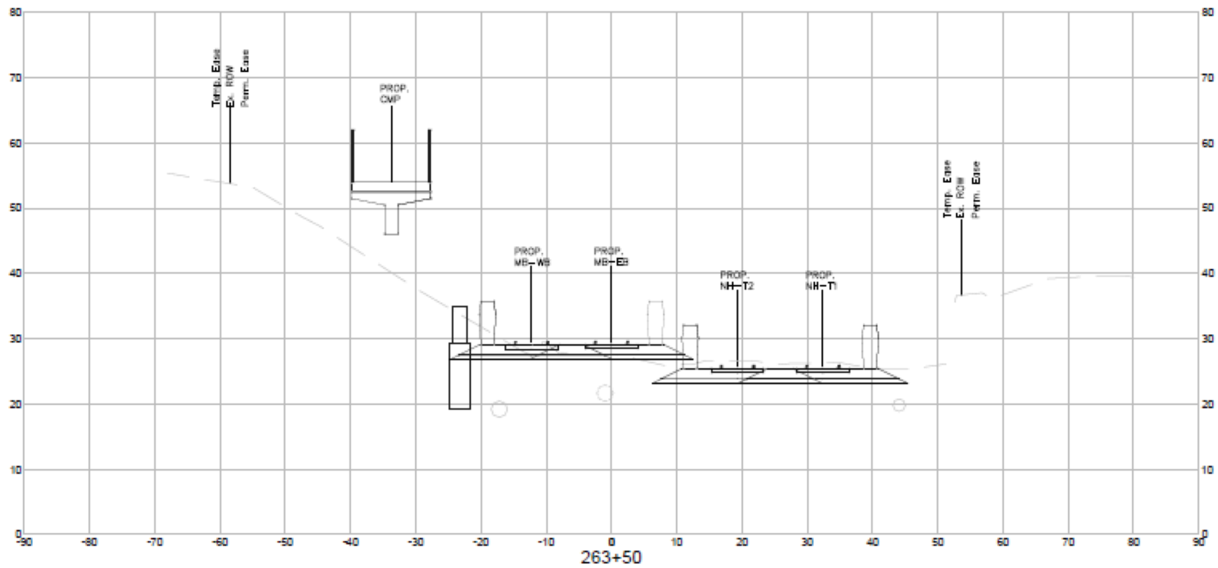

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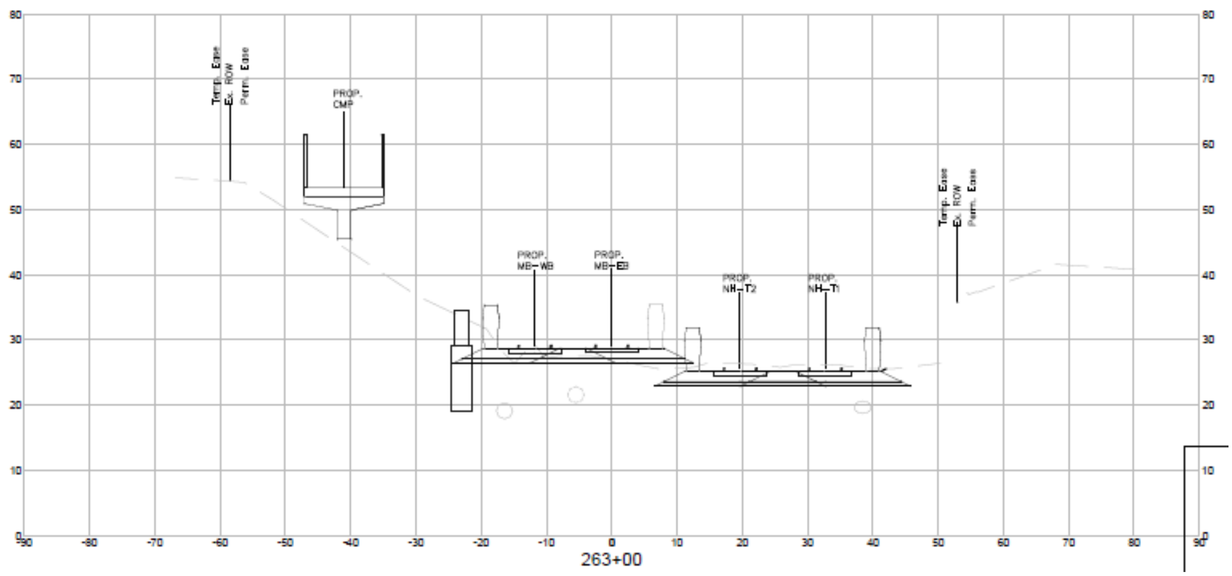

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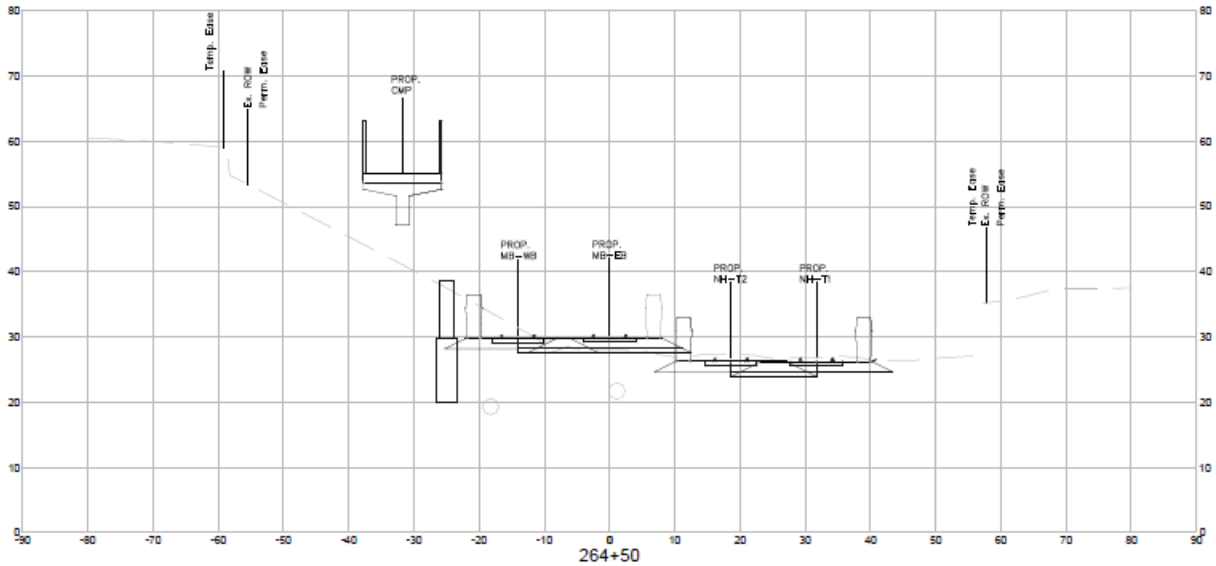
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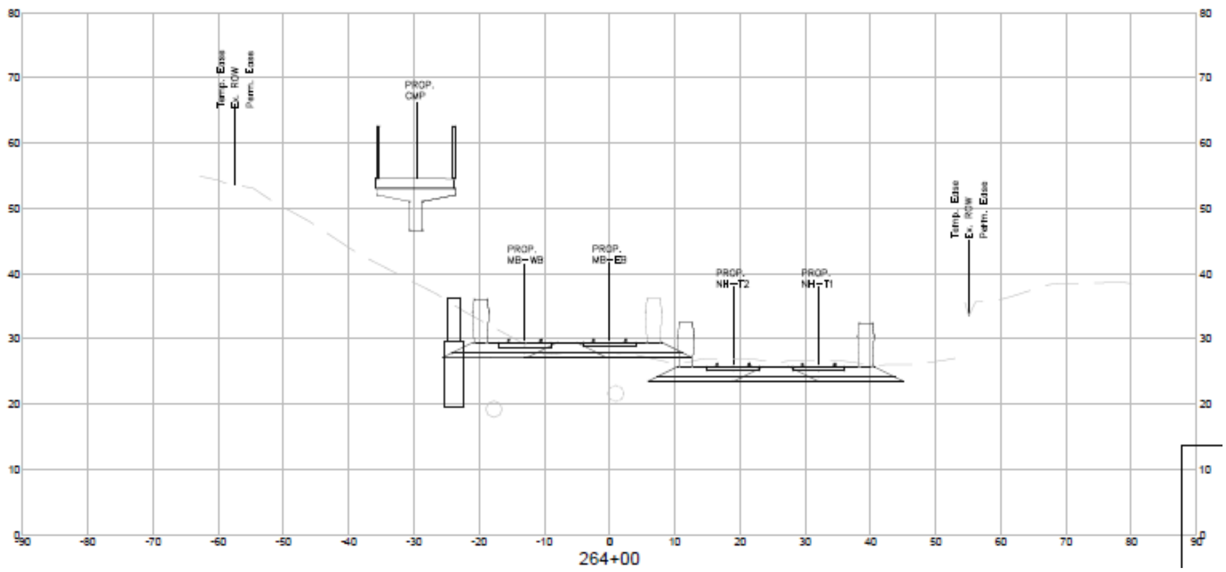
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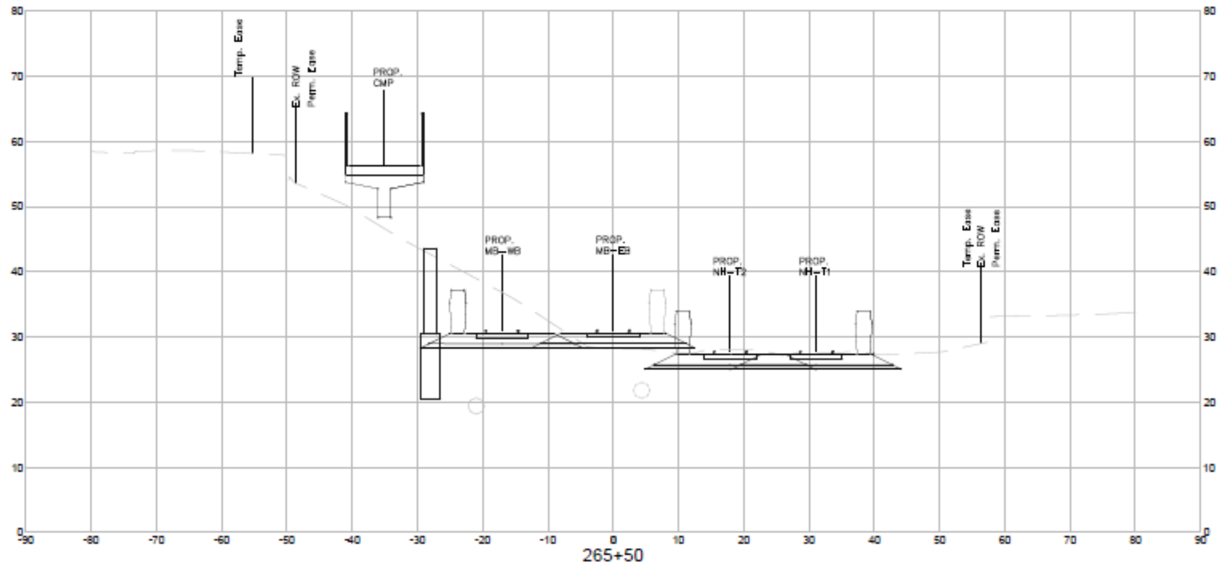
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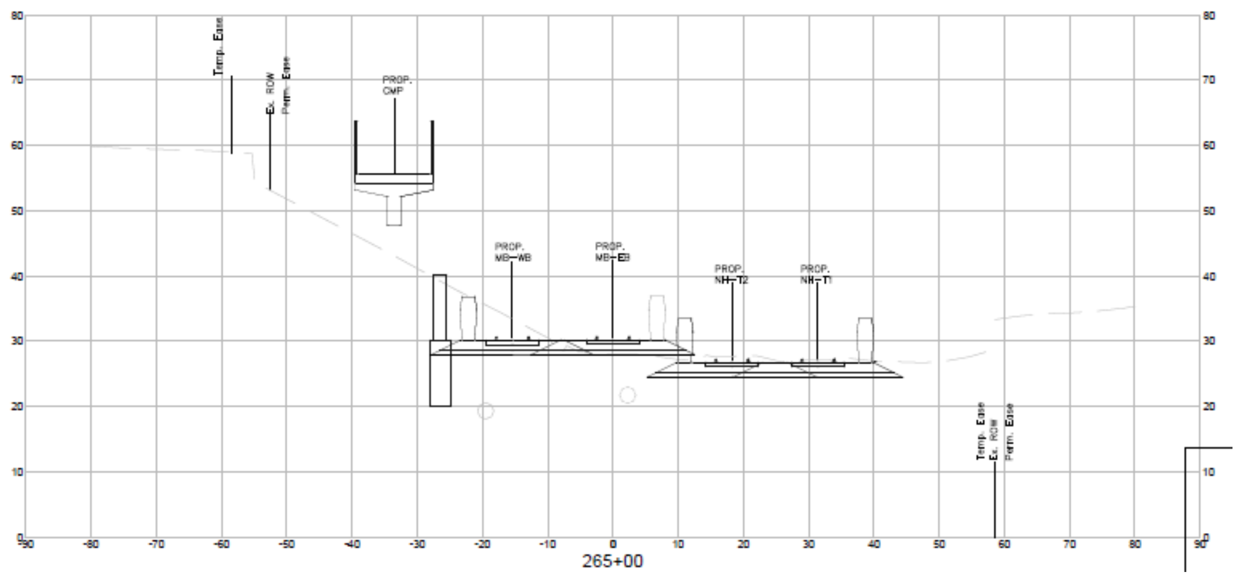
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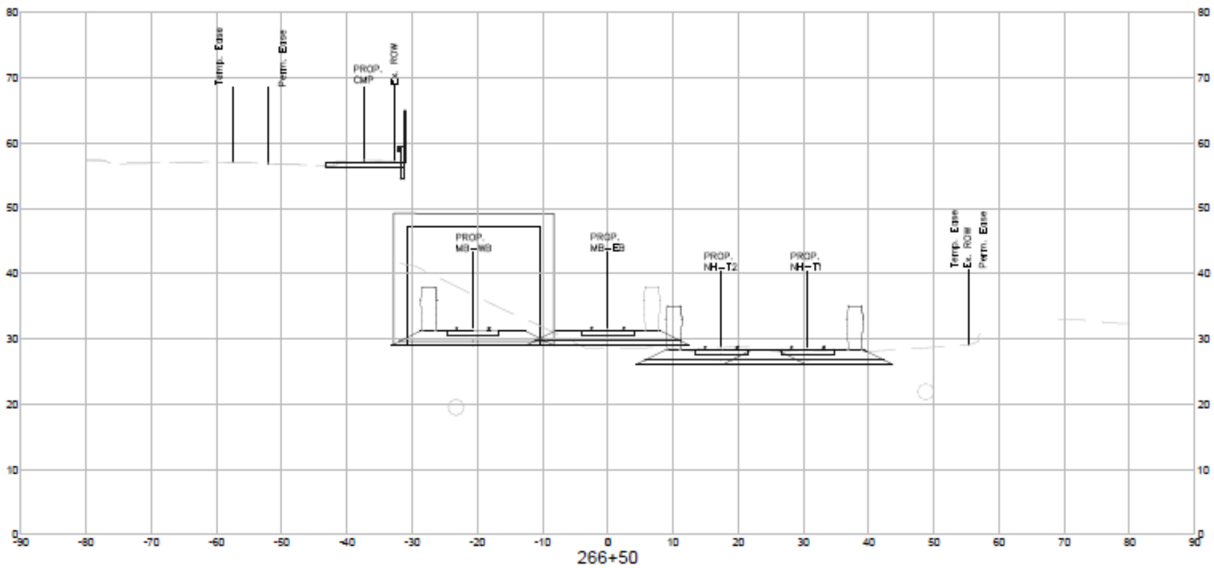
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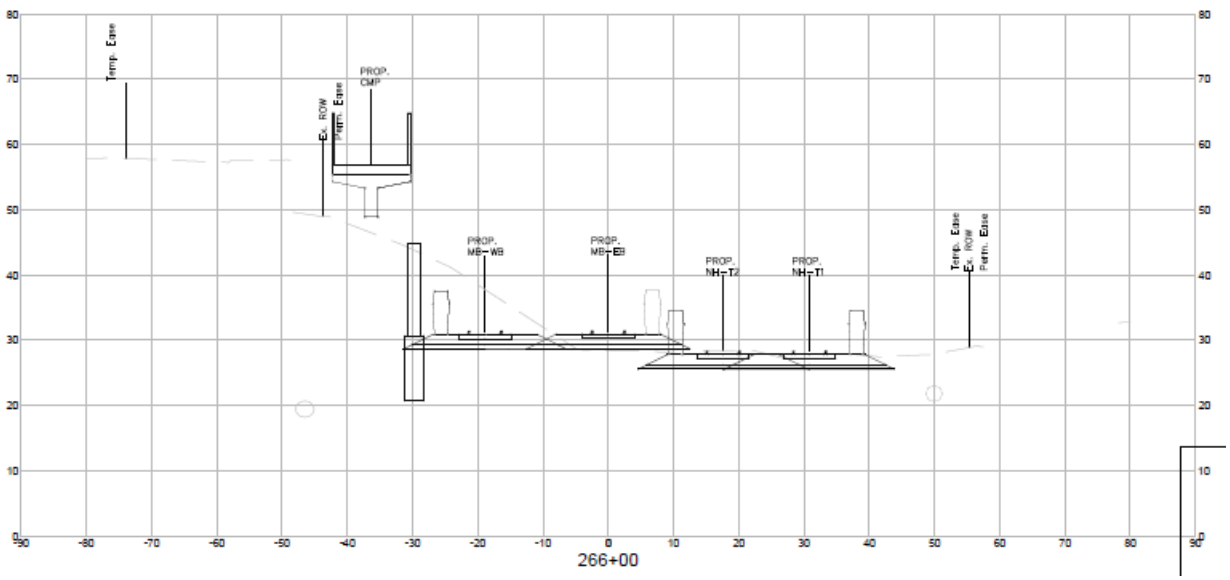
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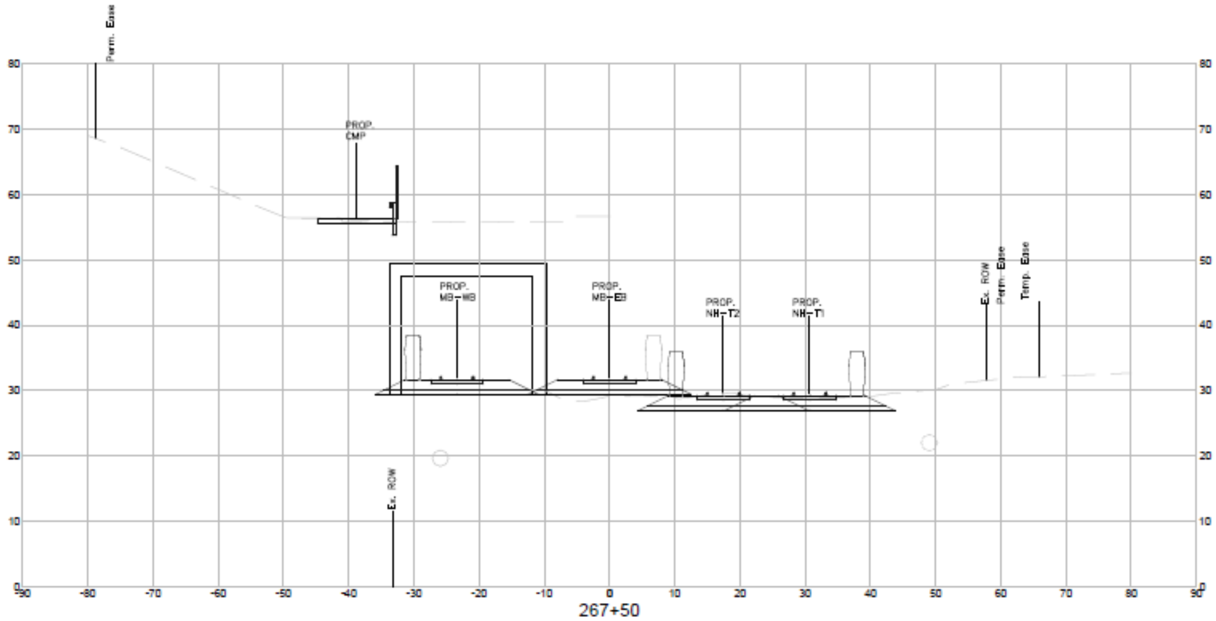
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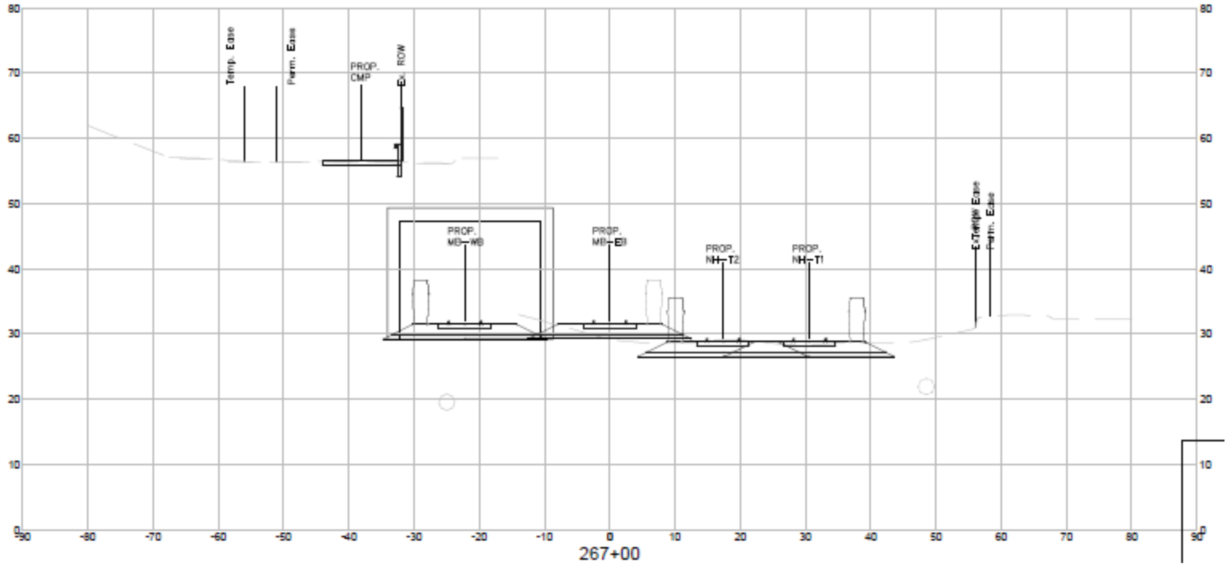
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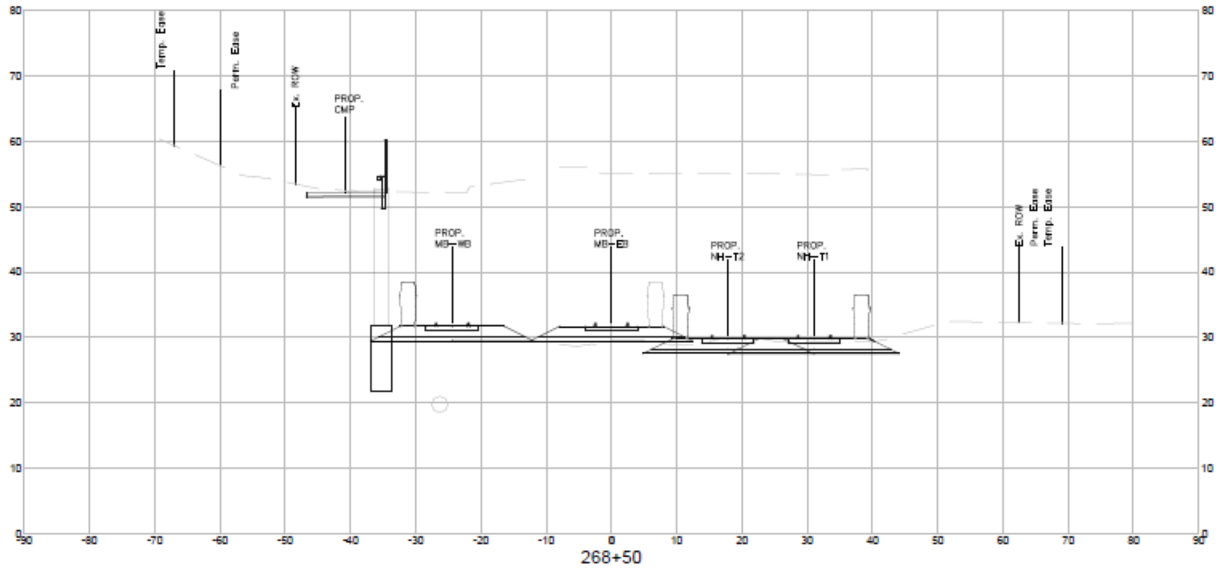
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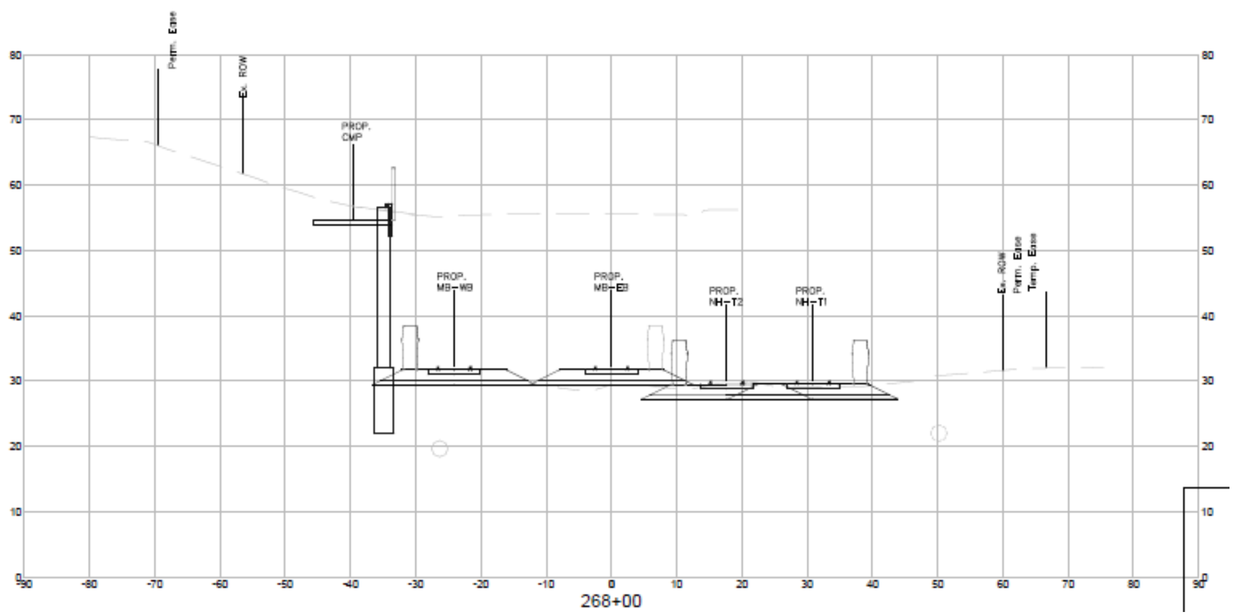
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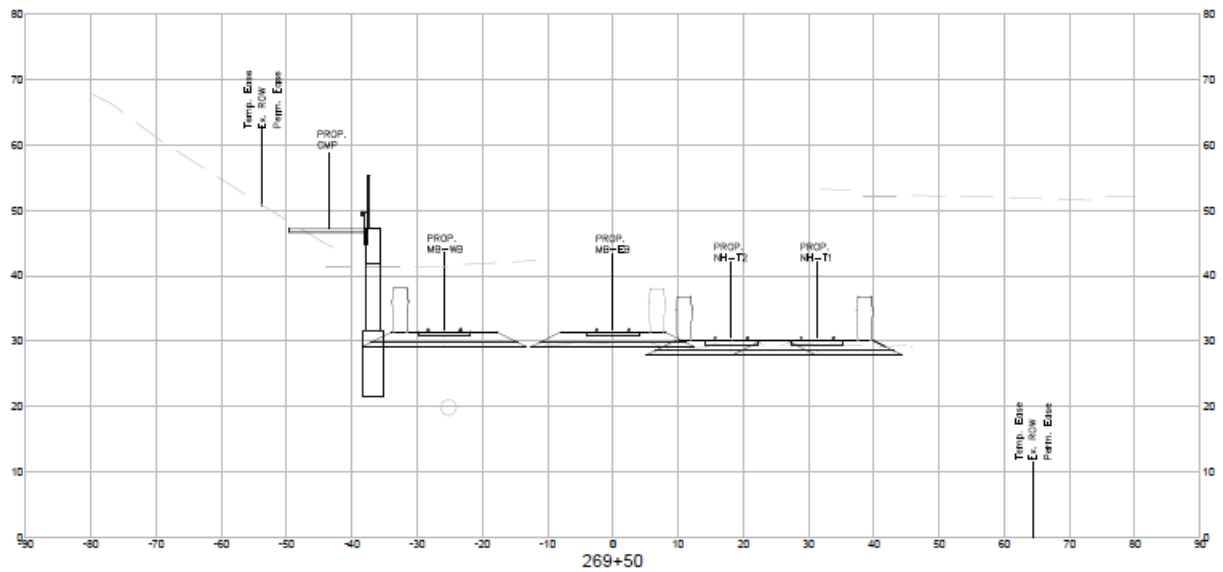
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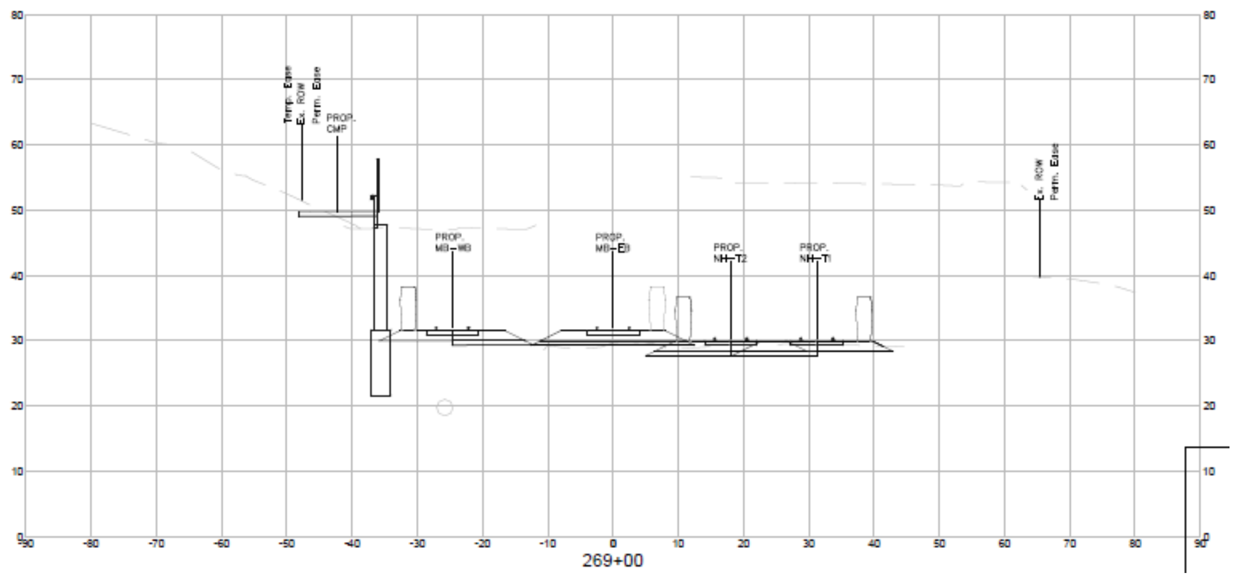
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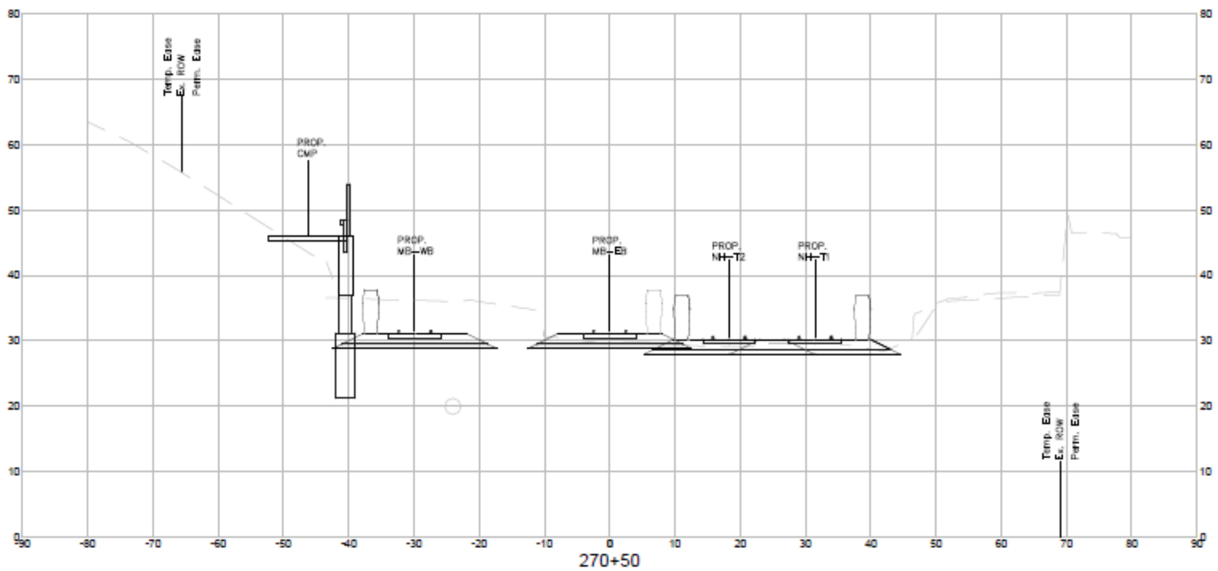
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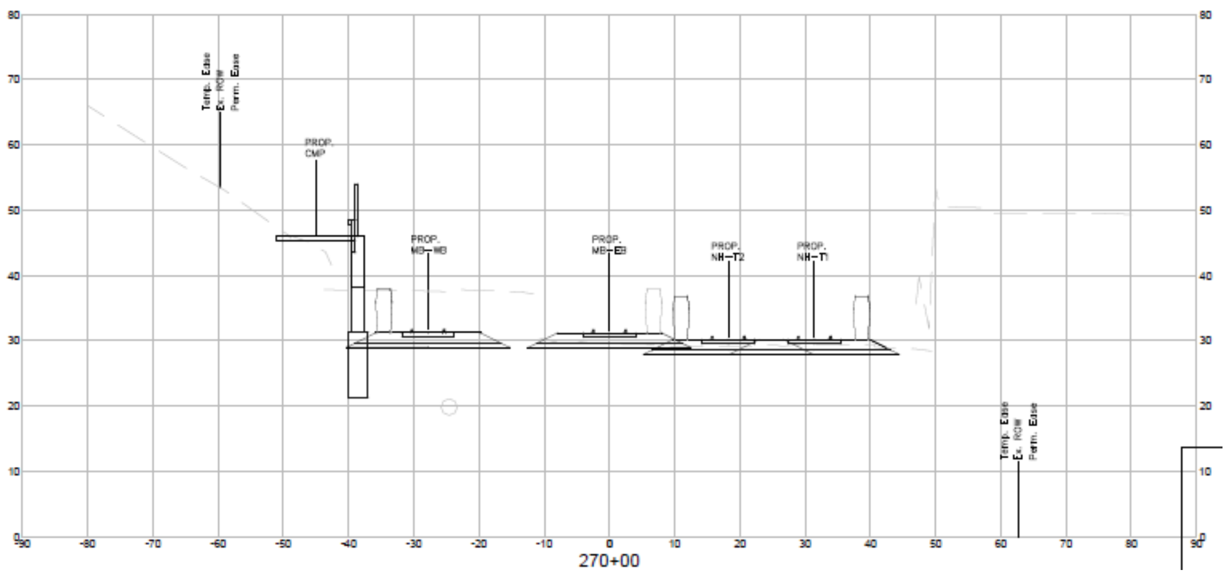
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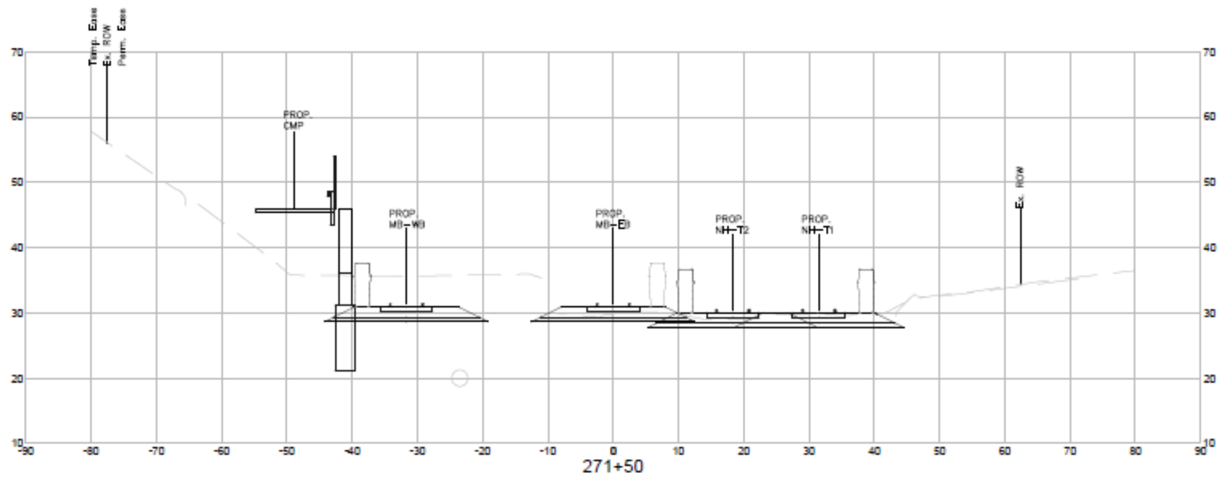
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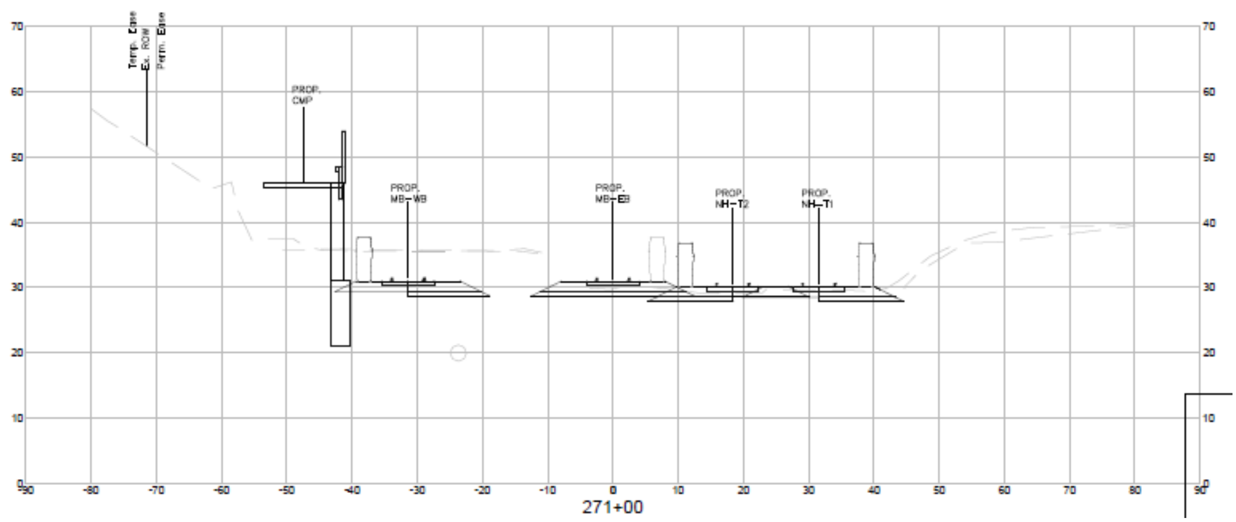
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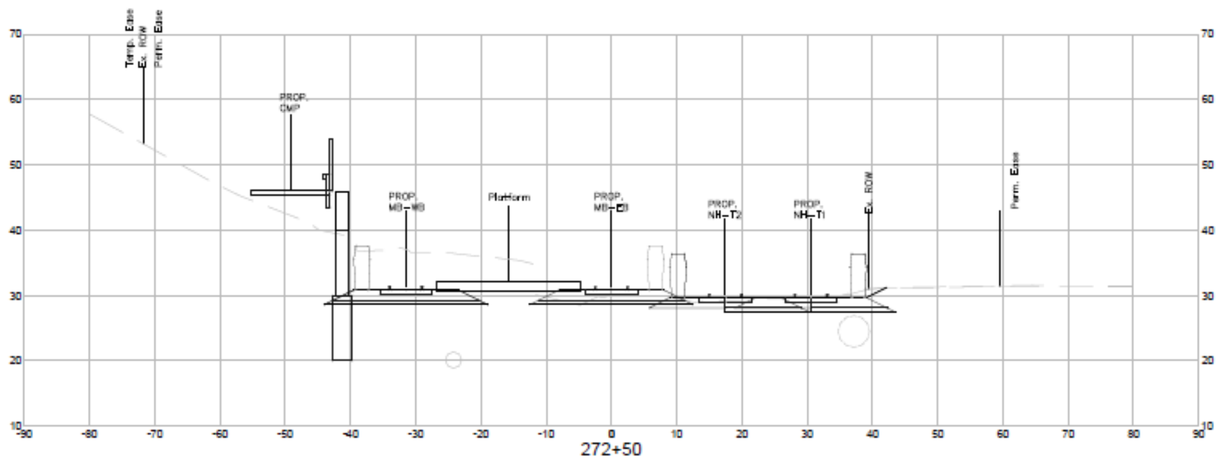
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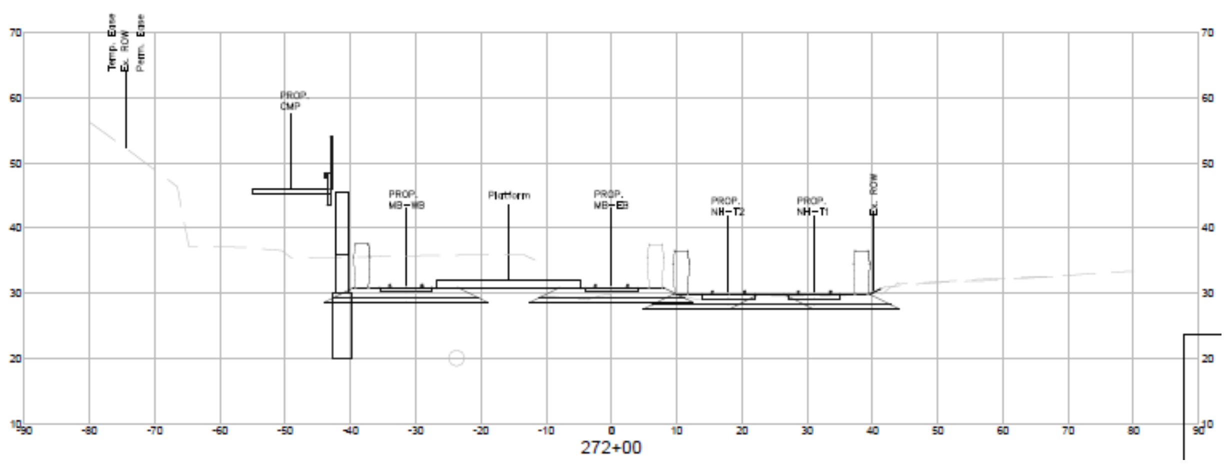
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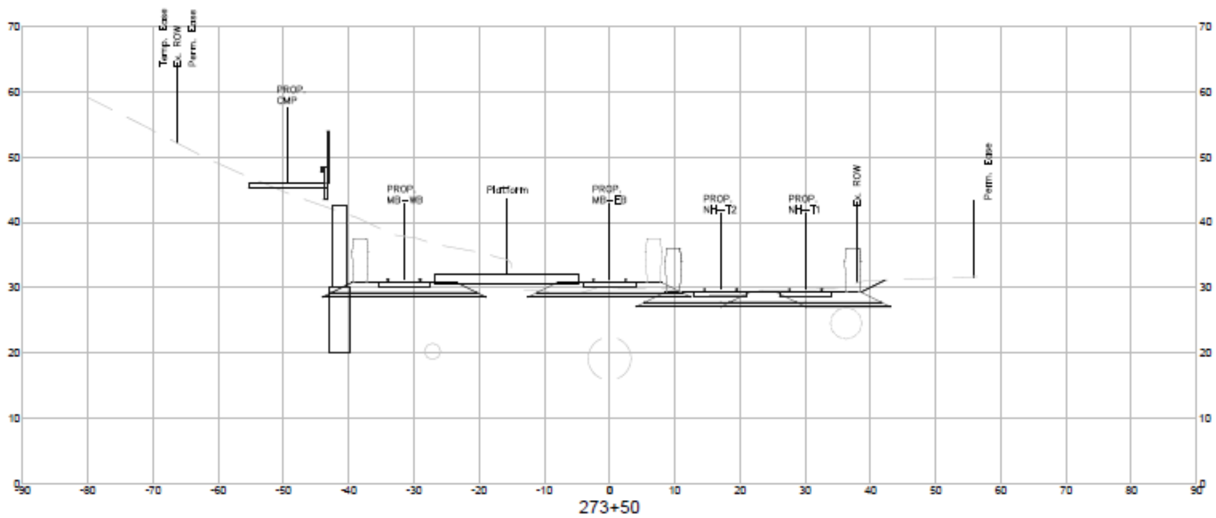
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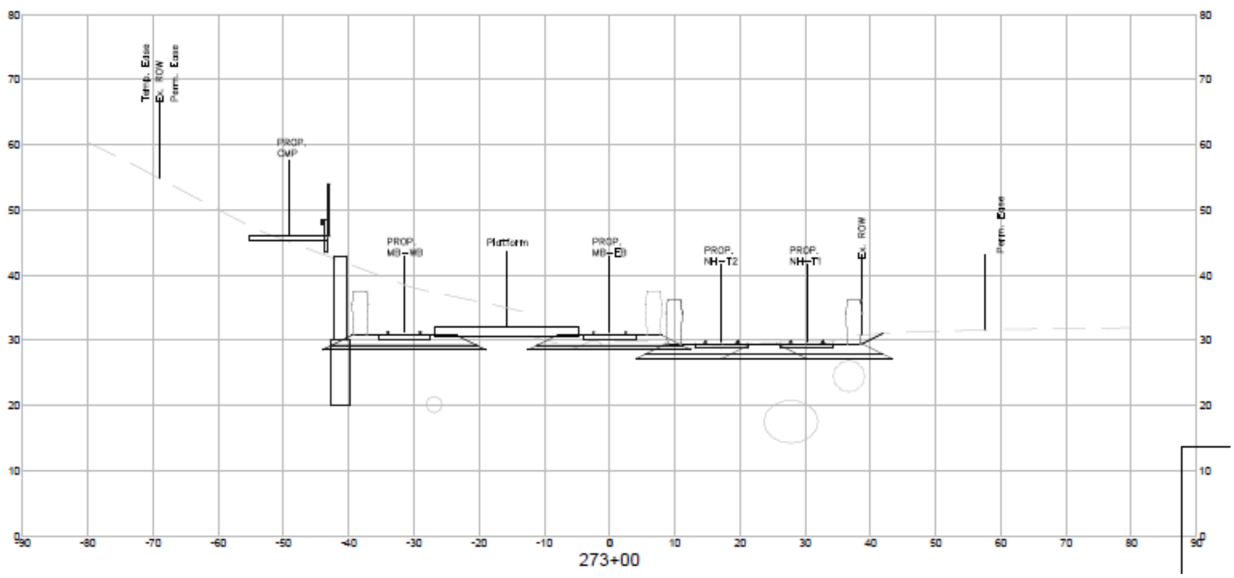
273+50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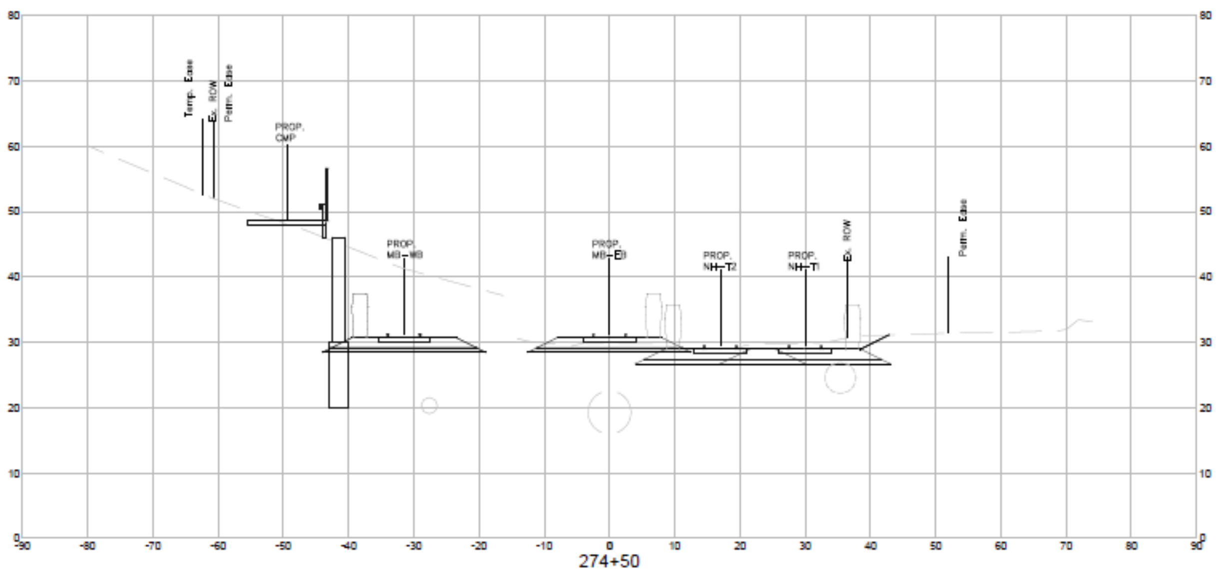
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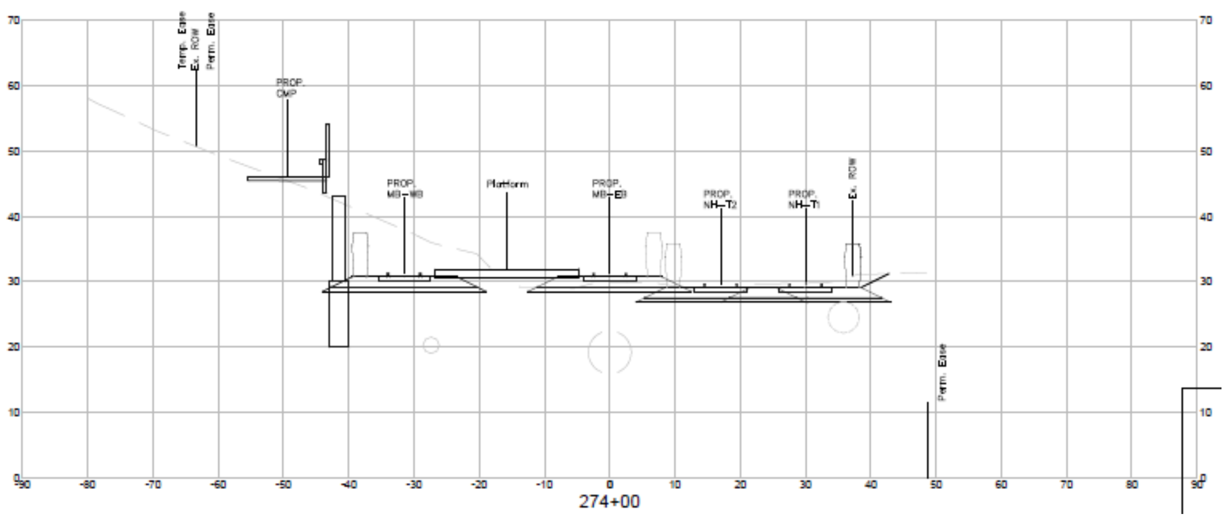
274+50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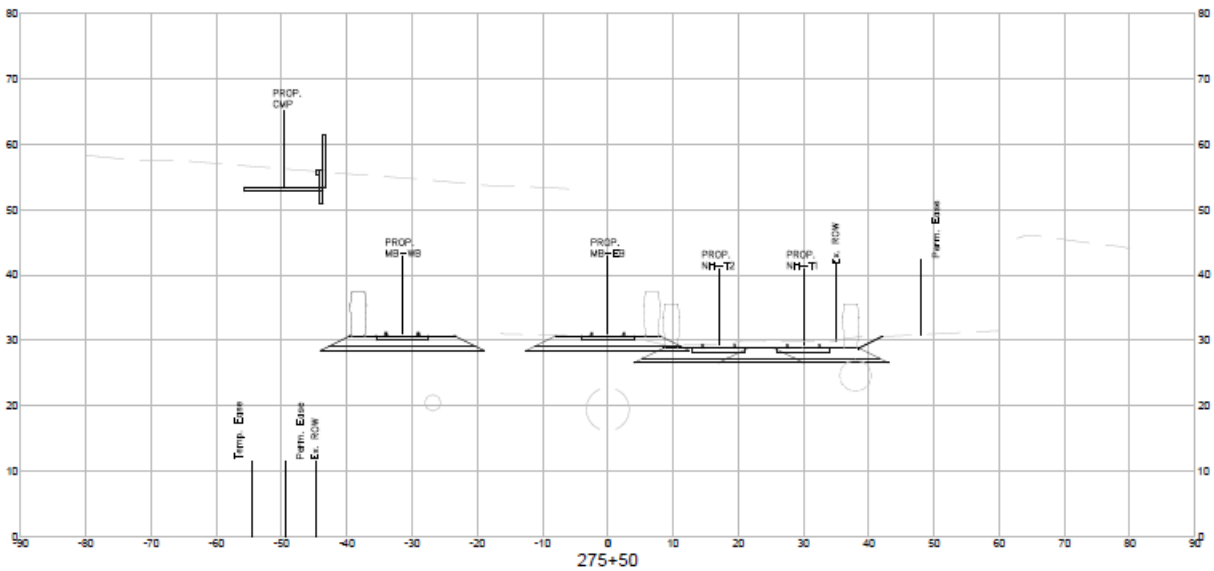
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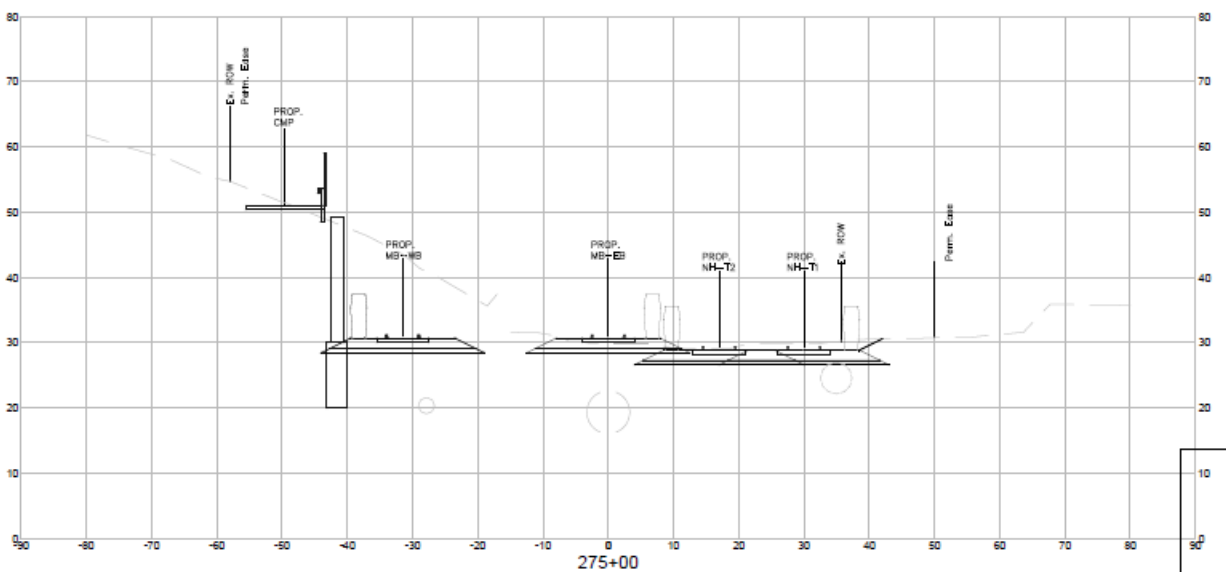
275+50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NH—T1
Ex. ROW
Perm. Ease
275+00

ATC No. 36

Acceptance of Formal Submission

Massachusetts Bay
Transportation Authority

GLX - Procurement

ATC Review

ATC Information:

Type of ATC: Formal
Title: GLX Constructors ATC 07 - Elevated Community Path
Proposer Company: GLX Constructors

Final Disposition:

Sent on behalf of Yvelisse Duvergé. The ATC Submittal is acceptable for inclusion in the Proposal.

COVER SHEET

GLX CONSTRUCTORS

MBTA CONTRACT NO. E22CN07

GREEN LINE EXTENSION DESIGN BUILD PROJECT

CONFIDENTIAL ATCs

FORMAL

ALTERNATIVE TECHNICAL CONCEPTS (“ATCs”)

JUNE 9, 2017 (First Round)

JUNE 22, 2017 (Second Round)

JULY 11, 2017 (Final Round)

GLX CONSTRUCTORS FORMAL ATC FORM

ELEVATED COMMUNITY PATH

Sections A though P below shall be completed to submit a Formal ATC for the Green Line Extension Design Build Project as specified in Section 3.2.1 of the Instructions to Proposers. This Formal ATC must be submitted to the MBTA's Designated Representative as specified in Section 2.4.1 of the Instructions to Proposers via the Project Management Information System.

A. ATC Number

A sequential ATC number identifying the Proposer and the ATC number. (Multi-part or multi-option ATCs shall be submitted as separate individual ATCs with unique sequential numbers.);

ATC 36

MBTA Preliminary ATC File Number: ATC-000014 – GLX Constructors ATC 08

B. Description and Conceptual Drawings

A description and conceptual drawings of the configuration of the ATC or other appropriate descriptive information;

This ATC will eliminate the underpass at Walnut Street and reduce the underpass width at Medford Street by elevating the Community Path starting at grade from School Street. The Community Path would continue near cross-street grade along the west side of the ROW to Medford Street. After crossing Medford Street at grade, the Community Path will continue near cross-street grade to Walnut Street. After crossing Walnut Street at grade, the Community Path then progressively declines to track grade south of Walnut Street. Please reference the attached Figures ATC 36-1 "Elevated Community Path Plan and Profile" and ATC-36-2 "Elevated Community Path Cross Sections"

C. Locations and How Used

The locations where, and an explanation of how, the ATC will be used on the Project;

The ATC will eliminate the Underpasses at Walnut Street and Medford Street by elevating the Community Path starting from approximately 38' left Sta. MB-EB 252+00 at elevation 26.00 crossing Walnut Street at Grade. The Community Path would continue to approximately 38' left Sta. MB-EB 267+00 elevation 56.00. The Community Path would cross Medford Street at Grade. The Community Path would continue to 54' left Sta .MB-EB 275+50 elevation 52.00 where it would tie into School Street. This would be the North End of the Elevated Community Path.

D. Changes in Rail or Transit Operations

Any changes in rail or transit operations requirements associated with the ATC, including ease of operations;

No changes in operations are anticipated as a result of this ATC.

E. Changes in Routine or Capital Maintenance

Any changes in routine or capital maintenance requirements associated with the ATC, including ease of maintenance;

This ATC eliminates the need for the routine and capital maintenance of lighting for the Walnut Street and Medford Street underpasses, as well as the routing and capital maintenance of the underground ventilation for the Medford Underpass as it would be over 200' long.

F. Changes in Anticipated Service Life

Any changes in the anticipated service life of the item(s) comprising the ATC or affected by the ATC;

No change in service life is anticipated as a result of this ATC.

G. References to Contract Documents

References to requirements of the Contract Documents that are inconsistent with the proposed ATC, an explanation of the nature of the deviations from said requirements, and a request for approval of such deviations;

Para 9.2.3.3 Geometry (h) Table 9.2-1 Community Path and Roadway Interfaces Medford Street and Walnut Street Underpass of the Technical Provisions.

H. Justification of Use

An analysis justifying use of the ATC and why the deviation, if any, from the requirements of the Contract Documents should be allowed;

This ATC eliminates the pedestrian underpass at Walnut Street and Medford Street which increases safety and security of Pedestrians using the Community Path. This ATC also eliminates the need for Fire and Life Safety features and lighting for underpasses at Walnut Street and Medford Street. This ATC improves accessibility for emergency and maintenance vehicles operating on the Community Path

I. Preliminary Analysis and Quantitative Discussion

A preliminary analysis and quantitative discussion of potential impacts on rail or transit operations (both during and after construction), environmental permitting, community impact, safety, and life-cycle Project and infrastructure costs, including impacts on the cost of repair, replacement, maintenance, and operation;

No impacts on rail or transit operations are anticipated as a result of this ATC.

J. Impacts on Third Parties

A description of any impacts on the land or facilities of third parties, including private owners, governmental entities, utility owners, and railroads, and identification of specific additional right of way required to implement the ATC. Proposers are advised that they may (i) be solely responsible for the cost and schedule impacts of the acquisition of any such Additional Properties, including the cost thereof and obtaining any necessary environmental approvals; (ii) not be entitled to any change order for time or money as a result of site conditions (i.e., hazardous materials, differing site conditions, geotechnical issues, or utilities) on such Additional Properties; and (iii) not be entitled to any change order for time or money as a result of any delay, inability, or cost associated with the acquisition of such Additional Properties;

This ATC eliminates the risk of relocating the 48" MWRA Waterline at Walnut Street. This ATC also reduces the footprint of the Community Path which will reduce potential ROW issues.

K. History of Use and References

A description of any other projects where the ATC has been used, the degree of success or failure of such usage, and names and contact information, including phone numbers and E-mail addresses, for project owner representatives that can confirm such statements;

This ATC uses a similar elevated community path concept that has been successfully used at the NorthPoint park. This concept is also similar to what has been called for on the Project Concept Plans from School Street to Central Street.

L. Additional Risks

A description of added risks to the MBTA or third parties associated with implementing the ATC;

No additional risks to the MBTA or to third parties are anticipated as a result of this ATC.

M. Additional Costs

An estimate of any additional MBTA, DB Entity, and third-party costs associated with implementation of the ATC;

Additional costs to the MBTA, DB Entity and third parties will not result from this ATC. One of the primary purposes of this ATC is cost reduction.

N. Estimated Price Adjustment

An estimate of the price adjustment (i.e., cost savings), should the ATC be approved and implemented;

This ATC will result in an estimated savings of $2,000,000. The ATC pricing as shown in this proposal is an all inclusive price. All price deducts and/or adds have been considered, and the resulting price adjustment is offered as shown.

O. Schedule Adjustment

An estimate of the schedule adjustment, should the ATC be approved and implemented; and

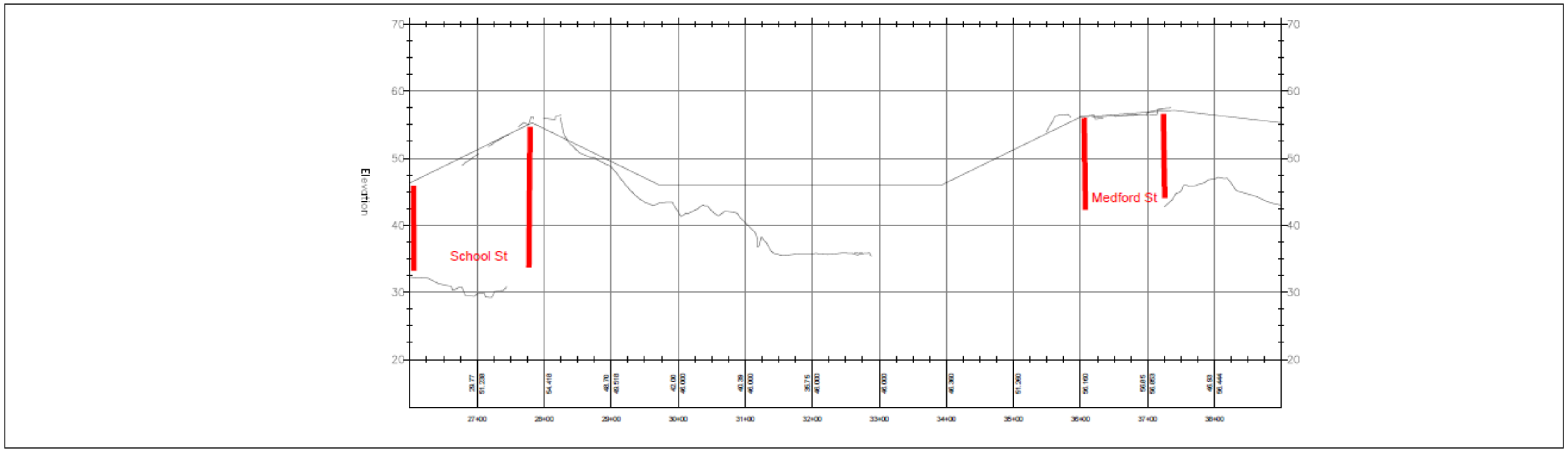
This ATC does not require any schedule adjustment.

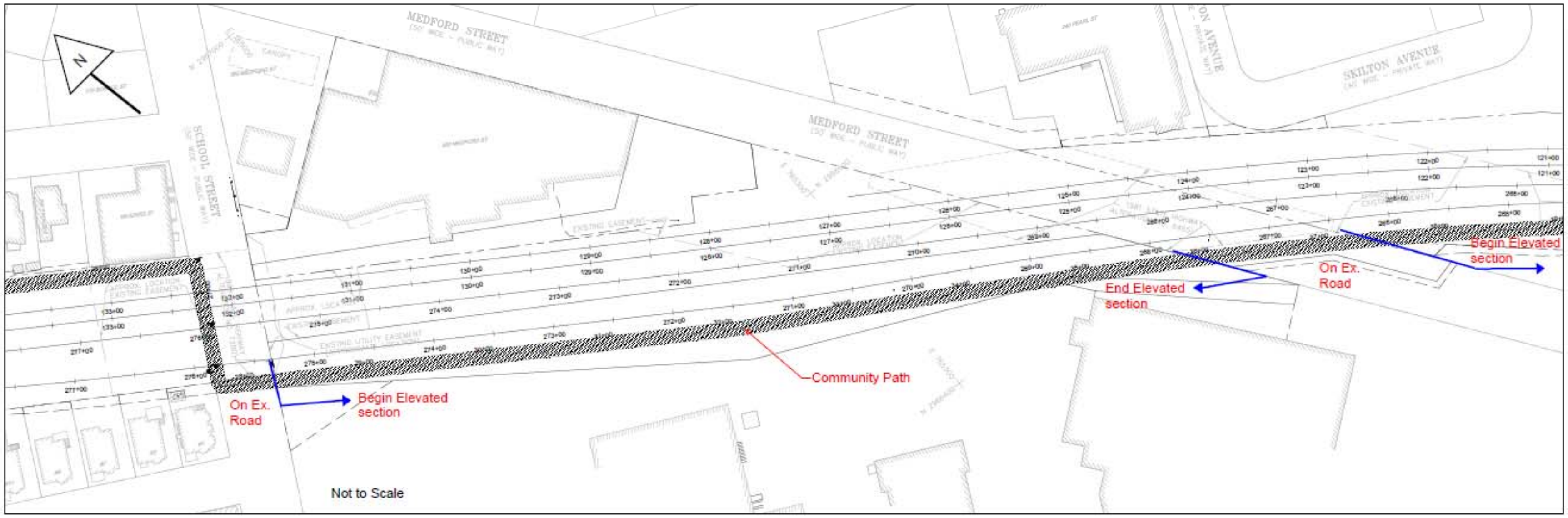
P. Analysis of Quality, Performance, and Reliability

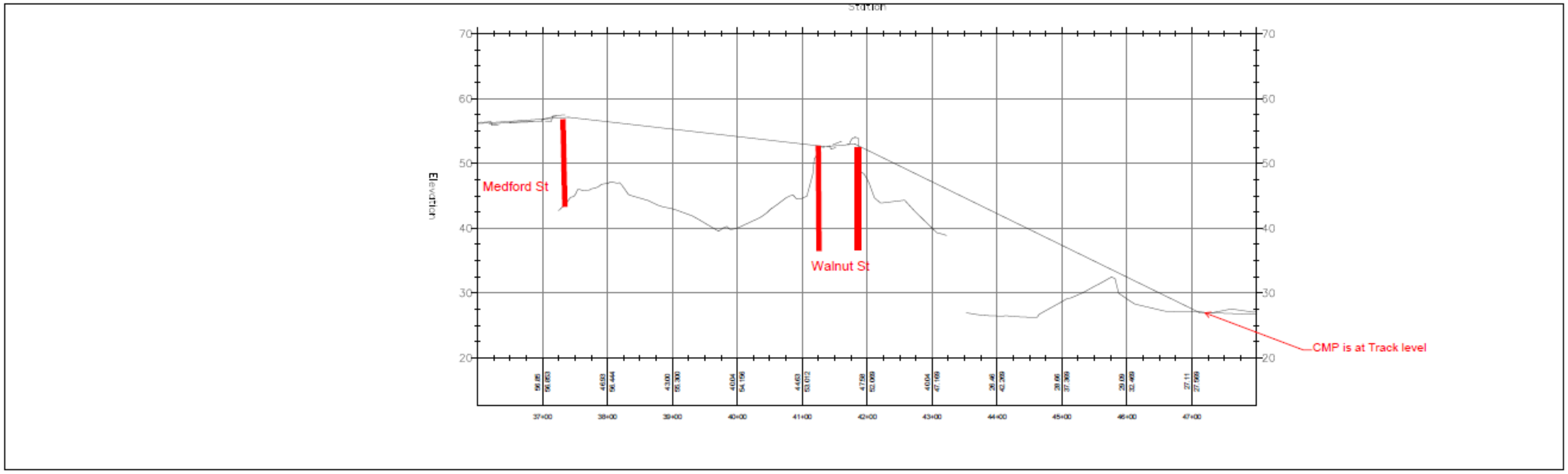
An analysis of how the ATC is equal to or better in quality, performance, and reliability than the requirements of the Contract Documents.

This ATC will provide equal quality, performance, and reliability to the specified plans. This ATC reduces maintenance cost needed to maintain performance through the elimination or reduction of ventilation and lighting requirements.

Figure ATC 36-1: Elevated Community Path Plan and Profile (2 Pages)






Station
Elevation
Medford St
Walnut St
CMP is at Track level
37+00
38+00
39+00
40+00
41+00
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43+00
44+00
45+00
46+00
47+00

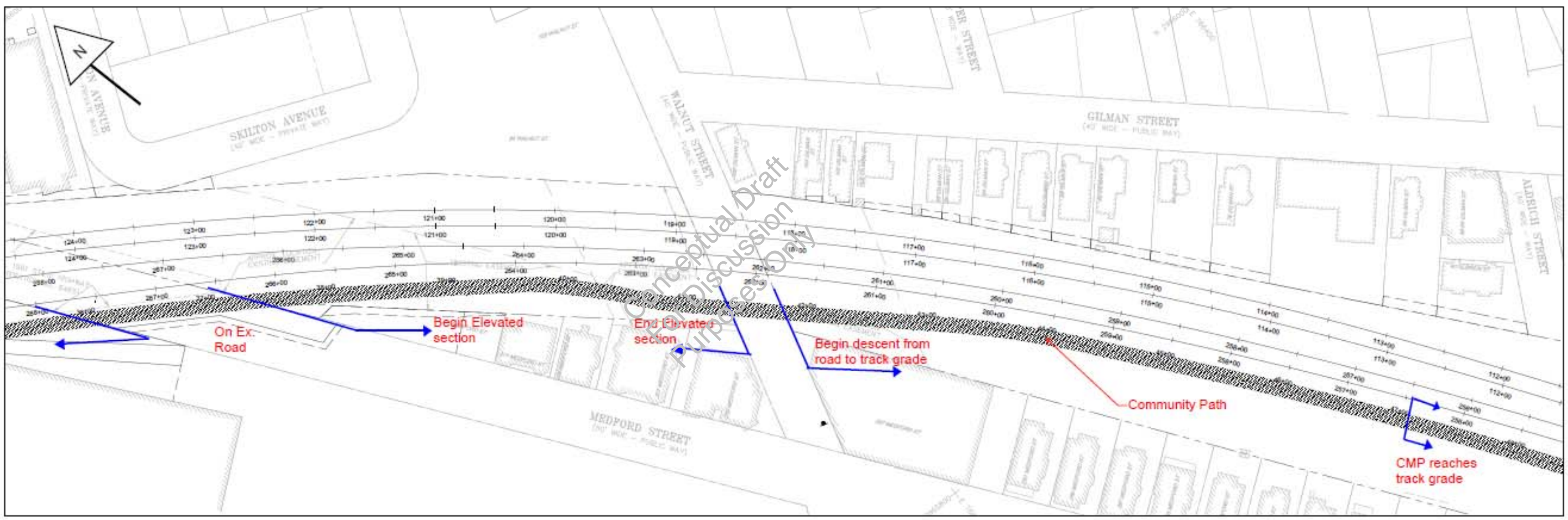
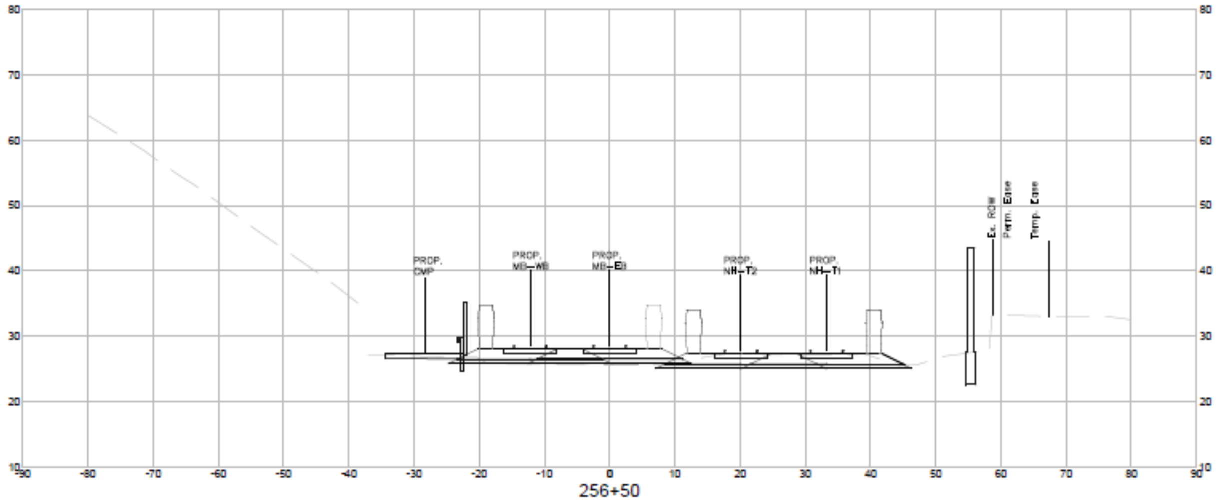
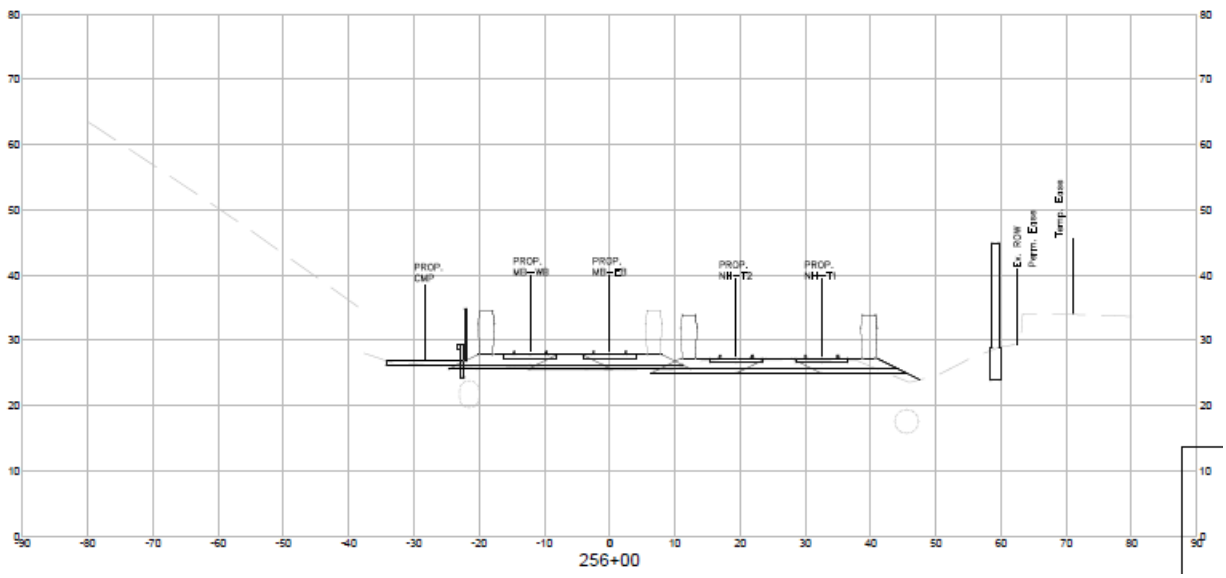
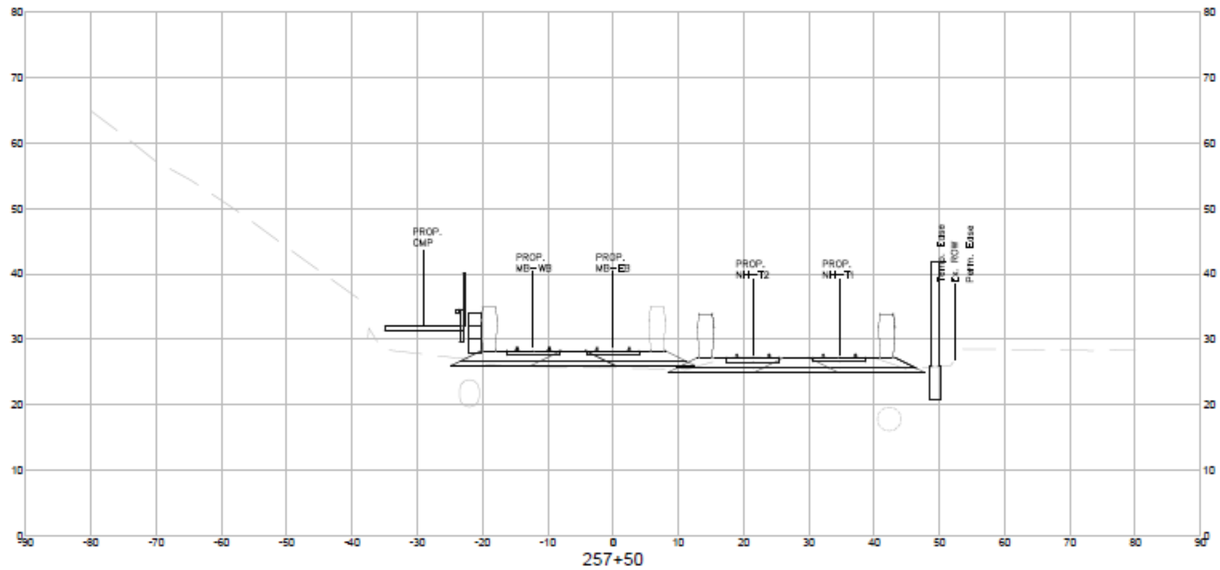

N
SKILTON AVENUE
WALNUT STREET
GILMAN STREET
ALDRICH STREET
MEDFORD STREET
On Ex. Road
Begin Elevated section
End Elevated section
Begin descent from road to track grade
Community Path
CMP reaches track grade
Conceptual Draft For Discussion Purposes Only

Figure ATC-36-2: Elevated Community Path Cross Sections (20 Pages)



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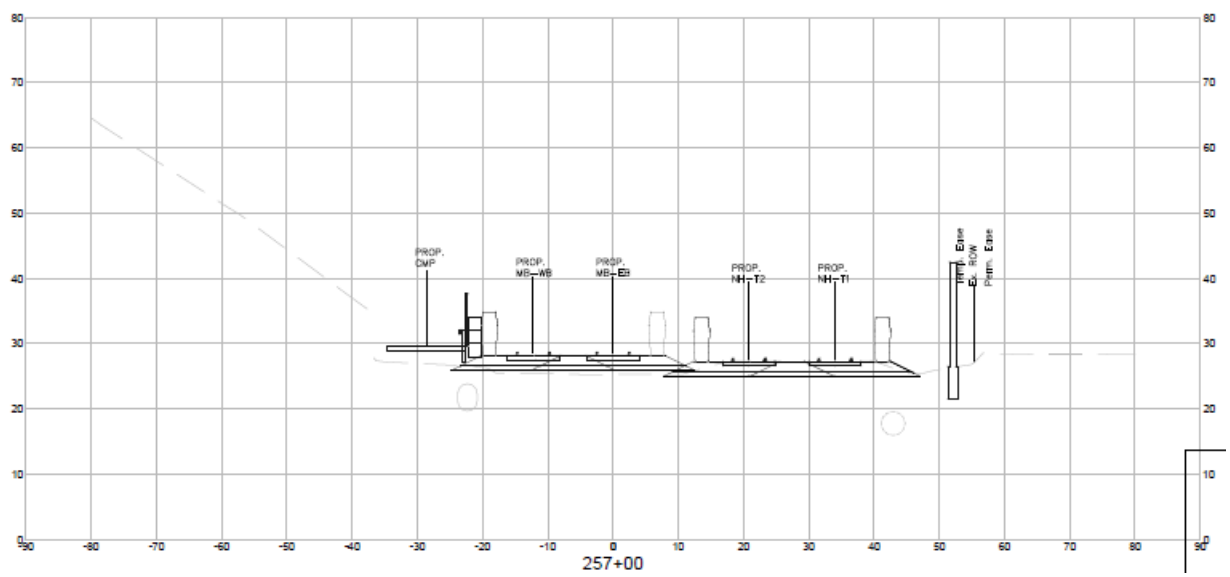
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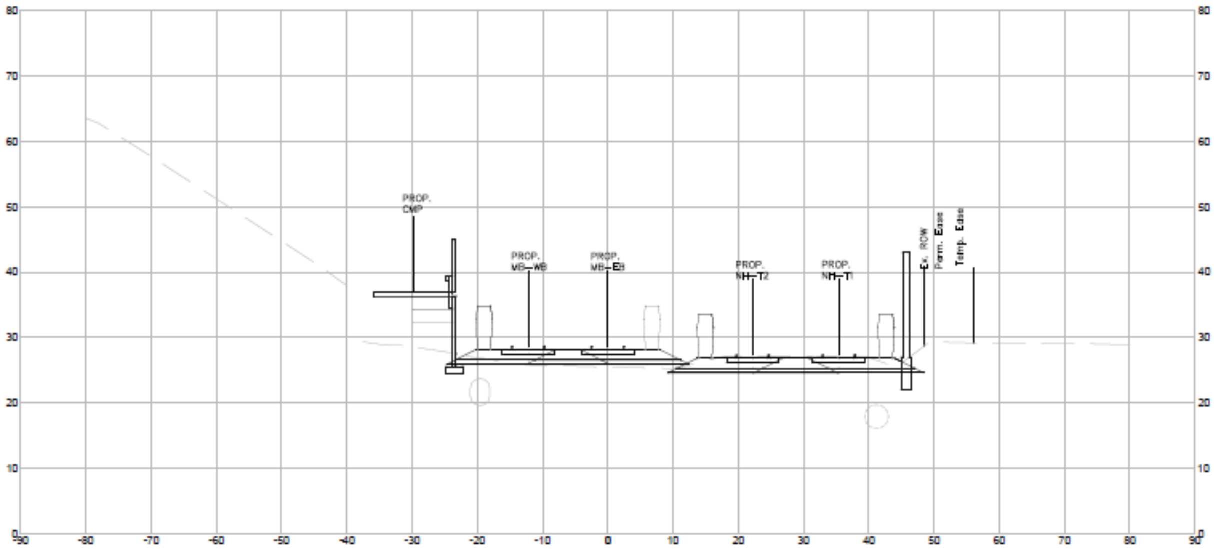
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Perm. Ease
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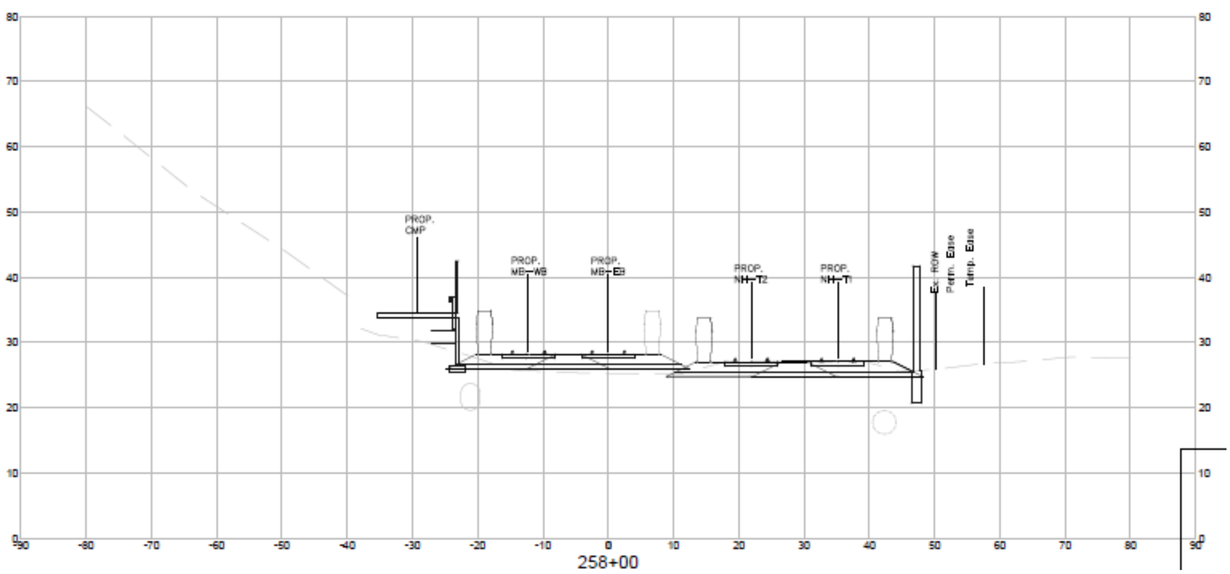
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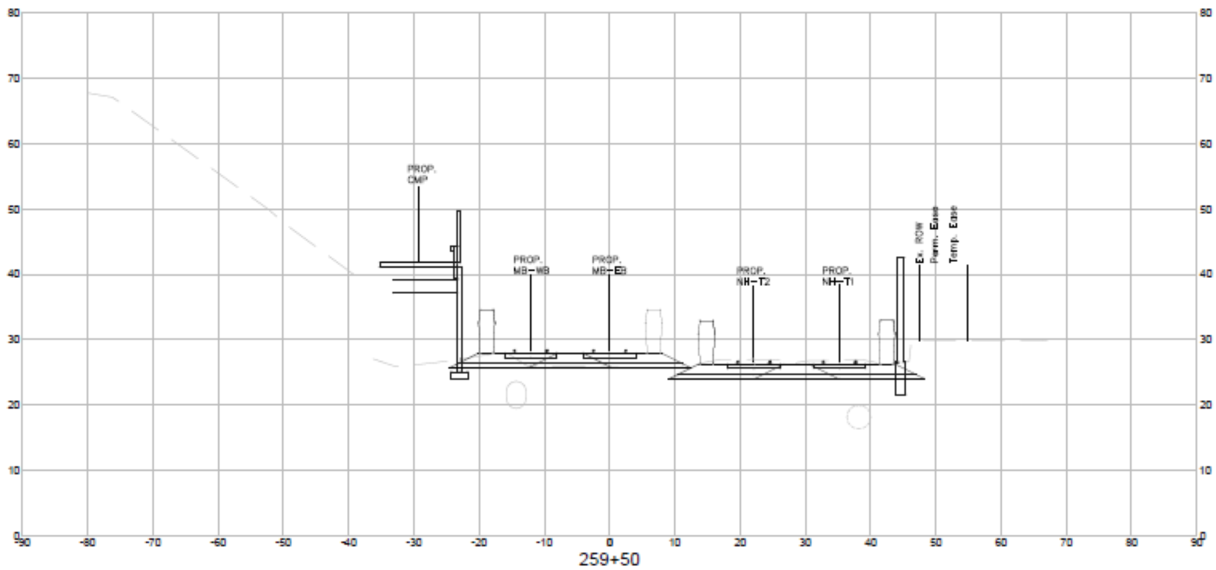
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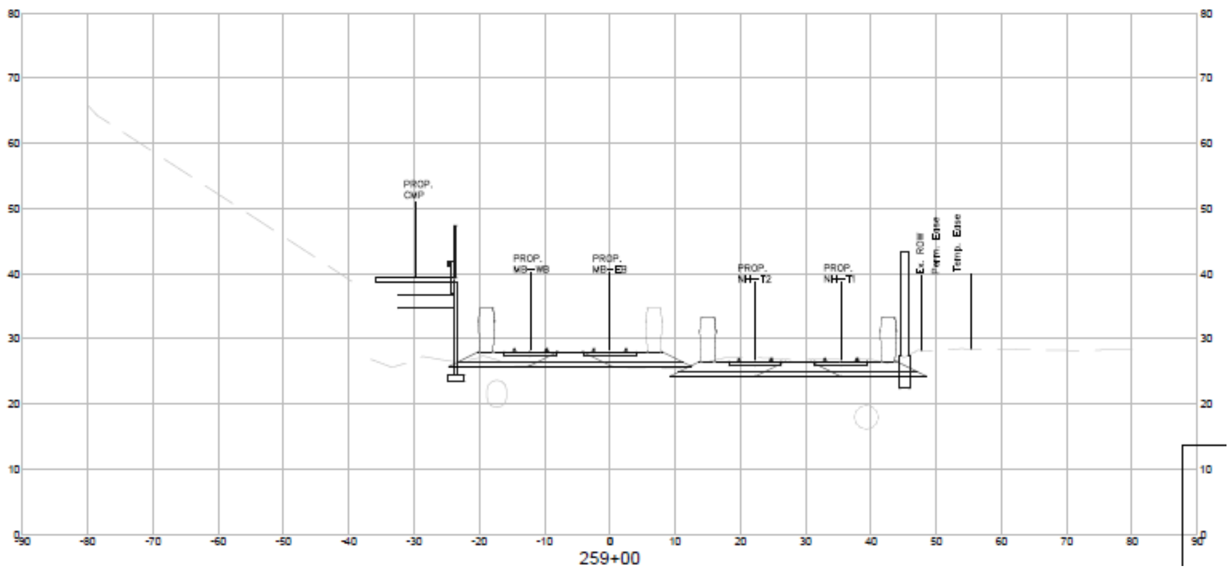
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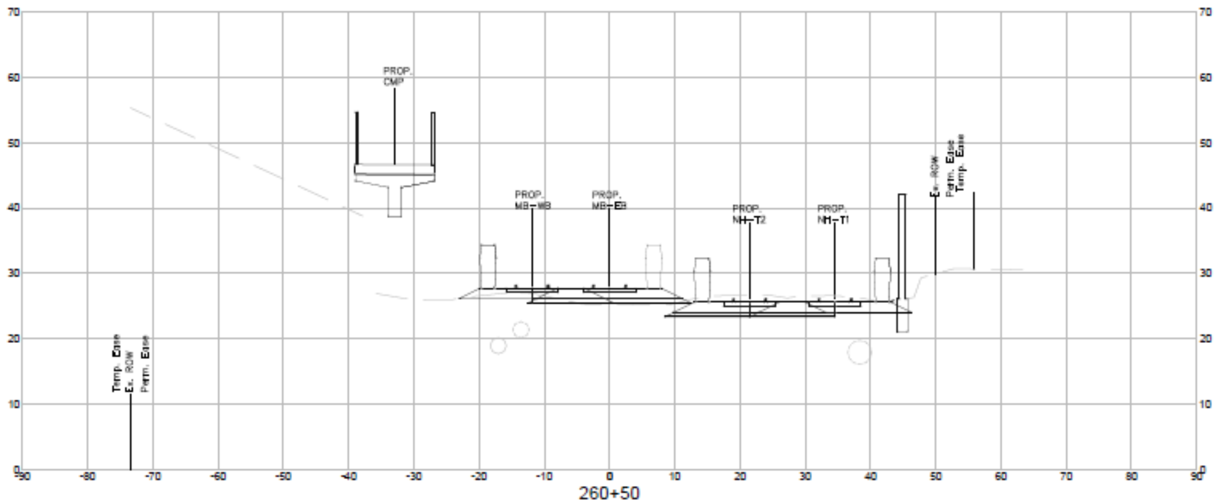
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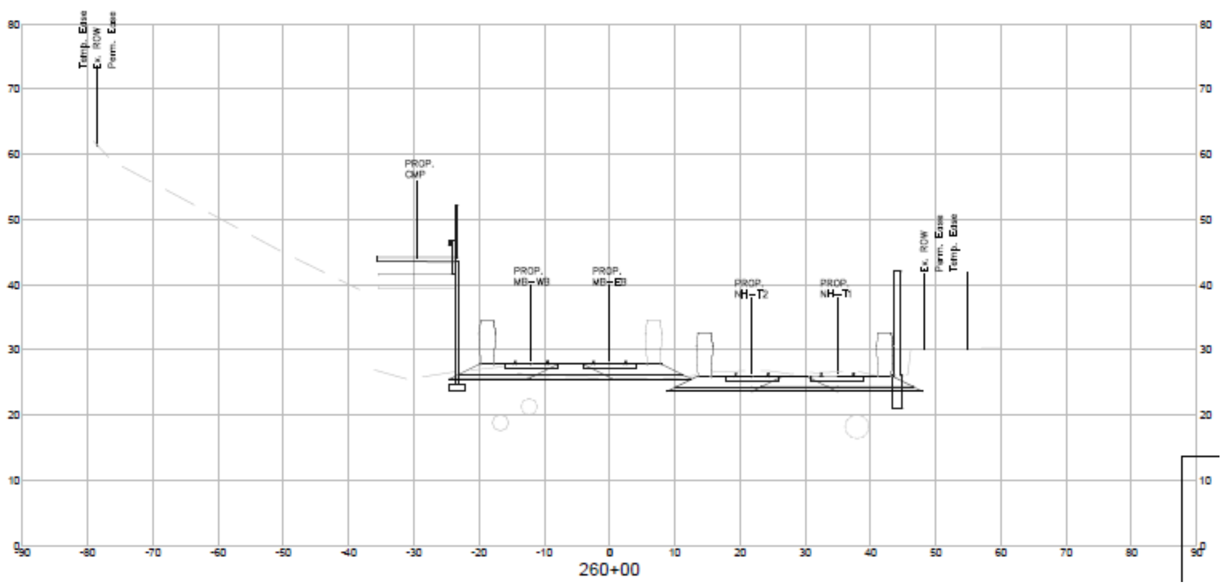
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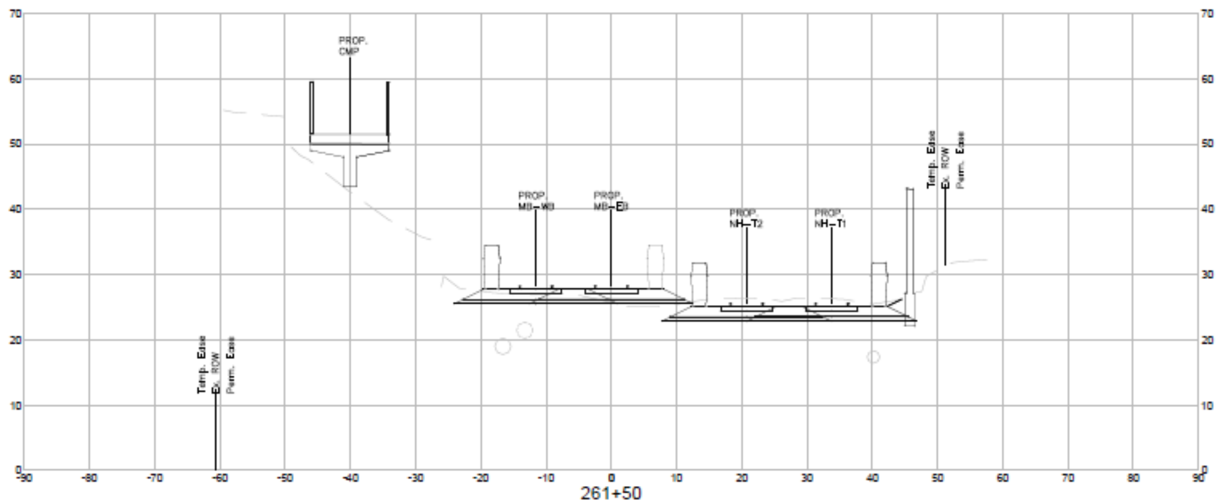
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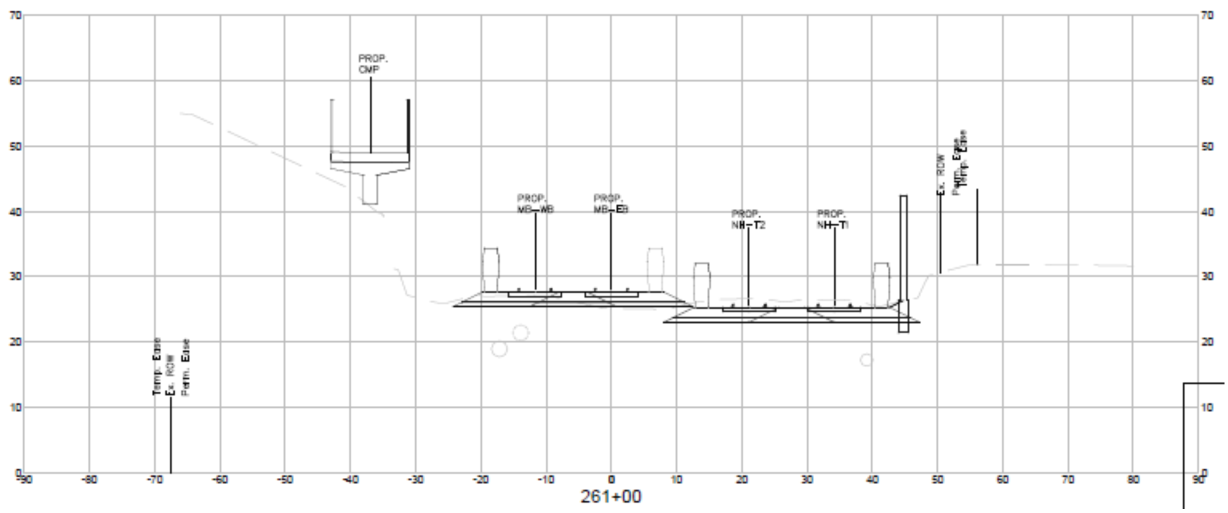
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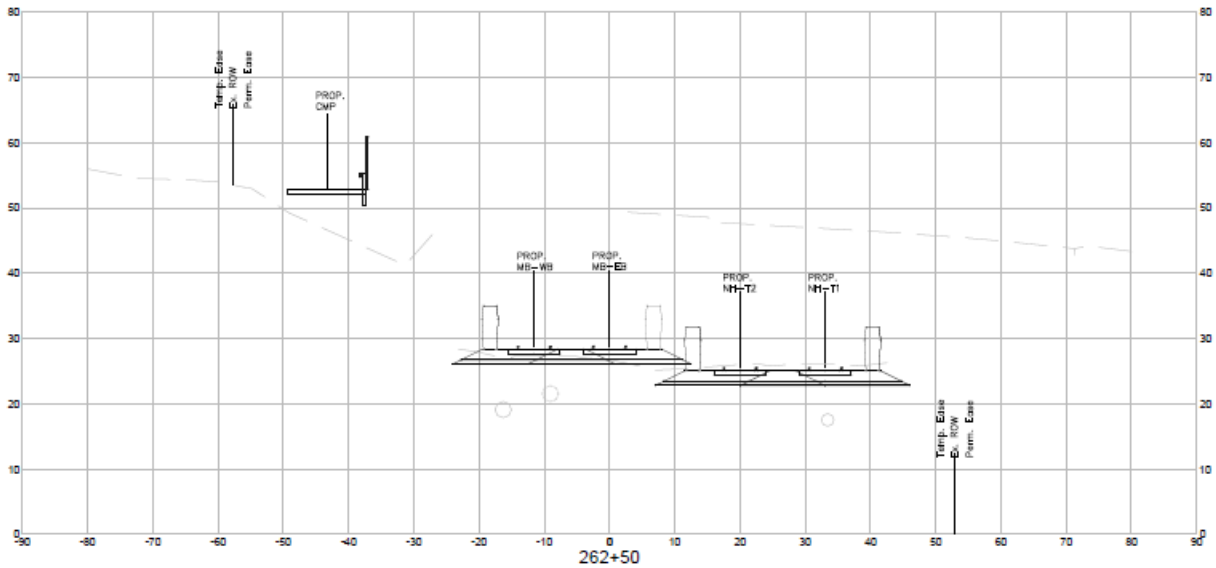

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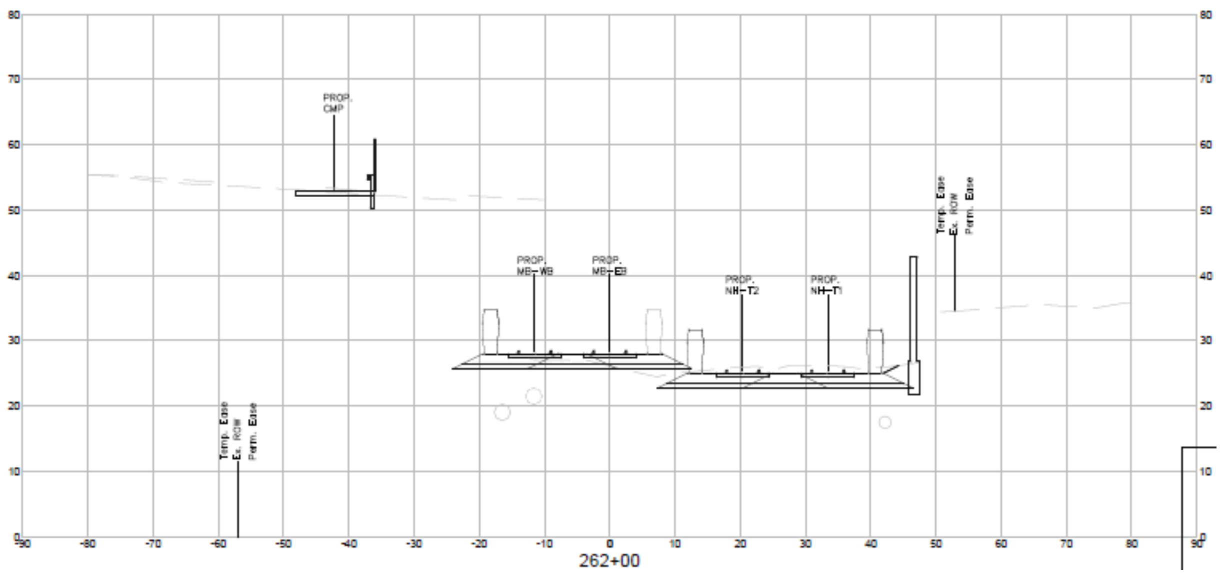

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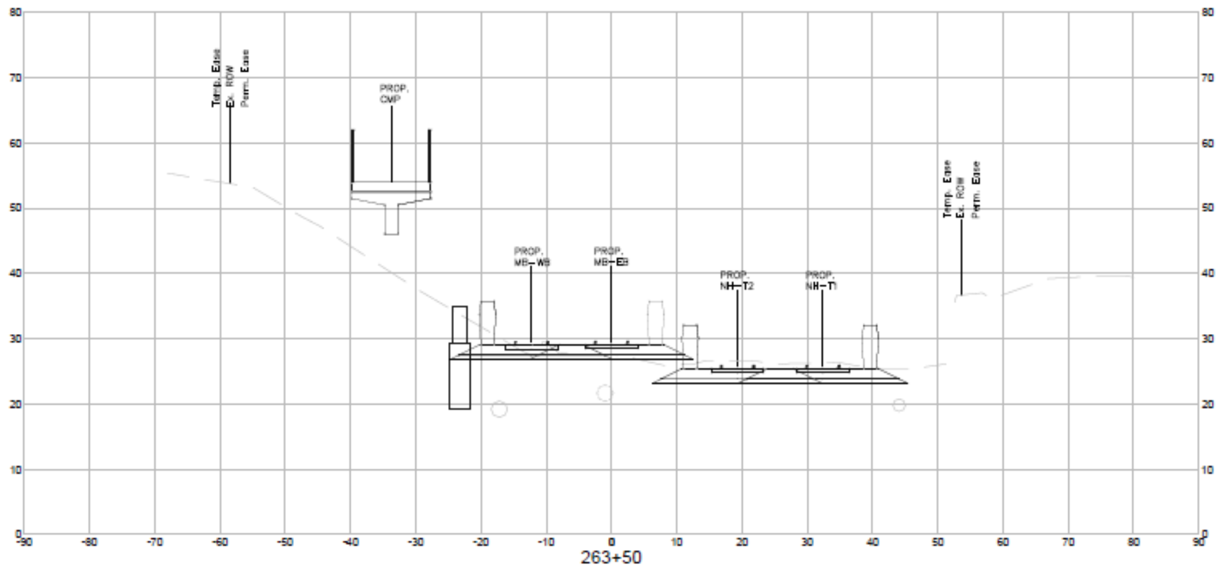
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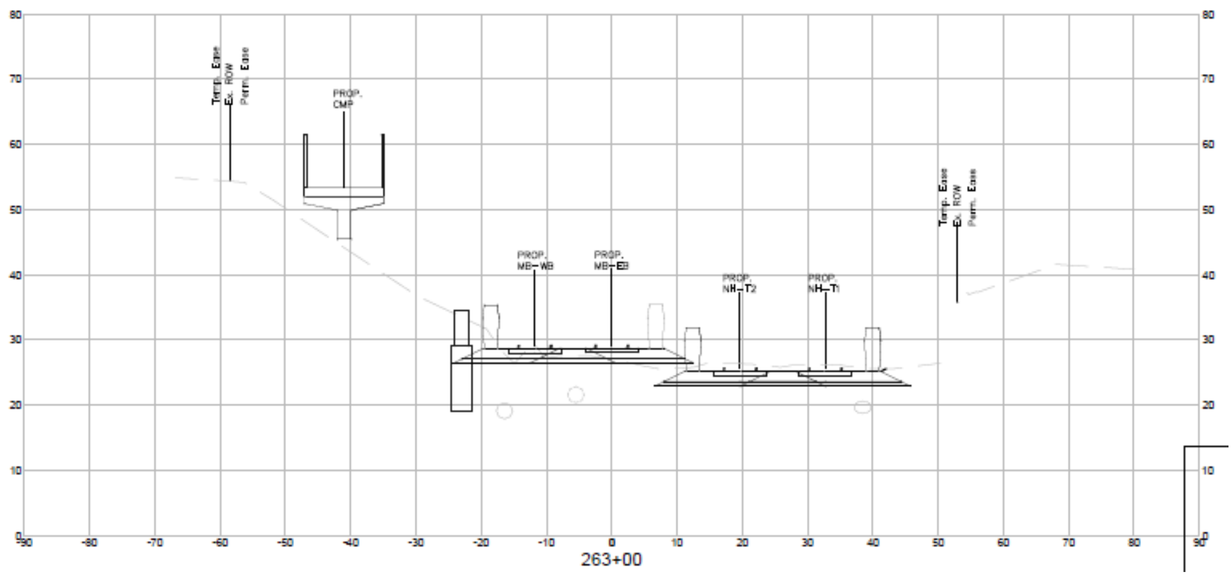
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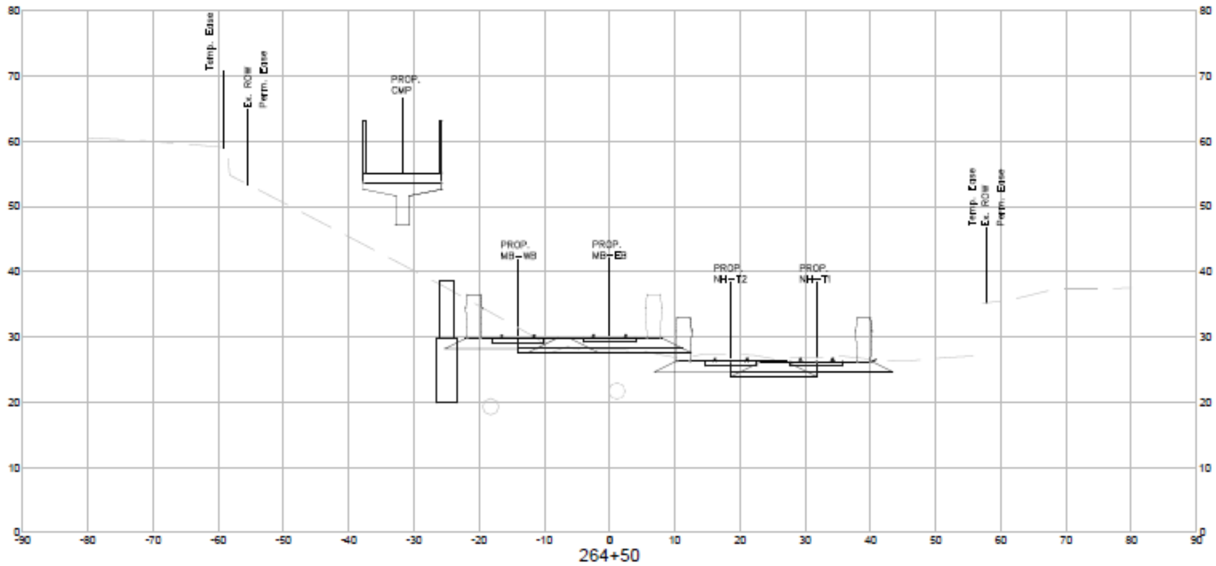
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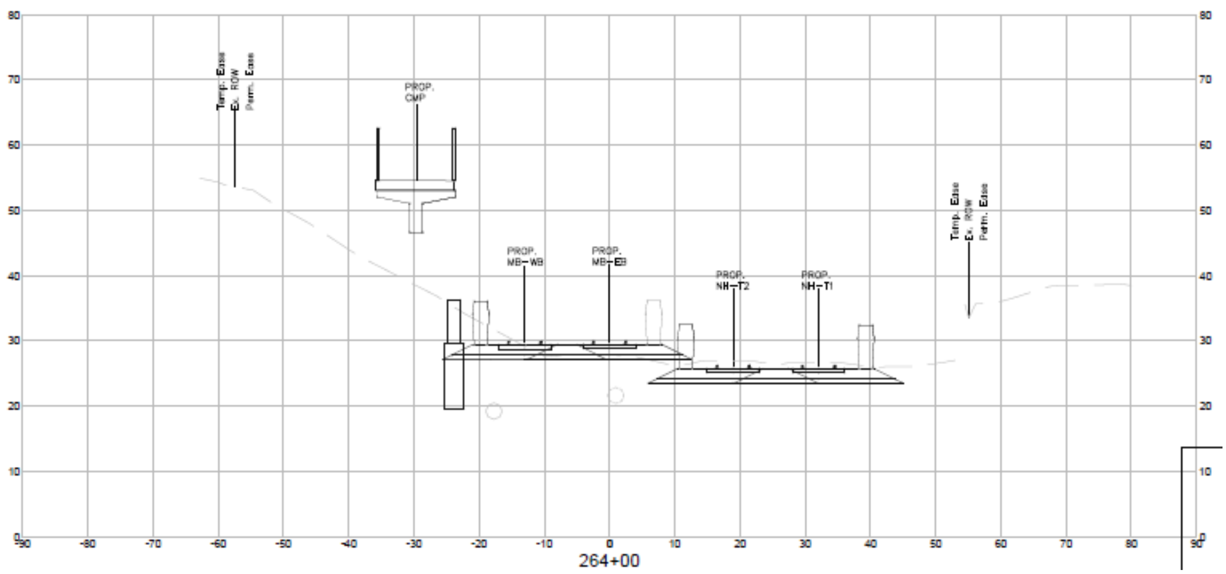
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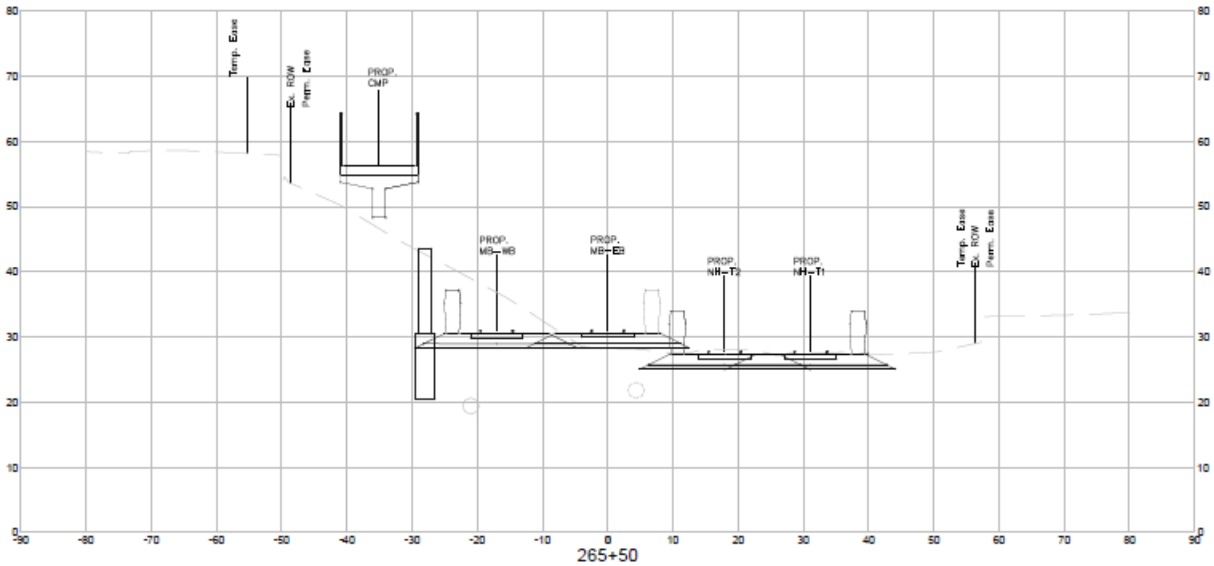

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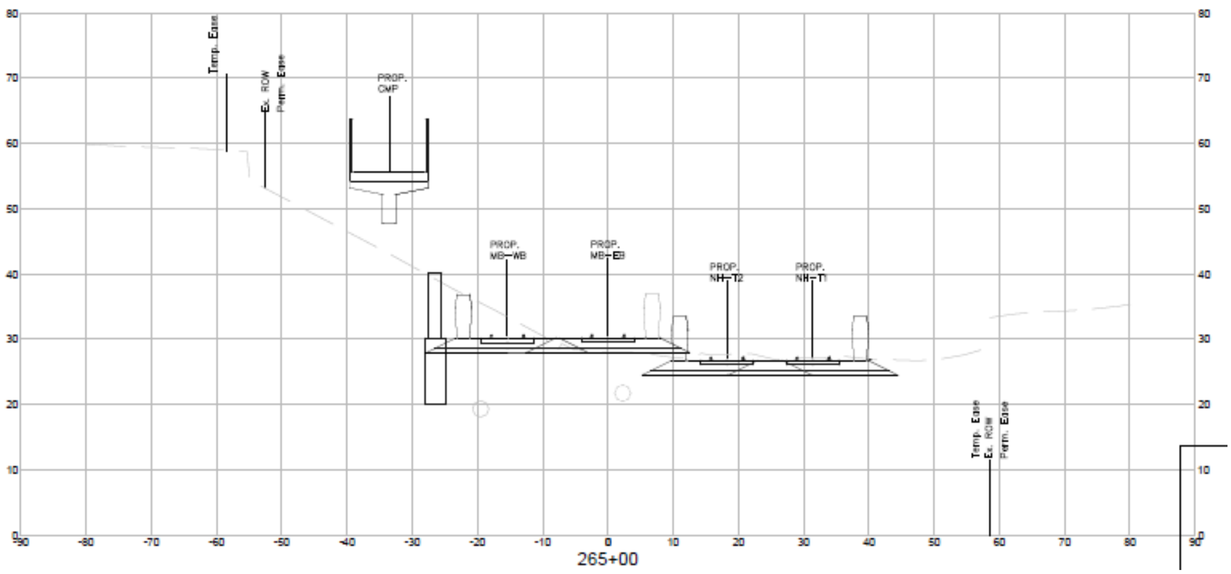

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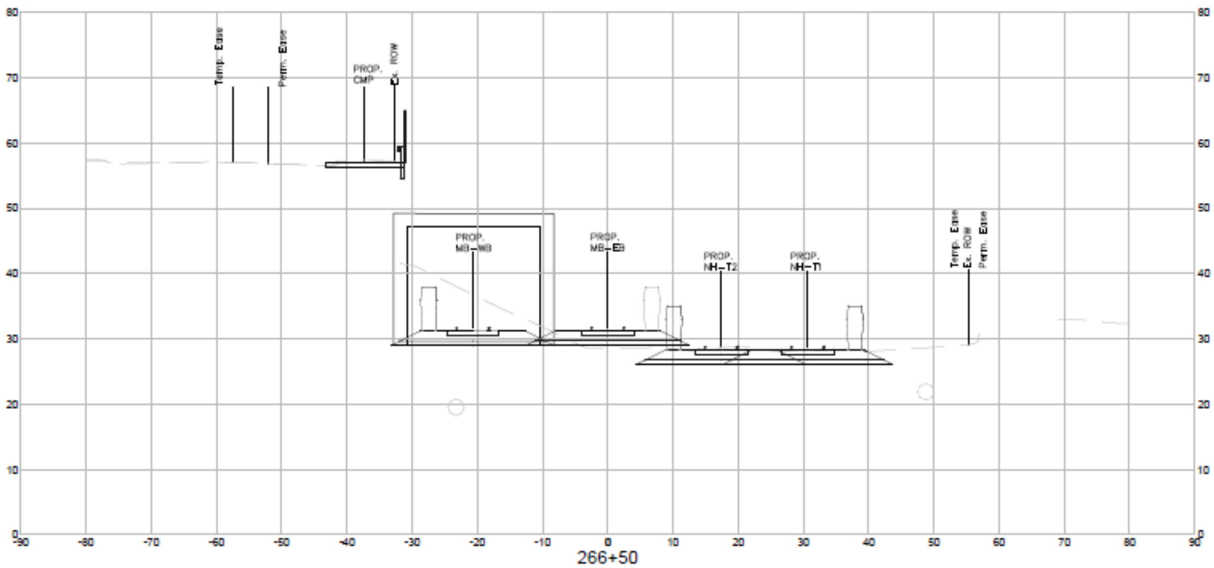
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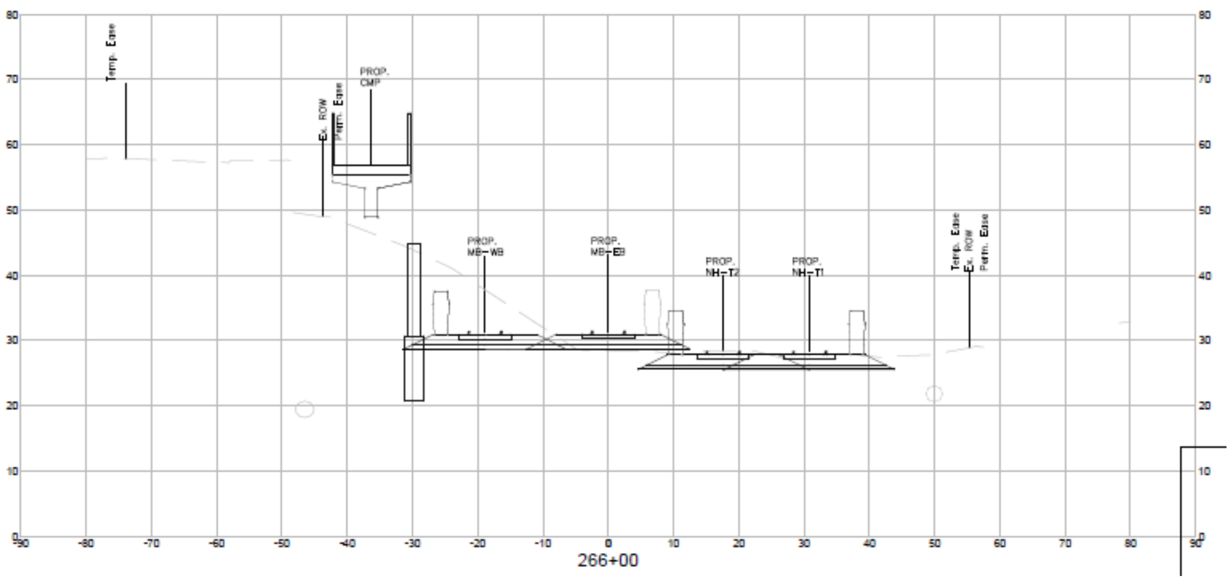
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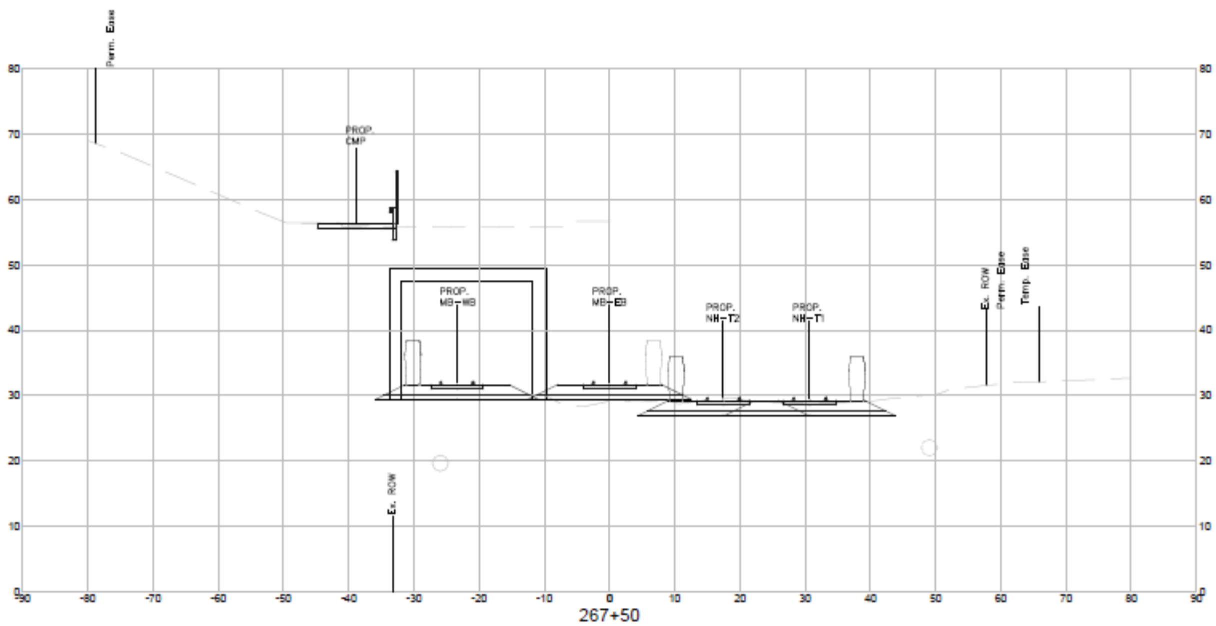
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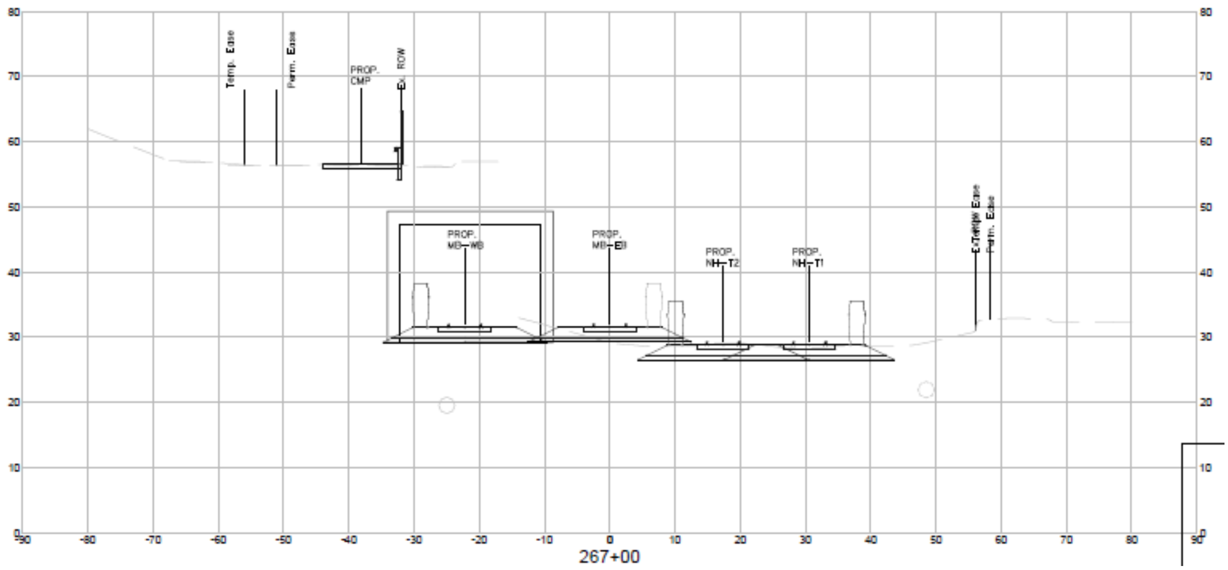
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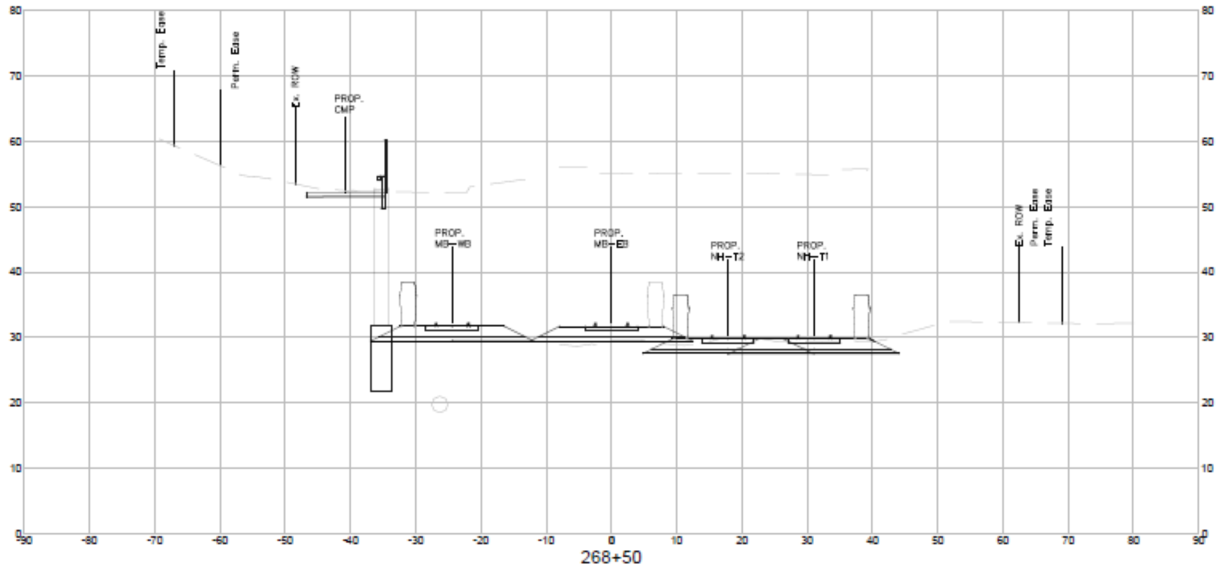
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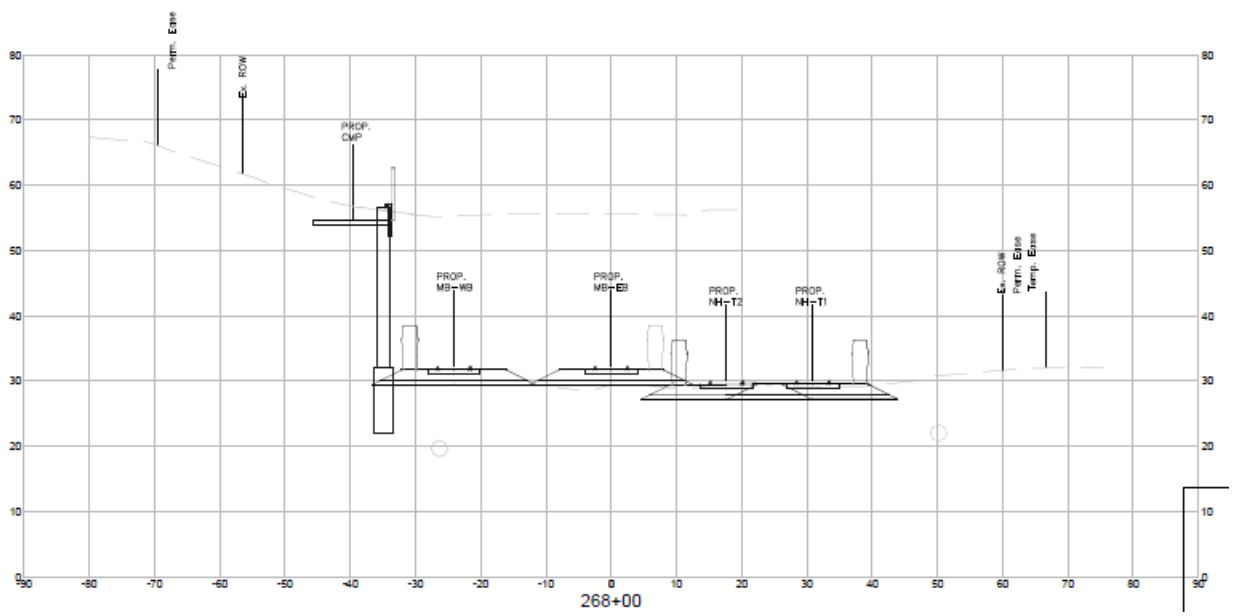
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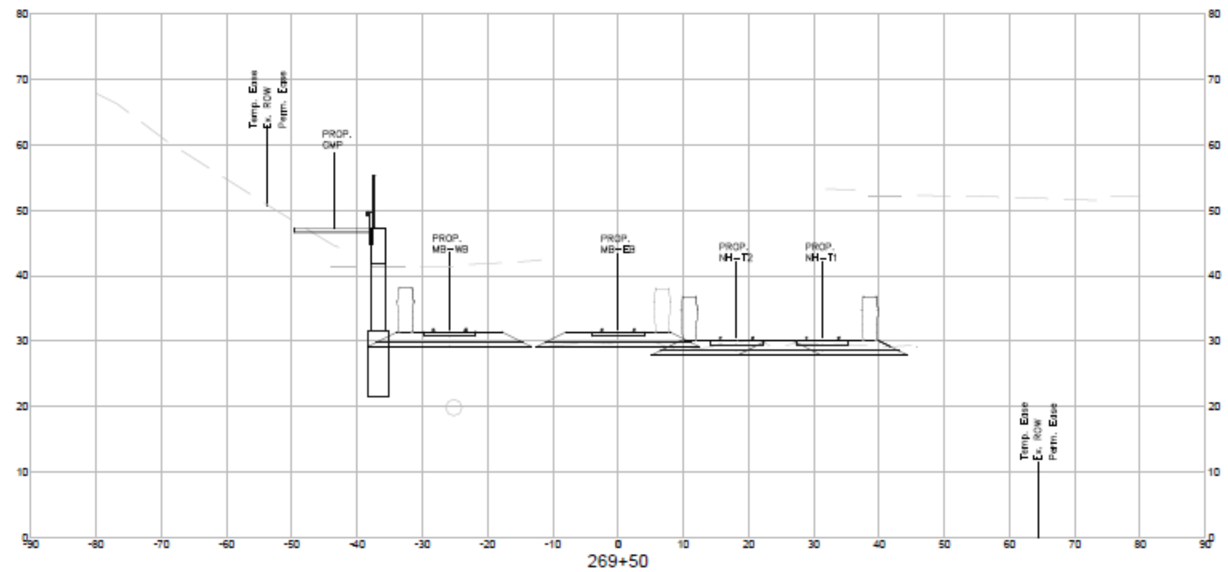
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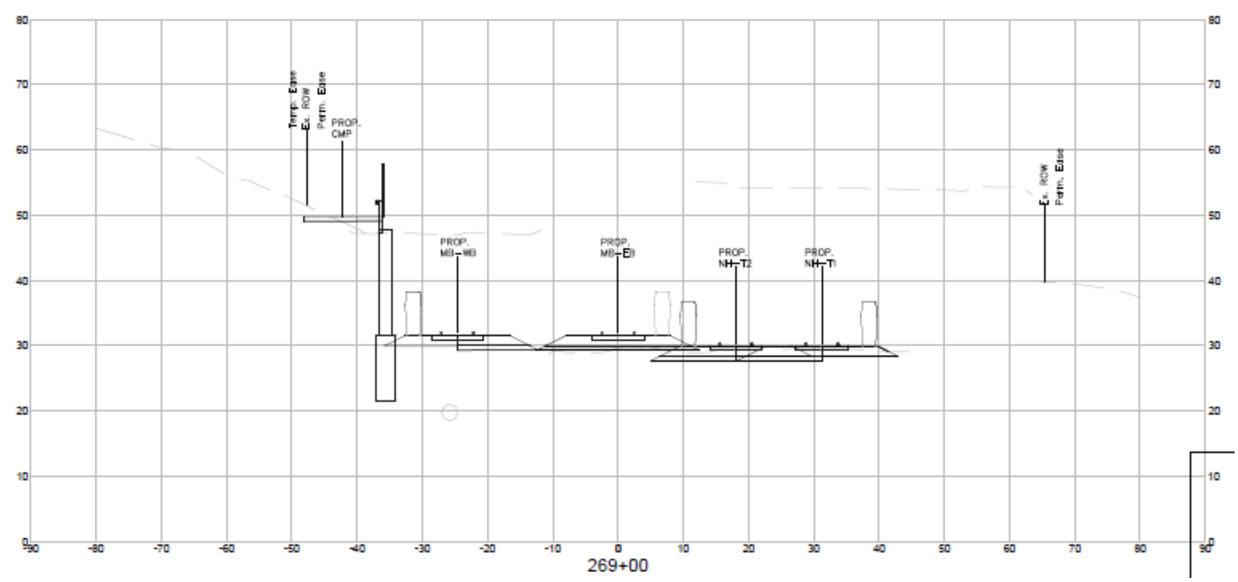
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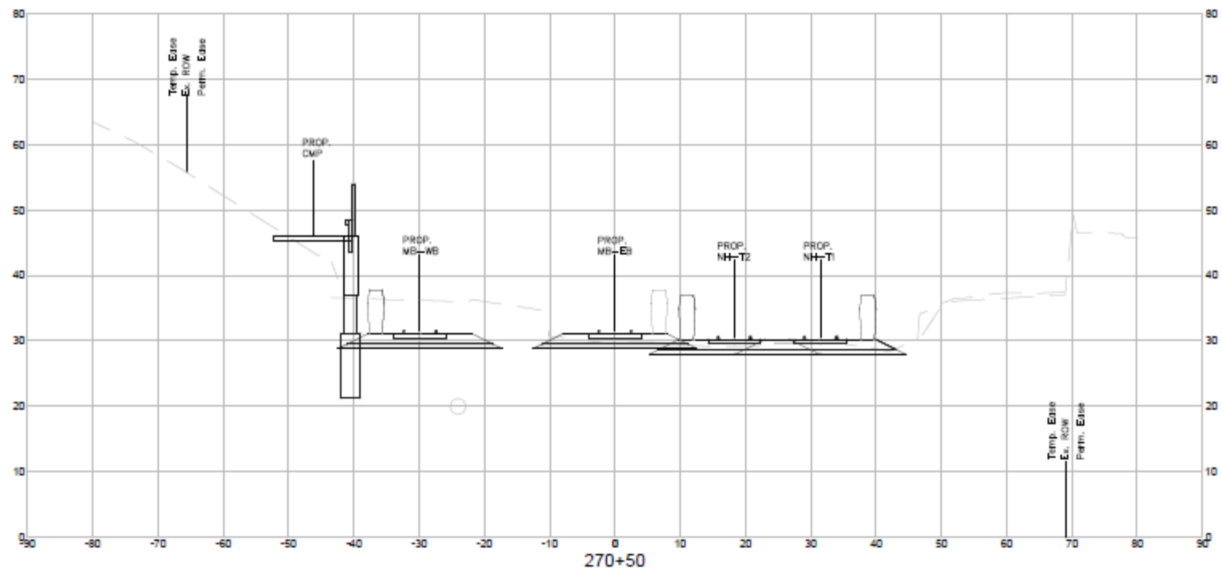
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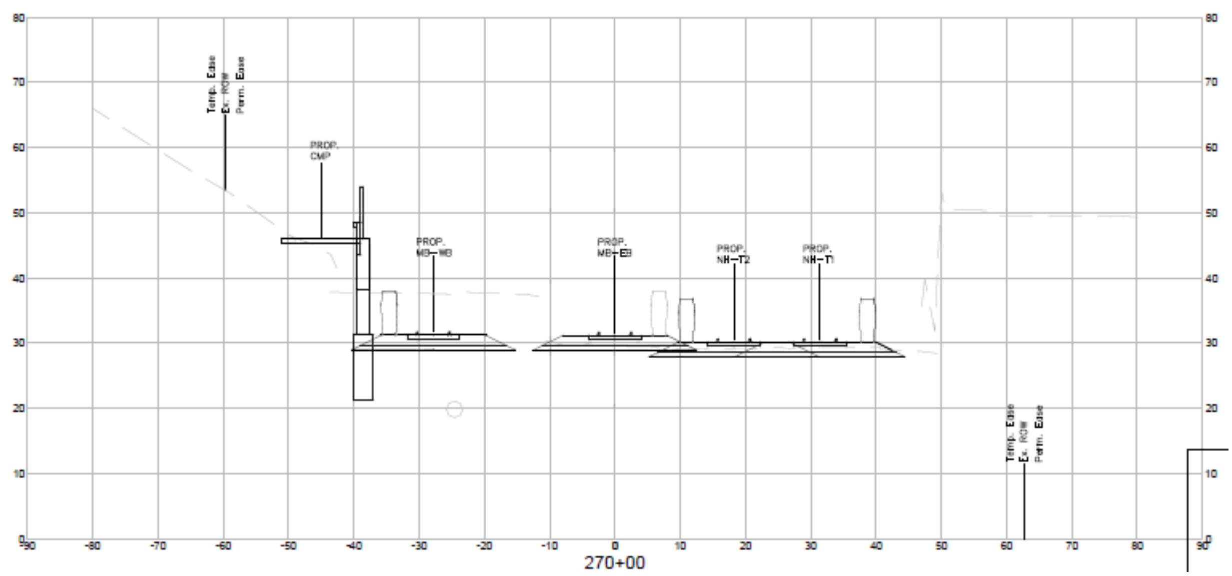
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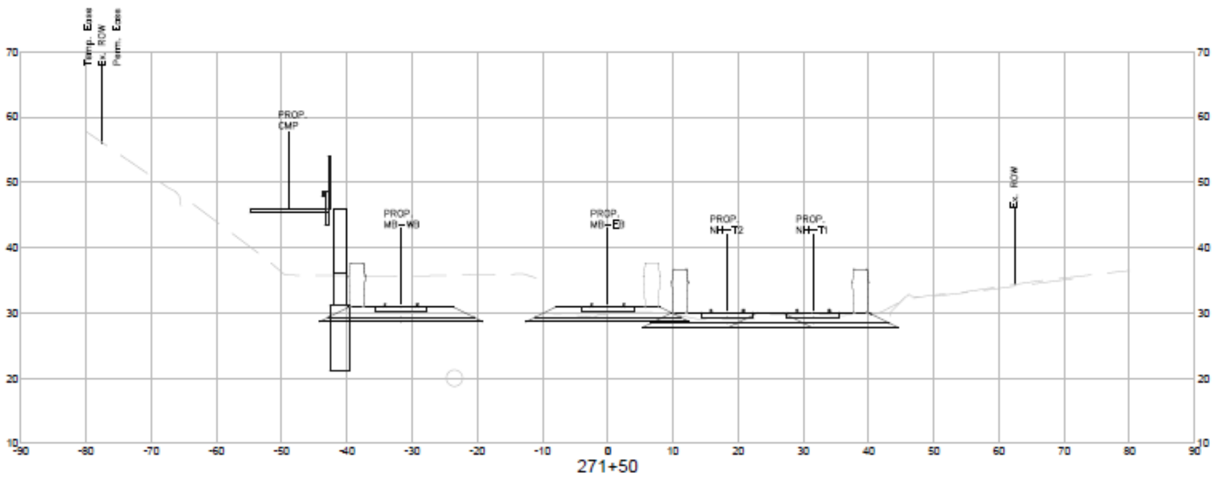

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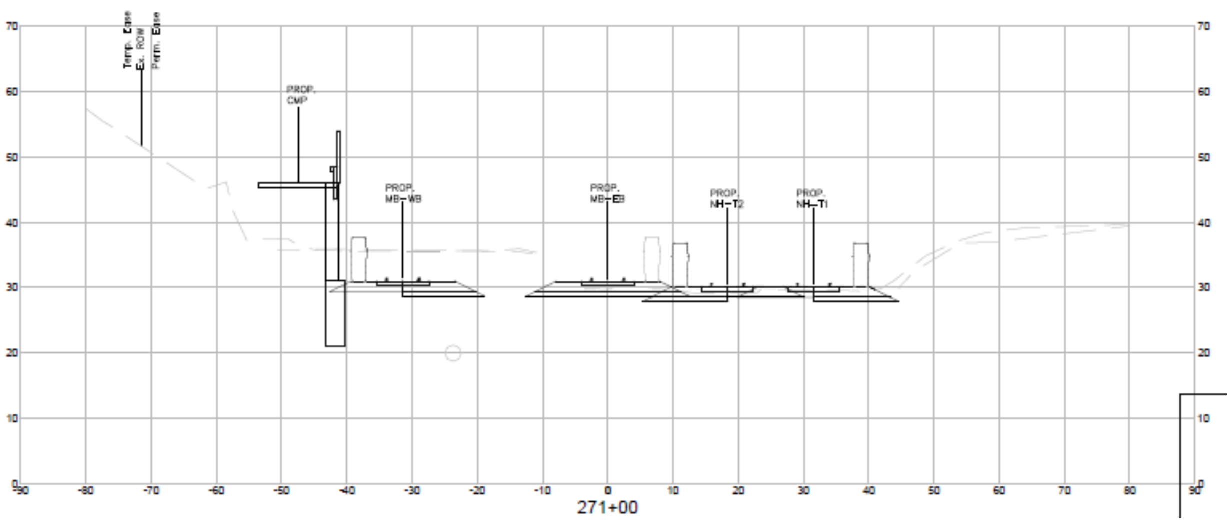

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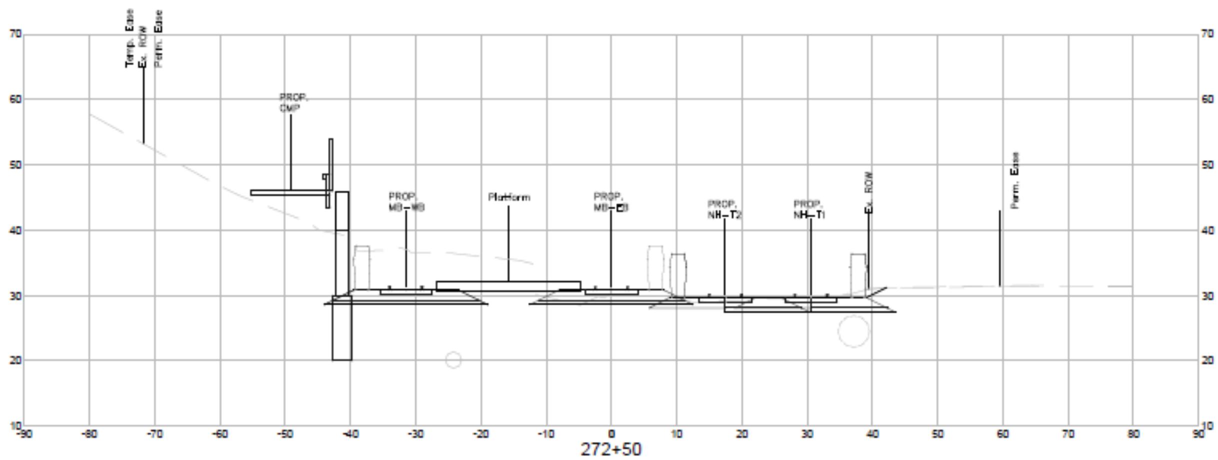
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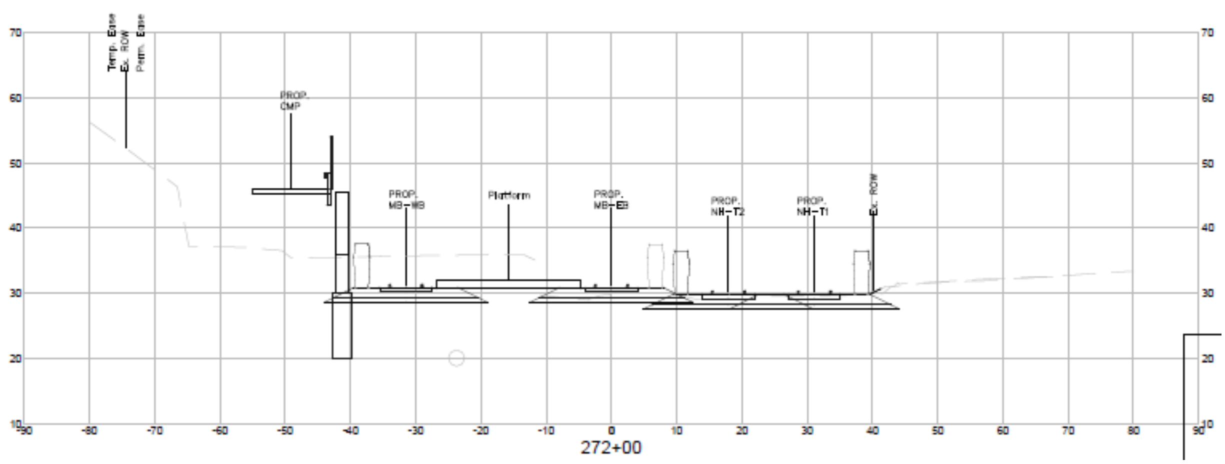
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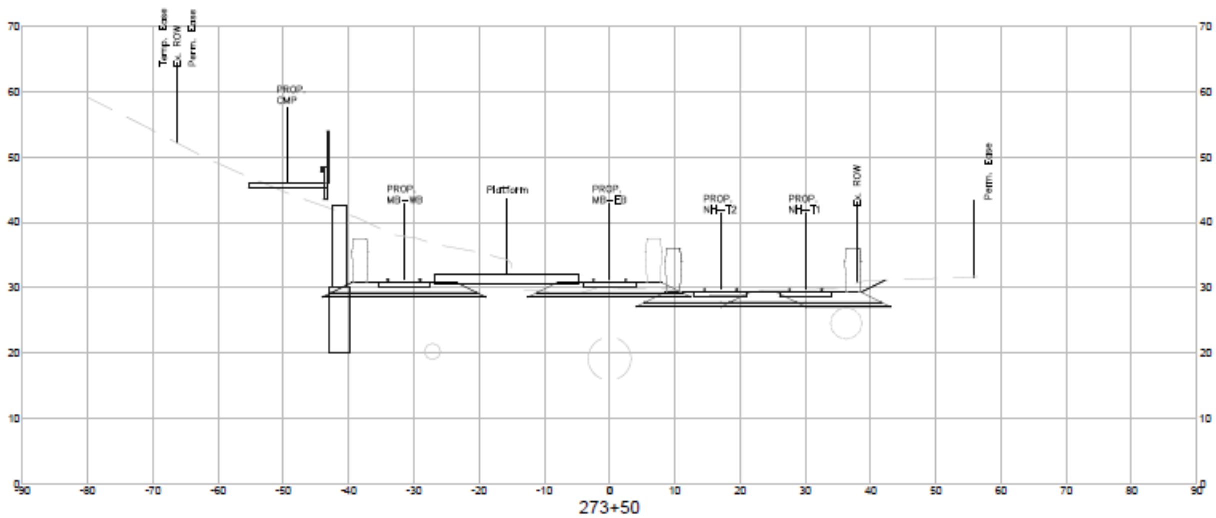
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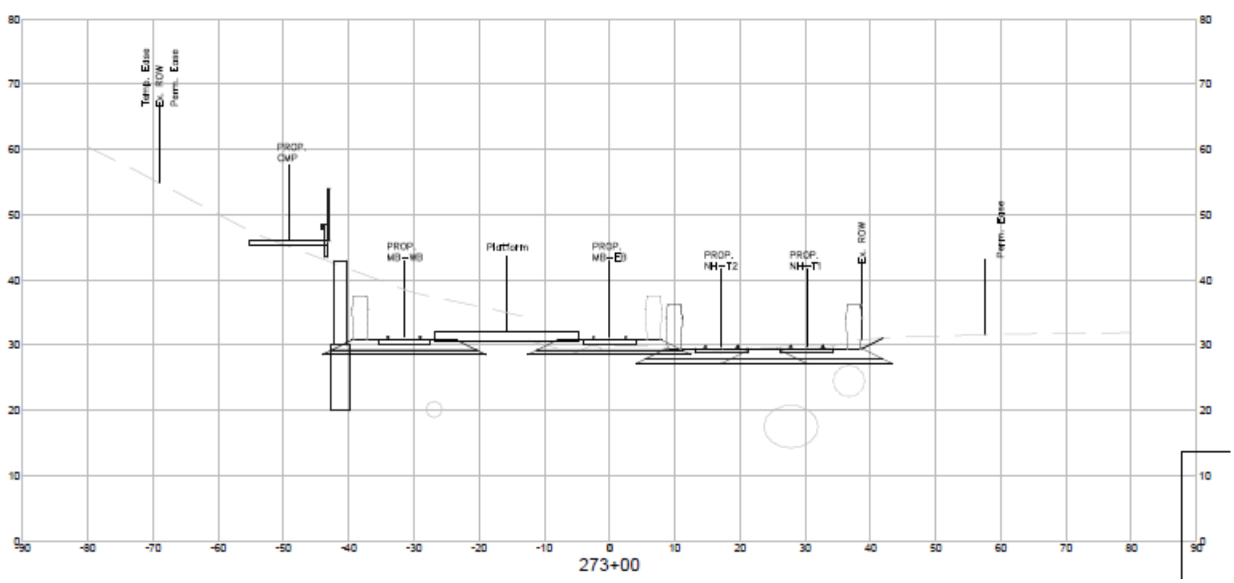
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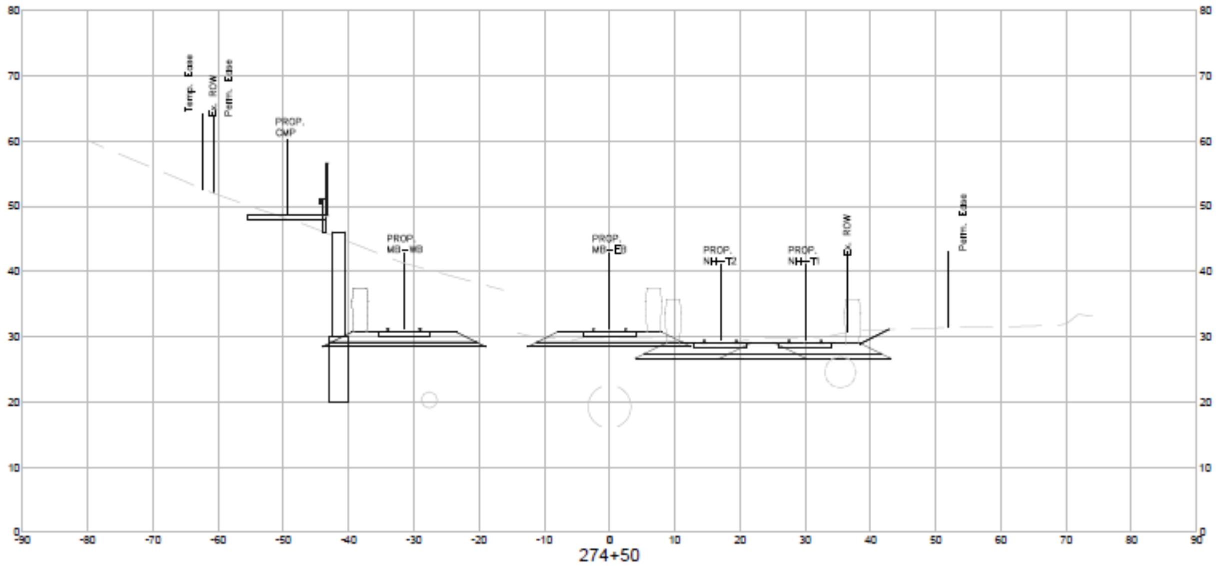
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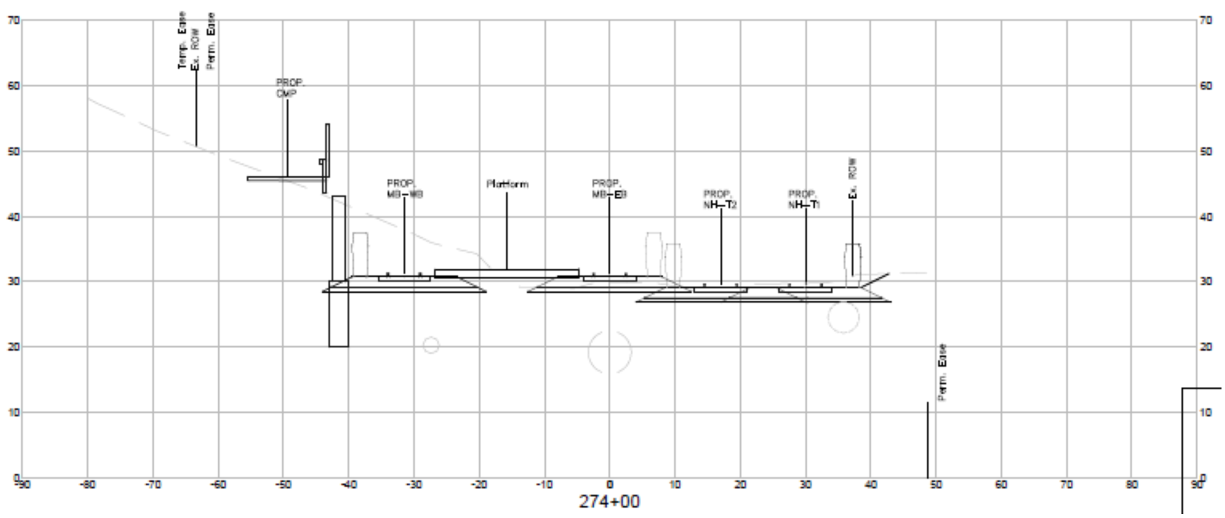
Temp. Ease
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PROP. MB-WB
Platform
PROP. MB-EB
PROP. NH-T2
PROP. NH-T1
Ex. ROW
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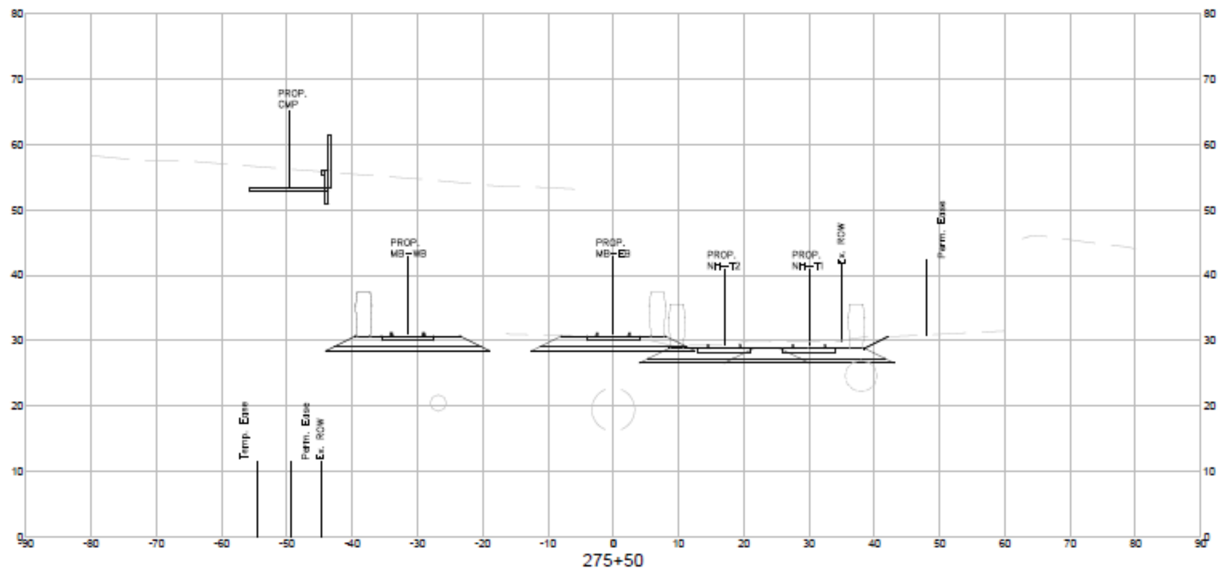
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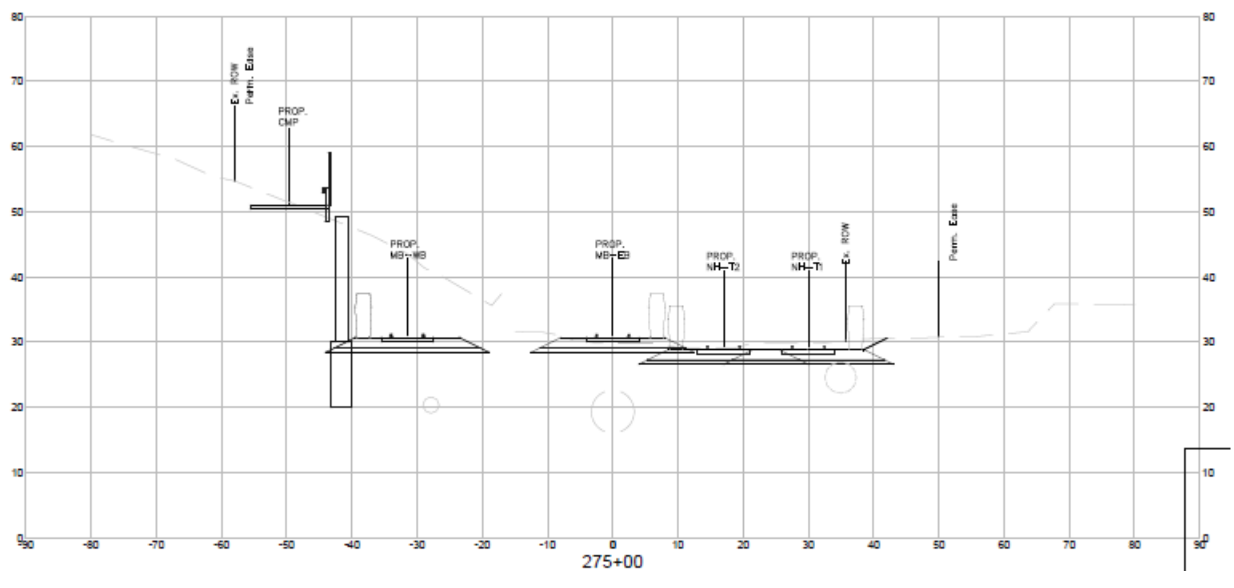
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MB–WB
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NH–T2
PROP.
NH–T1
Ex. ROW
Perm. Ease
275+00

ATC No. 43

ATC No. 43

Preliminary Submission

COVER SHEET

GLX CONSTRUCTORS

MBTA CONTRACT NO. E22CN07

GREEN LINE EXTENSION DESIGN BUILD PROJECT

CONFIDENTIAL ATCs

PRELIMINARY

ALTERNATIVE TECHNICAL CONCEPTS

("ATCs")

JUNE 9, 2017 (First Round)

JUNE 22, 2017 (Second Round)

GLX CONSTRUCTORS PRELIMINARY ATC FORM

ATC 43 – REPLACE SUBBALLAST WITH GEOTEXTILE AND GEOGRID REINFORCEMENT – COMMUTER RAIL

Sections A through E below must be completed to submit a Preliminary ATC for the Green Line Extension Design Build Project as specified in Section 3.2.1 of the Instructions to Proposers. This Preliminary ATC must be submitted to the MBTA's Designated Representative as specified in Section 2.4.1 of the Instructions to Proposers via the Project Management Information System.

A. General Description

A general description (not to exceed two pages) of the Preliminary ATC, how the ATC will be used on the Project, the proposed location of the ATC, and any other pertinent information that would provide a clear understanding of the potential ATC;

This ATC provides a filter fabric and geogrid reinforcement, and eliminates the subballast along sections of the alignment where subgrade conditions are favorable. The ballast will be 12" thick minimum below tie under rail.

B. References to Contract Documents

References to requirements of the Contract Documents that are inconsistent with the proposed ATC and an explanation of the nature of the deviations from said requirements;

Volume 2, Exhibit 2B, Project Definition Plans indicate that the track bed shall consist of 12" of ballast over 8" of subballast. This ATC replaces the 8" of subballast with geotextile and geogrid.

C. Benefits

Any potential benefits or implications of incorporating the Preliminary ATC into the Project, including in right-of-way acquisitions, rail operations, and routine or capital maintenance, and other Project risks;

This ATC will provide the following benefits:

- Limit ballast settlement and lateral creep
- Reduce excavation and export of potentially contaminated soils
- Reduce trucking impacts to local streets
- Expedite Installation
- Increase service life
- Reduce ballast maintenance

D. Conceptual Drawings

Any conceptual drawings (if applicable) of the configuration of the potential ATC or other appropriate descriptive information that provides an understanding of the Preliminary ATC; and

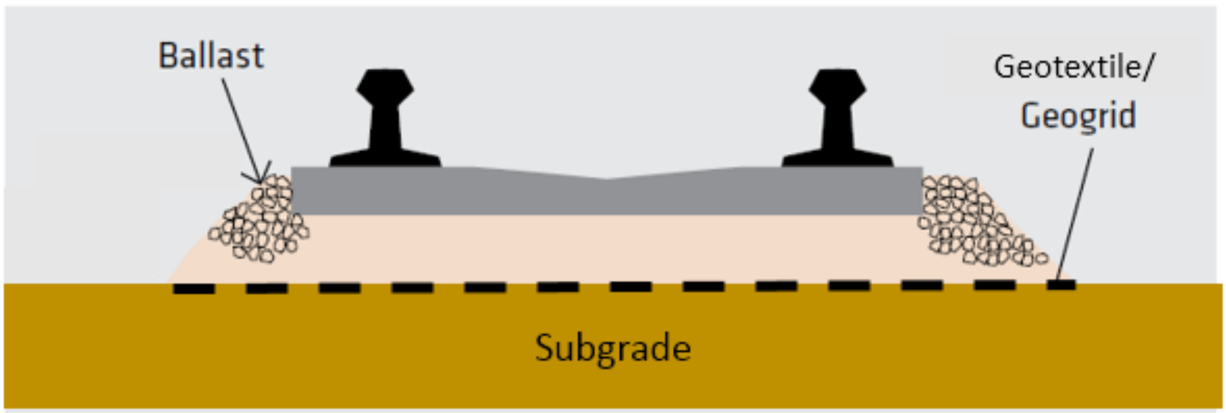
Please refer to Figure ATC-43-1, "Proposed Track Bed Section" for proposed track bed section details. Please refer to Figure ATC-43-1, "MBTA Greenbush Line Construction", which shows the track bed during MBTA Greenbush Line construction.

E. Cost Estimate and Schedule Impacts

An order of magnitude cost estimate and a preliminary analysis of schedule impacts associated with the Preliminary ATC.

This ATC will result in an estimated cost saving of $600,000. Our preliminary analysis indicates no impact to schedule milestones.

Figure ATC-43-1: Proposed Track Bed Section



(Ballast min. 12")

Figure ATC-43-2: MBTA Greenbush Line Construction

ATC No. 43

MBTA Acceptance of Preliminary Submission

Massachusetts Bay Transportation Authority

GLX Procurement

ATC Review

ATC Information:

Type of ATC: Preliminary
Title: GLX Constructors ATC 11 - Replace Subballast with Geotextile and Geogrid Reinforcement - Commuter Rail
Proposer Company: GLX Constructors

Final Disposition:

Sent on behalf of Yvelisse Duvergé. The Preliminary ATC can be formally submitted for MBTA review as an ATC Submittal, subject to further refinement and submission of supporting information pursuant to Section 3.3.1 of the Instructions to Proposers.

COVER SHEET

GLX CONSTRUCTORS

MBTA CONTRACT NO. E22CN07

GREEN LINE EXTENSION DESIGN BUILD PROJECT

CONFIDENTIAL ATCs

PRELIMINARY
ALTERNATIVE TECHNICAL CONCEPTS
(“ATCs”)

JUNE 9, 2017 (First Round)

JUNE 22, 2017 (Second Round)

GLX CONSTRUCTORS PRELIMINARY ATC FORM

ATC 43 – REPLACE SUBBALLAST WITH GEOTEXTILE AND GEOGRID REINFORCEMENT – COMMUTER RAIL

Sections A through E below must be completed to submit a Preliminary ATC for the Green Line Extension Design Build Project as specified in Section 3.2.1 of the Instructions to Proposers. This Preliminary ATC must be submitted to the MBTA's Designated Representative as specified in Section 2.4.1 of the Instructions to Proposers via the Project Management Information System.

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A general description (not to exceed two pages) of the Preliminary ATC, how the ATC will be used on the Project, the proposed location of the ATC, and any other pertinent information that would provide a clear understanding of the potential ATC;

This ATC provides a filter fabric and geogrid reinforcement, and eliminates the subballast along sections of the alignment where subgrade conditions are favorable. The ballast will be 12" thick minimum below tie under rail.

B. References to Contract Documents

References to requirements of the Contract Documents that are inconsistent with the proposed ATC and an explanation of the nature of the deviations from said requirements;

Volume 2, Exhibit 2B, Project Definition Plans indicate that the track bed shall consist of 12" of ballast over 8" of subballast. This ATC replaces the 8" of subballast with geotextile and geogrid.

C. Benefits

Any potential benefits or implications of incorporating the Preliminary ATC into the Project, including in right-of-way acquisitions, rail operations, and routine or capital maintenance, and other Project risks;

This ATC will provide the following benefits:

- Limit ballast settlement and lateral creep
- Reduce excavation and export of potentially contaminated soils
- Reduce trucking impacts to local streets
- Expedite Installation
- Increase service life
- Reduce ballast maintenance

D. Conceptual Drawings

Any conceptual drawings (if applicable) of the configuration of the potential ATC or other appropriate descriptive information that provides an understanding of the Preliminary ATC; and

Please refer to Figure ATC-43-1, "Proposed Track Bed Section" for proposed track bed section details. Please refer to Figure ATC-43-1, "MBTA Greenbush Line Construction", which shows the track bed during MBTA Greenbush Line construction.

E. Cost Estimate and Schedule Impacts

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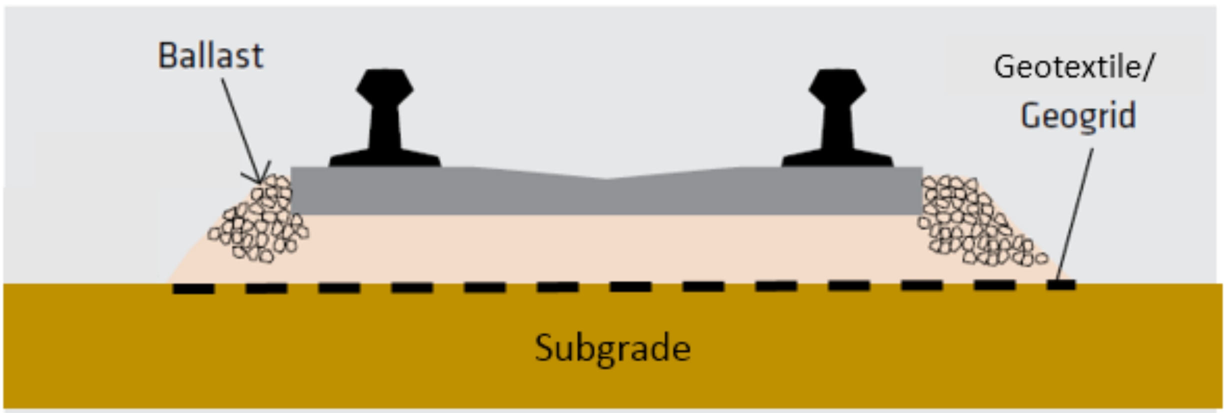
This ATC will result in an estimated cost saving of $600,000. Our preliminary analysis indicates no impact to schedule milestones.

Figure ATC-43-1: Proposed Track Bed Section



(Ballast min. 12")

Figure ATC-43-2: MBTA Greenbush Line Construction

ATC No. 43

Formal Submission

COVER SHEET

GLX CONSTRUCTORS

MBTA CONTRACT NO. E22CN07

GREEN LINE EXTENSION DESIGN BUILD PROJECT

CONFIDENTIAL ATCs

FORMAL

ALTERNATIVE TECHNICAL CONCEPTS (“ATCs”)

JUNE 9, 2017 (First Round)

JUNE 22, 2017 (Second Round)

JULY 11, 2017 (Final Round)

GLX CONSTRUCTORS FORMAL ATC FORM

REPLACE SUBBALLAST WITH GEOTEXTILE AND GEOGRID REINFORCEMENT – COMMUTER RAIL

Sections A though P below shall be completed to submit a Formal ATC for the Green Line Extension Design Build Project as specified in Section 3.2.1 of the Instructions to Proposers. This Formal ATC must be submitted to the MBTA's Designated Representative as specified in Section 2.4.1 of the Instructions to Proposers via the Project Management Information System.

A. ATC Number

A sequential ATC number identifying the Proposer and the ATC number. (Multi-part or multi-option ATCs shall be submitted as separate individual ATCs with unique sequential numbers.);

ATC 43

MBTA Preliminary ATC File Number: ATC-000017 – GLX Constructors ATC 11

B. Description and Conceptual Drawings

A description and conceptual drawings of the configuration of the ATC or other appropriate descriptive information;

This ATC provides a filter fabric and geogrid reinforcement, and eliminates the subballast along sections of the alignment where subgrade conditions are favorable. The ballast will be 12" thick minimum below tie under rail. Please refer to Figure ATC-43-1, "Proposed Track Bed Section" for proposed track bed section details. Please refer to Figure ATC-43-1, "MBTA Greenbush Line Construction", which shows the track bed during MBTA Greenbush Line construction.

C. Locations and How Used

The locations where, and an explanation of how, the ATC will be used on the Project;

This ATC will be used where subgrade conditions are favorable when commuter rail track is installed as part of the project.

D. Changes in Rail or Transit Operations

Any changes in rail or transit operations requirements associated with the ATC, including ease of operations;

No changes in operations are anticipated as a result of this ATC.

E. Changes in Routine or Capital Maintenance

Any changes in routine or capital maintenance requirements associated with the ATC, including ease of maintenance;

This ATC will result in reduced ballast maintenance.

F. Changes in Anticipated Service Life

Any changes in the anticipated service life of the item(s) comprising the ATC or affected by the ATC;

The separation of fines in the subgrade from the ballast and structural support of the geogrid should permit longer service life than the track bed shown by the Project Definition Plans.

G. References to Contract Documents

References to requirements of the Contract Documents that are inconsistent with the proposed ATC, an explanation of the nature of the deviations from said requirements, and a request for approval of such deviations;

Volume 2, Exhibit 2B, Project Definition Plans indicate that the track bed shall consist of 12" of ballast over 8" of subballast. This ATC replaces the 8" of subballast with geotextile and geogrid.

H. Justification of Use

An analysis justifying use of the ATC and why the deviation, if any, from the requirements of the Contract Documents should be allowed;

This ATC will increase the service life of the track bed section by limiting ballast settlement and lateral creep. This will reduce ballast maintenance. During construction, this ATC reduces the excavation and export of potentially contaminated soils. This results in less trucking on local streets. The time required to install this track bed section is shorter than the specified section.

I. Preliminary Analysis and Quantitative Discussion

A preliminary analysis and quantitative discussion of potential impacts on rail or transit operations (both during and after construction), environmental permitting, community impact, safety, and life-cycle Project and infrastructure costs, including impacts on the cost of repair, replacement, maintenance, and operation;

MBTA Contract No. E22CN0 Formal ATC 37A GLX DB Project Page 4 June 30, 2017 No impacts on rail or transit operations are anticipated as a result of this ATC.

J. Impacts on Third Parties

A description of any impacts on the land or facilities of third parties, including private owners, governmental entities, utility owners, and railroads, and identification of specific additional right of way required to implement the ATC. Proposers are advised that they may (i) be solely responsible for the cost and schedule impacts of the acquisition of any such Additional Properties, including the cost thereof and obtaining any necessary environmental approvals; (ii) not be entitled to any change order for time or money as a result of site conditions (i.e., hazardous materials, differing site conditions, geotechnical issues, or utilities) on such Additional Properties; and (iii) not be entitled to any change order for time or money as a result of any delay, inability, or cost associated with the acquisition of such Additional Properties;

No impacts to third parties are anticipated as a result of this ATC.

K. History of Use and References

A description of any other projects where the ATC has been used, the degree of success or failure of such usage, and names and contact information, including phone numbers and E-mail addresses, for project owner representatives that can confirm such statements;

This ATC concept was successfully used as an equal replacement for the specified track bed section on MBTA's Greenbush Line.

Paul Hadley, MBTA, 617.512.5999, phadley@MBTA.com

L. Additional Risks

A description of added risks to the MBTA or third parties associated with implementing the ATC;

No additional risks to the MBTA or to third parties are anticipated as a result of this ATC.

M. Additional Costs

An estimate of any additional MBTA, DB Entity, and third-party costs associated with implementation of the ATC;

Additional costs to the MBTA, DB Entity and third parties will not result from this ATC. One of the primary purposes of this ATC is cost reduction.

N. Estimated Price Adjustment

An estimate of the price adjustment (i.e., cost savings), should the ATC be approved and implemented;

This ATC will result in an estimated savings of $600,000. The ATC pricing as shown in this proposal is an all inclusive price. All price deducts and/or adds have been considered, and the resulting price adjustment is offered as shown.

O. Schedule Adjustment

An estimate of the schedule adjustment, should the ATC be approved and implemented; and

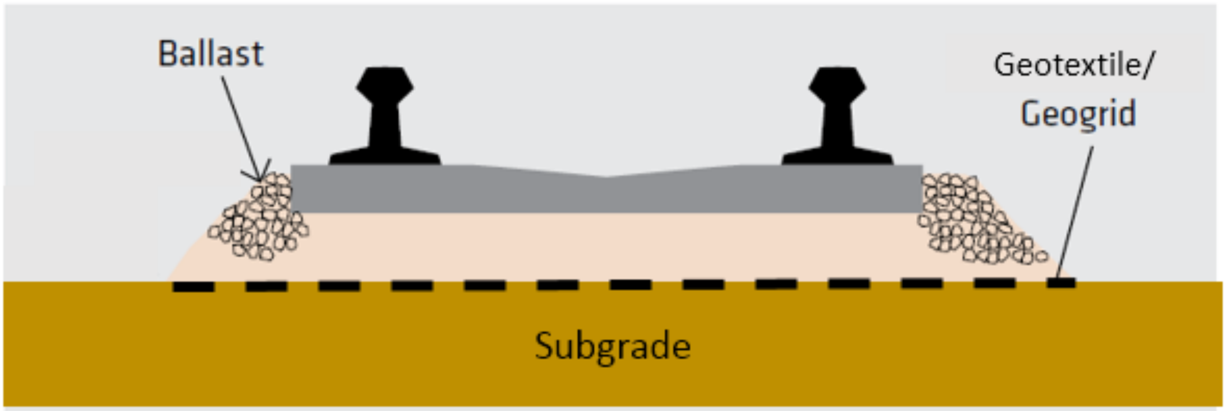
This ATC does not require any schedule adjustment.

P. Analysis of Quality, Performance, and Reliability

An analysis of how the ATC is equal to or better in quality, performance, and reliability than the requirements of the Contract Documents.

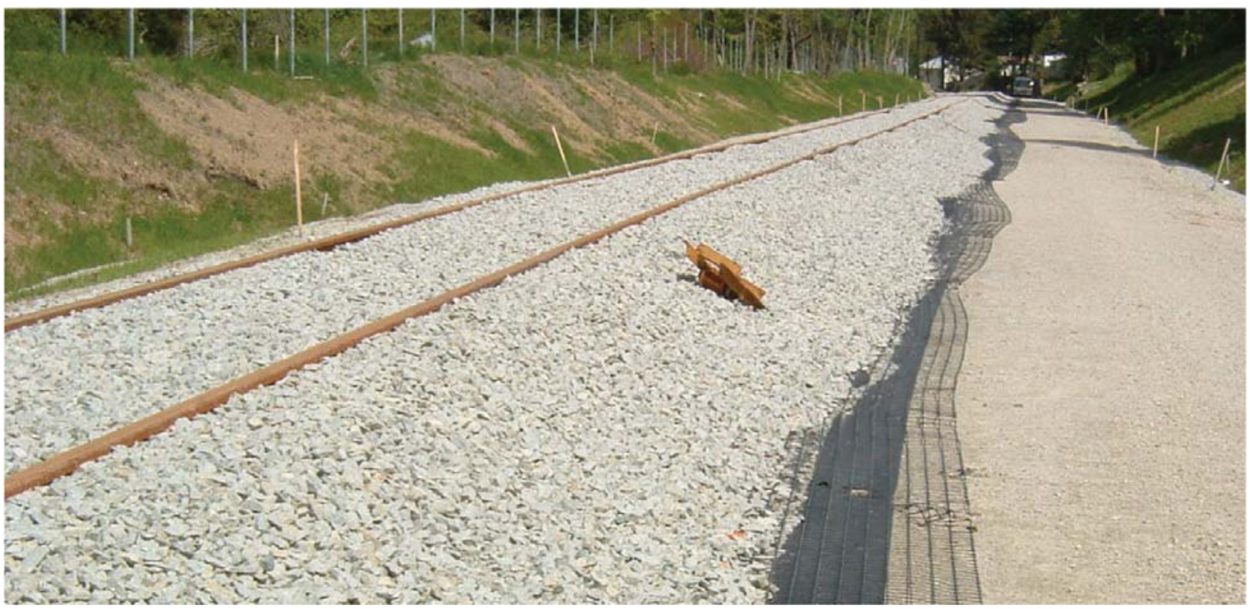
This ATC will provide a better quality, performance and reliability than the specified track bed section because the separation of fines in the subgrade from the ballast and structural support of the geogrid should permit longer service life. The longer service life will allow for less maintenance and higher reliability.

Figure ATC-43-1: Proposed Track Bed Section



(Ballast min. 12”)

Figure ATC-43-2: MBTA Greenbush Line Construction



ATC No. 43

MBTA Acceptance of Formal Submission

Massachusetts Bay
Transportation Authority

GLX - Procurement

ATC Review

ATC Information:

Type of ATC: Formal
Title: GLX Constructors ATC 09 - Replace Subballast with Geotextile & Geogrid Reinforcement - Commuter Rail
Proposer Company: GLX Constructors

Final Disposition:

Sent on behalf of Yvelisse Duvergé. The ATC Submittal is acceptable for inclusion in the Proposal.

COVER SHEET

GLX CONSTRUCTORS

MBTA CONTRACT NO. E22CN07

GREEN LINE EXTENSION DESIGN BUILD PROJECT

CONFIDENTIAL ATCs

FORMAL

ALTERNATIVE TECHNICAL CONCEPTS ("ATCs")

JUNE 9, 2017 (First Round)

JUNE 22, 2017 (Second Round)

JULY 11, 2017 (Final Round)

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ATC 43

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Paul Hadley, MBTA, 617.512.5999, phadley@MBTA.com

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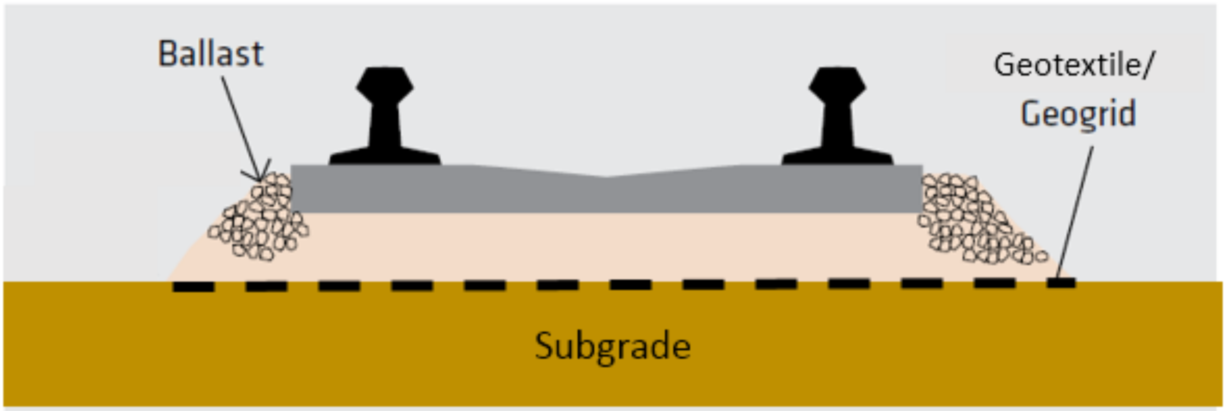
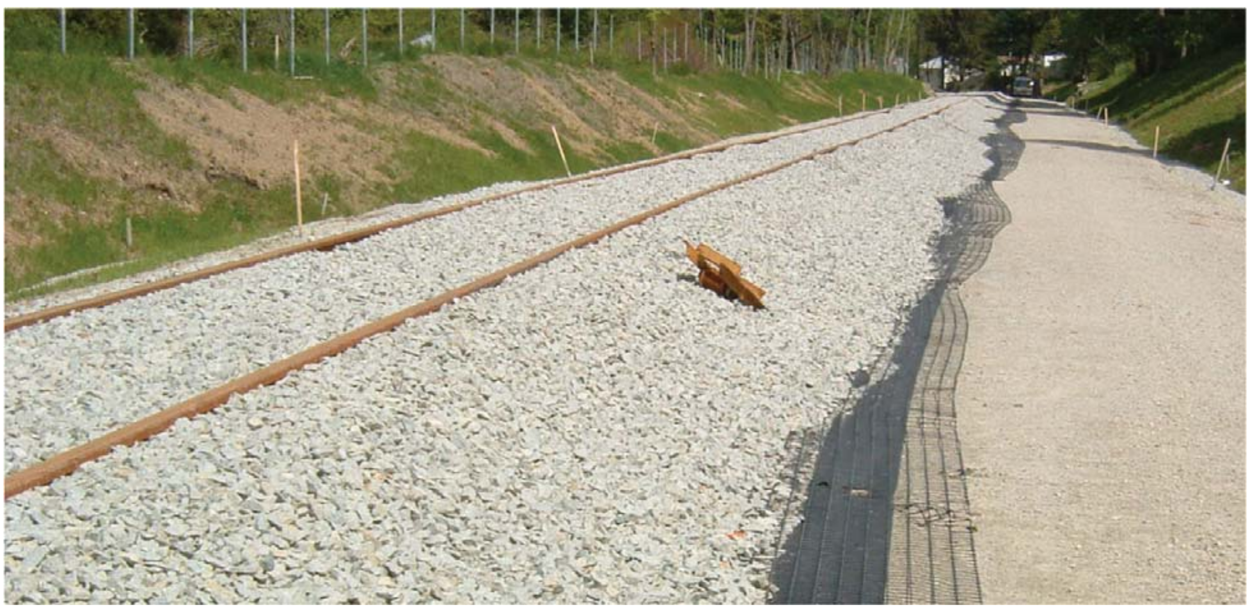
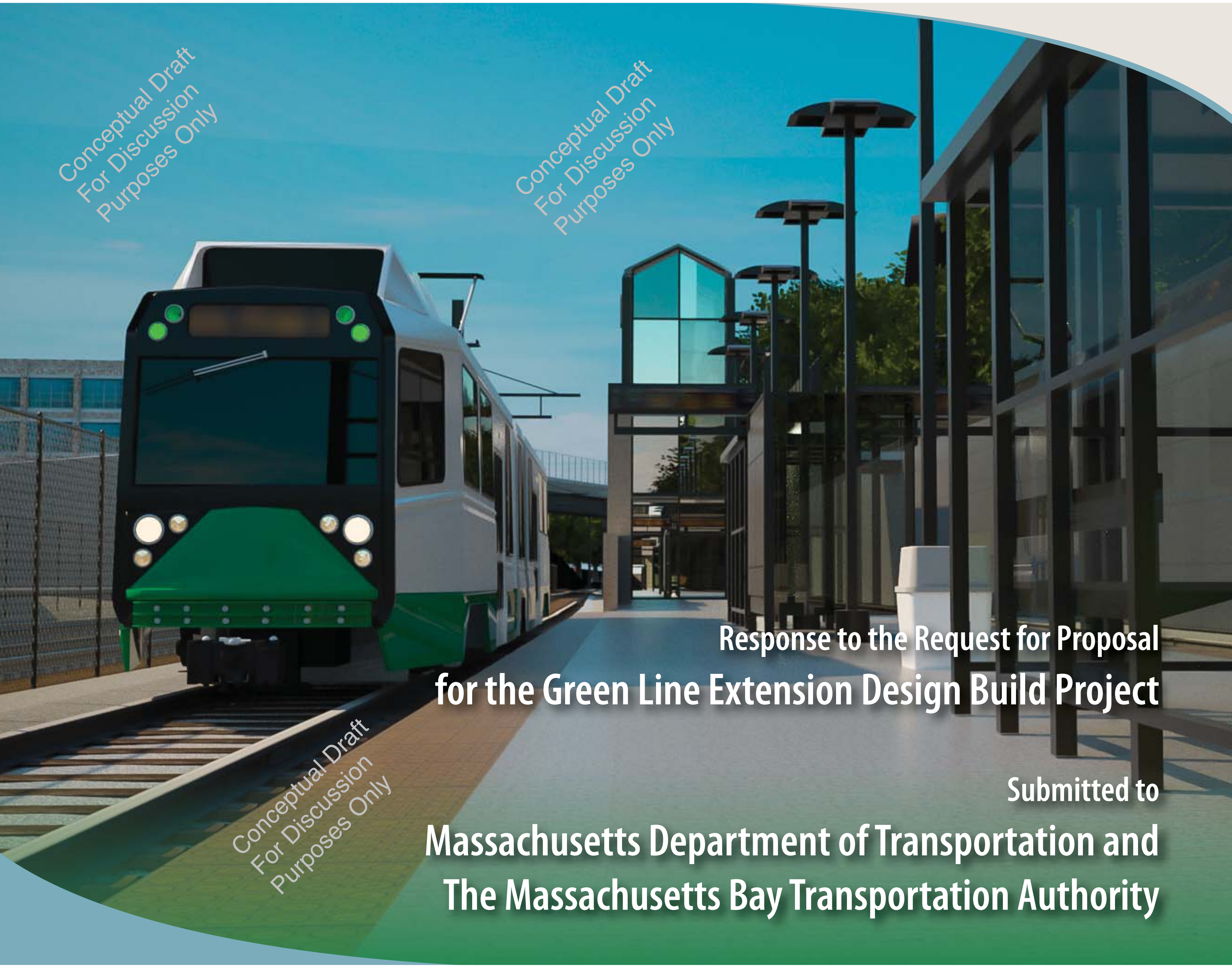


(Ballast min. 12")

Figure ATC-43-2: MBTA Greenbush Line Construction



Technical Proposal • Original • October 2017



Response to the Request for Proposal

for the Green Line Extension Design Build Project

Submitted to

Massachusetts Department of Transportation and The Massachusetts Bay Transportation Authority

Response to Request for Clarification No. 4

Where possible recycled paper was used.

GLX CONSTRUCTORS

GLX Constructors
100 Fluor Daniel Drive, C602D
Greenville, SC 29607
USA

864.320.4489 tel
max.jordan@fluor.com

October 16, 2017

Massachusetts Bay Transportation Authority
GLX Project Office
200 Innerbelt Road, Third Floor
Somerville, MA 02143-4456

Subject: Response to the Request for Clarifications No. 4

Dear Mr. Petersen:

GLX Constructors is pleased to provide you with our response to your Proposal Clarifications dated October 12, 2017.

1. In response to Question No. 1, based on the ITP, Attachment A, Section A3.2.2 (3)(c), the requested Guarantor Letter of Support from Fluor Corporation should not be required pursuant to items (x), (y), or (z) described therein. Notwithstanding the foregoing, attached is an executed Form AA, Guarantor Commitment Letter, stating that Fluor Enterprises, Inc., as a Major Participant, will receive, if required by the MBTA and the Instructions to Proposers, a parent company guarantee on its behalf from its parent, Fluor Corporation.

2. In accordance with Section A3.2.2(C) of Attachment A to the ITP, please see attached letter from Balfour Beatty Infrastructure, Inc. regarding the request to confirm no unaudited interim 2017 financials are available for Balfour Beatty Infrastructure, Inc.

3. In accordance with Section A3.2.2(3)(e) of Attachment A to the ITP, see attached most recent credit reports available for Fluor Corporation, Inc. from Standard & Poor's and Moody's.

4. GLX Constructors confirms receipt of Questions and Responses 7 issued on September 14, 2017.

5. Please see attached certified Articles of Incorporation and Bylaws for the following:

    a. The Middlesex Corporation

    b. Herzog Contracting Corp.

    c. Balfour Beatty Infrastructure, Inc.

6. Regarding the joint venture agreement of GLX Constructors, all members confirm and agree to be held jointly and severally liable to the MBTA for any and all duties and obligations of the joint venture.

7. In response to Question No. 7, please see evidence that the following individuals signing Form C are authorized to execute Form C on behalf of the applicable team member:

    a. Po-Shang Chen, C&C Consulting Engineers, LLC

    b. Deborah A. Jue, Wilson Ihrig

We continue to look forward to working with the MBTA to make this project a success and are happy to answer and additional questions or clarifications that may arise.

Sincerely,

Max Jordan
Authorized Representative

Financial information contained in the GLX Constructors Technical Proposal is located at the GLX Project Office, 200 Innerbelt Road, Third Floor, Somerville, MA 02143-4456.

WILSON IHRIG

Secretary Certificate

CERTIFICATE OF VOTE

I, James E. Phillips, hereby certify that I am the Secretary of Wilson Ihrig (the "Company"), and I further certify that the Directors of the Company have confirmed by unanimous written consent that Derek L. Watry is the Chief Executive Officer of the Company, that Deborah A. Jue is the Treasurer, and both have been since March 13, 2014 or earlier.

I additionally certify that the Company's Articles and By-Laws state, "The board of directors ... may authorize any officer or officers, agent or agents, to enter into any contract or execute any instrument in the name of and on behalf of the corporation," and I certify that the Directors of the Company confirmed by unanimous vote, on August 14, 2012, that "officers of the firm be allowed to sign contracts", including the execution of Form C, and any similar documents certifying information for Wilson Ihrig for the MBTA Green Line Extension, Contract No. E22CN07.

By: J E Phillips
Secretary

A True Copy:

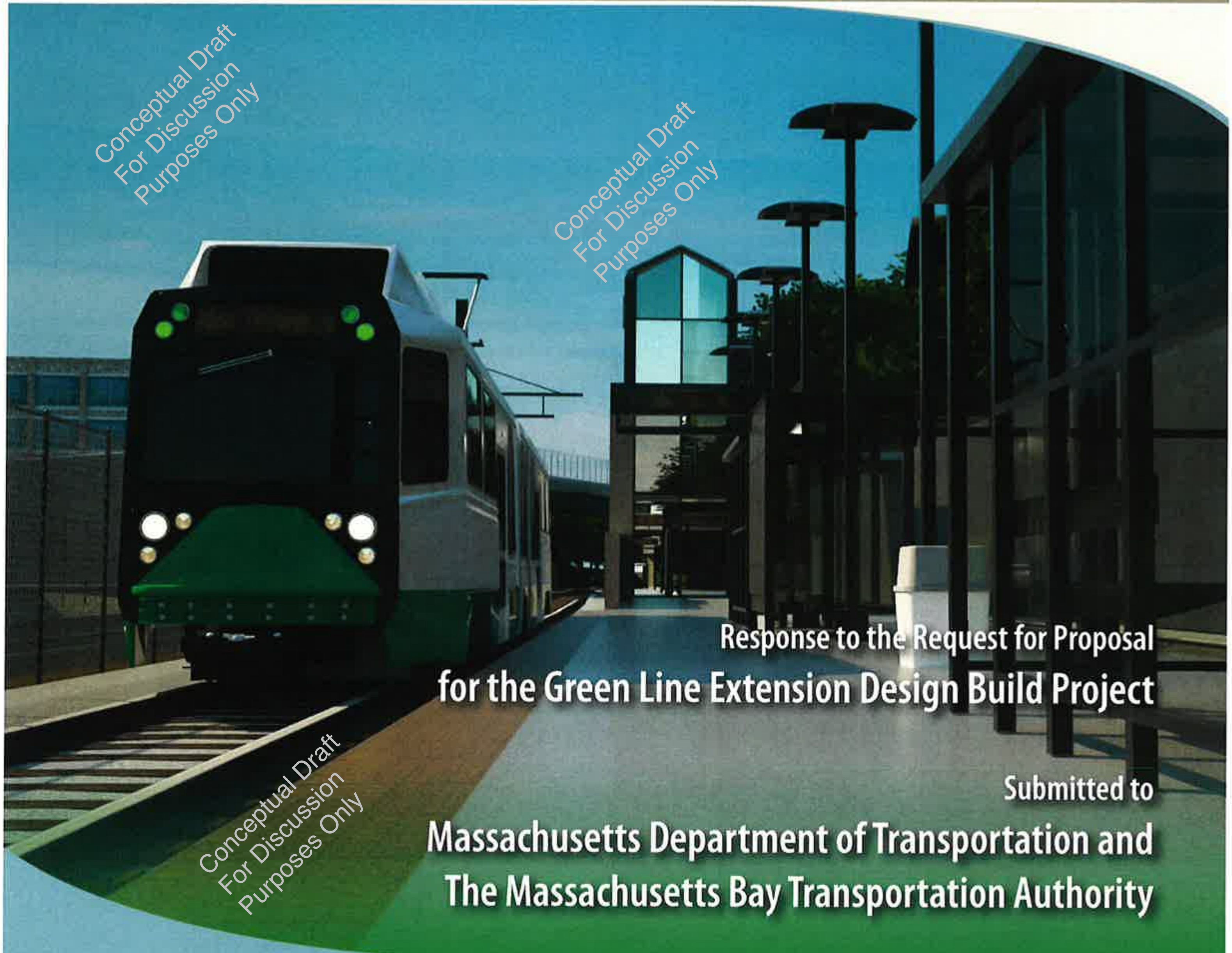
Attest: Denise White
Notary Public

DENISE A. WHITE
COMM. #2178919
Notary Public - California
Alameda County
My Comm. Expires Jan. 8, 2021
NR01

My Commission Expires: 1/8/2021

Date: 10/13/2017

Technical Proposal • Original • October 2017



Response to the Request for Proposal for the Green Line Extension Design Build Project

Submitted to

Massachusetts Department of Transportation and The Massachusetts Bay Transportation Authority

Response to Request for Clarification No. 6

Where possible recycled paper was used.

GLX CONSTRUCTORS

GLX Constructors
100 Fluor Daniel Drive, C602D
Greenville, SC 29607
USA

864.320.4489 tel
max.jordan@fluor.com

October 20, 2017

Massachusetts Bay Transportation Authority
Mr. Donald Petersen
GLX Project Office
200 Innerbelt Road, Third Floor
Somerville, MA 02143-4456

Subject: Response to the Request for Clarifications No. 6

Dear Mr. Petersen:

We have carefully reviewed the request for Clarification No. 6 and offer the following response. We regret the difference in interpretation on the support letter. We have truly tried to be responsive within the terms of the RFP and are not trying to be difficult.

Fluor Corporation only recently started doing separate audited financials for its wholly owned subsidiary Fluor Enterprises, Inc. Prior to that, the financials of Fluor Enterprises, Inc. were consolidated within the audited financials of Fluor Corporation. As a result, we provided all of the most recent audited financials that we had at the time of submittal for Fluor Enterprises and Fluor Corporation, along with the unaudited financials for Fluor Enterprises for the previous 3 years.

We are providing in this response, as you have requested, an unaltered Guarantor Commitment to Provide Parent Guaranty for the Green Line Extension Design Build Project per the RFP.

We apologize for any confusion this may have caused and for any misinterpretation of your previous request. If you have any questions or concerns about whether this meets your Request for Clarification No. 6 or your ability to determine the TNW of Fluor or GLX Constructors, please contact me immediately and we will immediately rectify any further problems or shortcomings."

If there are any issues or concerns whatsoever please pick up the phone and call me directly at 864 320 4489 and I will get it resolved.

Sincerely,

Max Jordan
Authorized Representative

FLUOR®

Fluor Corporation
6700 Las Colinas Boulevard
Irving, Texas 75039
USA

469.398.7060 tel
469.398.7715 fax
jim.lucas@fluor.com

James M. Lucas
Senior Vice President, Tax & Treasury, and Treasurer

FORM AA

GUARANTOR COMMITMENT LETTER

October 20, 2017

Yvelisse Duvergé
Manager of Construction Procurement
Massachusetts Bay Transportation Authority
GLX Project Office
200 Innerbelt Road, Second Floor
Somerville, MA 02143-4456

RE: Guarantor Commitment to Provide Parent Guaranty for the Green Line Extension Design Build Project

Dear Ms. Duvergé:

Fluor Corporation, hereinafter "Guarantor," is the parent company of Fluor Enterprises, Inc., a Major Participant of GLX Constructors. This commitment letter is provided on behalf of GLX Constructors, an unincorporated joint venture ("GLX Constructors"), in connection with its Proposal for the Design Build Contract ("DB Contract") for the Green Line Extension Design Build Project ("Project"). Guarantor hereby irrevocably agrees to provide a guaranty, guaranteeing all the obligations of GLX Constructors with respect to the DB Contract in the form of Exhibit 11 of the DB Contract. This commitment is subject only to award of the DB Contract to GLX Constructors, execution of the DB Contract by the MBTA, and GLX Constructors and the issuance of NTP.

Sincerely,

James M. Lucas

James M. Lucas
Senior Vice President, Tax & Treasury, and Treasurer

<u>EXHIBIT 1R</u>

ADDITIVE OPTION PROPOSAL

(See attached.)

Technical Proposal • Original • September 2017

Response to the Request for Proposal

for the Green Line Extension Design Build Project

Submitted to

Massachusetts Department of Transportation and The Massachusetts Bay Transportation Authority

Additive Option Submission

GLX CONSTRUCTORS

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ADDITIVE OPTIONS SUBMISSION →

GV20170258-242.INDD

ADDITIVE OPTIONS

> **This additive option will enhance the overall commuter experience for the MBTA riders, expand protection for all commuters during inclement weather conditions while simultaneously all but eliminate, the need for snow removal along the entire length and width of the station platform area.**

1. DESIGN AND CONSTRUCTION OF STATION CANOPIES TO ALL STATIONS

1.A GENERAL APPROACH AND LOCATION-SPECIFIC DESIGNS

This additive option will enhance the overall commuter experience for the MBTA riders, expand protection for all commuters during inclement weather conditions, while simultaneously all but eliminate the need for snow removal along the entire length and width of the station platform area. In covering the entire length and width of the station platform area with a continuous canopy it insures the MBTA's physically challenged riders will have a smooth, clear, and totally protected path-of–travel from the elements from the point where they enter the station to when they embark on the train and vice versa on their return trip to the station.

GLX Constructors' Lead Designer, STV, is very familiar with gull wing canopy concept portrayed in Figures 1 and 2 under the Volume No. 3 – Additive Options. As shown in Figure 1-1, this base concept was used by STV in designing the canopy structure system for the recently completed MBTA Boston Landing Commuter Rail (Purple Line) Station in Brighton, Massachusetts. Because of that design, similarity to what is shown as an additive concept for this Project, we have adapted it for our proposal herein by extending the wings of the canopy 5-1/4 feet beyond the edge of the platform.

With the exception of Lechmere Station, the platforms at all of the other six stations are identical. They are all 225-feet long, and their widths vary by only by 1 to 3 feet. Under our base proposal, we have been able to tweak the track geometry whereas both tracks through all six stations in question are parallel to another. The edge of platform is set at 4 to 9 feet from center line of track and therefore also runs parallel to the tracks. Since both the tracks and platform edges are straight this means the edge of the canopies are also straight making its framing, structural support, and canopy roof assembly almost identical at all six stations. This simplifies the fabrication process which in turn helps control costs and more importantly maintains symmetry at all stations along the entire length of the Green Line extension.

The platform at Lechmere Station is unique since it is driven by the track geometry throughout the station. Both tracks are curved differently and the profile, albeit the same for both tracks varies between the two headhouses serving the station platform. This results in a much wider and varying platform width and curved height throughout, requiring two rows of canopies which Additive Option Item 1 acknowledges. Although different than the other stations, our proposed design concept plans provided herein shows that the base design can be easily tweaked by reducing the span of the inner wings of both rows of columns and adding additional framing members (purlins) at the outer wings framing at the wider sections of platforms while still maintaining the 5-1/4 foot overhang along the continuous curved edge of the platform as required per the RFP. Once again, symmetry with the other stations canopy design remains intact.

Figure 1-1. MBTA Boston Landing Commuter Rail Line Canopy. *The wing-style canopy used will be adapted for this Project to extend the wings of the canopy 5-1/4 feet beyond the edge of the platforms.*

Our proposed canopy design presented takes into account the possibility and requirements for the station platform and canopy structure to be extended in the future to accommodate a four-LRV car platform. As shown in the framing plans at the end of this section, the last end-roof section of the canopy structure is cantilevered 7'-6" off the last canopy support column shown. When and if the platform canopy is extended, the next column can be placed 7'-6" from the edge of the end of the existing platform. This creates the 15'-0" spacing to match the other existing canopy support columns in place thus providing the same rhythm and symmetry between the existing and new, making the canopy to appear to be as one.

Changes from the Technical Proposal

To support this enhancement, some of the enclosed, standalone shelters and light poles will be replaced by the canopies. The canopy support columns will be more robust with heavier reinforcement than the replaced light poles. The overall size and shape of the foundation to accommodate the canopy loading will be minimal. The canopy roof framing will support light fixtures as well as other system components and devices required on the station platform, such as VMS, PA speakers, CCTV cameras, etc. Conduits and wiring will be changed to run aboveground and at the underside of the canopy structure to feed all of the aforementioned systems.

The canopy roof will require a stormwater collection system, with a minimal number of downspouts and lateral drainage piping running under the platform to connect with the closed storm water system in the track bed.

1.B SCHEDULE IMPACT ASSESSMENT

GLX Constructors' efforts to support this Additive Option will not impact the proposed schedule.

1.C STATION CANOPIES DRAWINGS

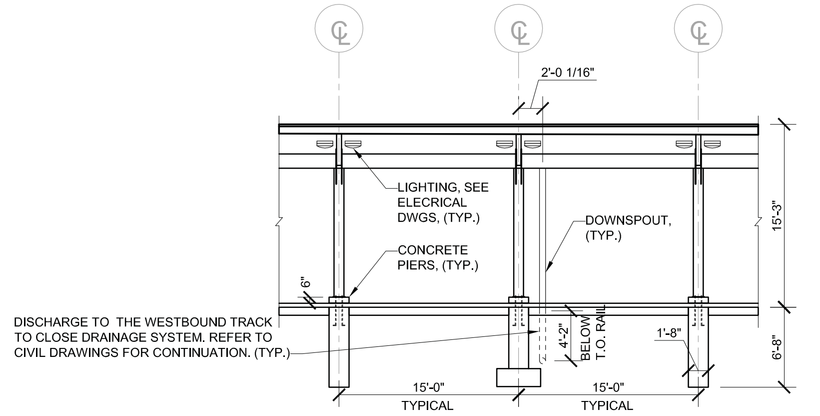
We adjusted the spacing of the canopy support columns to match the spacing of the light poles along the entire length of platform. We are basically dropping it in and substituting the canopy columns for the light poles. This in turn means minimal or no impacts will be experienced because of the effort we put forth in meticulously laying out the platform furnishings, such as emergency kiosks, benches, wayfinding signage, spider maps, and information plaque per the MBTA Standards and Guidelines and the required code and MBTA driven accessibility path-of–travel at the platform level under our base proposal drawing. Although the canopy structure would displace the light poles under the base proposal it indirectly provides a more flexible means for providing the required illumination levels throughout the station. The lighting plan layout and lighting fixture schedule provided demonstrates this flexibility. By supporting the light fixtures off the underside of the canopy framing allows lighting to be placed continuously along the edge of the canopy to illuminate the platform edge in accordance with the specific MBTA standards for foot candle requirements. The canopy also allows the other interior lighting to be spaced accordingly to provide a more even coverage of illumination. The proposal canopy herein also offers alternative support for the other systems along the station platform such as VMS signage that under the base proposal requires its own support pole and foundation assembly, PA speakers, passive wayfinding signage, FA devices, CCTV security cameras, etc. all while providing the minimum 9'-0" clearance requirement as shown in the cross sections on the drawings.

The gull wing shape of the canopy roof structure also provides the most efficient means for collecting and discharging of storm water runoff. The aforementioned cross sections contained under this section as well as the framing plans show a center gutter system which are sloped to a series of closed down spouts which occur at the low point at every other canopy structure support column (approximately 30 feet o.c.) which in turn are connected to lateral drainage piping underneath the platform which then lead out to a closed track system storm water infrastructure collection system in the track bed. In the case of Lechmere Station the drainage piping will be brought over to the nearest viaduct pier(s) then down to connect to the storm water infrastructure below the street level as depicted and noted in the cross sections provided.

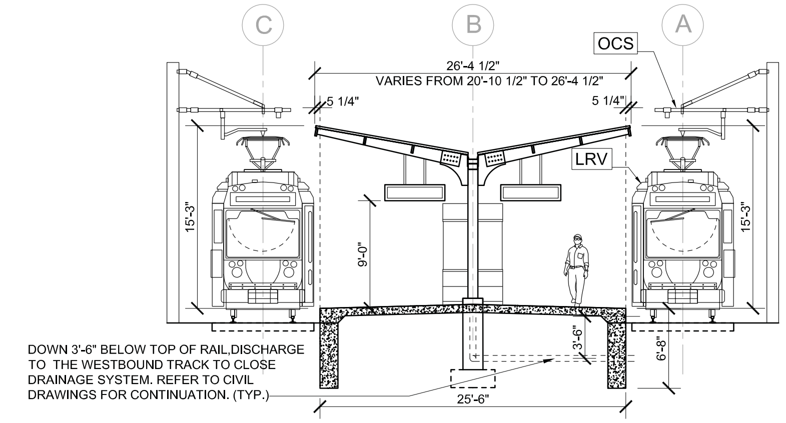
As with the base proposal the cross sections show a crowned platform center to promote positive drainage to either track bed.

At Lechmere station, the entire platform slab is supported by its own steel girder framing system as shown on the cross sections. The girder framing system, although separate and independent of the Viaduct structure, is supported by the viaduct piers. The design of the platform slab and its steel girder framing system take into account the loading conditions that will be imposed by the canopy structure if this additive option is incorporated into the work.

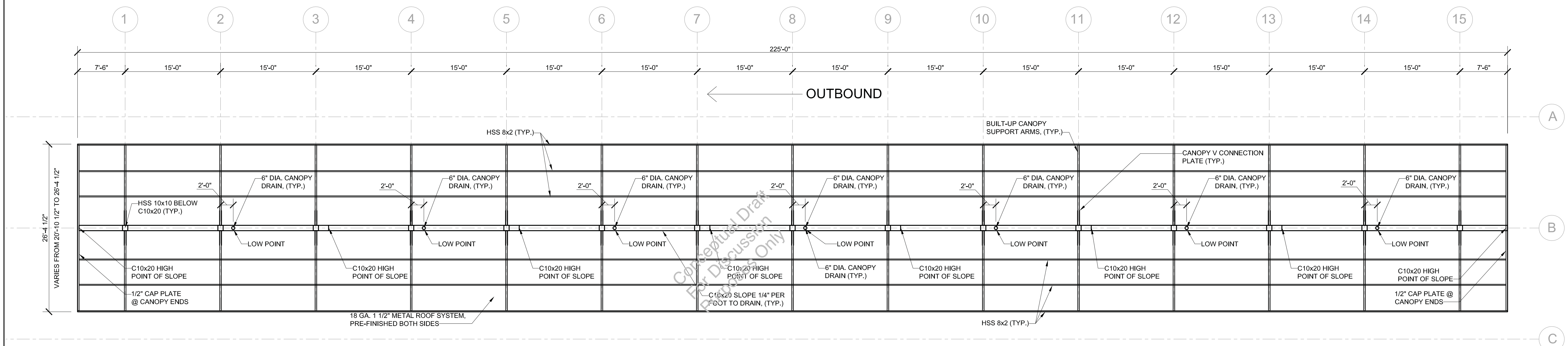
RFP	
Drawing Number	**Drawing Title**
OPT1-01	Typical Single Wing Station Platform Canopy Elevation and Section – Additive Option 1
OPT1-02	Typical Single Wing Station Platform Canopy Section – Additive Option 1
OPT1-03	Typical Canopy Details – Additive Option 1
OPT1-04	Typical Station Canopy Lighting Plan – Additive Option 1
OPT1-05	Lechmere Part 1 Canopy Plan, Elevation and Sections – Additive Option 1
OPT1-06	Lechmere Part 2 Canopy Plan, Elevation and Sections – Additive Option 1
OPT1-07	Lechmere Canopy Section At Column Line 1 – Additive Option 1
OPT1-08	Lechmere Canopy Section At Column Line 23 – Additive Option 1
OPT1-09	Lechmere Canopy Lighting Plan Sheet 1 Of 2 – Additive Option 1
OPT1-10	Lechmere Canopy Lighting Plan Sheet 2 Of 2 – Additive Option 1



TYPICAL PIER SPACING
SCALE: 1/8"= 1'-0"

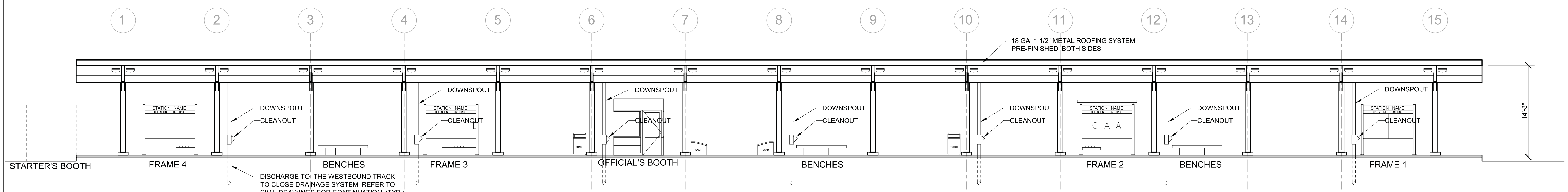


PLATFORM CANOPY ELEVATION - 2
SCALE: 1/8"= 1'-0" TYPE 3



PLATFORM CANOPY PLAN
SCALE: 1/8"= 1'-0" TYPE 3 DATE: 7-24-17

INBOUND



PLATFORM CANOPY ELEVATION - 1
SCALE: 1/8"= 1'-0" TYPE 3 DATE: 7-14-17

GRAPHIC_SCALE

0 4' 8' 12' 16' 20'

1/8"=1'-0"

NOTES:
1. THIS PLAN AND ELEVATION APPLIES TO ALL STATIONS EXCEPT LECHMERE STATION
2.PLATFORM CANOPY WIDTH VARIES FROM 20'-10 1/2" TO 26'-4 1/2"

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

TYPICAL SINGLE WING STATION PLATFORM CANOPY, ELEVATION AND SECTION - ADDITIVE OPTION 1

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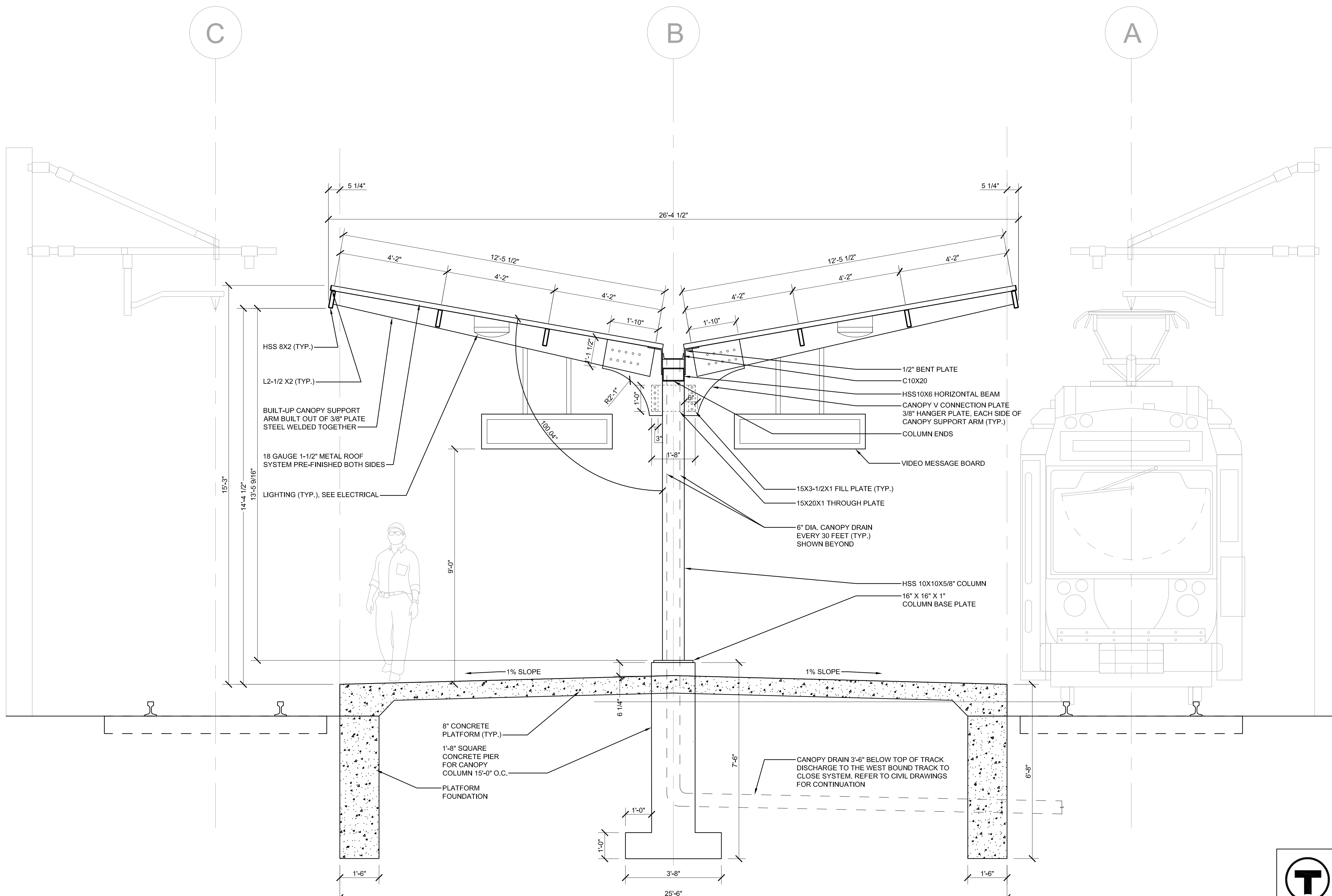

TYPICAL SECTION - 1

SCALE: 1/2"= 1'-0" TYPE 3 DATE: 7-14-17

PLATFORM TYPE 3-COLLEGE SQUARE STATION. - (25'-6") WIDE PLATFORM

ALL STEEL SHALL BE GRADE Fy = 50 KSI

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

TYPICAL SINGLE WING PLATFORM
CANOPY SECTION
- ADDITIVE OPTION 1

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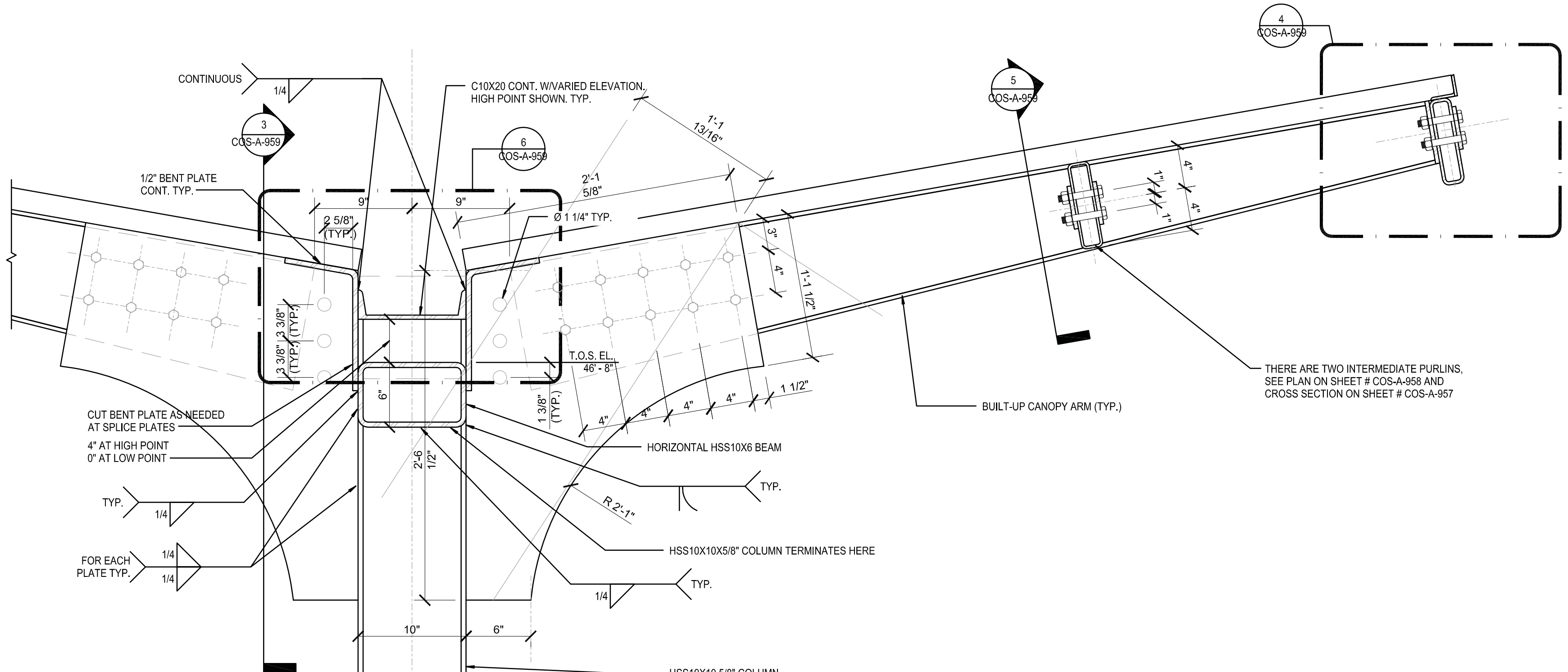
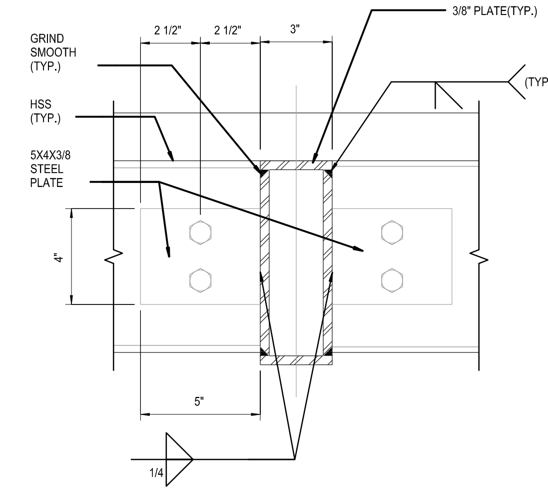


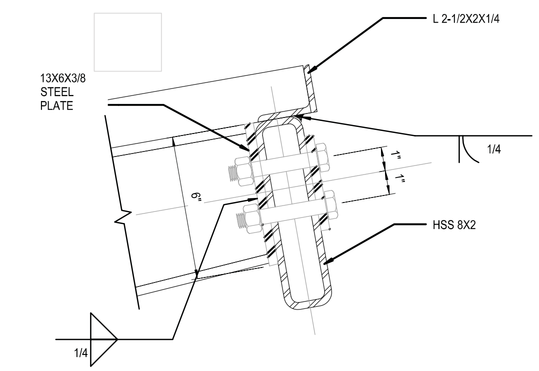
PLATFORM CANOPY ARM DETAIL

1 1/2" = 1'-0"



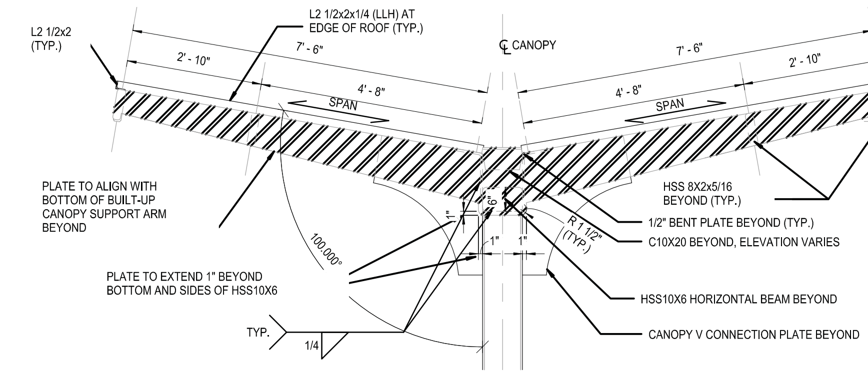
5 DETAIL

COS-A-959 3" = 1'-0"



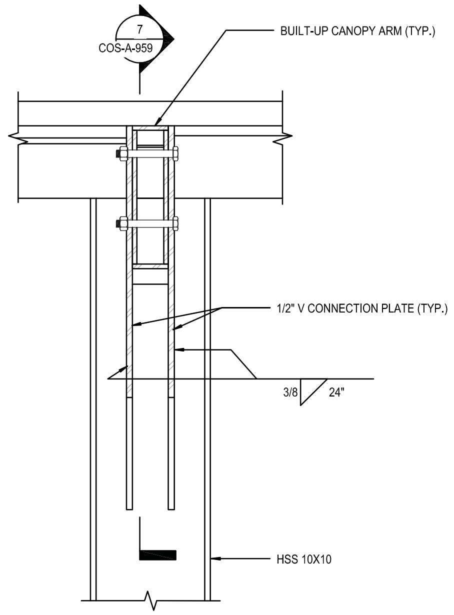
4 CANOPY ARM SECTION

COS-A-959 3" = 1'-0"



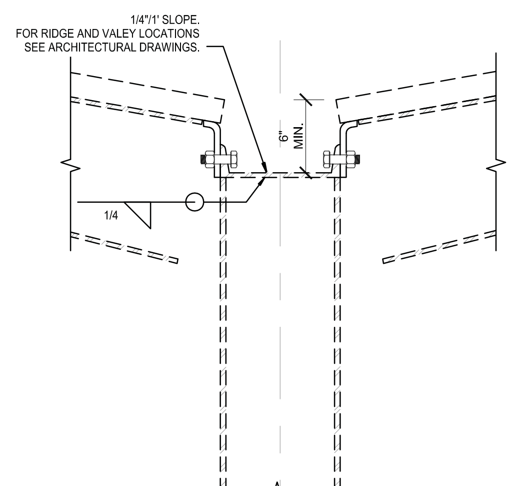
PLATFORM CANOPY END PLATE

1/2" = 1'-0"



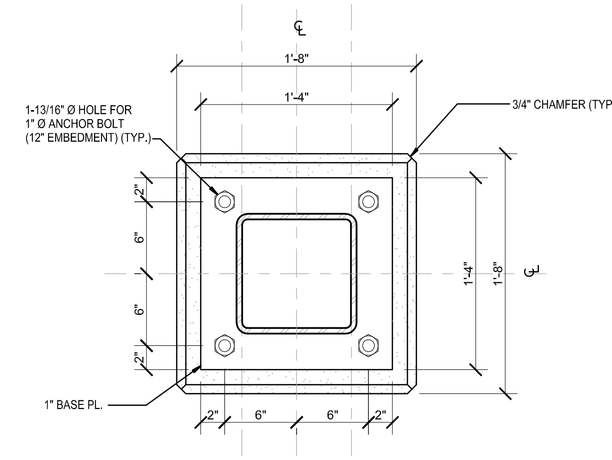
3 SECTION

COS-A-959 1 1/2" = 1'-0"



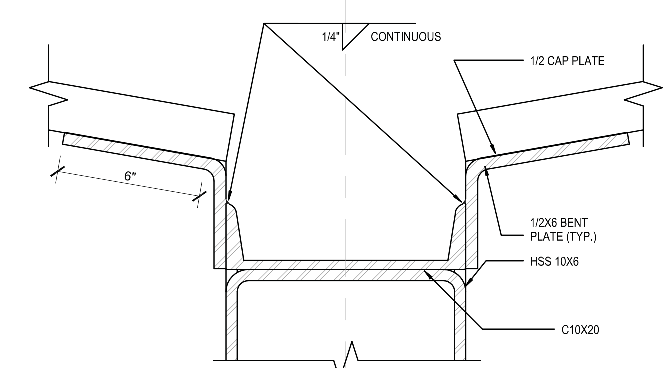
7 SECTION

COS-A-959 1 1/2" = 1'-0"



2 PLATFORM CANOPY BASE PLATE DETAIL

COS-A-959 1 1/2" = 1'-0"



6 DETAIL

COS-A-959 3" = 1'-0"

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
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CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

TYPICAL CANOPY DETAILS - ADDITIVE OPTION 1

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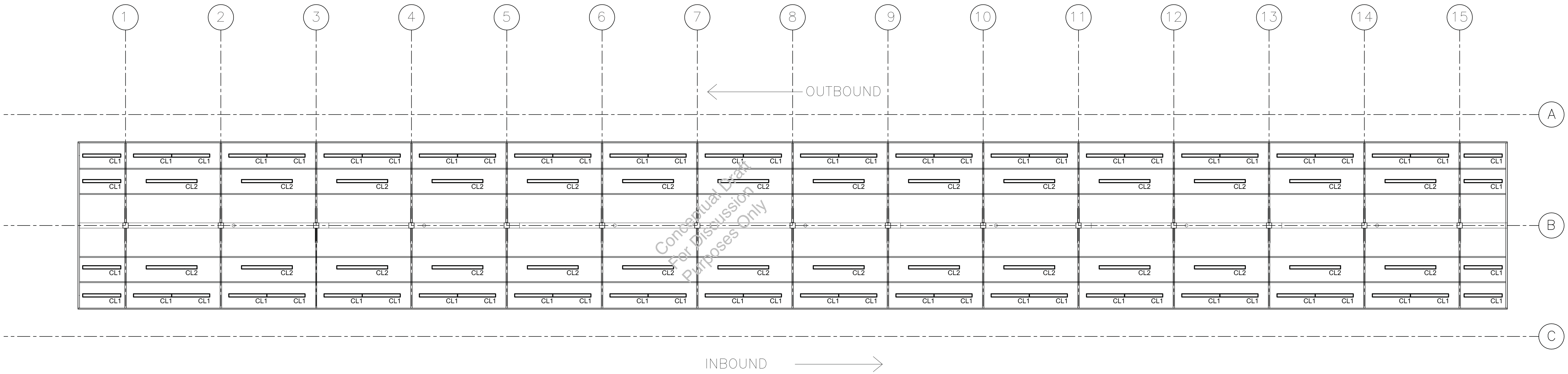


TYPICAL STATION PLATFORM CANOPY LIGHTING PLAN

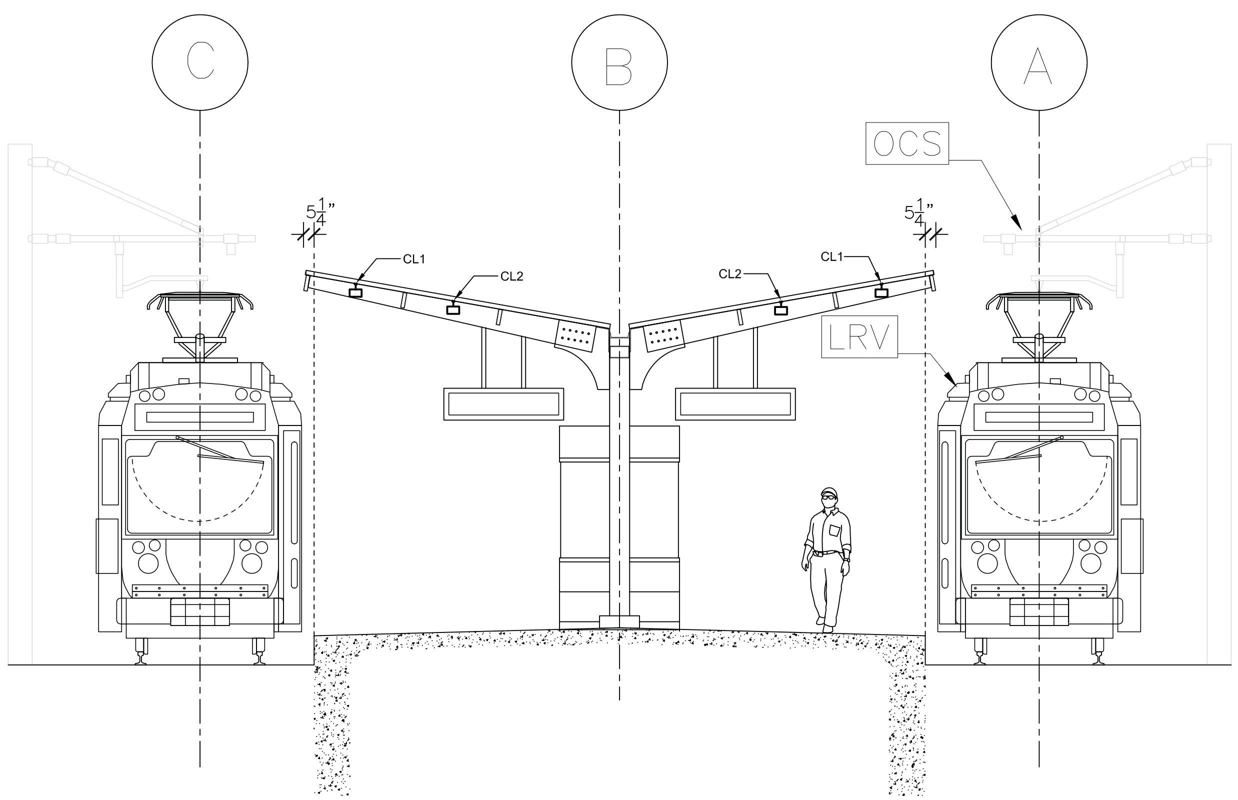
1/8"=1'-0"

0 4' 8' 16'

LIGHTING FIXTURE SCHEDULE								
FIXTURE TYPE	MANUFACTURER	CATALOG NUMBER	DESCRIPTION	MOUNTING	LAMP TYPE	VOLTAGE	LAMP WATTS	NOTES
CL1	FORUM	AQD-36-125LED30-SAT-H2.5"X6-UNV-SV	WET LOCATION RECTANGULAR LUMINAIRE	PENDANT	LED	120-277	75	MOUNT APPROX. 14'-0" FROM BOTTOM OF LIGHT FIXTURE
CL2	FORUM	AQD-36-125LED30-SAT-H2.5"X8-UNV-SV	WET LOCATION RECTANGULAR LUMINAIRE	PENDANT	LED	120-277	100	MOUNT APPROX. 13'-2" FROM BOTTOM OF LIGHT FIXTURE

NOTES:

1. LIGHTING ON THIS DRAWING APPLIES TO ALL STATIONS EXCEPT LECHMERE STATION



TYPICAL STATION PLATFORM CANOPY LIGHTING SECTION

1/4"=1'-0"

0 2' 4' 8'

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

TYPICAL STATION PLATFORM
CANOPY LIGHTING PLAN
- ADDITIVE OPTION 1

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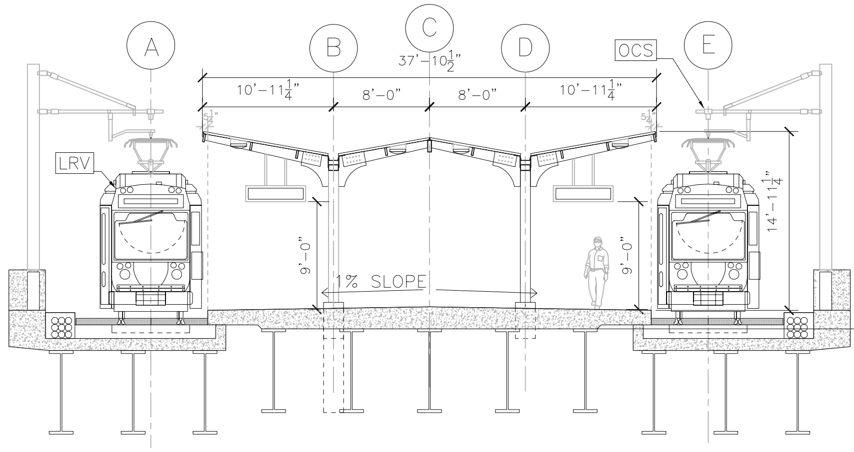
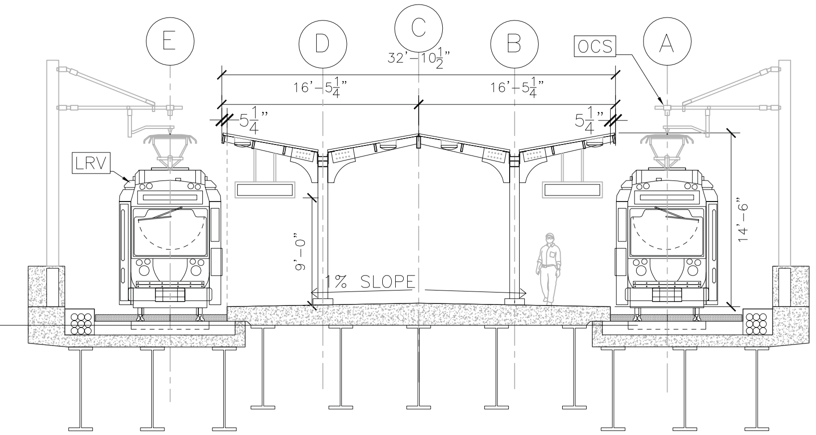
SHEET: OPT1-04

ISSUE .



PLATFORM CANOPY SECTION @ CL1

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



PLATFORM CANOPY SECTION @ CL 23

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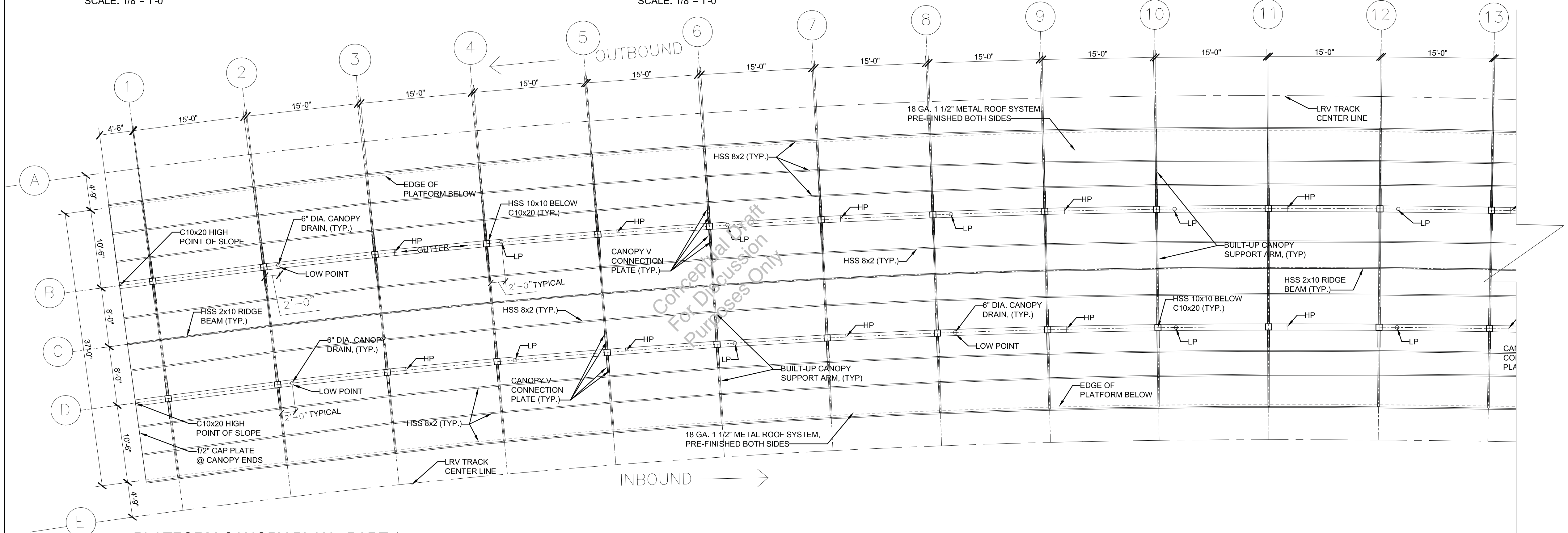
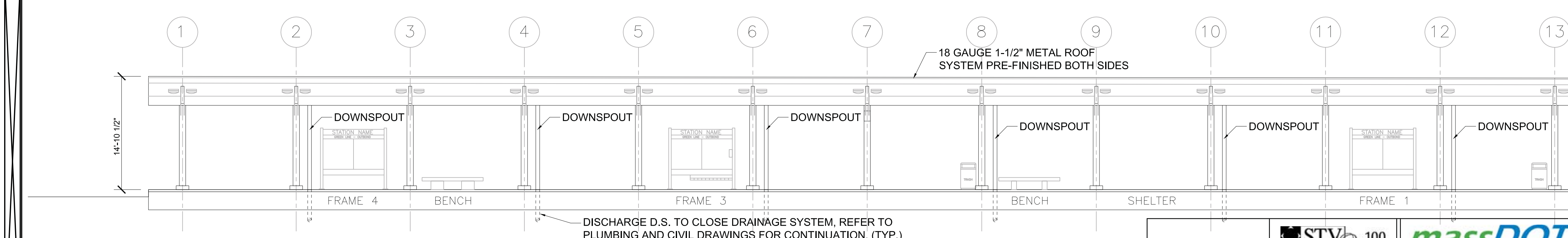


PLATFORM CANOPY PLAN - PART 1

SCALE: 1/8"= 1'-0" TYPE 4, DATE: 7-31-17

TYPE 4-WIDTH VARIES (32'-0" to 37'-0") LECHMERE STATION

TOTAL LENGTH @ CENTER LINE C OF PLATFORM=339'-4" +/-



PLATFORM CANOPY ELEVATION - PART 1

SCALE: 1/8"= 1'-0" TYPE 4 DATE: 7-31-17

PLATFORM TYPE 4 = LECHMERE- 32'-0" to 37'-0" WIDE PLATFORM

ALL PLATFORM CANOPY STEEL SHALL BE GRADE Fy = 50 KSI

0 1' 2' 3' 4' 5' 1/8" = 1'-0"

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PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

LECHMERE STATION PART 1
CANOPY PLAN, ELEVATION AND SECTIONS
- ADDITIVE OPTION 1

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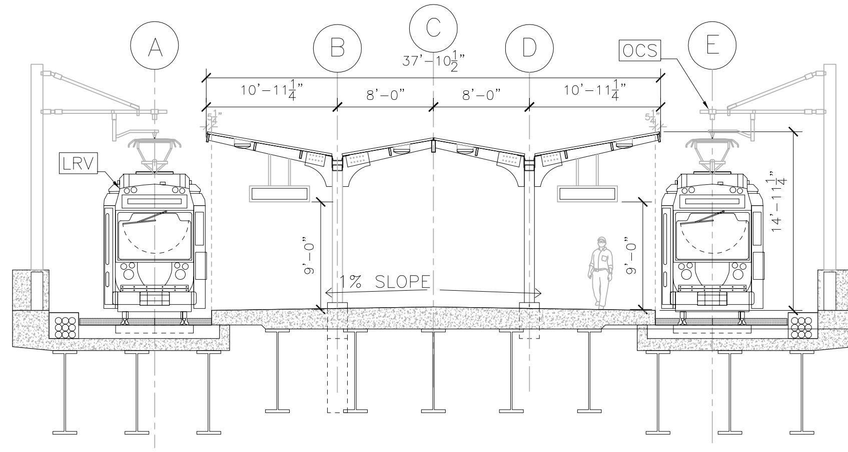

PLATFORM CANOPY SECTION @ CL 1

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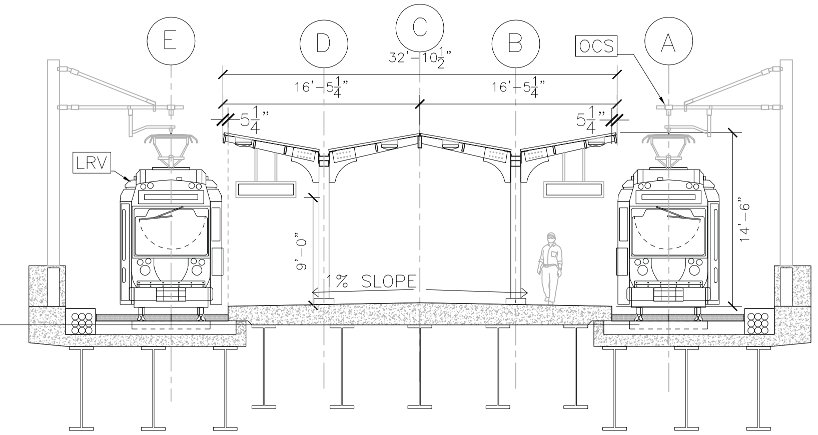

PLATFORM CANOPY SECTION @ CL 23

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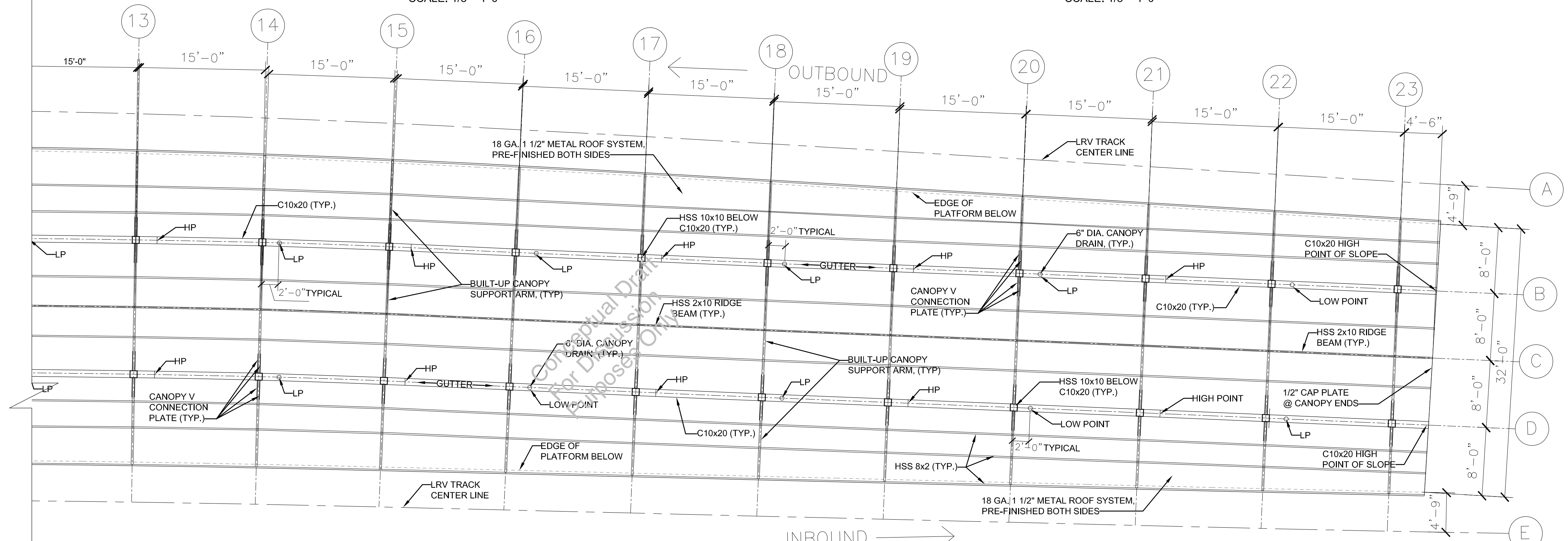

PLATFORM CANOPY PLAN - PART 2

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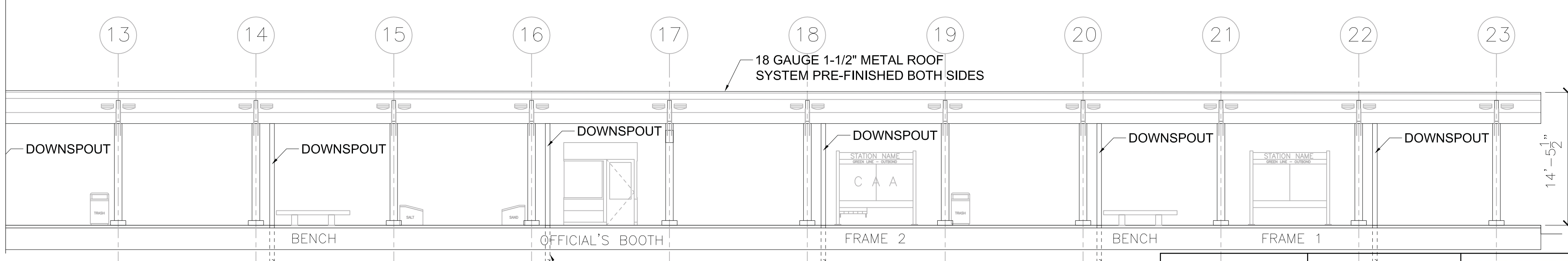

PLATFORM CANOPY ELEVATION - PART 2

SCALE: 1/8"= 1'-0" TYPE 4 DATE: 7-31-17

PLATFORM TYPE 4 = LECHMERE- 32'-0" to 37'-0" WIDE PLATFORM

ALL PLATFORM CANOPY STEEL SHALL BE GRADE Fy = 50 KSI

0 1' 2' 3' 4' 5' 1/8" = 1'-0"

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PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

LECHMERE STATION PART 2
CANOPY PLAN, ELEVATION AND SECTIONS
- ADDITIVE OPTION 1

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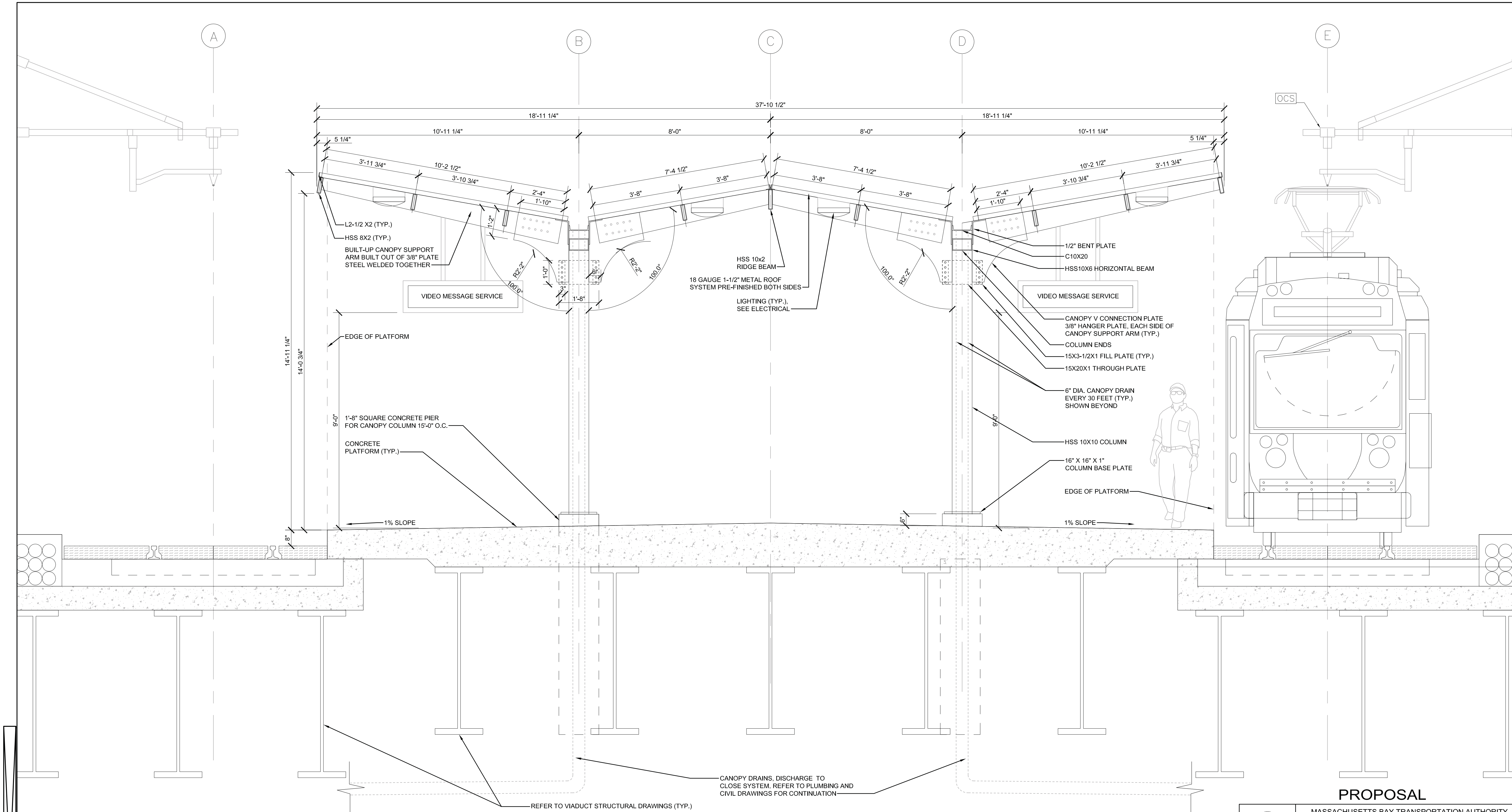

PLATFORM CANOPY SECTION @ CL 1

SCALE: 1/2"= 1'-0" TYPE 4, DATE: 7-31-17

PLATFORM TYPE 4 = LECHMERE- 32'-0" to 37'-0" WIDE PLATFORM

ALL PLATFORM CANOPY STEEL SHALL BE GRADE Fy = 50 KSI

0 1' 2' 3' 4' 5' 1/2" = 1'-0"

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PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

LECHMERE STATION
CANOPY SECTION @ COLUMN LINE 1
- ADDITIVE OPTION 1

STV 100 Years

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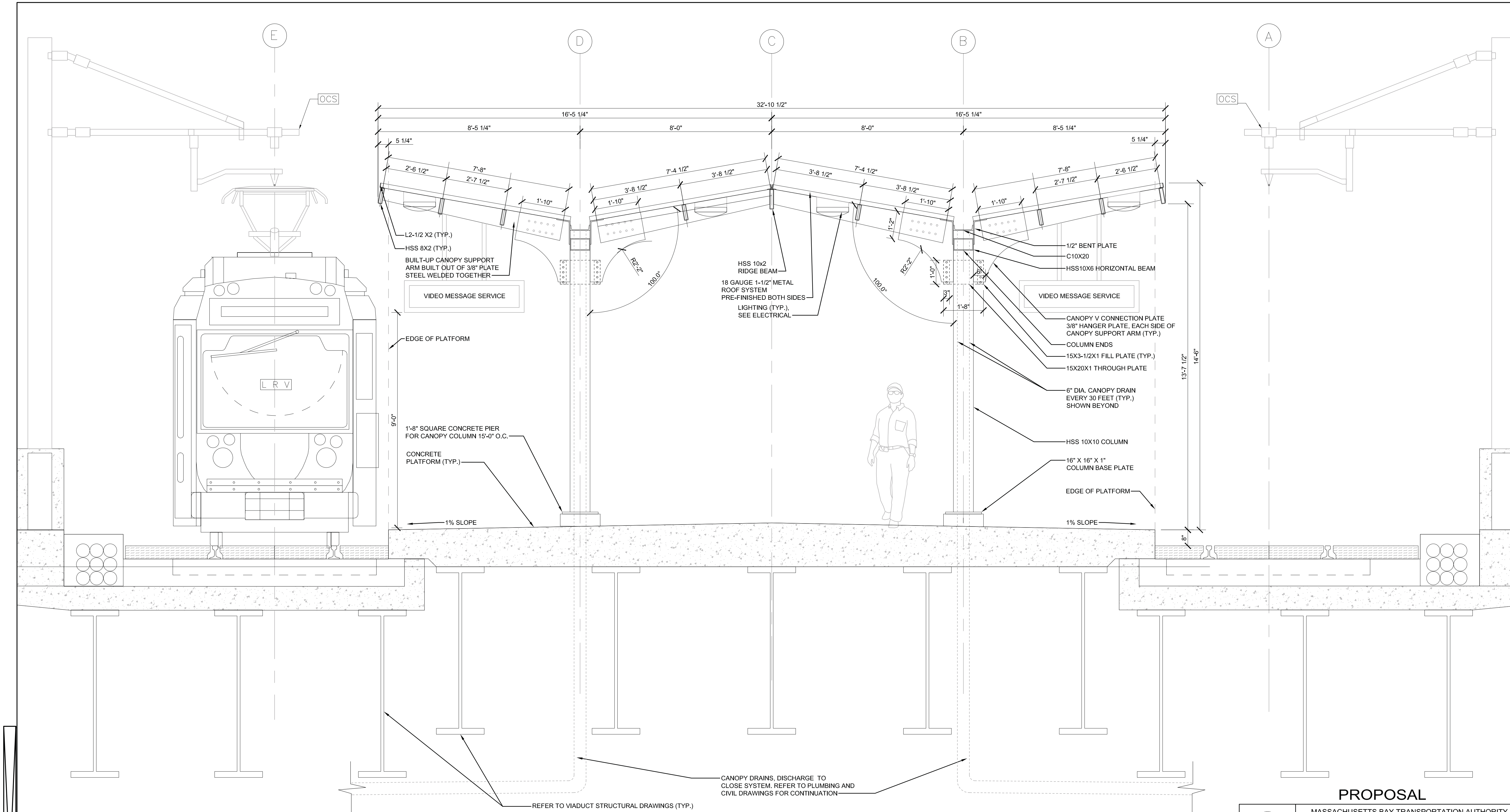

PLATFORM CANOPY SECTION @ CL 23

SCALE: 1/2"= 1'-0" TYPE 4, DATE: 7-31-17

PLATFORM TYPE 4 = LECHMERE- 32'-0" to 37'-0" WIDE PLATFORM

ALL PLATFORM CANOPY STEEL SHALL BE GRADE Fy = 50 KSI

0 1' 2' 3' 4' 5'
1/2" = 1'-0"

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PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

LECHMERE STATION
CANOPY SECTION @ COLUMN LINE 23
- ADDITIVE OPTION 1

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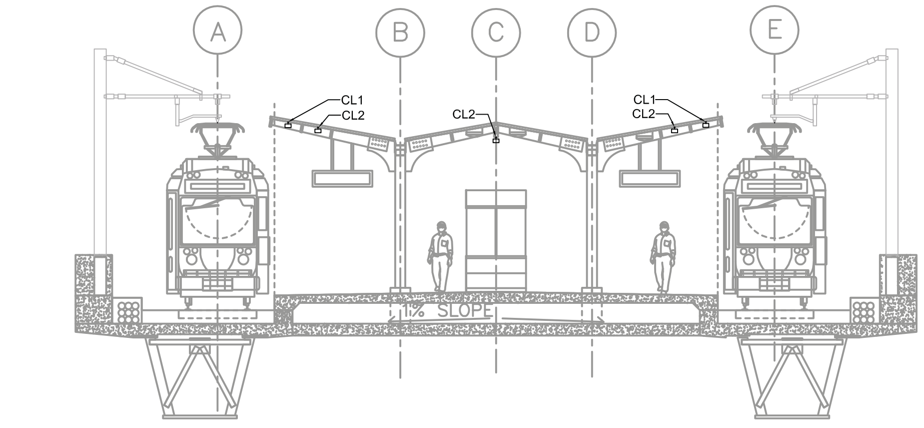
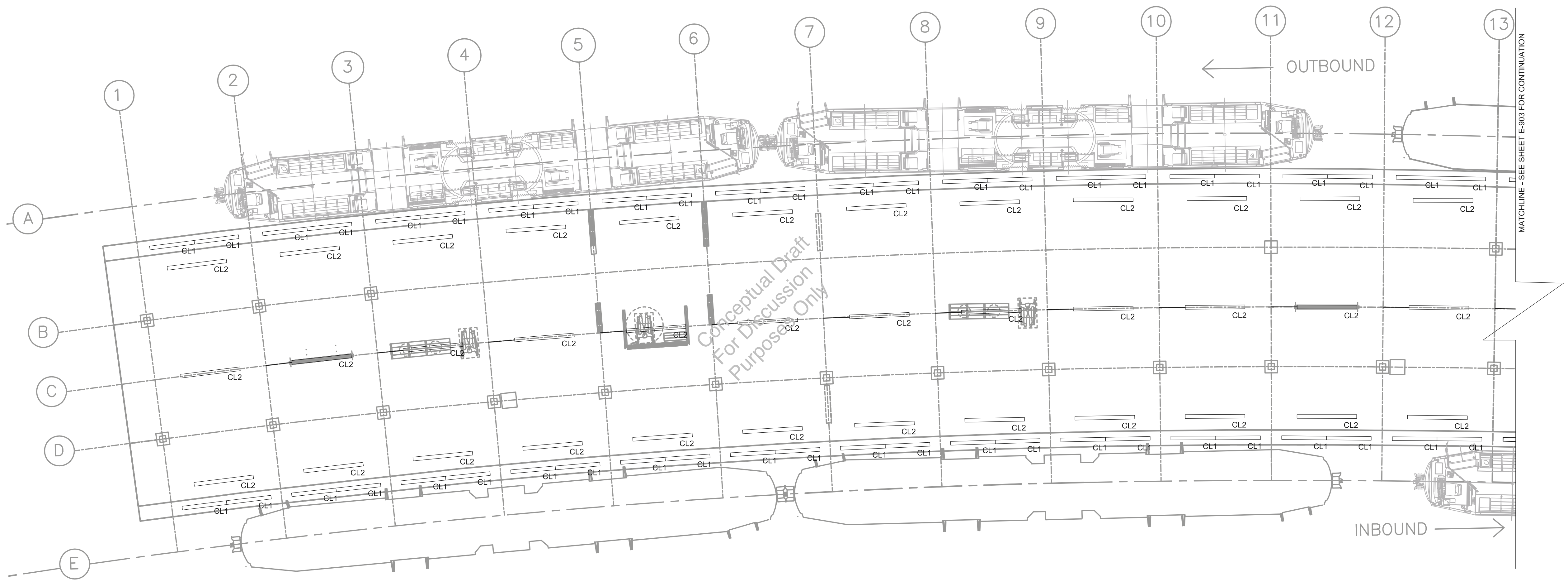


LECHMERE STATION CANOPY LIGHTING SECTION

1/8"=1'-0"

0 4' 8' 16'



LECHMERE STATION CANOPY LIGHTING PLAN

1/8"=1'-0"

0 4' 8' 16'

LIGHTING FIXTURE SCHEDULE

FIXTURE TYPE	MANUFACTURER	CATALOG NUMBER	DESCRIPTION	MOUNTING	LAMP TYPE	VOLTAGE	LAMP WATTS	NOTES
CL1	FORUM	AQD-36-125LED30-SAT-H2.5"X6-UNV-SV	WET LOCATION RECTANGULAR LUMINAIRE	PENDANT	LED	120-277	75	MOUNT APPROX. 14'-0" FROM BOTTOM OF LIGHT FIXTURE
CL2	FORUM	AQD-36-125LED30-SAT-H2.5"X8-UNV-SV	WET LOCATION RECTANGULAR LUMINAIRE	PENDANT	LED	120-277	100	MOUNT APPROX. 13'-2" FROM BOTTOM OF LIGHT FIXTURE

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

LECHMERE STATION
CANOPY LIGHTING PLAN SHEET 1 OF 2
- ADDITIVE OPTION 1

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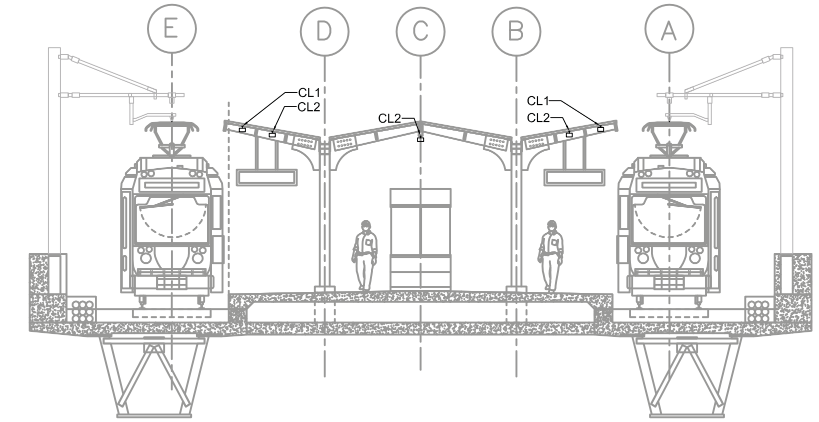
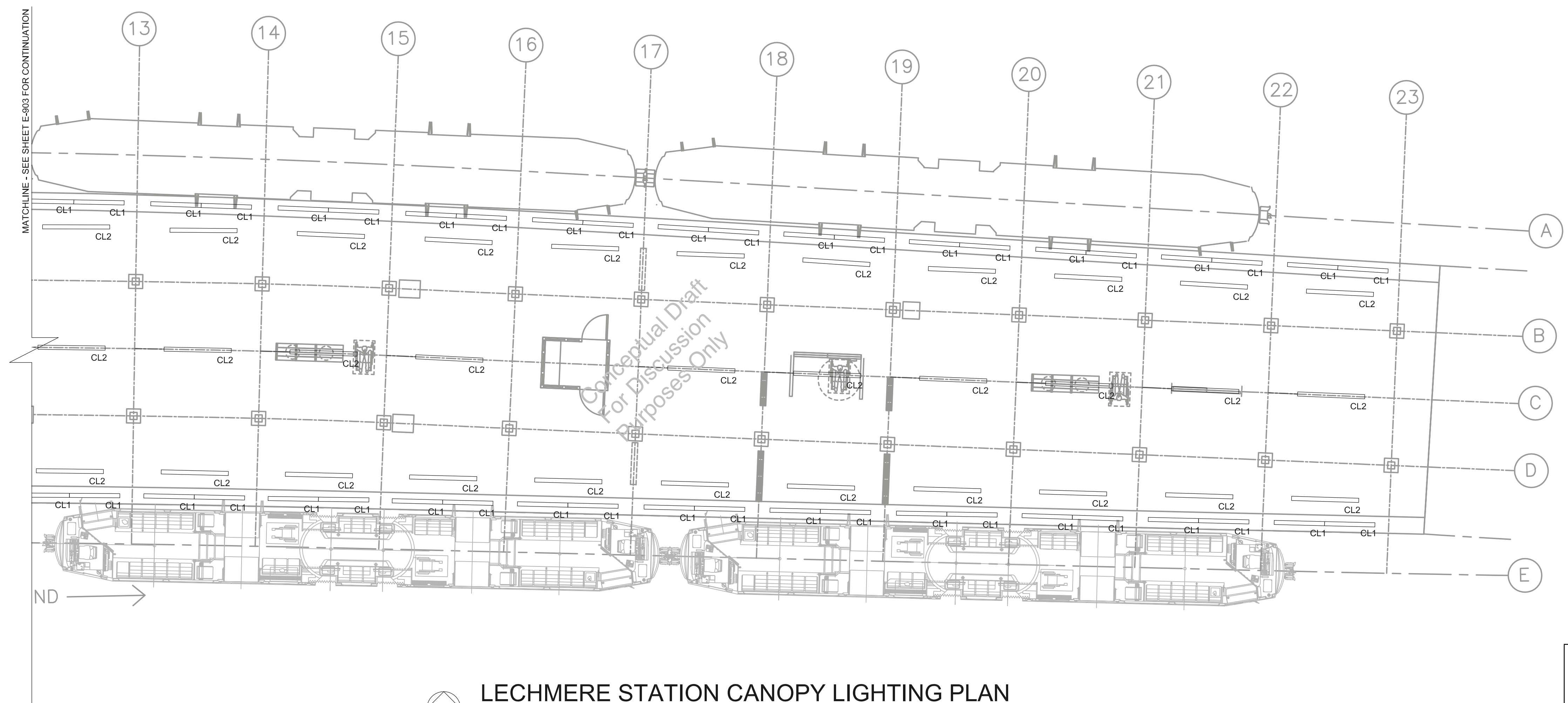


LECHMERE STATION CANOPY LIGHTING SECTION

1/8"=1'-0"



LECHMERE STATION CANOPY LIGHTING PLAN

1/8"=1'-0"

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

LECHMERE STATION
CANOPY LIGHTING PLAN SHEET 2 OF 2
- ADDITIVE OPTION 1

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2. DESIGN AND CONSTRUCTION OF ELEVATORS TO STATIONS PROPOSED FOR NEW/ADDITIONAL ELEVATORS

2.A GENERAL APPROACH AND LOCATION-SPECIFIC DESIGNS

This additive option provides commuters with a different type of means of egress from the RFP base requirements, including:

- Alternatives for accessing and exiting particular stations in the way of additional means of egress to and from the station.
- A second means of egress from a different direction or level.

All of the additive options draw from our base design proposal drawings. This allows us to match and maintain the aesthetic style and materials that are being proposed under our proposed design approach while minimizing the impact to the base design if the additive option means of egresses are incorporated into one or all of the stations in question, reducing cost. For example, we utilized the same layout and concept for the additional elevator at Magoun Station that is reflected in our base proposal plans for College Station. This approach addresses all criteria under Sections 12 and 14 of Volume 2, Technical Provisions, because we have taken into consideration the space, dimensions, structural, architectural, and projected MEP requirements, and therefore, we are not reinventing the wheel. We applied this approach to all the additive options means of egress being considered.

> **"All of the additive options draw from our base design proposal drawings. This allows us to match and maintain the aesthetic style and materials that are being proposed under our proposed design approach while minimizing the impact to the base design if the additive option means of egresses are incorporated into one or all of the stations in question, reducing cost.**

The following subsections correspond with the additive options listed under Volume 3 – Addendum Number. 9; 3.2.2. Additive Option Item 2: Elevators.

Lechmere Station North Headhouse. Under the base proposal, the entire elevator shaft construction, including foundations, structural steel framing, CMU walls and glass curtain walls, roof assembly, penthouse ventilation (in wall fixed louvers), and entrance canopies top and bottom are provided in the design. The elevator control room, located in the supporting headhouse facility, is sized for the additional elevator already. Circulation leading to and from the elevator doors at the street and station levels are already taken into account in the base design floor plans.

Incorporating the additional elevator at the Lechmere Station North Headhouse has little or no impact on the Technical Provisions. Other than specifying the actual elevator cab and hoisting equipment, which would be exact to the other two elevators programmed for this station as part of the base proposal, all of the infrastructure and shaft is accounted for under the base design proposal drawings.

Additional HVAC will need to be provided in the elevator control room, but this is minimal. Even though an additional elevator is being proposed, the electrical service for the station does not need to be upgraded from a 600 amp service. There is no additional lighting required. A minimal amount of additional wayfinding signage will be required.

Gilman Square Station. This additive option substitutes a second stairway and elevator in lieu of the emergency covered exit switchback ramp system under the base RFP. However, the second stairway and elevator would be located on the east side of the School Street Bridge as opposed to the ramp system on the west side of the School Street Bridge. Our interpretation of the additive option description indicates the MBTA intends to use the second stairway and elevator as a second means of egress to enter and exit the station as opposed to the ramp being used only as an emergency exit.

The layout and arrangement of support spaces, including crash walls, has essentially been rotated 180 degrees and mirrors the Main Station Headhouse floorplate and arrangement. The layout, as shown on the proposal drawings, also takes into account the possible extension of the station platform in the future to 300 feet. The stairs are covered over its entire run and extends 5 feet beyond the last riser at the top and bottom per the RFP criteria. Canopy extensions have also been provided over the elevator door opening top and bottom per the RFP.

Incorporating the second set of stairs, elevator, and support spaces (essentially second Station Headhouse) has little or no impact on the Technical Provisions, since it is replacing a structure that encompasses a much larger footprint. Additional HVAC will need to be provided since a second elevator control room is required.

Since an additional elevator is being proposed the electrical service for the station will need to be upgraded from 400 amps under the base RFP to a 600 amp service. There is additional lighting required but is less than provided for the emergency ramp system so it may be considered awash.

A minimal amount of additional wayfinding signage will be required since it will be used as a second station entrance/exit. An additional fare collection machine (ticket vending) was not called for as part of the additive options, but can be discussed and addressed with the MBTA if this additive option is exercised.

Note: ATC 36 – Raised Community Path has been approved by the MBTA. The ATC has a direct impact on the main station entrance/exit to and from Gilman Square under the based RFP proposal. However, it does not impact in any way the substitute elevator and stair headhouse additive option presented.

Magoun Square Station. This additive option calls for an additional elevator to be provided adjacent to the base proposal elevator location. To comply with the adjacency criteria, and as previously mentioned above, we utilized the same layout and concept that is reflected in our base proposal plans for College Station. Both elevator doors will be facing one another and will share a common covered enter/exit landing area (top and bottom) in accordance with the RFP criteria. The additional elevator will have its own elevator control room. The structural foundation, framing, and elevator shaft construction mirrors what we are proposing under our base proposal for College Station.

Incorporating the second elevator and support spaces will have a minimal impact on the Technical Provisions. The base floorplate of the Station Headhouse will have to be elongated in order to fit a second elevator and elevator control room at the station platform level. However, additional foundations, structural framing for the shaft construction, as well as glass curtain walls, CMU, and crash walls will be required along with additional roof assembly.

Additional HVAC will need to be provided since a second elevator control room is required. Since an additional elevator is being proposed, the electrical service for the station will need to be upgraded from 400 amps under the base RFP to a 600 amp service. There is additional lighting required but it is minimal. Additional wayfinding signage will be required, but again it's envisioned to be minimal.

Ball Square Station. Ball Square Station is an at-grade station. This additive option is to provide a stairway and elevator off of the Broadway Street Bridge leading down to the Station platform level. It will provide commuters with a second means of egress to enter and exit the station. We interpret the additive option criteria to mean that the stairs and elevator are not to replace or substitute the main at-grade (track crossing) station entrance under the base RFP. Again, keeping with the same aesthetics and style architecture, we will use the same concept and layout as shown for the Gillman Square Station substitute 2nd stair and elevator headhouse Additive option for Ball Square Station is only rotating it 180 degrees. However, unlike the School Street Bridge, where the span is in parallel with the entrance to the elevator and stairs at Gilman Square Station, the Broadway Bridge span is skewed. This will require a short triangular elevated walkway plaza to be provided between the bridge and the stairs/elevator headhouse at Ball Square Station, which our proposal drawings show.

Incorporating a second means of egress in the way of a set of stairs, elevator, and support spaces will have a minimal impact on the Technical Provisions, mainly since the headhouse, which encompasses all of these elements, will be located southeast and away from the at-grade station platform area and as close to the Broadway Street Bridge as possible to keep the length and size of the aforementioned triangular elevated walkway plaza to a minimum. However, in doing so, its impact is felt once reaching the station platform level. An open roof corridor is now being created between the stairs/elevator and the actual station platform requiring crash walls to be provided on either side where they were not required before, since the station was considered an at-grade station. Additionally, the stand alone building services building cluster, which is comprised of the electrical, communications and EFM rooms, fall within the footprint of the aforementioned corridor. This will require the structural roof framing of these spaces to be more robust to handle the crash wall loads imposed on them.

In addition to the above, foundations and structural framing for the elevator shaft construction, as well as glass curtain and CMU walls, will be required along with additional roof framing and assemblies for both stairs and elevator. Structural steel framing and concrete deck will be required for the elevated walkway plaza. HVAC will need to be provided, since an elevator does not exist. Additional lighting and wayfinding signage will be required, but they both will be localized. Since there is only one elevator being proposed, the electrical service for the station does not need to be upgraded from 400 amp service.

Changes from the Technical Proposal

The proposed Addition of Elevators to Stations Proposed for New/Additional Elevators does not require any deviation from the requirements of the Technical Proposal.

2.B SCHEDULE IMPACT ASSESSMENT

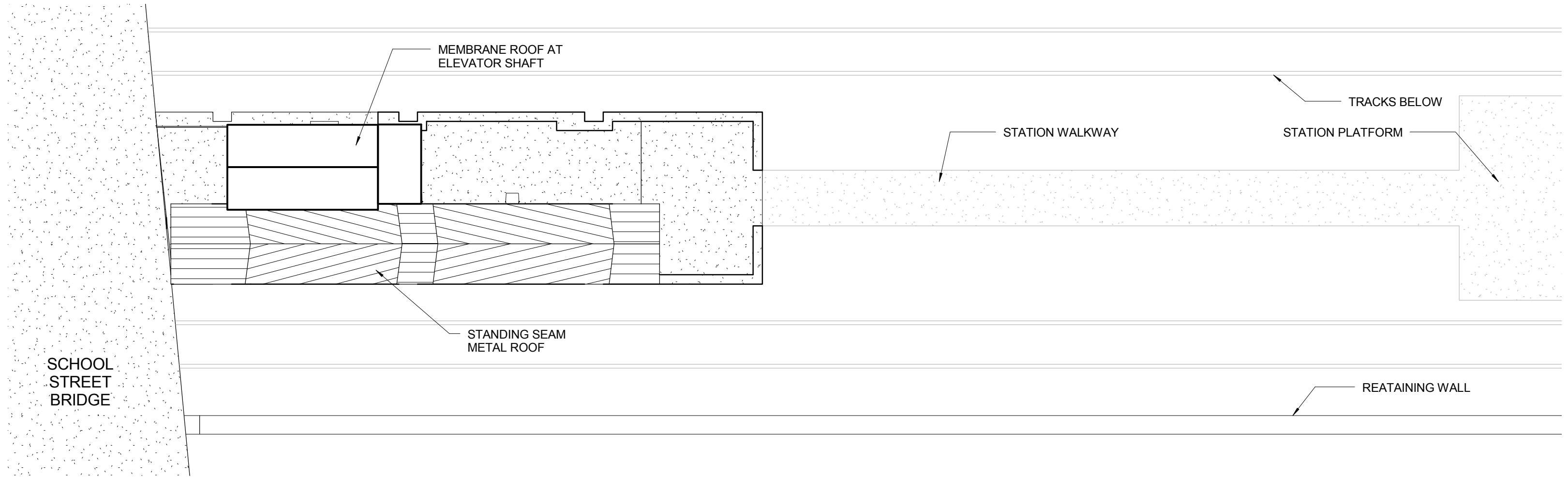
GLX Constructors' efforts to support this additive option, as described, are minimal and will not impact the proposed schedule.

2.C ELEVATORS DRAWINGS

The drawings provided show graphically, and in more detail, what is described above for all of the additive options under this section.

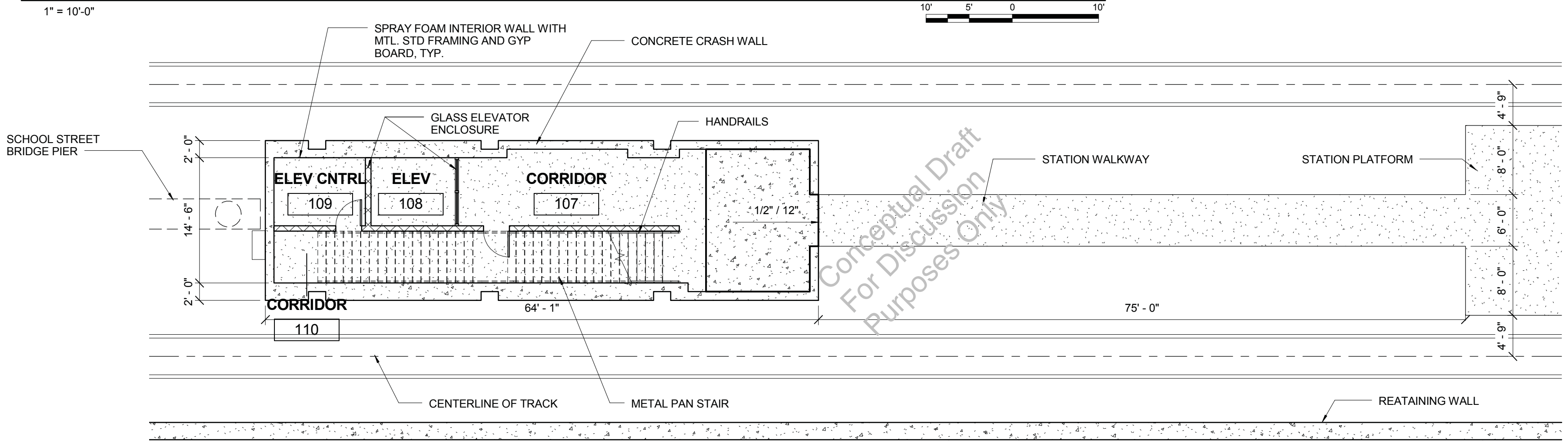
As with our base proposal, the design of any and all additive options under this section will include and address all criteria and requirements set forth under Sections 12 and 14 in Volume 2 – Technical Provisions of the RFP.

ITP Request	RFP	
	Drawing Number	Drawing Title
C2.0	OPT2-01	Overall Plans And Headhouse Sections – Additive Option 2
C2.0	OPT2-03	Platform, Headhouse Plans and Section – Additive Option 2
C2.0	OPT2-05	Overall And Walkway Plans – Additive Option 2



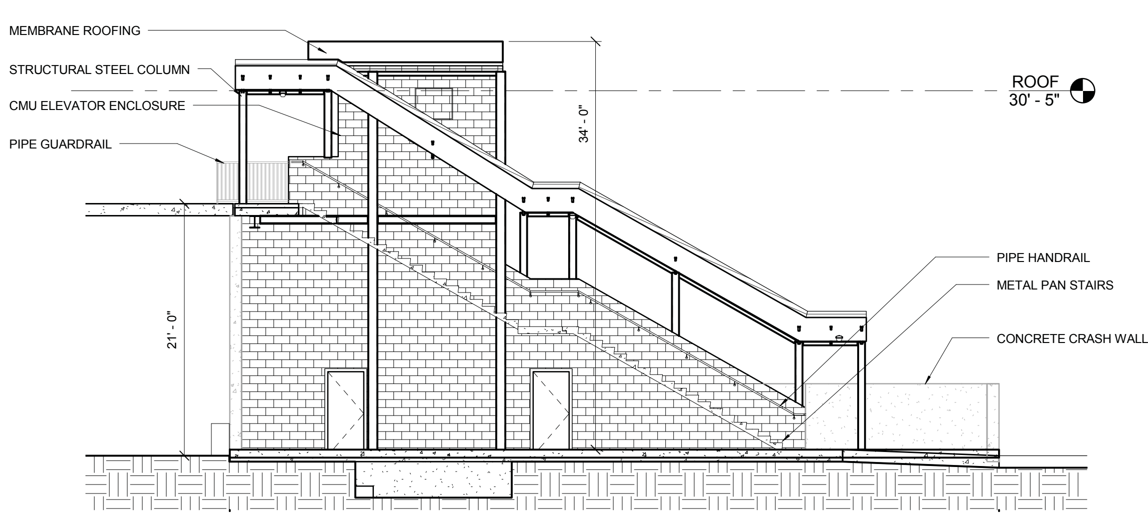
SCHOOL STREET HEAD HOUSE - ENTRY LEVEL

1" = 10'-0"



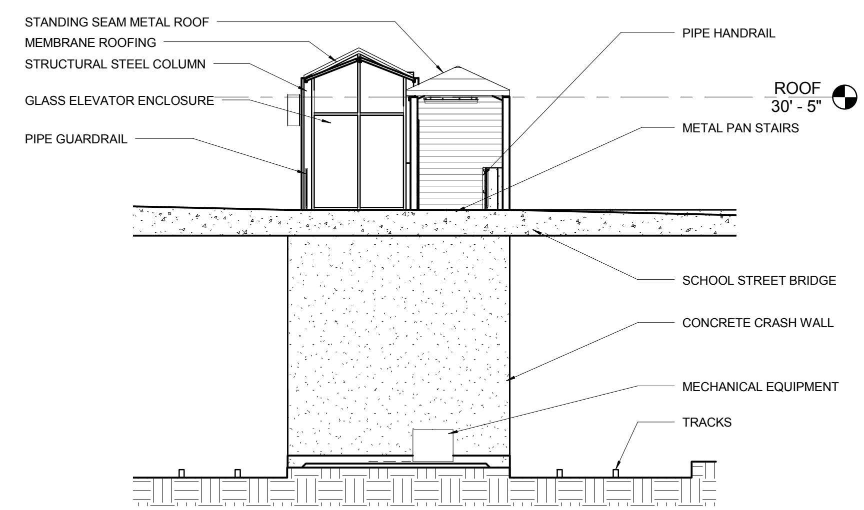
SCHOOL STREET HEAD HOUSE - PLATFORM LEVEL

1" = 10'-0"



SCHOOL STREET HEAD HOUSE - SECTION

1/8" = 1'-0"



SCHOOL STREET HEAD HOUSE - TRANSVERSE SECTION

1/8" = 1'-0"

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

GILMAN STATION
OVERALL PLANS & HEADHOUSE SECTIONS - ADDITIVE OPTION 2

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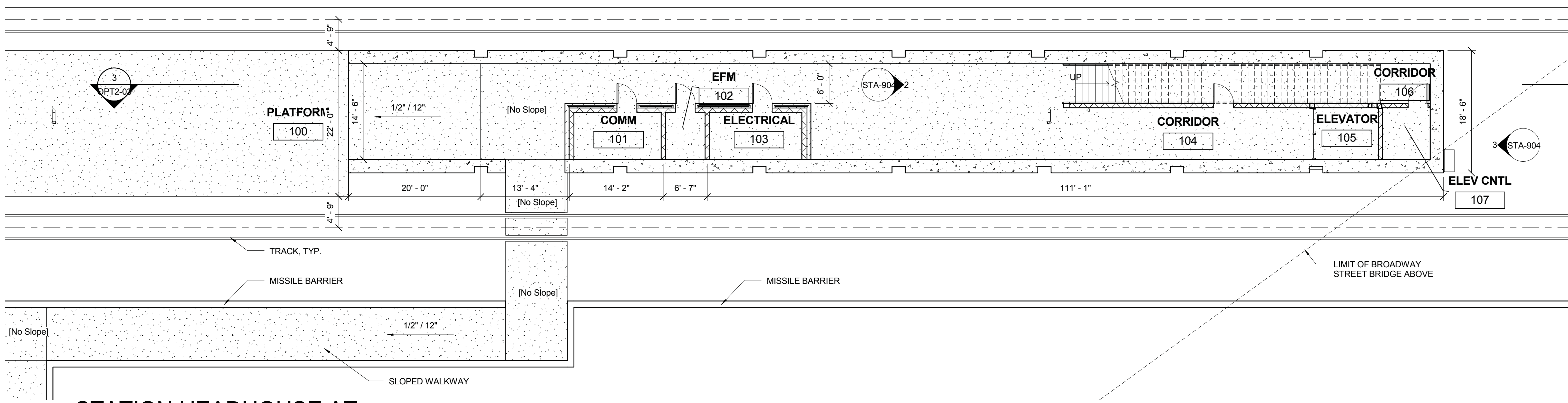
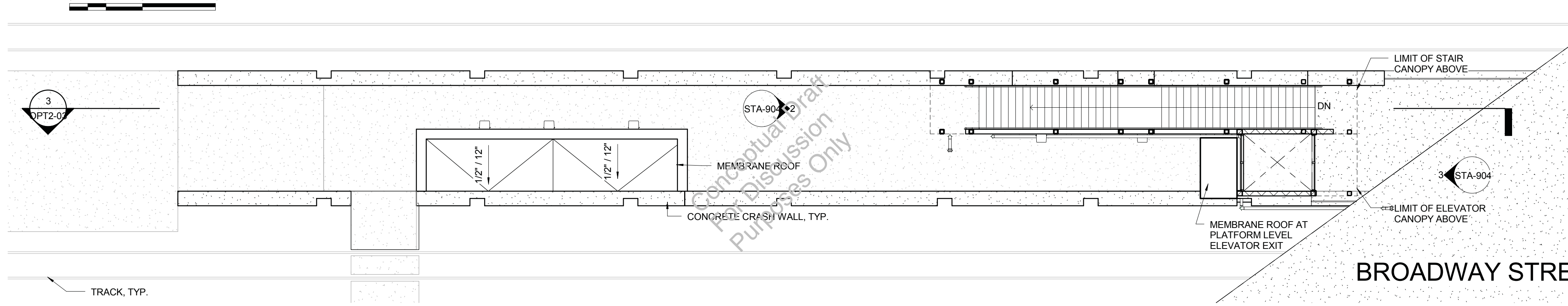


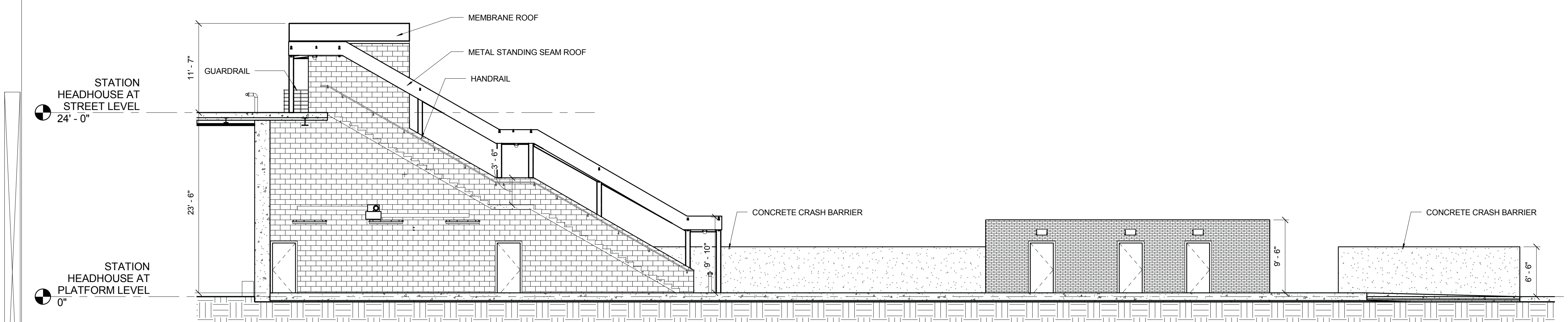
STATION HEADHOUSE AT PLATFORM LEVEL

1" = 10'-0"



STATION HEADHOUSE AT STREET LEVEL

1" = 10'-0"



3 OPT2-03 LONGITUDINAL SECTION

1/8" = 1'-0"

Conceptual Draft For Discussion Purposes Only

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

BALL STATION
PLATFORM, HEADHOUSE PLANS & SECTION - ADDITIVE OPTION 2

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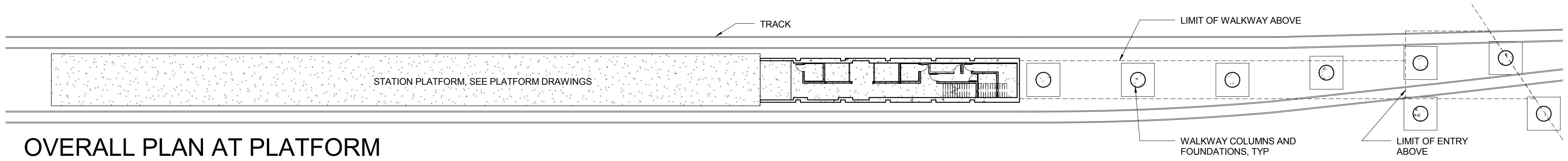
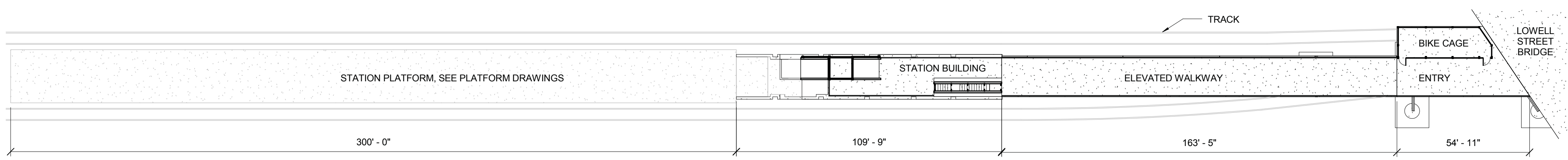


OVERALL PLAN AT PLATFORM LEVEL

1" = 30'-0"

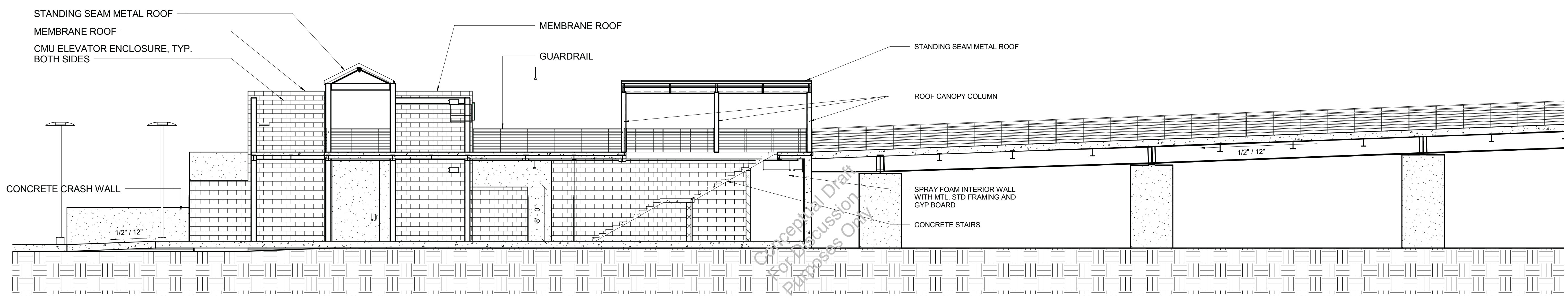
30' 15' 0 30'



OVERALL PLAN AT STREET LEVEL

1" = 30'-0"

30' 15' 0 30'



3 STA-906

LONGITUDINAL SECTION

1/8" = 1'-0"

0 4' 8' 16'

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

MAGOUN STATION
OVERALL, WALKWAY PLANS AND SECTION
- ADDITIVE OPTION 2

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DATE: SEPT. 28, 2017	SP	SP		SHEET: OPT2-05	.

3. INCLUSION OF AN ART PROGRAM

3.A GENERAL APPROACH AND LOCATION-SPECIFIC DESIGNS

The inclusion of an art program on the Green line Extension provides the following benefits to the Project:

- Enhance visual interest
- Improve the user experience
- Integrate with the community
- Offer enjoyment to the neighborhood
- Unify the system
- Differentiate the station

For many years, the MBTA has promoted the inclusion of meaningful artwork into station and system-wide design to foster an approachable and pleasant environment for the commuting public. Many people spend more than a short time commuting to and from work during the week, passing through, or spending time in these facilities. The MBTA recognizes the importance of the experience and the enhancement of travel for this population. In addition, they recognize that for those who live in the communities where these stations are, there should be a commitment to improving and enriching the environs and creating a relationship between the station, artwork, and community.

Artwork Integration

It is understood that the art should be integrated into the stations. In order for it to be integrated, it cannot be an afterthought, and the process of working with an artist should begin as soon as possible. Investigating the opportunities for incorporation should be made throughout the elements of the station and also explored throughout the areas of the passenger experience leading up to the station. Each of the various stations have opportunities for integration of artwork, and while this can be an opportunity to unify the entire system, it also needs to differentiate each place, each station.

Working with the Artist, the MBTA and the Contractor

The MBTA's arts budget is for enhancement of essential station elements such as fences, wall surfaces, and screening panels and includes only the cost differential between the underlying element and the artist-enhancement. The budget allowance is for the designer, artist and builder to design the incorporation of the artwork, coordination, and fabrication of the artwork and the installation. It also includes any necessary lighting, power, drainage, or infrastructure associated with the piece.

Because of the integral nature of the artwork, the artist and the concept need to be selected as early in the process as possible in order to work directly with our team to guide and influence the overall incorporation of artwork into the station design. Because there are seven stations, decisions will need to be made early on as to what might be incorporated as station-unifying features and what might be incorporated as station-specific.

The artwork will need to comply with the safety, accessibility, durability, and maintenance requirements of other elements of the stations. The artwork must be durable, vandal-resistant, and require no additional maintenance as well as conform to the MBTA standards of resilience, indestructibility, and preservation.

There are three phases indicated to be included in the project schedule and described in Figure 3-1.

PHASE 1 ARTWORK FEASIBILITY CONFIRMATION	PHASE 2 FINAL DESIGN AND FABRICATION	PHASE 3 ARTWORK INSTALLATION
Confirm feasibility of artwork	Design and fabrication of artwork	Coordinate the installation of work with the artist
Approval of concepts	Technical submittal of 2-D drawings	Fabricate and install the artwork
Review for technical compliance	Technical submittal of engineering drawings	Coordinate with artist for inspection of work
Review for budgetary compliance	Calculations for structural elements	Punch List of artwork
Submittal of comments to MBTA regarding technical issues and solutions	Specifications for artwork over and above station structures	
Submittal of budget confirmation and indications of cost savings measures	Response to technical reviews at preliminary, intermediate, release for construction submittals, and log of comments and responses	
Work with artist if needed to reduce costs		

Figure 3-1. Project Schedule Phases. *These phases allow time for concept approvals, technical reviews, budget adherence, design, fabrication, and installation.*

Stations

As noted above, possibilities and opportunities present themselves at each station. The RFP lists possible and anticipated elements that may lend themselves to integral or added artwork. All stations in the RFP have listed the possible treatment of fences, screens, porcelain enamel panels, site elements, retaining walls, glazing, lighting, ceilings, tile wall surfaces, or other features. Because many of these features are similar among stations, they might become a way of unifying the stations using artwork. For example, all stations include bike cages, and most of them are of a very large scale. A similar way of treating the elements of the bike cage (color, material, caging) creatively would be one way to include interest, artwork, and a pleasant experience.

Although there are many features that are similar at each station, they each also have character, elements, and layouts that provide diverse opportunities for artwork. The plans and elevations of the stations suggest unique possibilities for each station:

College Station. The pedestrian bridge from College Avenue to Boston Avenue and College Station is an excellent opportunity for integrated artwork. Not only are people passing along the bridge, but the bridge can be viewed from both College Avenue and Boston Avenue. Enhancement of the essential elements of railings, barriers, and landings could include the incorporation of artwork. The bridge's entrance and arrival points could feature interesting elements, as well such as elements cast into paving.

The long expanse of missile barrier type fencing could be rethought of as integrated artwork element. Its entire length is not only viewed by automobiles and pedestrians along Boston Avenue, but also by people waiting on the platform and by passengers within the trains.

Other opportunities exist within or on the outside of the headhouse containing the vertical transportation elements. The stretch of masonry or concrete walls housing the utility rooms, as well as the fencing (missile barrier) on the second level provide occasions for artwork integration. Areas that open up through two levels could experience art from two levels.

Ball Square. Potential at this station exists along the long processional to the platform that could celebrate arrival to and departure from the station. Either or both sides of the sloped pathway to the platform would allow introduction of artwork along the way or along the right of way fence. Artwork in this area would not only enhance the user experience but should be developed to be seen from Broadway, as well as the entry point on Boston Avenue, thus enlivening what would otherwise remain a graveled expanse.

The back wall of the traction power substation prominently presents itself to the station platform as the right-of-way fence. This wall would be a fine canvas for many different types of art, which could be directly incorporated into the building material, not just applied to the building.

This is similar to the Wellington Carhouse Project that GLX Constructors' Lead Designer, STV, recently completed design on. The Carhouse, another utilitarian building, is immediately adjacent to the Wellington subway platform. The use of colorful metal panels and textured precast concrete panels gives a nod to the local river in their design, and presents an interesting face to the users of the station.

Magoun Square. Magoun Square presents opportunities for both the exterior and interior of the station. Because there is a stairway and an elevator headhouse that passes pedestrians from the upper level to the platform level below, there are interior opportunities to include artwork on the platform level wall and ceiling surfaces. The exterior of these walls, which house utility rooms, can be seen from the train and from nearby developments and the surfaces could be treated with interest to acknowledge this.

This is similar to the Wellington Carhouse Project that GLX Constructors' Lead Designer, STV, recently completed design on. The Carhouse, another utilitarian building, is immediately adjacent to the Wellington subway platform. The use of colorful metal panels and textured precast concrete panels gives a nod to the local river in their design, and presents an interesting face to the users of the station.

Gilman Station Bike Storage Facility. The large cage area on the storage facility would be an appropriate area to incorporate the proposed artwork.

The open stairway is roofed but screening materials on these open sides can be both functional (wind screens or fall barriers), beautiful, or interesting, lending themselves to art that can be transparent or open.

Gilman Square. The entry points from both School Street and Medford Street to the headhouse area of Gilman Square is both large and unobstructed enough to allow incorporation of artwork along the community path. Similar to some of the other stations the very large bike cage will also invite concepts incorporating interesting features.

The masonry walls of the lower level of the headhouse also lend themselves to treatments that would provide interest and enrichment, similarly to the Magoun Square Station.

East Somerville. The leg of the Community Path that someone will traverse on the way to this station will provide an excellent opportunity for artwork incorporation. This artwork might lend itself to integration with wayfinding, benches, fencing, plantings, or lighting to be experienced on the way to and from the platform.

Union Square Station. Union Square Station has two points of entry/departure for pedestrians and those arriving by vehicle. At-grade fencing and walls separating track areas from arriving pedestrians are opportunities for incorporation of artwork. The street connection from Union Square, while currently outside the limit of work, would also be an opportunity for incorporating artwork while offering enjoyment to the neighborhood.

Lechmere Station's two opposing headhouses will be seen from new neighboring condominium developments as well as the existing neighborhood of East Cambridge. The design should incorporate features of visual interest to both these neighboring uses. The retaining wall at the Glass Factory parking area is also viewable from both sides (condos and East Cambridge/station) and presents an excellent opportunity for artwork. Similar to the other stations with headhouses, any necessary walls and ceilings naturally lend themselves to decoration; as well the guardrails and handrails which provide opportunities to incorporate artwork that may be designed to be experienced from both levels. Uniquely, at Lechmere Station the opportunity exists to treat the soffit of the viaduct, starting perhaps with color and lighting.

Changes from the Technical Proposal

The proposed Art Program does not require any deviation from the requirements of the Technical Proposal.

3.B SCHEDULE IMPACT ASSESSMENT

GLX Constructors' efforts to support this additive option will not impact the proposed schedule.

4. DESIGN AND CONSTRUCTION OF THE COMMUNITY PATH CONNECTION TO CHESTER STREET

4.A GENERAL APPROACH AND LOCATION-SPECIFIC DESIGNS

The Chester Street Path will provide an important addition point of entry and departure for the users of the Community Path, cementing it as more than just a connection between MBTA Green Line stations, and truly as a multiuse path. From careful review of the grades, GLX Constructors prepared an ADA compliant slope from the Community Path alignment (included in the RFP) adjacent to the GLX Eastbound light rail track to the Northern corner of Chester Avenue and Cross Street. The total ramp length is approximately 330'. The ramp will be supported by a combination of solider pile and lagging walls and modular pre-cast block walls, both of which are being employed widely throughout the project. From our site visits, we noted that the Cross Street Truss Bridge has recently been reconstructed. The recent bridge work creates a number of challenges, including the need to avoid the corrugated metal bridge joint plate and concrete truss barrier. Our design will include an extended sidewalk along Chester Avenue providing additional space for passengers entering or exiting the path. This extended landing area may require relocation of the existing street light at the north corner.

This additive option compliments GLX Constructors approved ATC 36 to elevate the Community Path between School Street and Walnut Street. These combined efforts create an additional three locations for the surrounding community to access the Community Path, significantly increasing its use. These locations include access to Medford Street, Walnut Street, and Chester Avenue. This additive option also increases connections opportunities to the Somerville High School and the Somerville Public Library.

Changes from the Technical Proposal

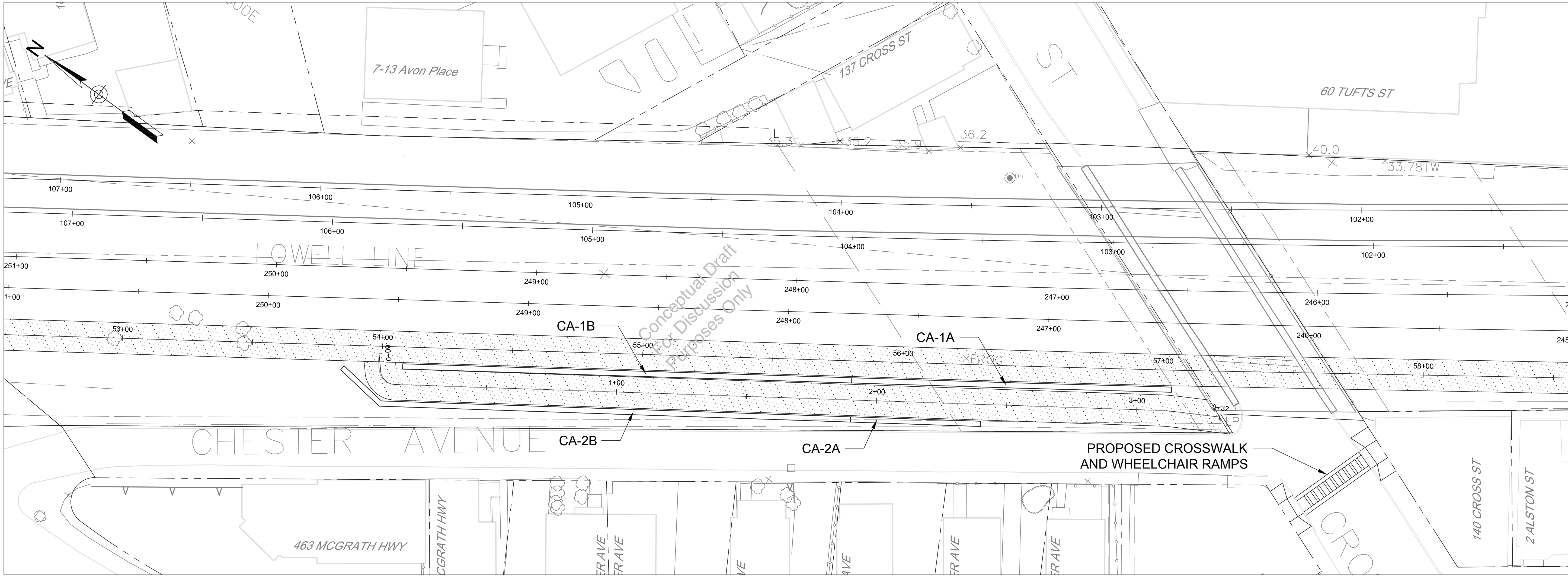
The proposed Chester Avenue Path does not require any deviation from the requirements of the Technical Proposal.

4.B SCHEDULE IMPACT ASSESSMENT

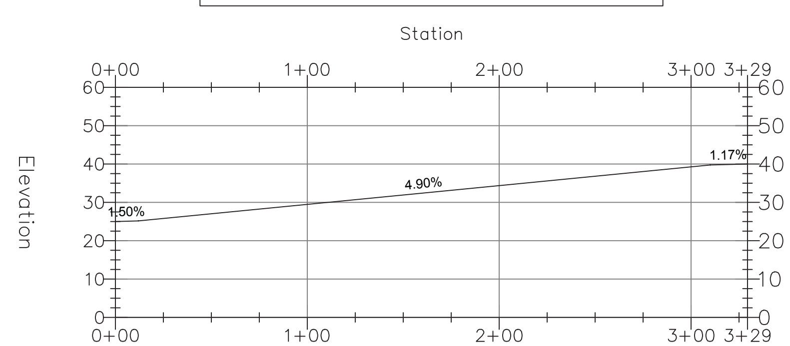
GLX Constructors' efforts to support this additive option will not impact the proposed schedule.

4.C COMMUNITY PATH CONNECTION TO CHESTER STREET DRAWINGS

ITP Request	RFP	
	Drawing Number	Drawing Title
C2.0	OPT 4-01	Chester Avenue Connection Community Path Plan and Profile – Additive Option 4
C2.0	OPT 4-02	Chester Avenue Connection Typical Sections – Additive Option 4
C2.0	OPT 4-03	Chester Avenue Connection Retaining Wall Table – Additive Option 4



Chester Ave Community Path Profile



PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

CHESTER AVENUE CONNECTION
COMMUNITY PATH PLAN AND PROFILE
ADDITIVE OPTION # 4

STV 100 Years

massDOT Massachusetts Department of Transportation

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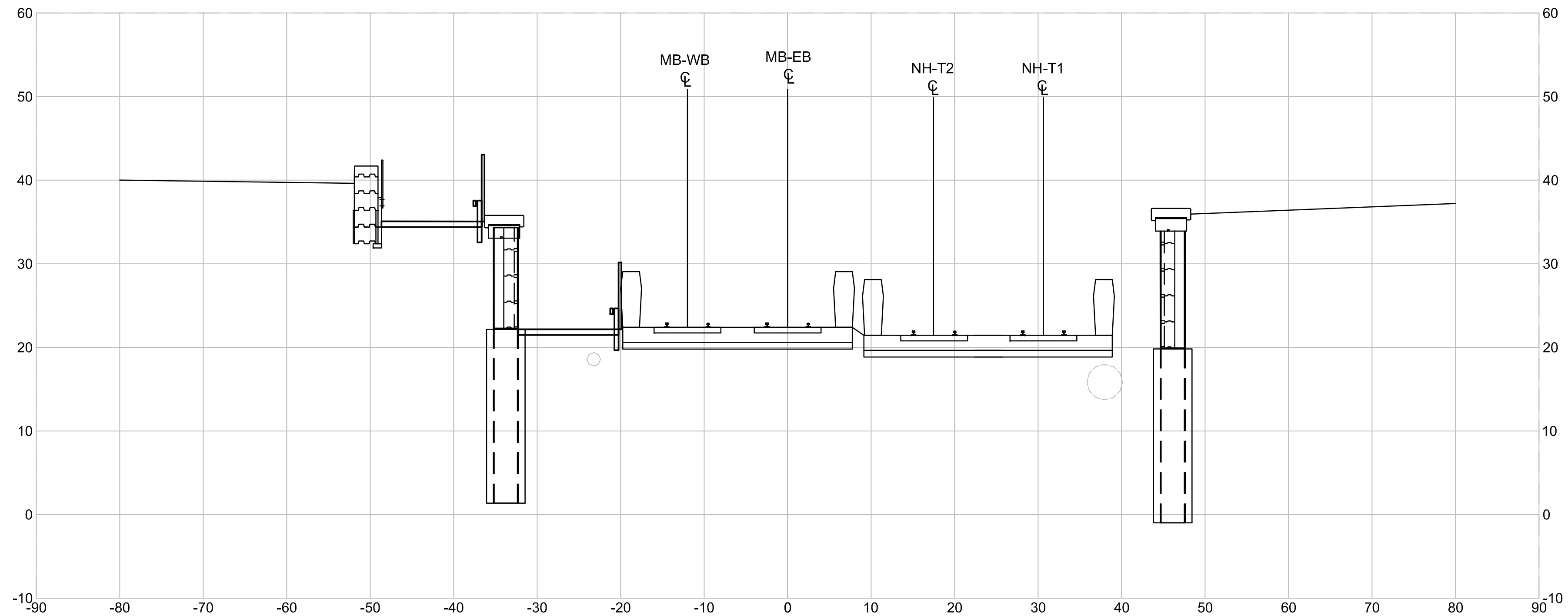

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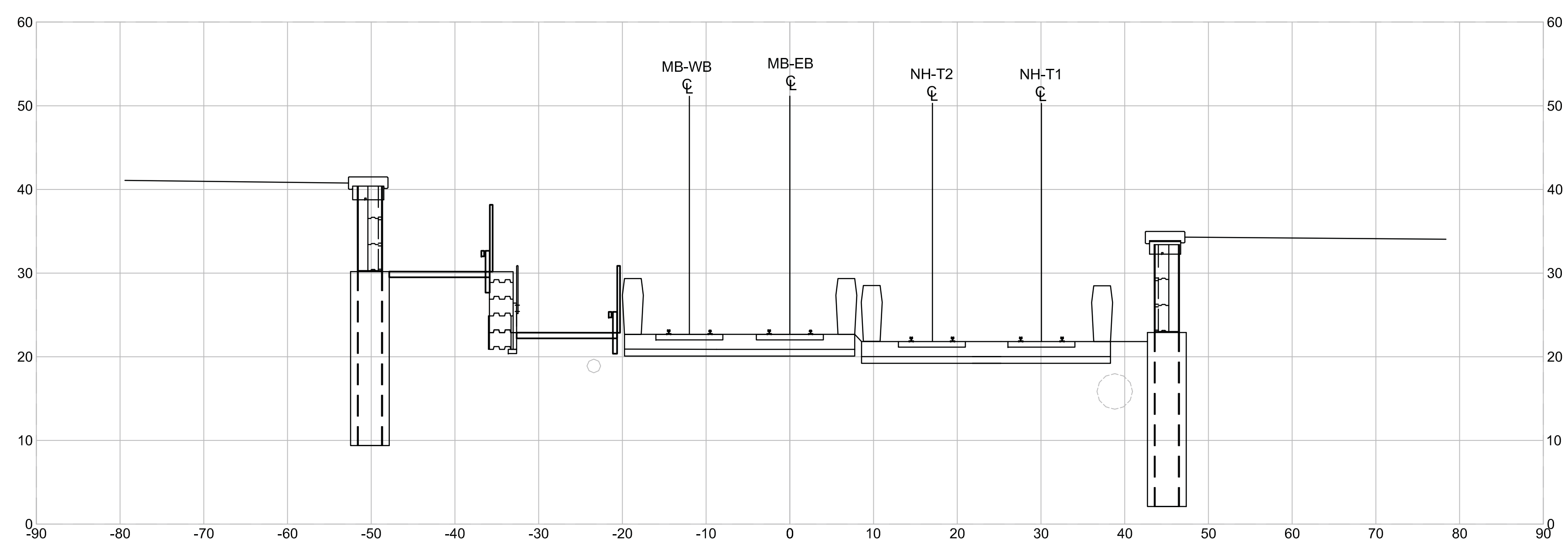

Typical Section 2

1"=10'

10' 5' 0 10'

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GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

CHESTER AVENUE CONNECTION
TYPICAL SECTIONS
ADDITIVE OPTION # 4

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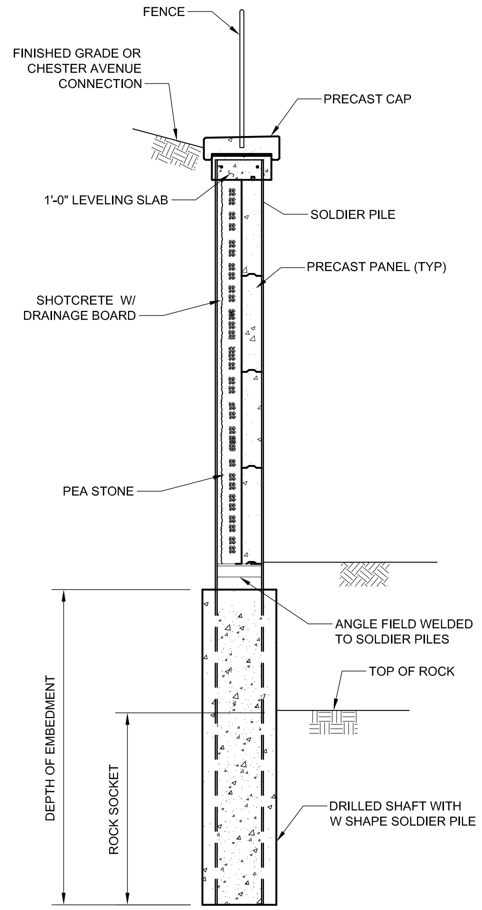
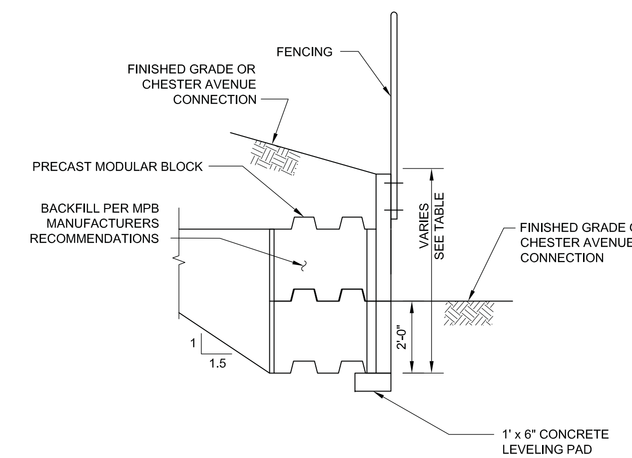


TYPICAL SOLDIER PILE AND LAGGING (SPL) WALL

1/4"=1'-0" 0 2' 4' 8'



MODULAR PRECAST BLOCK WALL SECTION

3/8"=1'-0" 0 2' 4' 6'

SOLDIER PILE AND LAGGING WALL

WALL	STATION		OFFSET (FT) FROM ME-EB	OFFSET (FT) WALL FACE-TEMP EASE	OFFSET (FT) WALL FACE-PERM EASE	PILE SIZE	PILE SPACING (FT)	SHAFT DIAMETER (FT)	EXPOSED FACE (FT)	PILE LENGTH (FT)	SOIL EMBEDMENT (FT)	ROCK SOCKET (FT)
	START	END										
CA-1A	246+50	247+50	35-37	17-20	17-20	W24x229	8	3	19	46	20	7
	247+50	247+75	35	21	21	W24x117	8	3	14	37	20	3
CA-2B	247+75	249+50	48-50	9-12	9-12	W24x229	8	3	16	45	22	7

SEE SHEET S-001 FOR SOLDIER PILE AND LAGGING WALL DETAILS.

MODULAR PRECAST BLOCK WALL

WALL	STATION		OFFSET (FT) FROM ME-EB	TOTAL HEIGHT (FT)
	START	END		
CA-1B	247+75	248+25	32	12
	248+25	249+25	32	10
CA-2A	247+25	247+75	48	8

SEE SHEET S-003 FOR MODULAR PRECAST WALL DETAILS.

NOTE:
CRIB WALL REPLACEMENT LIMIT FOR MCW-1 IS FROM STA. 249+50 TO STA. 251+36.
REFERENCE CRIB WALL REPLACEMENT WITH MPB SHEET S-003 FOR DETAILS.

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CHESTER AVENUE CONNECTION
RETAINING WALL TABLE
ADDITIVE OPTION 4

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5 DESIGN AND CONSTRUCTION OF THE COMMUNITY PATH CONNECTION FROM EAST SOMERVILLE TO LECHMERE

5.A GENERAL APPROACH AND LOCATION-SPECIFIC DESIGNS

Design

Horizontal and vertical alignments of the Community Path from East Somerville Station to the existing Lechmere path segment are already constructed.

The original Community Path in this area was on a 2,200-foot-long viaduct structure that ran along the east side of the Medford Branch viaduct. Both viaducts were approximately at the same elevation and profile grade, and even shared some of the piers. It appears the Community Path was deleted from the Definition Plans due to the expense of this very long viaduct with shared piers.

Additive Option 5 requested an alternative alignment for the path from East Somerville Station to the existing Lechmere Path. GLX Constructors reviewed many concepts, and was able to develop an alignment that is a more cost efficient one than the original, while still being able to thread through the constricted corridor. The proposed path is entirely contained within the Project ROW, except for the South end that is within the Project's permanent easement. The path is partly on a viaduct structure, but is only 1,175 feet in length, approximately 1,000 feet shorter in length than the original path.

GLX Constructors' alignment starts at ground level at the existing Lechmere Path on the narrow permanent easement granted by the developer of this area. This narrow easement is the main driver of the horizontal alignment. The height of the elevated Union Square West Bound track is the main driver of the vertical alignment.

The horizontal alignment goes under the elevated US-EB; avoids the Red Bridge Traction Power Station; goes under the elevated Medford Branch; goes over the pond and retaining wall built in an advanced contract; goes over the Fitchburg line, the elevated US-WB, and the at-grade US-EB; avoids the Brick Bottom pump station; then goes north to meet the project's community path at the East Somerville Station.

The vertical alignment starts at-grade at the existing Lechmere Community Path, then goes up at an almost 5 percent grade to crest over the elevated Union Square Eastbound track. The path's profile then goes down to grade as the path travels to the path at the East Somerville Station.

The proposed path's horizontal and vertical alignments meet the requirements of the project Technical Provisions, including clearances, maximum grade, minimum curve radius, and minimum width.

Sections of the Community Path that cross the various project elements will be constructed on an elevated viaduct. The viaduct will be a ten span structure with spans varying from approximately 65 to 145 feet. The longest span, also the tallest span crosses the Fitchburg Line Tracks. For this span, we have chosen to utilize a prefabricated truss structure supported by drilled shafts and concrete pier caps. This structure type was selected to minimize disruptions to the active tracks below. The completed span can be constructed offsite and will then be lifted onto the piers, requiring only a single short duration track outage.

The deck will then be cast. Bridge rail and anti-missile fence erection will follow. As much of this work is outside of any foul areas, this work will require minimal impact to train operations and the addition of this option will have no impact on the overall project schedule.

Chester Street Paths Connection Drawings

As the approach spans descend from the main span highpoint, the path will transition and be supported between two MSE walls. The walls will begin when the path is approximately 12 feet above grade and end when it transitions to the at-grade paths connecting to the new East Somerville Station and existing Lechmere Path. MSE supported portions of the community path are shown on Figure 5-1.

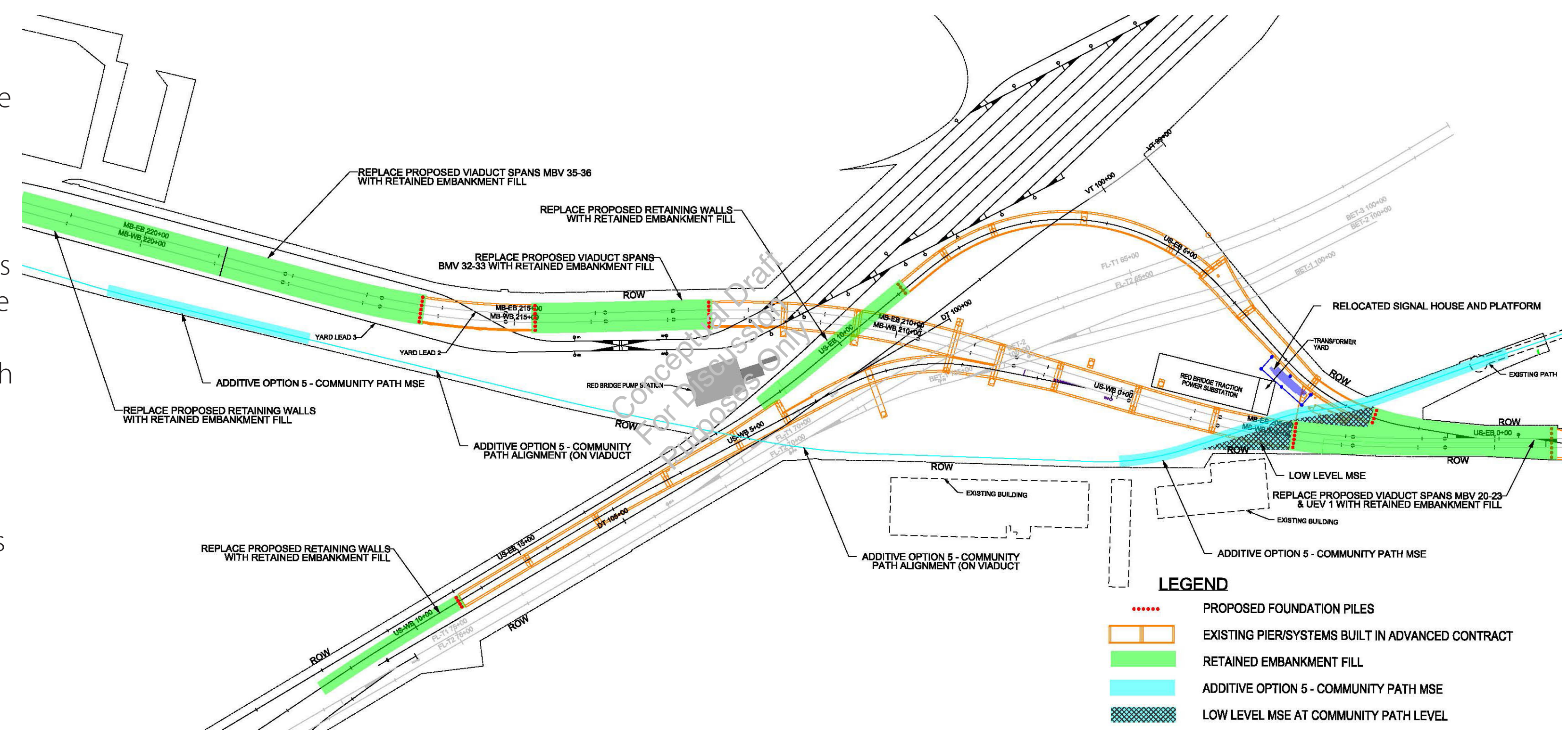


Figure 5-1. Location of MSE supported Community Path. *MSE supported Community Path guideway approved as part of ATC 35 reduces risk associated with construction of deep foundation elements and reduces long-term maintenance costs.*

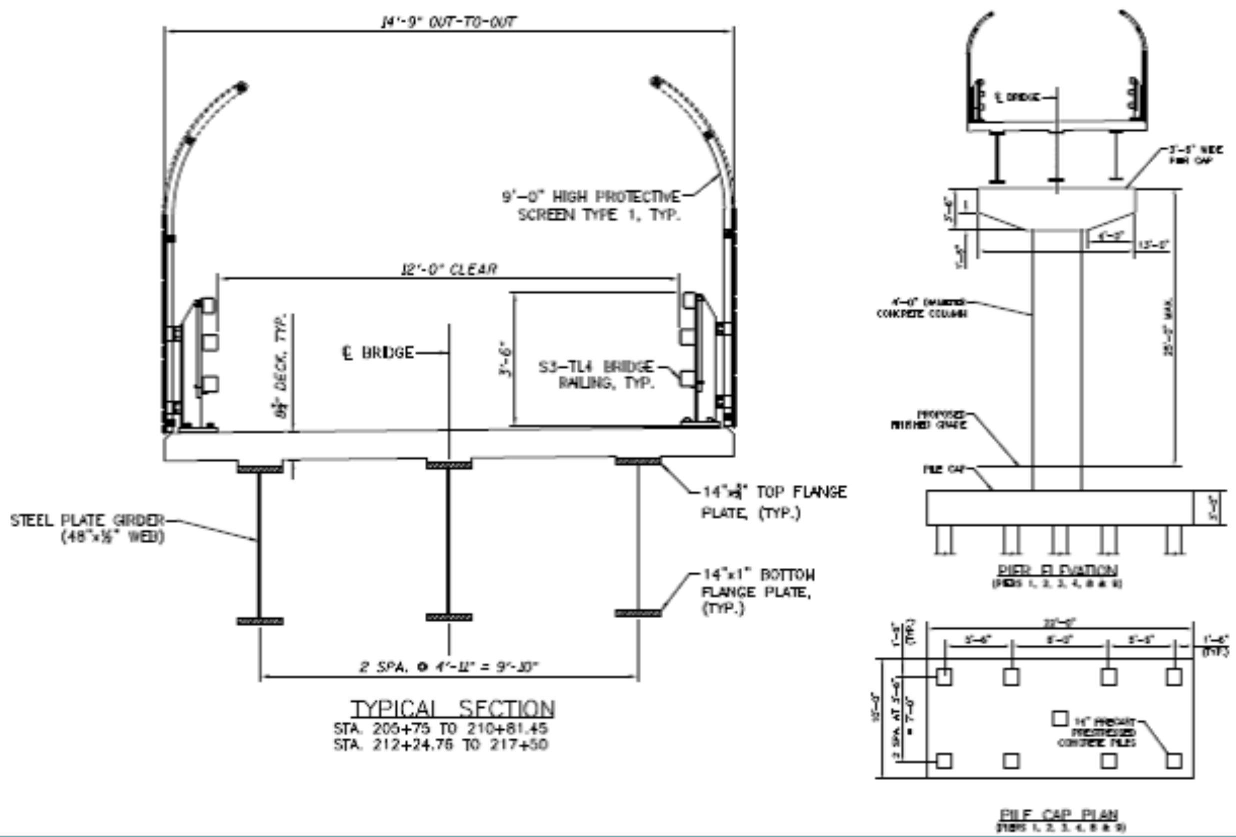


Figure 5-2. Community Path, Approach Span Superstructure Details. *The drawing above is a typical cross section of the prefabricated approach span for the community path, and a section and plan of the pier foundation that will support the approach span.*

The path will then transition from MSE walls to an at-grade segment constructed of bituminous concrete. As with all sections raised and at-grade, the Community path will be graded to provide positive drainage and will include a closed drainage system. The path will be designed to meet ADA requirements and include lighting to meet the required design criteria.

This mixed-use Community Path connection from East Somerville to Lechmere will serve walkers, bikers, and small maintenance vehicles. It will be an elevated structure less than a half-mile in length, with 1,370 feet on a MSE wall and the remaining 1,050 feet on a viaduct structure. This particular Community Path will cross over the Fitchburg Commuter Line, the Valley Line, the US-EB, the US-WB, and YL-4 between MB-EB Sta 210+00 and MB-EB Sta 212+25.

Specifically, the Community Path will cross beneath the Medford Viaduct between MB-EB Sta 203+50 and MB-EB Sta 205+50. It will be elevated on the MSE wall and will continue to MB-EB Sta 206+43.17, at which point it will transition to viaduct. The Community Path will continue on viaduct to MB-EB Sta 216+92.85. From here, it will return to MSE Wall to its touchdown point at MB-EB Sta 223+62.85. Because of the complexity of the Community Path's location, our constructability reviews hold an elevated importance to minimize any potential down time to rail services.

Construction

We understand the far-reaching impact to the MBTA and the surrounding community of closing an active railroad – even if only briefly during the non-peak hours of 10:30 am and 3:30 pm. In response, we will prefabricate the truss which will minimize the amount of time we must close the track.

On the Community Path Connection from East Somerville to Lechmere, we will begin construction at the North Point Path terminus and proceed northward. The MSE wall will be built from MB-EB Sta 200+00 to MB-EB Sta 206+43. Concurrently, we will proceed with construction on Piers 1-4.

After completing the MSE wall from MB-EB Sta 200+00 to MB-EB Sta 206+43, we will construct an MSE wall from MB-EB Sta 223+63 to MB-EB Sta 217+00. We will complete Piers 5-8 concurrently with the MSE wall construction.

After Abutment 1 and Piers 1-4 are complete, steel girder erection can proceed for Span 1-4, and we will begin to construct Piers 5-8. Likewise, when we complete Abutment 2 and Piers 5-8, we will proceed with the steel girder erection for Span 6-9.

In the case of Span 5, we will design, fabricate, assemble, and erect the span as a truss in lieu of bridge girder spans. By taking this approach, we can set Span 5 in one pick instead of many picks, resulting in significantly less interference with railroad operations. We have determined that the ideal time to erect the Span 5 truss would be between 7:30 p.m. and 5:30 a.m., during which commuter operations are at their least for the day.

Our construction team is well-versed in accelerating construction to avoid rail closures. On the Utah I-15 CORE Highway Design Build Project, GLX Constructors' Team Members used Accelerated Bridge Construction (ABC) to expedite the schedule. Under this ABC method, four bridges were constructed on the side of I-15. With the use of a remote-controlled, self-propelled modular transporter, the bridges were swiftly moved into place overnight, allowing for only a single-night full freeway closure—without affecting the safety or travel times of motorists using the interstate.

Changes from the Technical Proposal

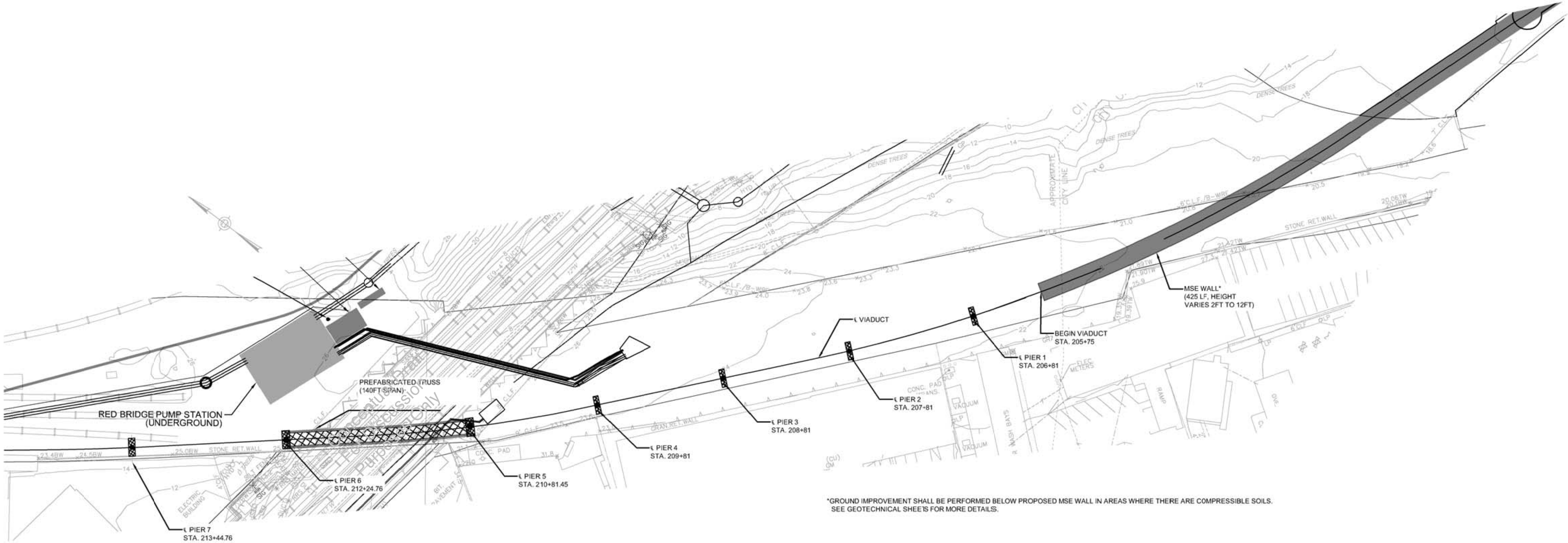
The proposed Community Path Connection does not require any deviation from the requirements of the Technical Proposal.

5.B SCHEDULE IMPACT ASSESSMENT

The GLX Constructors' planned effort to support this additive option will not impact the proposed schedule.

5.C COMMUNITY PATH CONNECTION FROM EAST SOMERVILLE TO LECHMERE DRAWINGS

ITP Request	RFP	
	Drawing Number	Drawing Title
C2.0	OPT 5 – 01	Community Path Viaduct General Plan – Additive Option 5
C2.0	OPT 5 – 02	Community Path Viaduct Typical Sections – Additive Option 5
C2.0	OPT 5 – 03	Community Path Viaduct Pier Details – Additive Option 5
C2.0	OPT 5 – 04	ATC 35-MSE Plan View – Additive Option 5
C2.0	OPT 5 – 05	Community Path Plan and Profile – Additive Option 5
C2.0	OPT 5 – 06	Community Path Plan and Profile – Additive Option 5
C2.0	OPT 5 – 07	Community Path Plan and Profile – Additive Option 5



PLAN

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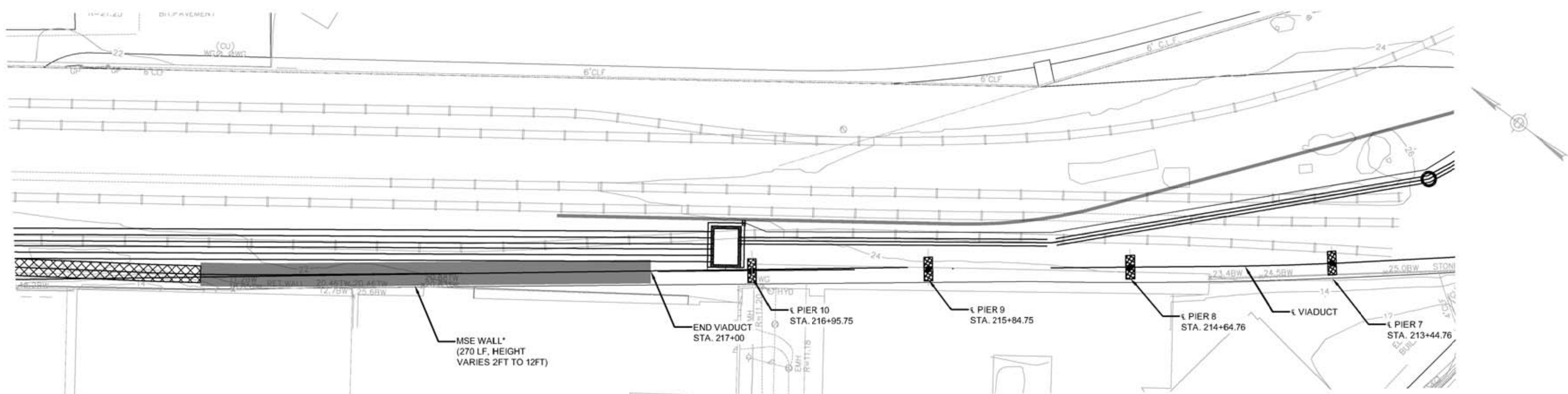

PLAN

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*GROUND IMPROVEMENT SHALL BE PERFORMED BELOW PROPOSED MSE WALL IN AREAS WHERE THERE ARE COMPRESSIBLE SOILS.
SEE GEOTECHNICAL SHEETS FOR MORE DETAILS.

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COMMUNITY PATH VIADUCT
GENERAL PLAN
ADDITIVE OPTION 5

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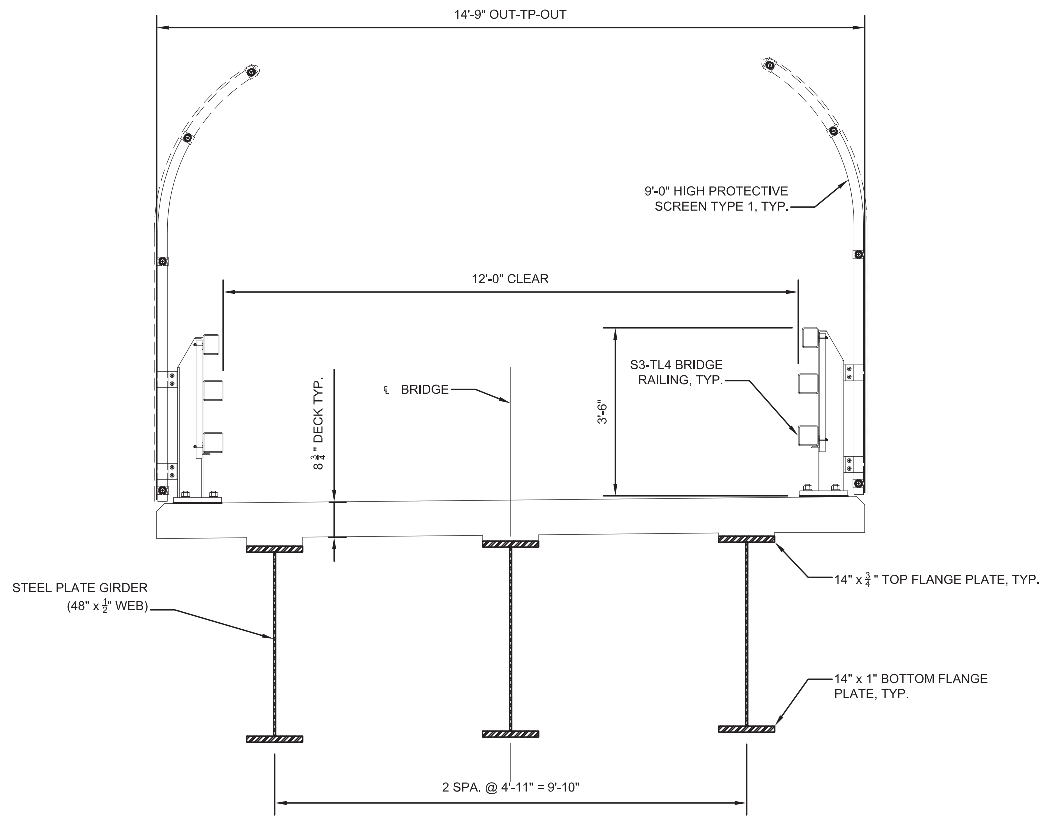

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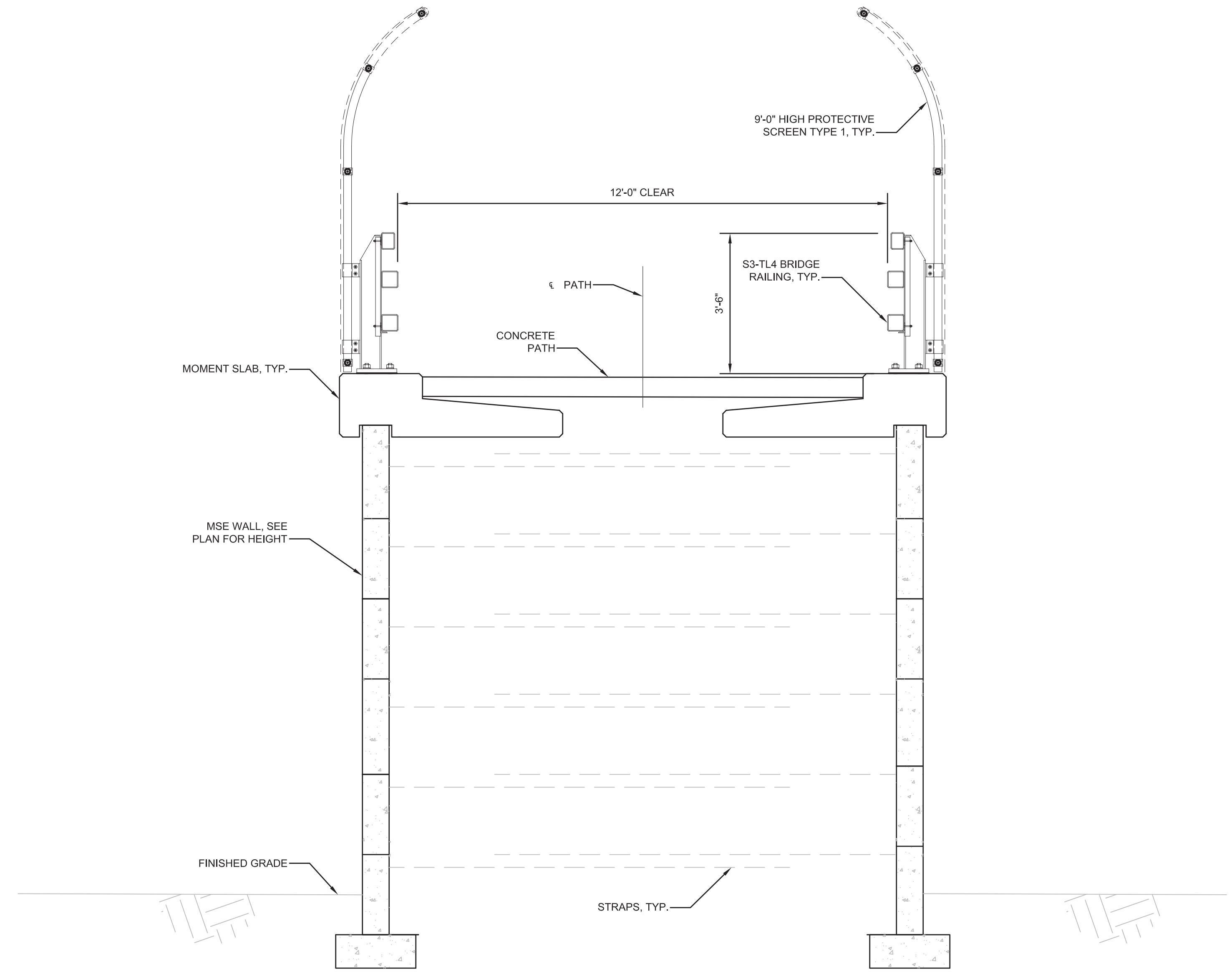

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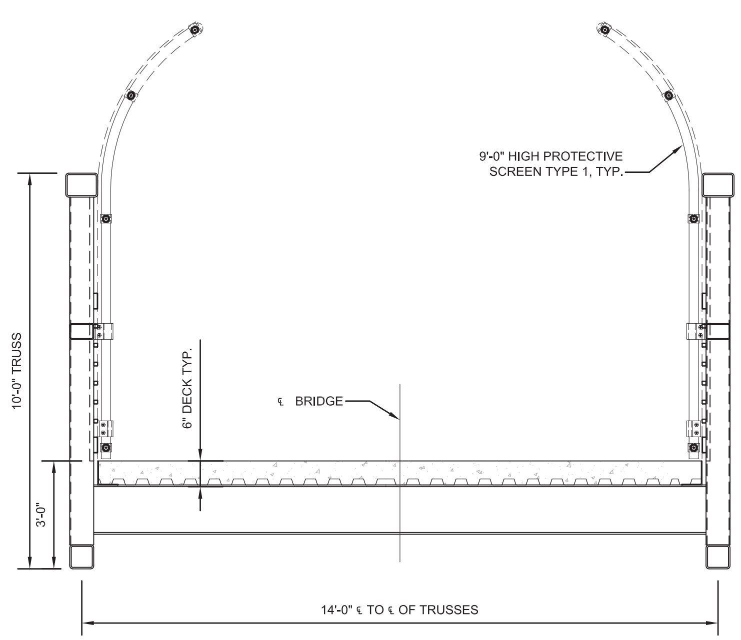

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COMMUNITY PATH VIADUCT
TYPICAL SECTION
ADDITIVE OPTION 5

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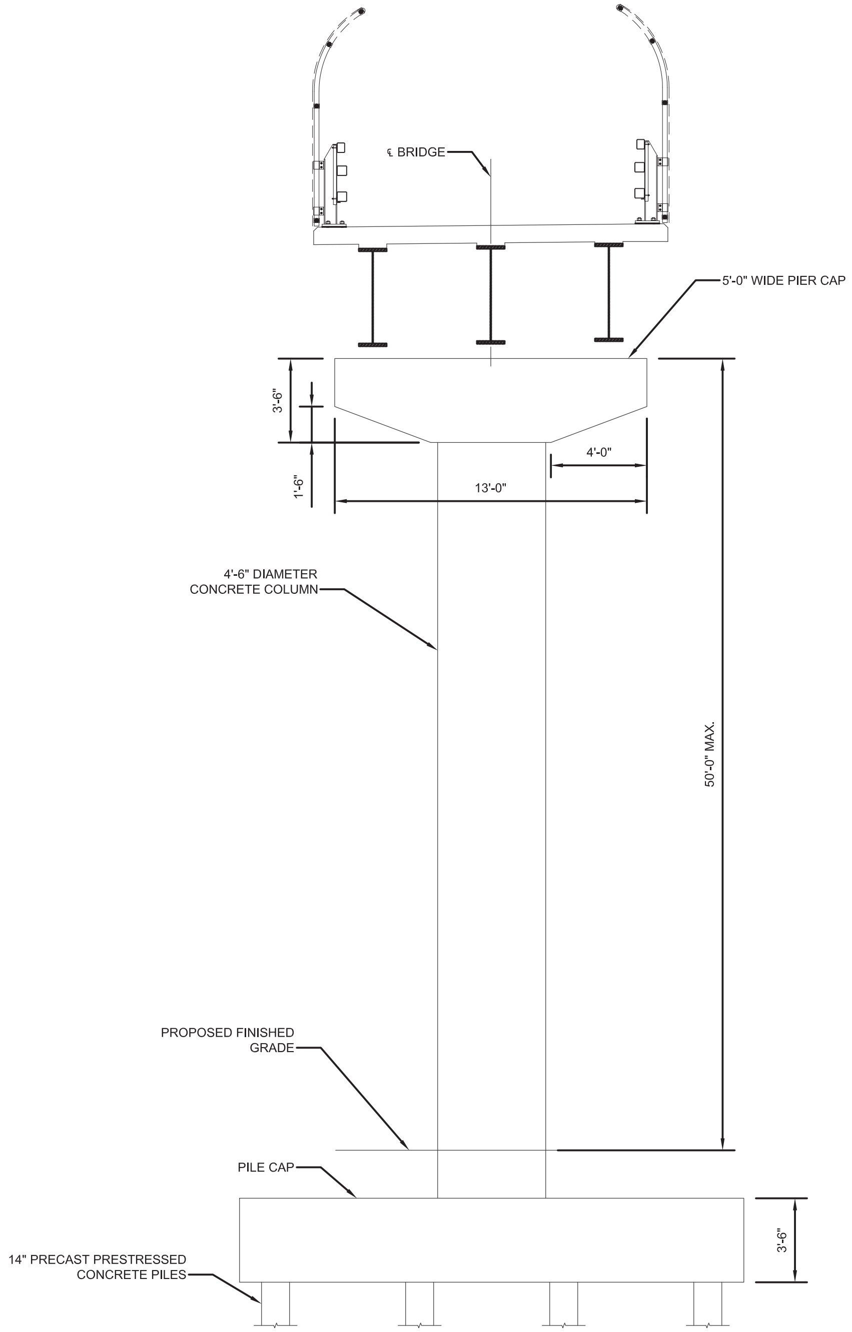

PIER TYPE 1 ELEVATION

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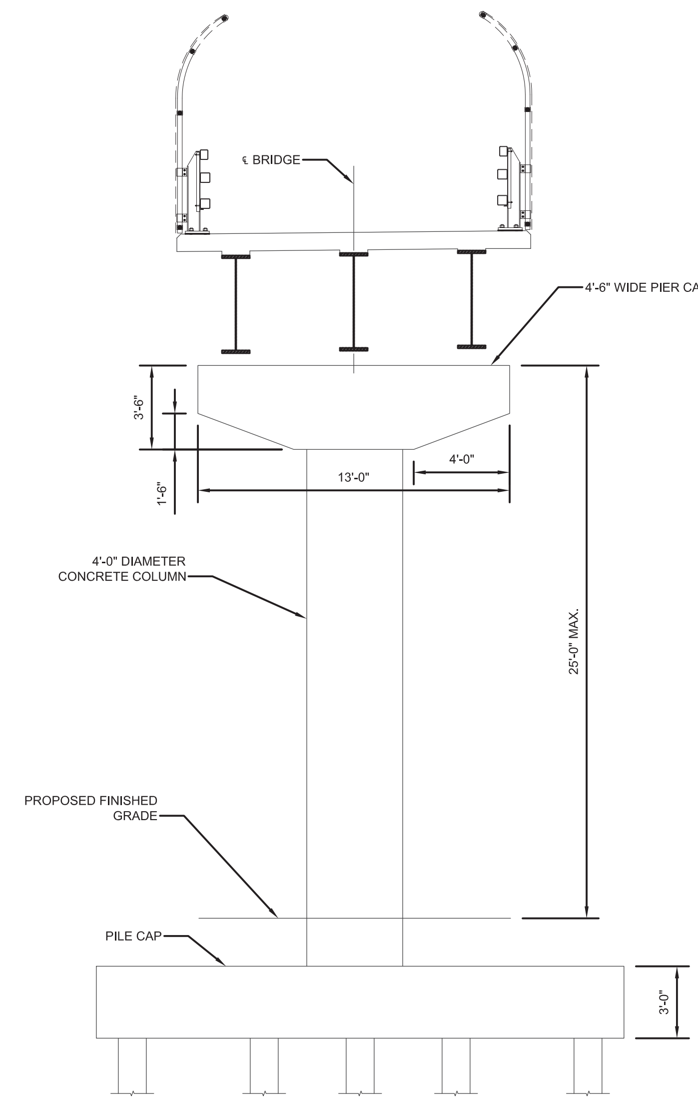

PIER TYPE 2 ELEVATION

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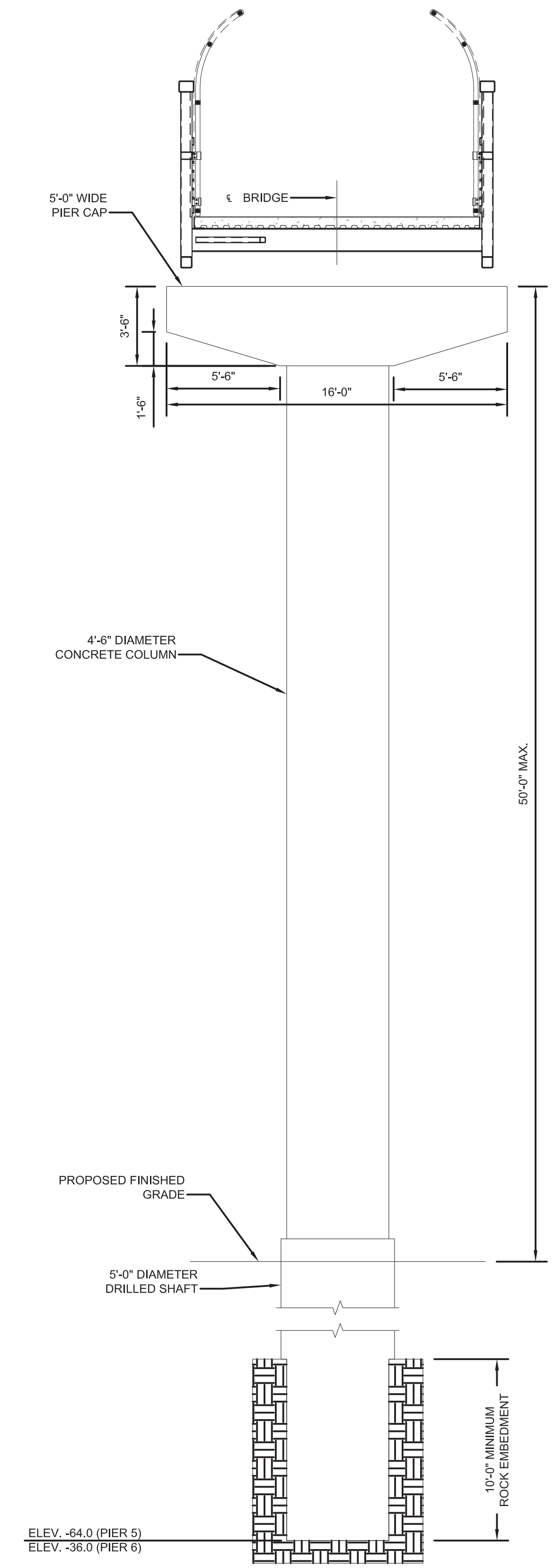
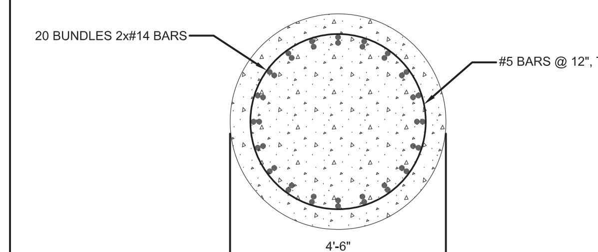


PIER TYPE 3 ELEVATION

NOT TO SCALE (PIERS 5 & 6)

FOUNDATION	GROUND ELEVATION	PILE TIP ELEVATION	PILE LENGTH
EAST ABUTMENT*	28	-40	66
PIER 1	23	-40	60
PIER 2	23	-40	60
PIER 3	24	-40	61
PIER 4	24	-40	61
PIER 7	16	-40	53
PIER 8	16	-40	53
PIER 9	19	-40	56
PIER 10	23	-40	60
WEST ABUTMENT*	29	-40	67

* ASSUME 5 PILES ARE REQUIRED AT EACH ABUTMENT



TYPICAL COLUMN SECTION PIER TYPE 1 AND 3

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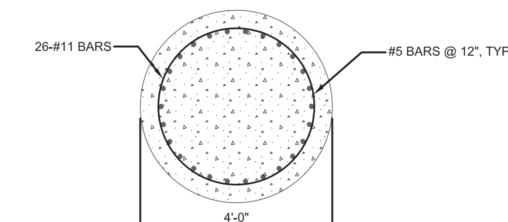

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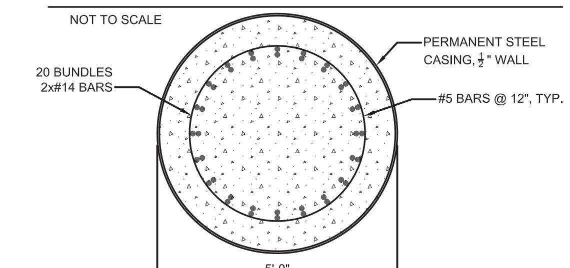

DRILLED SHAFT SECTION PIER TYPE 3

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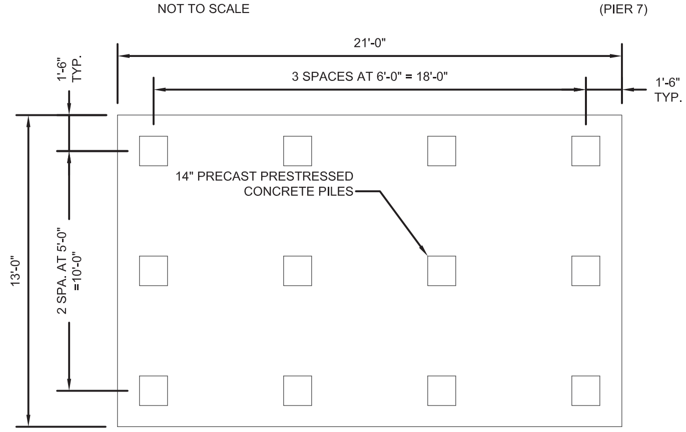

PILE CAP PLAN

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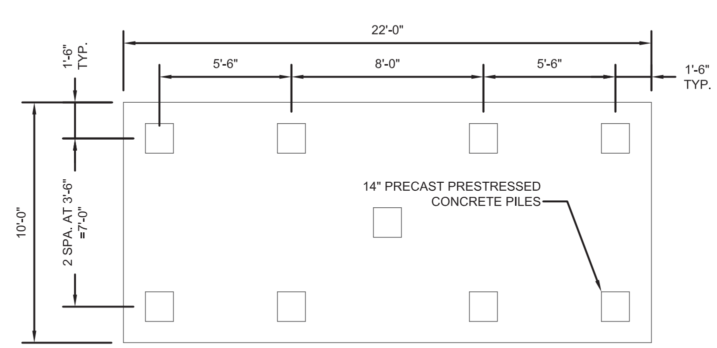

PILE CAP PLAN

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COMMUNITY PATH VIADUCT
PIER DETAILS
ADDITIVE OPTION 5

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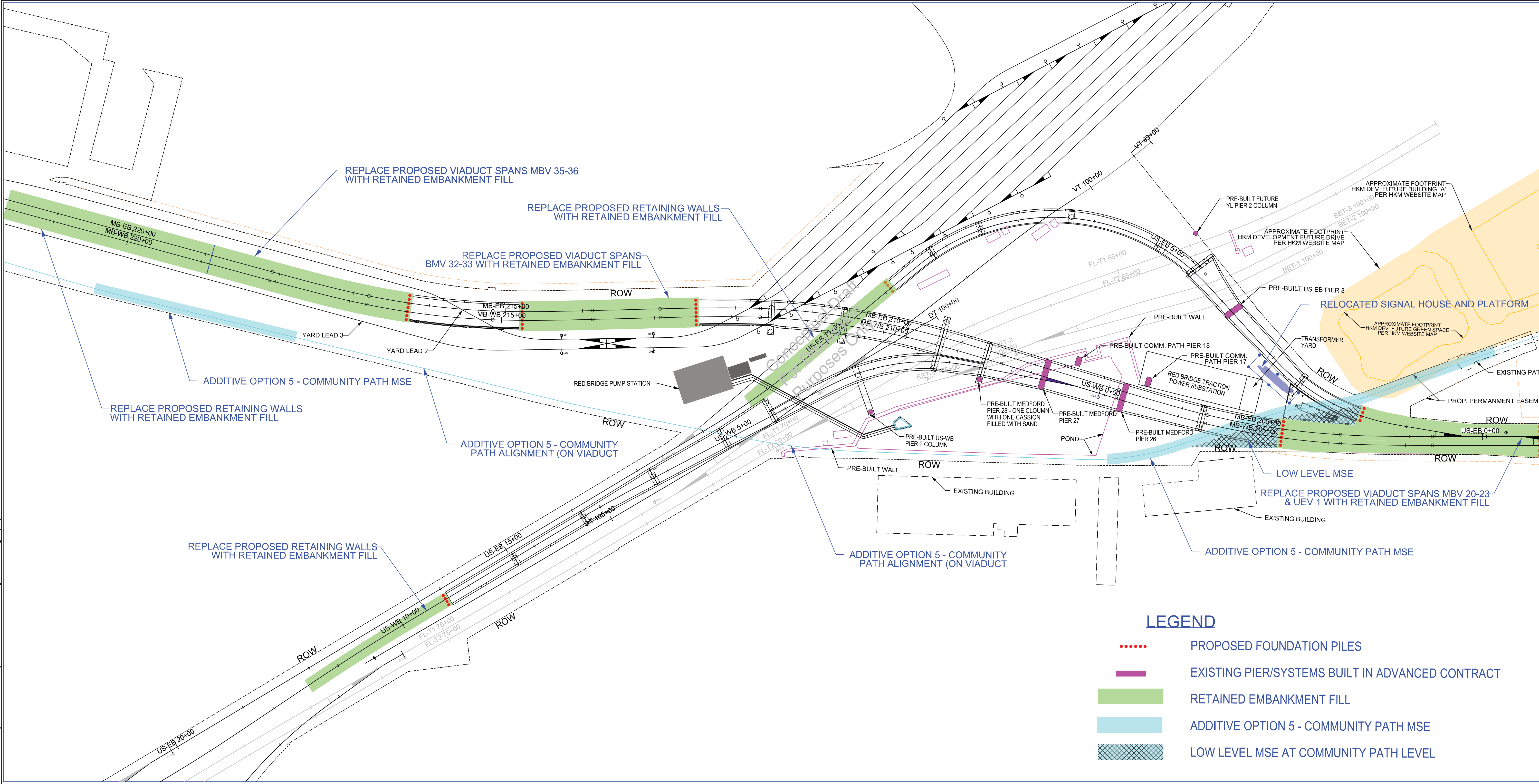

PLAN

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MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

ATC 35 - MSE
PLAN VIEW
ADDITIVE OPTION 5

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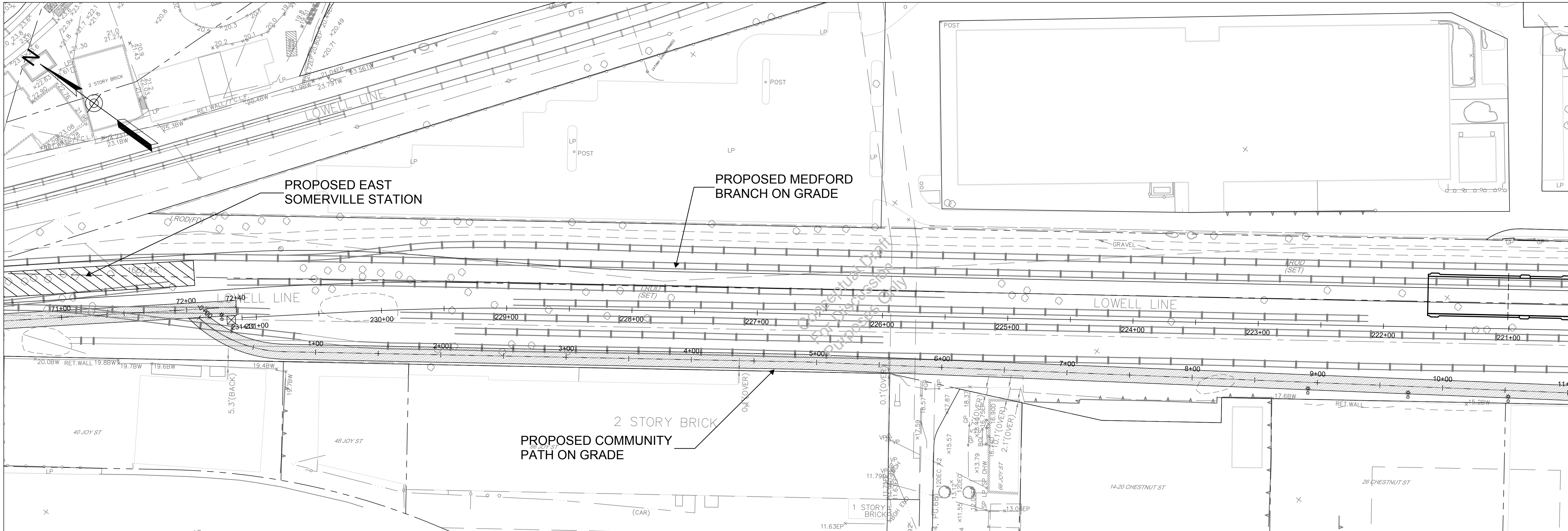

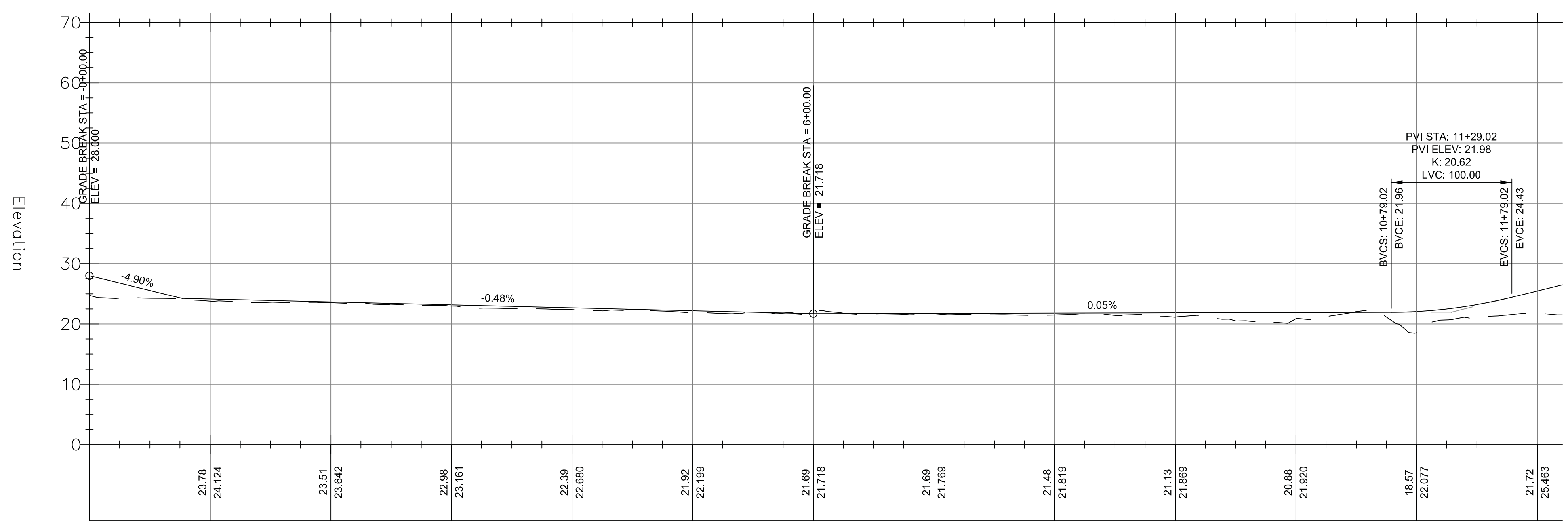

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COMMUNITY PATH PLAN AND PROFILE ADDITIVE OPTION # 5

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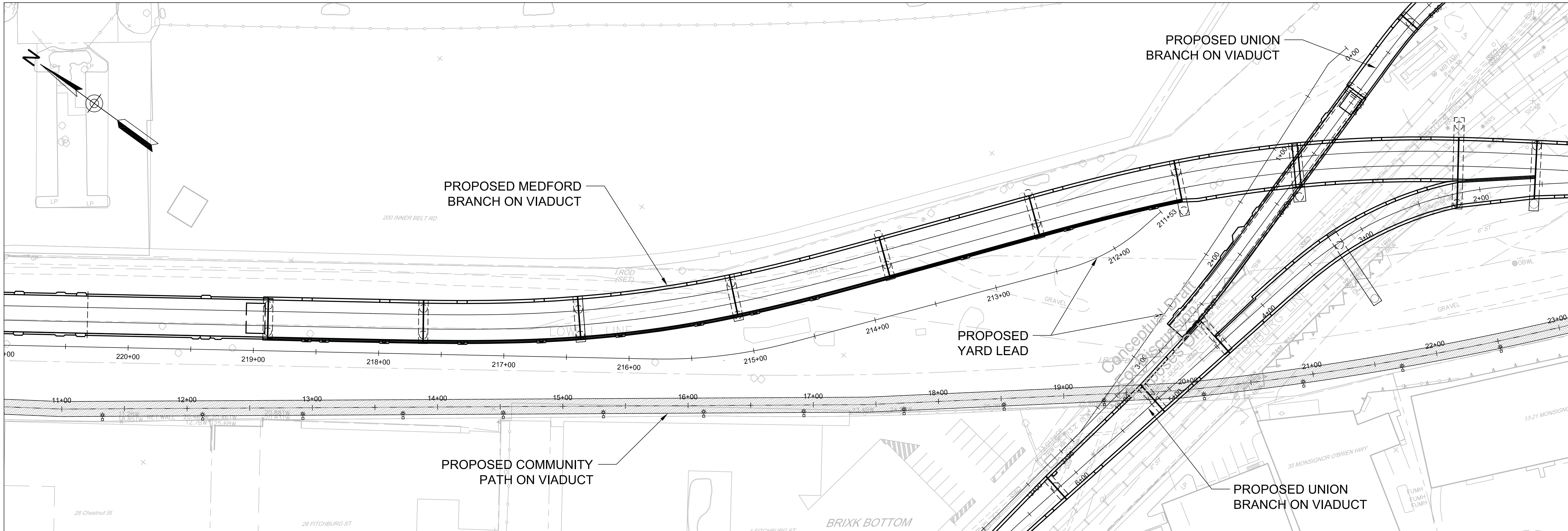

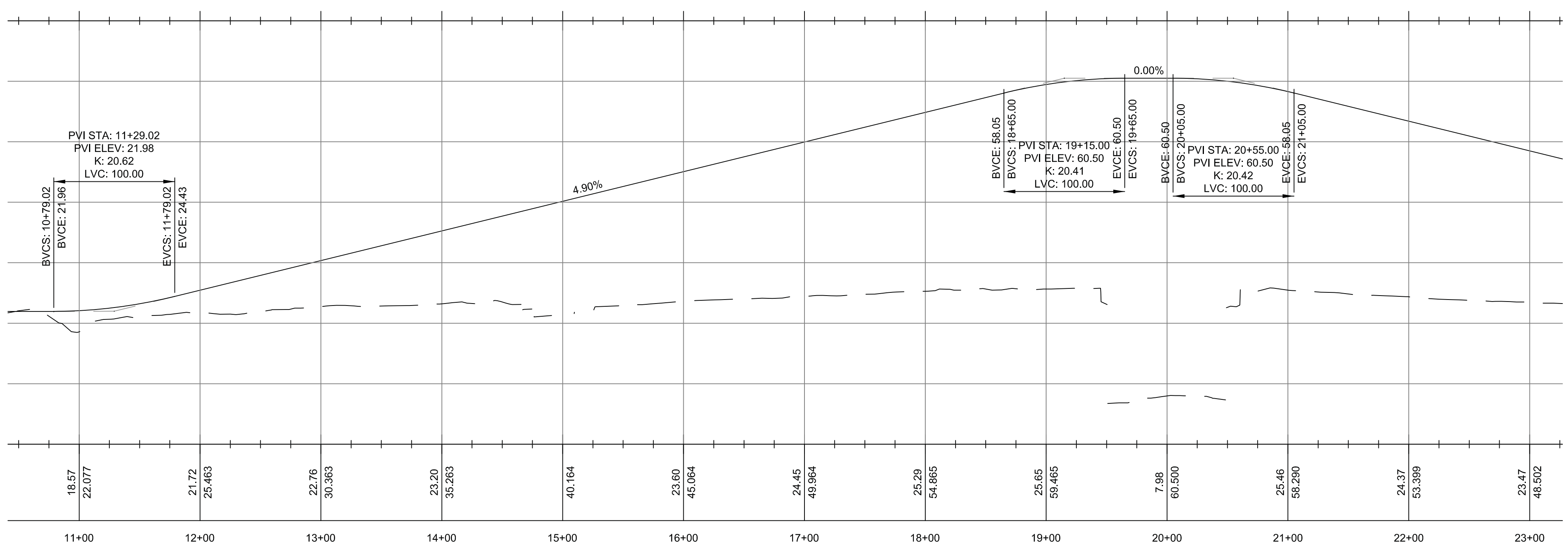

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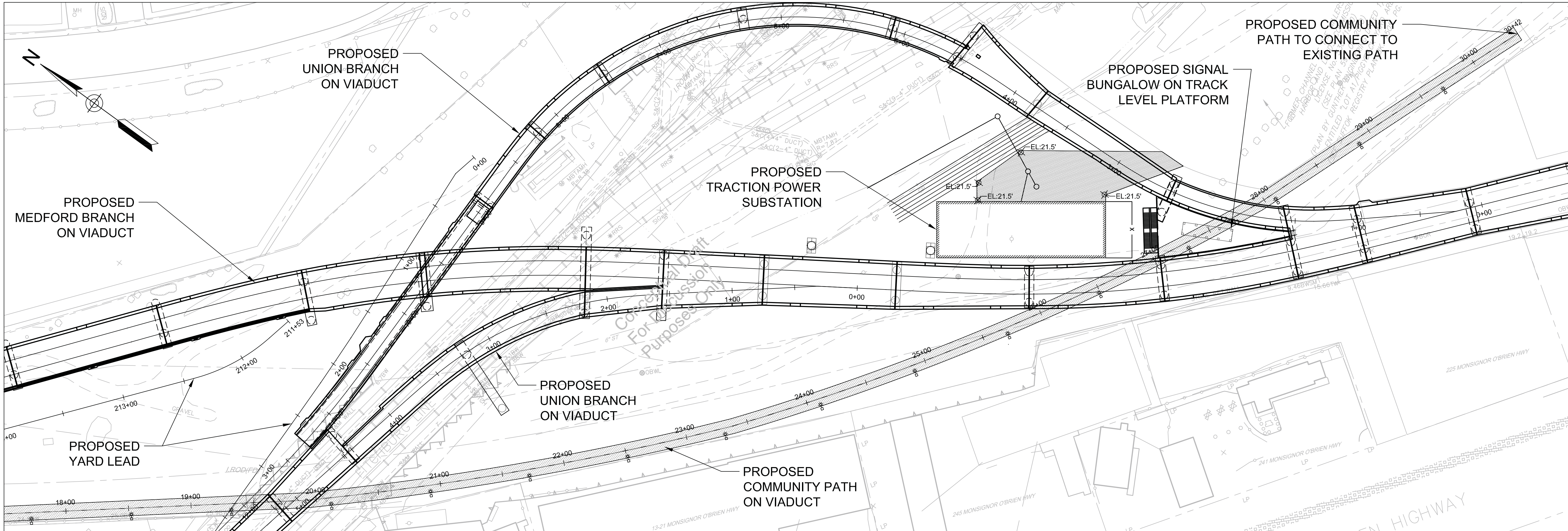

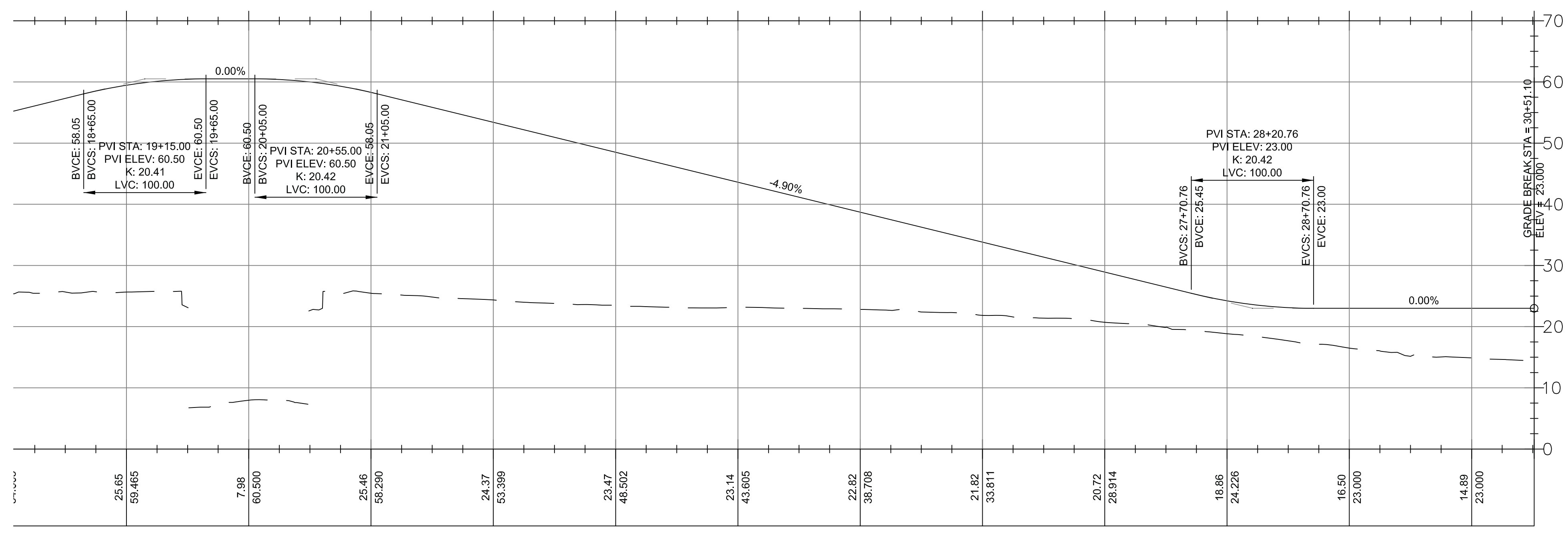

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

COMMUNITY PATH
PLAN AND PROFILE
ADDITIVE OPTION # 5

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GV20170258-281.pdf

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DATE: SEPT. 28, 2017 | SHEET: OPT 5-07 | ISSUE: -

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6. DESIGN AND CONSTRUCTION OF AN ENHANCED VMF

6.A GENERAL APPROACH AND LOCATION-SPECIFIC DESIGNS

The main focus of this additive option is to provide:

- The means and equipment to increase productivity and facilitate multiple/simultaneous vehicle inspections and repair work at the VMF
- A more expansive and flexible transportation building space to execute and schedule operators shifts and communicate activities between the VMF, storage yard tracks, and revenue service along the ROW
- Increased storage yard track capacity, which allows more options for train movements throughout the yard.

All of the additive options outlined in the RFP for the VMF fall within the programmed floor plate. Architectural, structural, and building support systems (MEP), the infrastructure, for the additional set of vehicle lifts along Track 4, South and the inclusion of the wheel truing machine (Track 4 North) are part of the base RFP Technical Provision requirements. The site location of the VMF, and its floor plate size, remain as is. Conversely the floor plate size of the transportation building has increased, but its location on site has not. However, its related site work (i.e., relocated parking lot, roadway circulation, landscaping treatment, and lighting) and track (i.e., additional storage yard tracks, related drainage, and pedestrian access between the building and yard) surroundings and adjacencies have.

We believe all of the additive options being considered under this section bring added value across the board to the overall project. In the case of the wheel truing machine and additional vehicle lift in the VMF, not only will the equipment increase and expand productivity, it will eliminate the need for regularly scheduled maintenance having to be performed at another facility. Incorporating these essential maintenance equipment items into the project will not only reduce or eliminate deadhead costs, but save time, in general, and keep feeding vehicles into the revenue stream more efficiently and timely. The enhanced and expanded transportation building provides a more robust and durable complex that, along with the planned additive landscaping and site furnishings options, creates a more pleasant work environment for MBTA personnel. Last, but not least, anytime there is an opportunity to expand track storage upfront and not add after the fact will eliminate potential impacts and costs.

The following narrative bullets correspond with the additive options as listed under Volume 3 – Addendum No. 8; 3.2.6. Additive Option Item – Enhanced VMF, dated August 17, 2017.

Wheel Truing Machine. Volume 2 – Exhibit 2A.1 Specification Section No. 11550 – Wheel Truing Machine calls for a wheel truing and reprofiling milling machine to be furnished. The most comparable machine that can be used on wheelsets, with or without stub axles, would be the MBTA's No. 7, 8, and 9 Green Line LRVs and meet the requirements and criteria set forth in the aforementioned specification is the underfloor Stanray M2 machine manufactured by Simmons, which is a centerless milling style wheel truing machine. Alternatively, the wheel truing function can also be accomplished on the Green Line fleet with a lathe-style wheel truing machine. Should this option be exercised, an underfloor Stanray M2 wheel truing machine, also manufactured by Simmons, or a lathe-style wheel truing machine, manufactured by either Hegenscheidt or Delta Manufacturing, is recommended. However, the underfloor lathe-style machine usually requires a deeper pit.

Incorporating this type machine into the work has little or no impact on the Technical Proposal. The exact size, depth, and location of the wheel truing pit along Track 3, together with stairs, access points, and working envelope will have to be tweaked under subsequent design phases, but it is anticipated to be minimal. Adjustments to structural pits, support walls, and slabs will also be minimal, in fact the pit depth might be even shallower. There is no impact or change anticipated for the electrical power currently sized. Pit light revisions will be minimal.

Additional Set of Jacking Equipment (Vehicle (car hoist) Lift) and set of Bogie out tracks. This option calls for a hoist, LRV, with body stands, rotating hoist, manufactured by the Ray-Jurgen Company or approved equal, to be furnished and installed along Track 4 – North along with 3 sets of embedded Bogie-out tracks, one set per pit, approximately ten-feet long and running west, perpendicular to Track 4, as part of the based RFP. Based on our interpretation of the aforementioned specification a Model No. PKRL-40-4 with an overall lifting capacity of 129,000 pounds, as manufactured by the Ray-Jurgen Company, meets the intent of the MBTA specifications. We are proposing to furnish and install the same for the additional set of jacking equipment in the vehicle lift pits furnished and installed in Track 4 – South as part of the base RFP. We will also mirror the Bogie-out track layout from the base RFP.

Incorporating this type machine into the work has little or no impact on the Technical proposal. All pits, infrastructure, track rails, and building support systems will essentially be replicated. There is no impact or change anticipated for the electrical power currently sized. Whether or not this additional set of lifts is incorporated into the work, we recommend the three sets of Bogie-out tracks be made part of the based RFP since their rails need to be embedded in the concrete floor slab.

Full Height Storage. This option applies to Storage Room Nos. 120 and 124 (125) as shown on Project Definition Plan MAF-A-1100. The specifications and plan calls for all these rack pallets, which measure 10-feet in height (and are the highest in both of these rooms) to be manufactured by Lyon Workspace products or approved equal. Under this section, the minimum clear ceiling height in Storage rooms 120 and 124 is 14-feet minimum. Therefore, our interpretation, that there is already a 4-foot clearance from the top of the highest specified shelving to the underside of the building assembly in the criteria under the base RFP. The VMF plans, sections, and elevations we generated for our proposal have included and addressed this clearance requirement.

Enhanced Transportation Building. Under this additive option, the size of the transportation building is increasing in size from 1,425 square feet to over 5,000 square feet. Project Definition Plan TSP-A-1000 shows ramps and stairs on the north and south sides of the building, which we interpreted along with the required grades in the area, that the floor of the building needs to be raised. This is confirmed by avoiding to have to provide a gas vapor barrier membrane and venting system beneath the floor slab because of the environmental Activities Use Limitation (AUL) in place for this area of the site. Our base proposal design was based on a prefabricated, modular-code compliant structure supported on raised CIP concrete pedestals. However, the enhanced transportation building will be stick built construction to meet the requirements for a 50-year life span and will be supported on a conventional spread footing foundation.

Incorporating the expanded transportation building will have an impact on the Technical Proposal, as it is a much larger building with different construction materials being incorporated to extend its longevity and it has more activities and functions taking place within in its space. Because it requires a more conventional foundation system, the entire footprint will be in contact with the ground. Based on the current environmental AUL in place for this area of the site, the building will require a gas vapor barrier membrane and venting be placed underneath the entire floor slab. However, the same utility services tie-in points, routing and sizes for gas, domestic and fire protection water, sanitary and storm will essentially remain as is. Per the base RFP, the transportation building electrical service is to be fed from the switchgear in the VMF; that still applies. We have provided a 400 amp service for the transportation building. This size is adequate for the enhanced Transportation building.

Changes from the Technical Proposal

The proposed addition of an enhanced VMF does not require any deviation from the requirements of the Technical Proposal.

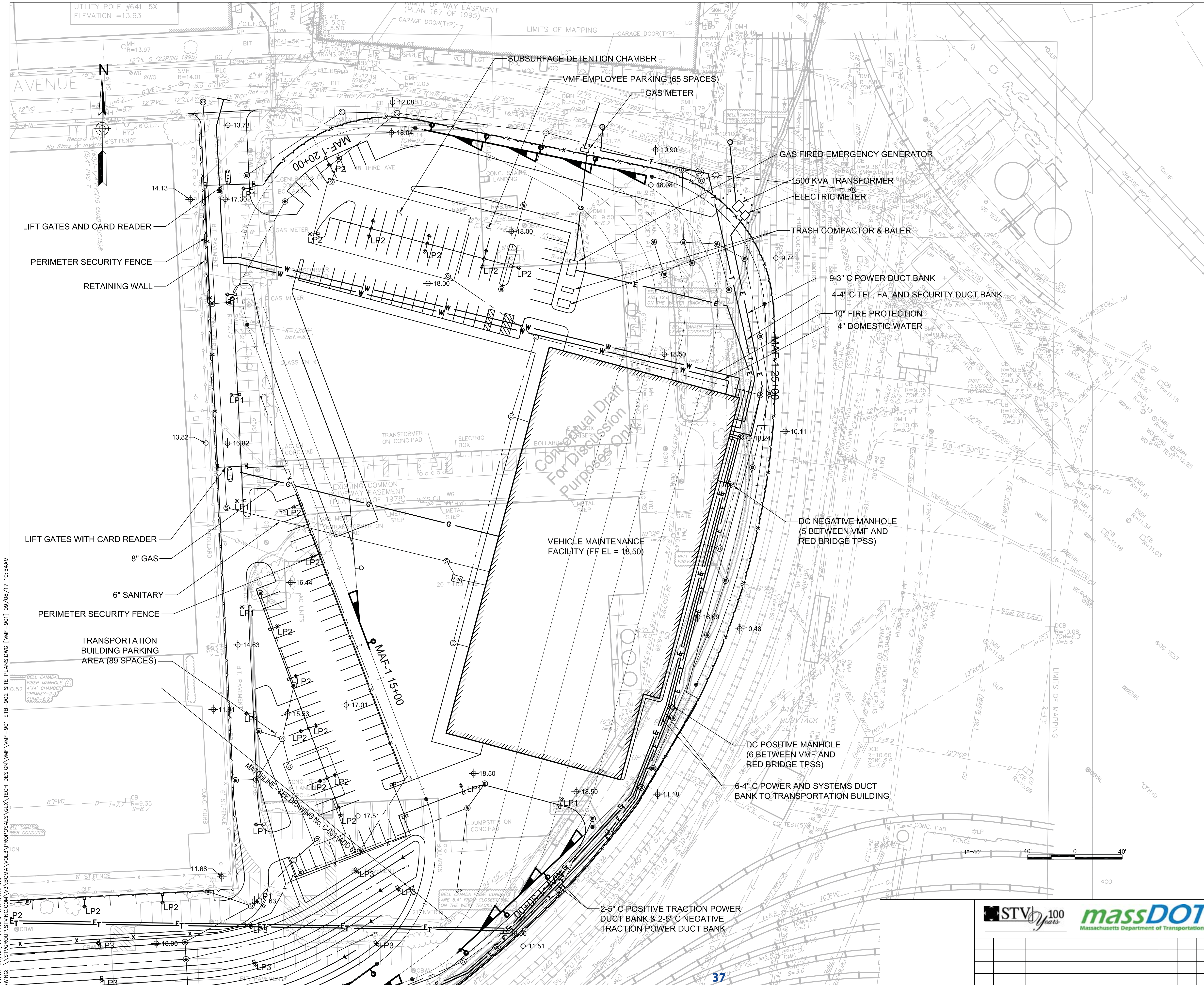
6.B SCHEDULE IMPACT ASSESSMENT

GLX Constructors' efforts to support this additive option as described are minimal and will not impact the proposed schedule.

6.C ENHANCED VMF (TRANSPORTATION) DRAWINGS

Drawings OPT6-01 through OPT6-11 provide the site plan showing the revised parking lot layout and roadway circulation along with the related site lighting. Floor plans, exterior building elevations, and sections along with finish room and door schedules have been provided. We have also provided a typical exterior wall section to show the construction materials are durable and in line with criteria set forth in the Technical Provisions and that the its assembly will pass NFPA 285 requirements. The drawings also show spread footing foundations, as well as the building superstructure steel framing. MEP buildings support systems will be advanced in subsequent design phases if the enhanced transportation building is incorporated into the work.

RFP	
Drawing Number	**Drawing Title**
OPT6-01	Vehicle Maintenance Facility Site Plan – Additive Option 6
OPT6-02	Enhanced Transportation Building Site Plan – Additive Option 6
OPT6-03	Enhanced Transportation Building First Floor Plan – Additive Option 6
OPT6-04	Enhanced Transportation Building Exterior Elevations – Additive Option 6
OPT6-05	Enhanced Transportation Building Sections – Additive Option 6
OPT6-06	Enhanced Transportation Building Door and Finish Schedule – Additive Option 6
OPT6-07	Enhanced Transportation Building Foundation Plan – Additive Option 6
OPT6-08	Enhanced Transportation Building Column Framing Plan – Additive Option 6
OPT6-09	Enhanced Transportation Building Roof Framing Plan and Building Section – Additive Option 6
OPT6-10	Vehicle Maintenance Facility Yard Lead and Maintenance Facility – Additive Option 6
OPT6-11	Vehicle Maintenance Facility Pole and Foundation Schedule – Additive Option 6



PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

VEHICAL MAINTENANCE FACILITY
SITE PLAN
- ADDITIVE OPTION 6

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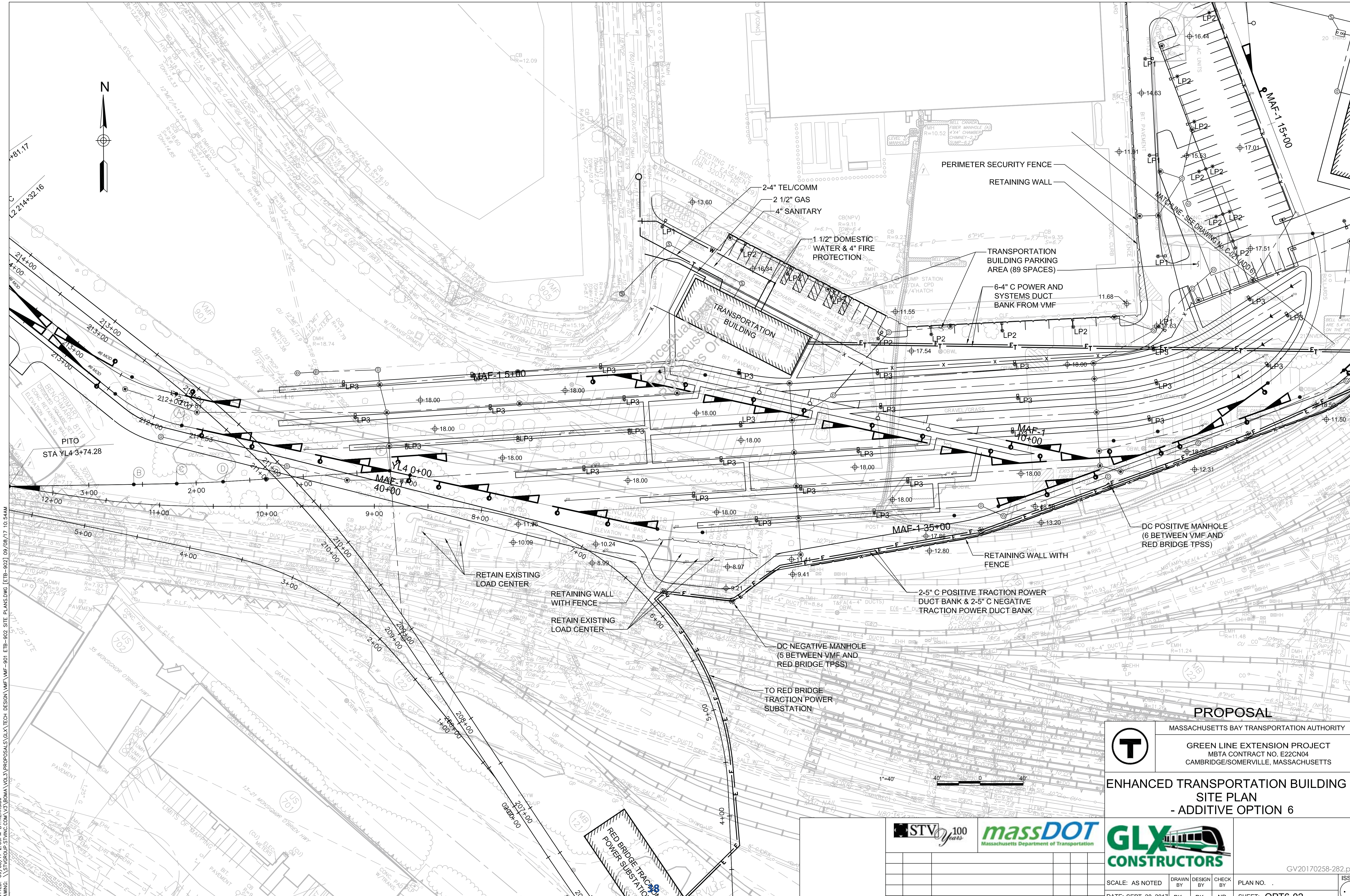

N
2-4" TEL/COMM
2 1/2" GAS
4" SANITARY
1 1/2" DOMESTIC WATER & 4" FIRE PROTECTION
TRANSPORTATION BUILDING
PERIMETER SECURITY FENCE
RETAINING WALL
TRANSPORTATION BUILDING PARKING AREA (89 SPACES)
6-4" C POWER AND SYSTEMS DUCT BANK FROM VMF
MATCHLINE - SEE DRAWING NO. C-021 (ADD 6)
MAF-1 15+00
MAF-1 5+00
MAF-1 10+00
MAF-1 35+00
MAF-1 40+00
YL4 0+00
PITO
STA YL4 3+74.28
DC POSITIVE MANHOLE (6 BETWEEN VMF AND RED BRIDGE TPSS)
RETAINING WALL WITH FENCE
2-5" C POSITIVE TRACTION POWER DUCT BANK & 2-5" C NEGATIVE TRACTION POWER DUCT BANK
RETAIN EXISTING LOAD CENTER
RETAINING WALL WITH FENCE
RETAIN EXISTING LOAD CENTER
DC NEGATIVE MANHOLE (5 BETWEEN VMF AND RED BRIDGE TPSS)
TO RED BRIDGE TRACTION POWER SUBSTATION
RED BRIDGE TRACTION POWER SUBSTATION
PROPOSAL
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS
ENHANCED TRANSPORTATION BUILDING SITE PLAN - ADDITIVE OPTION 6
1"=40'
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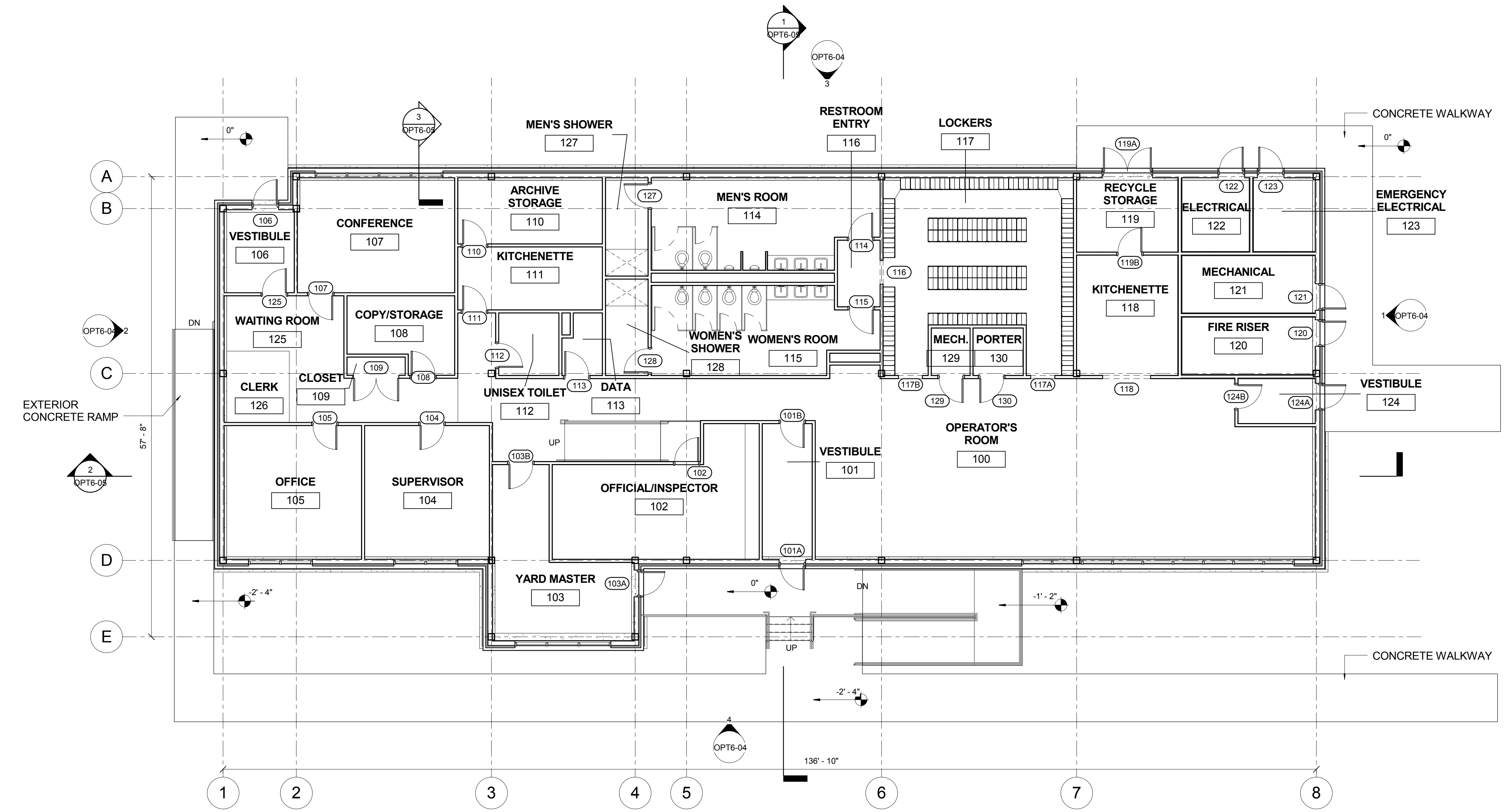

FIRST FLOOR PLAN

1/8" = 1'-0"

0 4' 8' 16'

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

ENHANCED TRANSPORTATION BUILDING
FIRST FLOOR PLAN
- ADDITIVE OPTION 6

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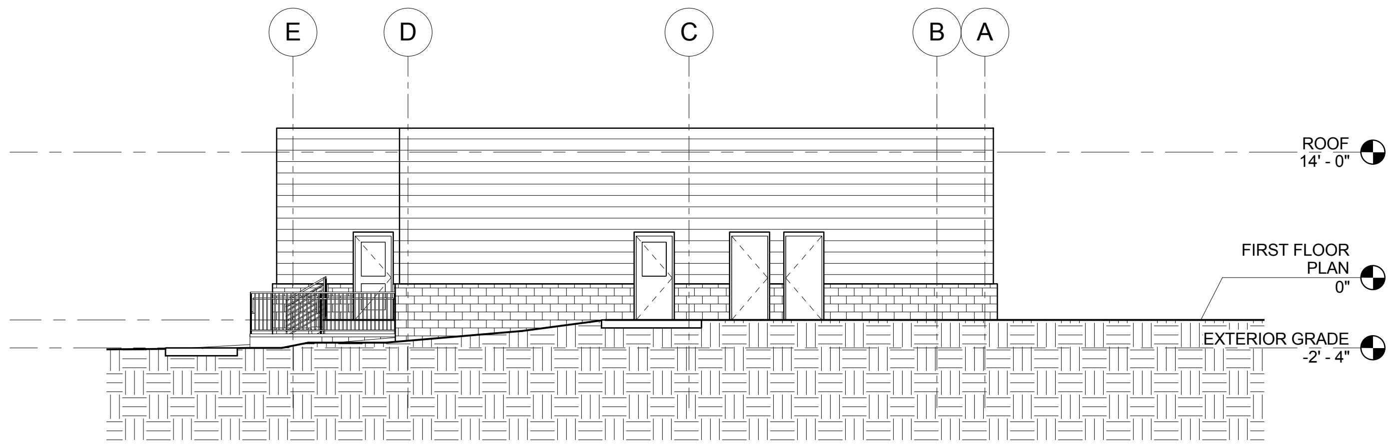
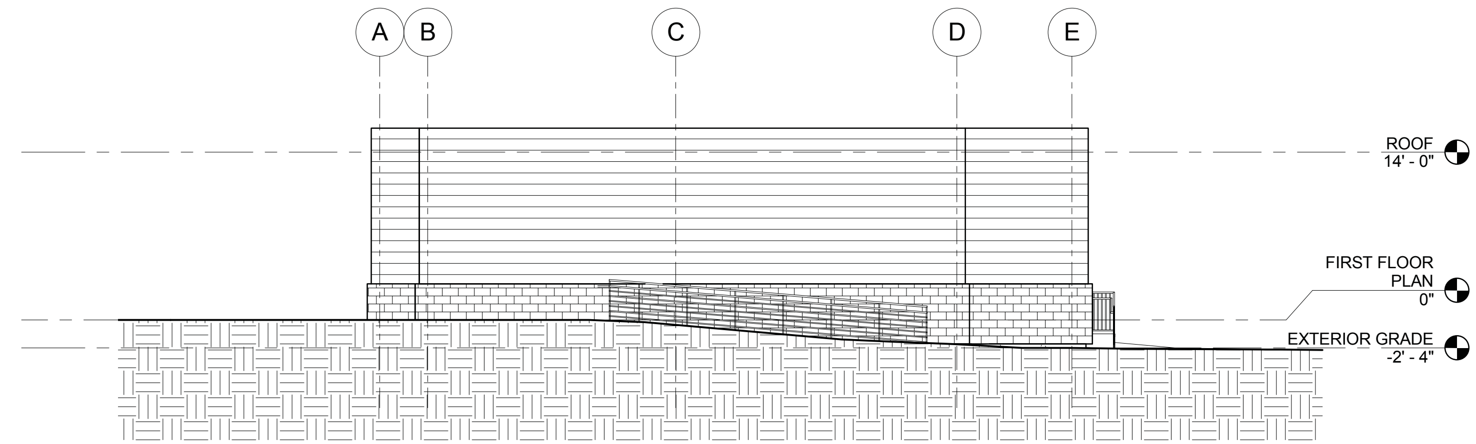
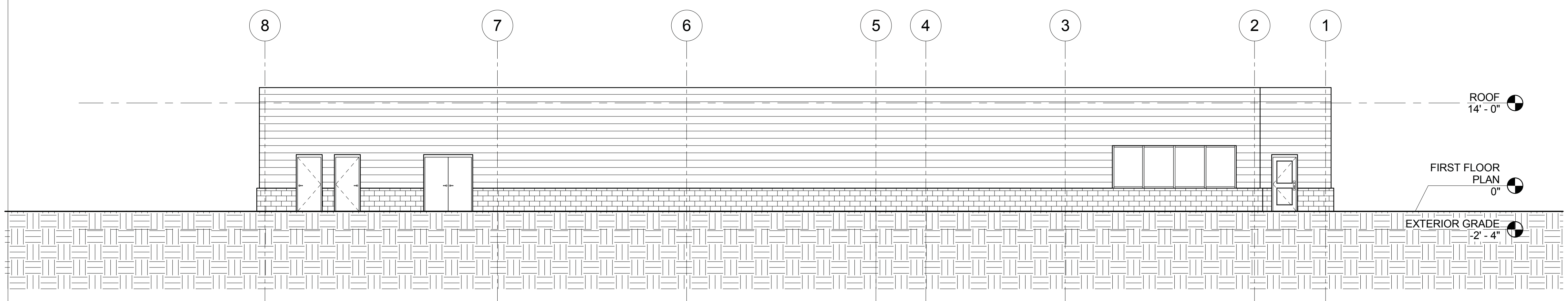


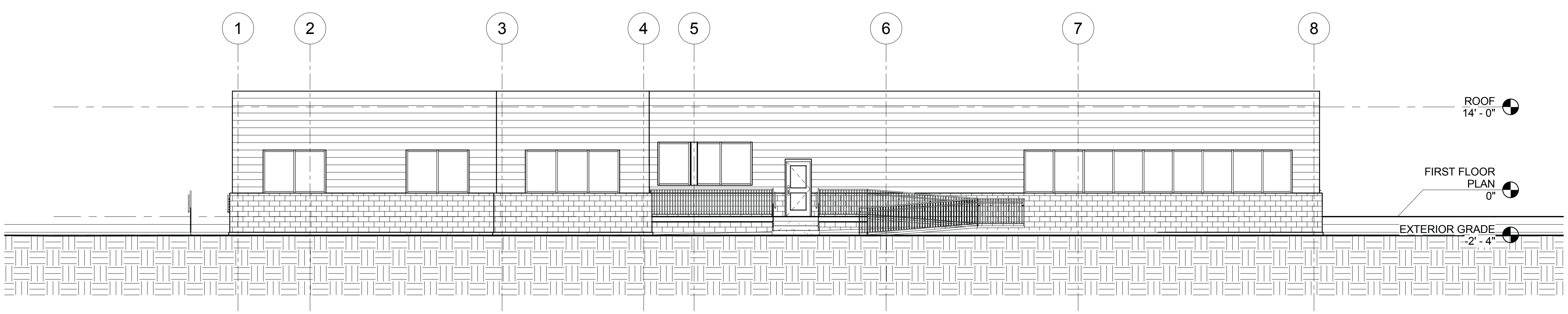
1
A-102
EAST ELEVATION
1/8" = 1'-0"



2
A-102
WEST ELEVATION
1/8" = 1'-0"



3
A-102
NORTH ELEVATION
1/8" = 1'-0"



4
A-102
SOUTH ELEVATION
1/8" = 1'-0"

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

ENHANCED TRANSPORTATION BUILDING
EXTERIOR ELEVATIONS
- ADDITIVE OPTION 6

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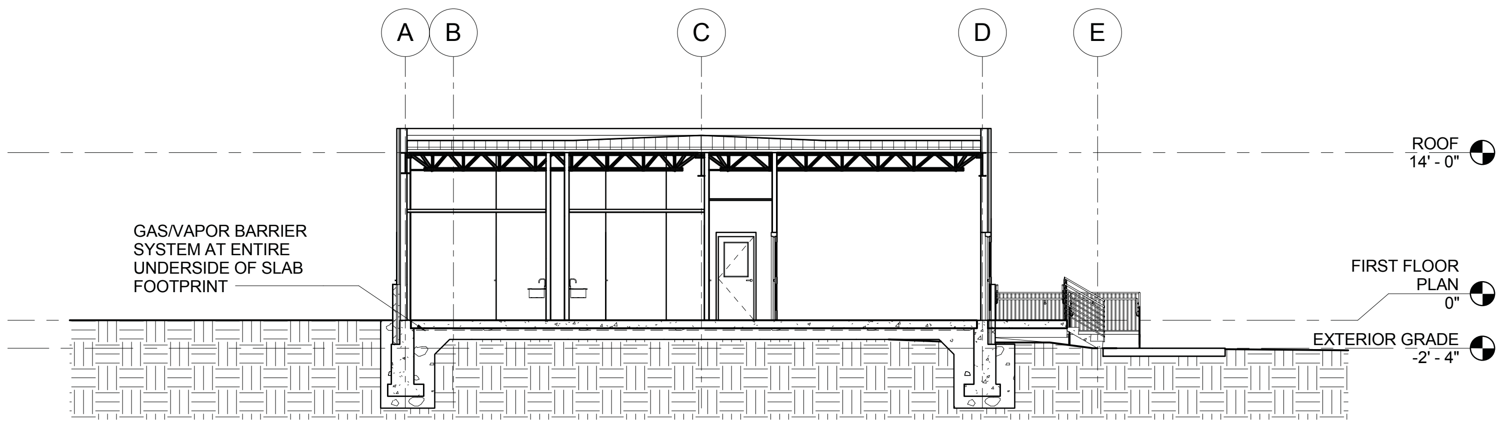
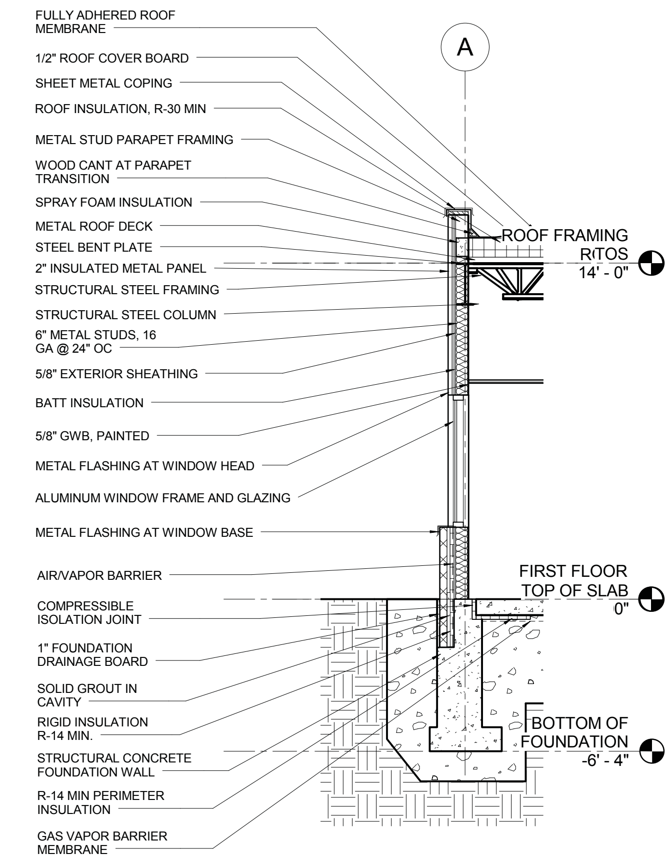
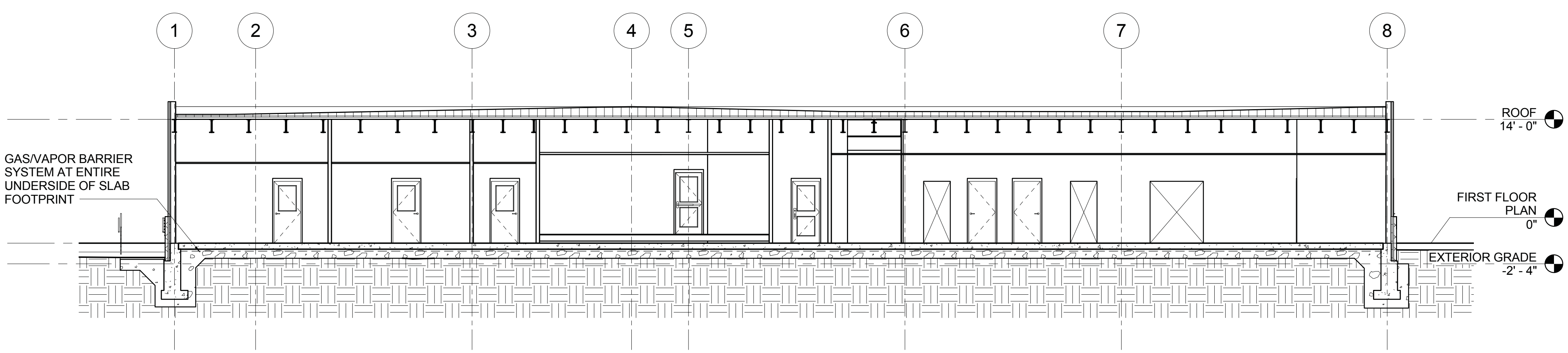


1
A-102
TRANSVERSE SECTION
1/8" = 1'-0"



3
A-102
TYPICAL WALL SECTION
1/4" = 1'-0"



2
A-102
LONGITUDINAL SECTION
1/8" = 1'-0"

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

ENHANCED TRANSPORTATION BUILDING SECTIONS - ADDITIVE OPTION 6

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- DOOR SCHEDULE 1 -

DOOR NUMBER	LOCATION	DOOR TYPE	DOOR MAT.	NOMINAL SIZE WIDTH	NOMINAL SIZE HEIGHT	NOMINAL SIZE THICKNESS	FRAME TYPE	FRAME MAT.	DETAIL JAMB	DETAIL HEAD	DETAIL SILL	FIRE RATING	HARDWARE SET	REMARKS
101A	VESTIBULE	B	HM	3' - 0"	7' - 0"	1 3/4"					0"			
101B	OPERATOR'S ROOM	B	HM	3' - 0"	7' - 0"	1 3/4"					0"			
102	OFFICIAL/INSPECTOR	B	HM	3' - 0"	7' - 0"	1 3/4"					1' - 0"			
103A	YARD MASTER	B	HM	3' - 0"	7' - 0"	1 3/4"					0"			
103B	OPERATOR'S ROOM	A	HM	3' - 0"	7' - 0"	1 3/4"					0"			
104	WAITING ROOM	A	HM	3' - 0"	7' - 0"	1 3/4"					0"			
105	WAITING ROOM	A	HM	3' - 0"	7' - 0"	1 3/4"					0"			
106	VESTIBULE	B	HM	3' - 0"	7' - 0"	1 3/4"					0"			
107	CONFERENCE	A	HM	3' - 0"	7' - 0"	1 3/4"					0"			
108	WAITING ROOM	A	HM	3' - 0"	7' - 0"	1 3/4"					0"			
109	CLOSET	F	HM	5' - 8"	6' - 8"	2"					0"			
110	KITCHENETTE	C	HM	3' - 0"	7' - 0"	1 3/4"					0"			
111	OPERATOR'S ROOM	A	HM	3' - 0"	7' - 0"	1 3/4"					0"			
112	OPERATOR'S ROOM	C	HM	3' - 0"	7' - 0"	1 3/4"					0"			
113	OPERATOR'S ROOM	C	HM	3' - 0"	7' - 0"	1 3/4"					0"			
114	RESTROOM ENTRY	C	HM	3' - 0"	7' - 0"	1 3/4"					0"			
115	RESTROOM ENTRY	C	HM	3' - 0"	7' - 0"	1 3/4"					0"			
116	LOCKERS	E	-	0"	0"						0"			
117A	LOCKERS	E	-	0"	0"						0"			
117B	LOCKERS	E	-	0"	0"						0"			
118	KITCHENETTE	G	-	0"	0"						0"			
119A	RECYCLE STORAGE	D	HM	6' - 0"	7' - 0"	1 3/4"					0"			
119B	KITCHENETTE	C	HM	3' - 0"	7' - 0"	1 3/4"					0"			
120	FIRE RISER	C	HM	3' - 0"	7' - 0"	1 3/4"					0"			
121	MECHANICAL	C	HM	3' - 0"	7' - 0"	1 3/4"					0"			
122	ELECTRICAL	C	HM	3' - 0"	7' - 0"	1 3/4"					0"			
123	EMERGENCY ELECTRICAL	C	HM	3' - 0"	7' - 0"	1 3/4"					0"			
124A	VESTIBULE	A	HM	3' - 0"	7' - 0"	1 3/4"					0"			
124B	OPERATOR'S ROOM	A	HM	3' - 0"	7' - 0"	1 3/4"					0"			
125	WAITING ROOM	B	HM	3' - 0"	7' - 0"	1 3/4"					0"			
127	MEN'S ROOM	C	HM	3' - 0"	7' - 0"	1 3/4"					0"			
128	WOMEN'S ROOM	C	HM	3' - 0"	7' - 0"	1 3/4"					0"			
129	MECH.	C	HM	3' - 0"	7' - 0"	1 3/4"					0"			
130	PORTER	C	HM	3' - 0"	7' - 0"	1 3/4"					0"			

- ROOM SCHEDULE -

Room Number	Room Name	Area	Floor Finish	Base Finish	Wall Finish	Ceiling Finish	Ceiling Height	Comments
100	OPERATOR'S ROOM	1773 SF	RS-1	RB-1	PT-1	ACT-1	10' - 0"	
101	VESTIBULE	106 SF	RS-1	RB-1	PT-1	ACT-1	9' - 0"	
102	OFFICIAL/INSPECTOR	342 SF	RS-1	RB-1	PT-1	ACT-1	9' - 0"	
103	YARD MASTER	261 SF	CPT-1	RB-1	PT-1	ACT-1	9' - 0"	
104	SUPERVISOR	261 SF	CPT-1	RB-1	PT-1	ACT-1	9' - 0"	
105	OFFICE	288 SF	CPT-1	RB-1	PT-1	ACT-1	9' - 0"	
106	VESTIBULE	91 SF	RS-1	RB-1	PT-1	ACT-1	9' - 0"	
107	CONFERENCE	283 SF	CPT-1	RB-1	PT-1	ACT-1	9' - 0"	
108	COPY/STORAGE	113 SF	CFT-1	RB-1	PT-1	ACT-1	9' - 0"	
109	CLOSET	16 SF	RS-1	RB-1	PT-1	ACT-1	9' - 0"	
110	ARCHIVE STORAGE	149 SF	CPT-1	RB-1	PT-1	ACT-1	9' - 0"	
111	KITCHENETTE	142 SF	RS-1	RB-1	PT-1	ACT-1	9' - 0"	
112	UNISEX TOILET	59 SF	CFT-1	CWT-1	CWT-1	EP-1	9' - 0"	
113	DATA	35 SF	RS-1	RB-1	PT-1	ES	9' - 0"	EXPOSED CEILING STRUCTURE
114	MEN'S ROOM	306 SF	CFT-1	CWT-1	CWT-1	EP-1	9' - 0"	
115	WOMEN'S ROOM	283 SF	CFT-1	CWT-1	CWT-1	EP-1	9' - 0"	
116	RESTROOM ENTRY	44 SF	CFT-1	CWT-1	CWT-1	EP-1	9' - 0"	
117	LOCKERS	511 SF	RS-1	RB-1	PT-1	ACT-1	9' - 0"	
118	KITCHENETTE	191 SF	RS-1	RB-1	PT-1	ACT-1	9' - 0"	
119	RECYCLE STORAGE	118 SF	SC-1	RB-1	EP-1	ES	9' - 0"	EXPOSED CEILING STRUCTURE
120	FIRE RISER	120 SF	SC-1	RB-1	PT-1	ES	9' - 0"	EXPOSED CEILING STRUCTURE
121	MECHANICAL	120 SF	SC-1	RB-1	PT-1	ES	9' - 0"	EXPOSED CEILING STRUCTURE
122	ELECTRICAL	78 SF	SC-1	RB-1	PT-1	ES	9' - 0"	EXPOSED CEILING STRUCTURE
123	EMERGENCY ELECTRICAL	71 SF	SC-1	RB-1	PT-1	ES	9' - 0"	EXPOSED CEILING STRUCTURE
124	VESTIBULE	54 SF	RS-1	RB-1	PT-1	ACT-1	9' - 0"	
125	WAITING ROOM	243 SF	CFT-1	RB-1	PT-1	ACT-1	9' - 0"	
126	CLERK	73 SF	CFT-1	RB-1	PT-1	ACT-1	9' - 0"	
127	MEN'S SHOWER	65 SF	CFT-1	CWT-1	CWT-1	EP-1	9' - 0"	
128	WOMEN'S SHOWER	64 SF	CFT-1	CWT-1	CWT-1	EP-1	9' - 0"	
129	MECH.	29 SF	SC-1	RB-1	EP-1	ES	9' - 0"	EXPOSED CEILING STRUCTURE
130	PORTER	37 SF	SC-1	RB-1	EP-1	ES	9' - 0"	EXPOSED CEILING STRUCTURE

Grand total: 31

FINISH LEGEND

SEALED CONCRETE

SC-1
MANUFACTURER:
STYLE:
COLOR:

FLOOR TILE

CERMAIC TILE
CFT-1
MANUFACTURER:
STYLE:
COLOR:
SIZE:

RESILIANT SHEET
RS-1
MANUFACTURER:
STYLE:
COLOR:
SIZE:

WALL BASE

CERAMIC TILE
CWT-1
MANUFACTURER:
STYLE:
COLOR:
SIZE:

RUBBER
RB-1
MANUFACTURER:
STYLE:
COLOR:
SIZE:

WALL FINISHES

CERAMIC TILE
CWT-1
MANUFACTURER:
STYLE:
COLOR:
SIZE:

PAINT
PT-1
MANUFACTURER:
COLOR:
CEILING FINISH:
WALL FINISH: (PAINTED CMU)

EP-1
MANUFACTURER:
STYLE: EPOXY COATING ON GWB
COLOR:

CEILING

PAINTED GWB
EP-1
TYPE: SUSPENDED OR FRAMED GYPSUM BOARD PAINTED EP-1

ACOUTIC CEILING TILE
ACT-1
TYPE: SUSPENDED ACT

ABBREVIATIONS

CWT:	CERAMIC WALL TILE
CFT:	CERAMIC FLOOR TILE
EP:	EPOXY COATING
SC:	SEALED CONCRETE
ES:	EXPOSED STRUCTURE
PT:	PAINT
RB:	RUBBER BASE
GWB	GYPSUM WALL BOARD

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

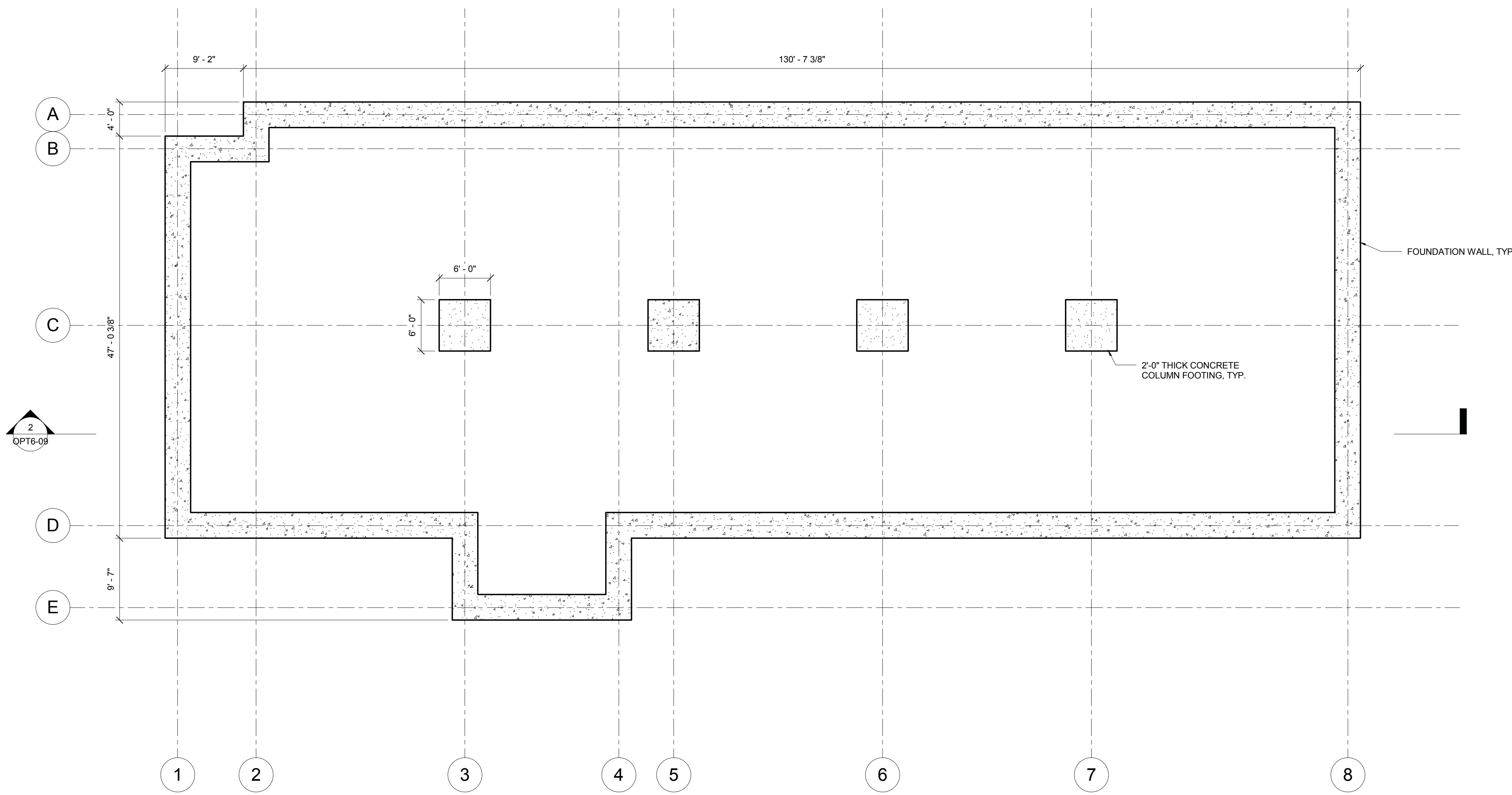
GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

ENHANCED TRANSPORTATION BUILDING
DOOR AND FINISH SCHEDULE
- ADDITIVE OPTION 6

STV 100 Years
massDOT Massachusetts Department of Transportation
GLX CONSTRUCTORS

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED | DRAWN BY | DESIGN BY | CHECK BY | PLAN NO. .
DATE: SEPT. 28, 2017 | SP | SP | | SHEET: OPT6-06
ISSUE .



FOUNDATION PLAN

1/8" = 1'-0"

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

ENHANCED TRANSPORTATION BUILDING
FOUNDATION PLAN
- ADDITIVE OPTION 6

STV 100 Years

massDOT Massachusetts Department of Transportation

GLX CONSTRUCTORS

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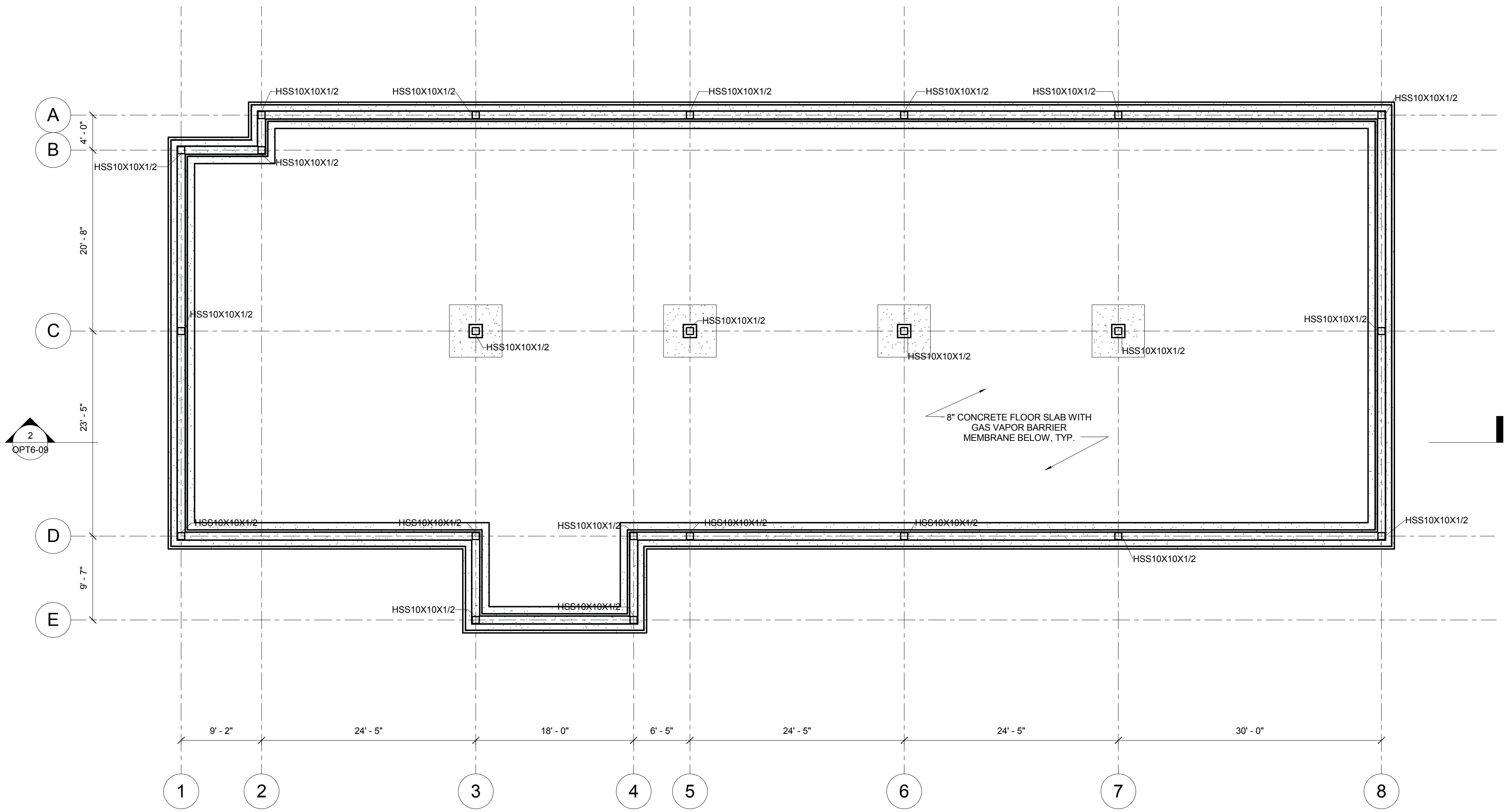

COLUMN FRAMING PLAN

1/8" = 1'-0"

0 4' 8' 16'

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

ENHANCED TRANSPORTATION BUILDING
COLUMN FRAMING PLAN
- ADDITIVE OPTION 6

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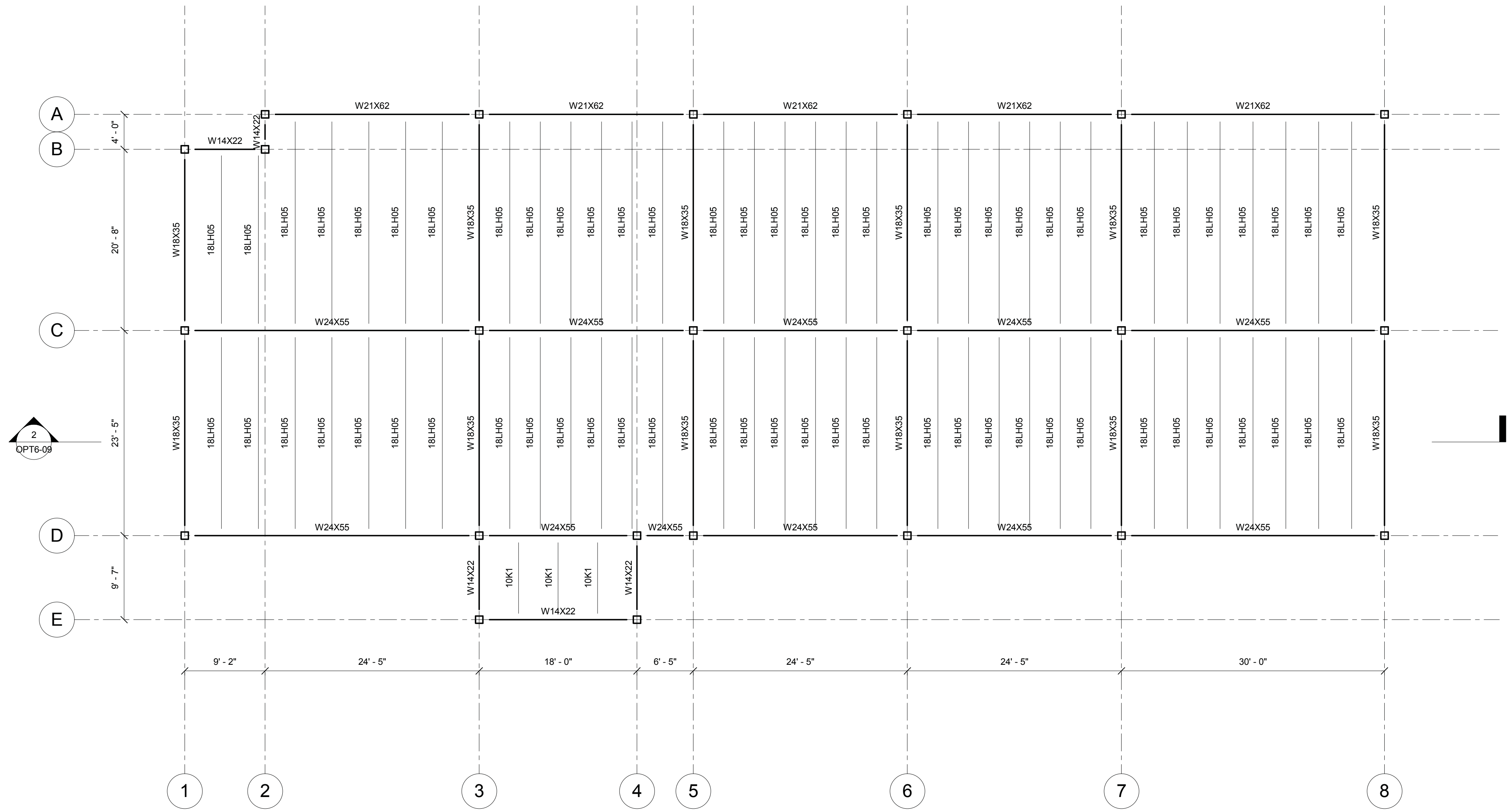
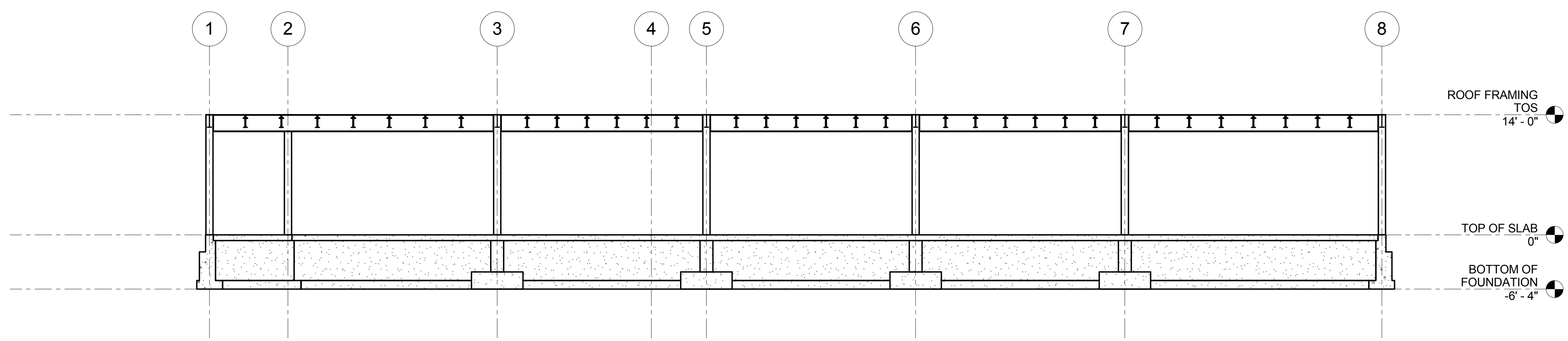
DATE: SEPT. 28, 2017	SP	SP		SHEET: OPT6-08	.



ROOF FRAMING PLAN

1/8" = 1'-0"



2 LONGITUDINAL SECTION

OPT6-07

1/8" = 1'-0"

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

ENHANCED TRANSPORTATION BUILDING
ROOF FRAMING PLAN & BUILDING SECTION
- ADDITIVE OPTION 6

STV 100 Years

massDOT Massachusetts Department of Transportation

GLX CONSTRUCTORS

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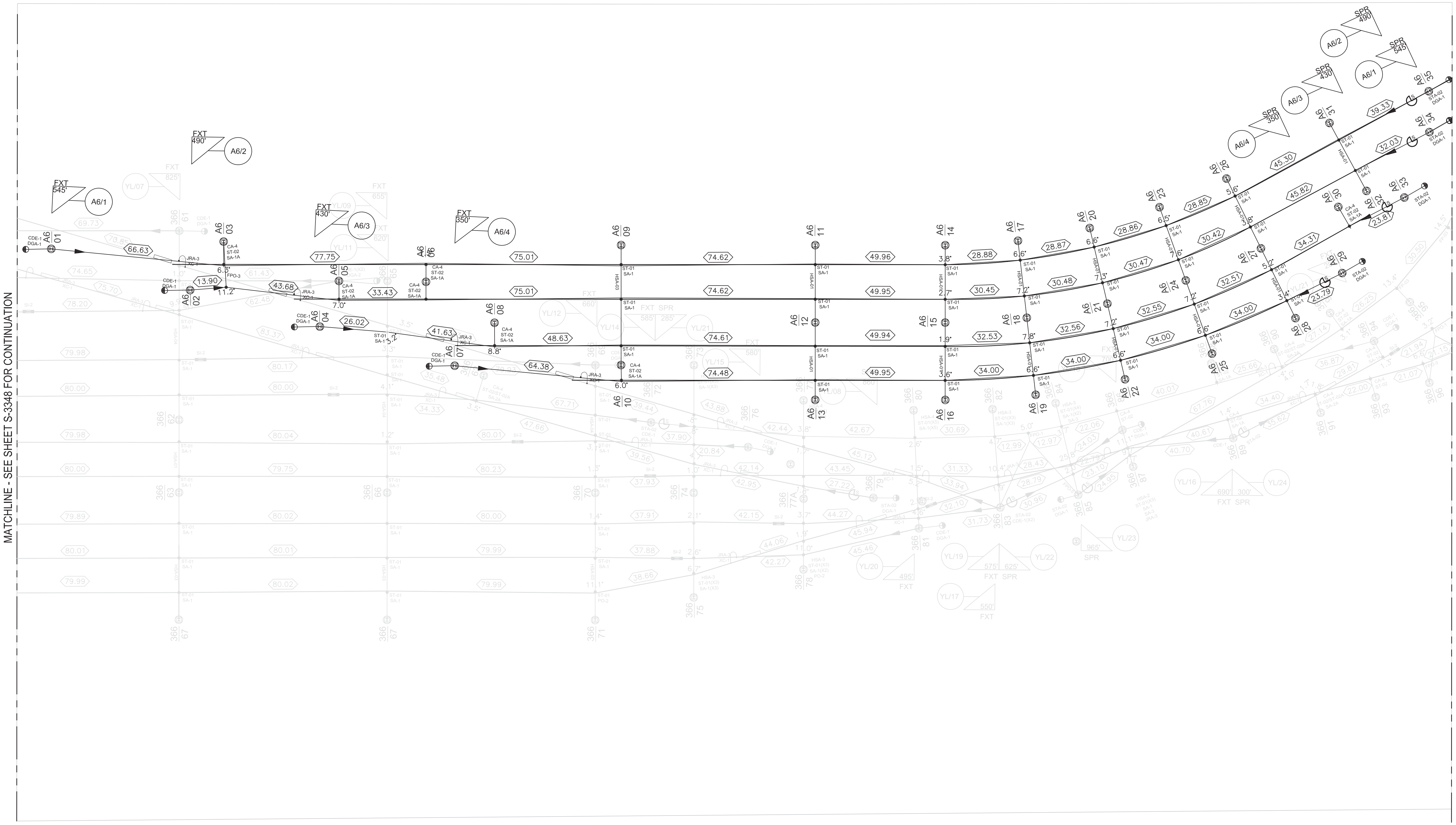

PROPOSAL

10 0 10 20
SCALE IN FEET

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

VEHICLE MAINTENANCE FACILITY
YARD LEAD & MAINTENANCE FACILITY
- ADDITIVE OPTION 6

STV 100 Years

massDOT Massachusetts Department of Transportation

GLX CONSTRUCTORS

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO. .
DATE: SEPT. 28, 2017	BT	BT	ND	SHEET: OPT6-10

ISSUE .

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PLOTTED: 09/08/17 9:22AM BY: THARPBM
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ITEM NO.	ALIGNMENT	POLE NUMBER	OFFSET (FT)	POLE TYPE	SOIL PROFILE	FDN TYPE	FDN DEPTH (FT)	BASE PLATE TYPE
781	ADD6	A6/01	-	W12x79	F	FDN-1	18	ABTP-1
782	ADD6	A6/02	-	W12x79	F	FDN-1	18	ABTP-1
783	ADD6	A6/03	-	W12x79	F	FDN-1	18	ABTP-1
784	ADD6	A6/04	-	W12x79	F	FDN-1	18	ABTP-1
785	ADD6	A6/05	-	W12x106	F	FDN-1	26	ABTP-1
786	ADD6	A6/06	-	W12x53	F	FDN-1	16	ABTP-1
787	ADD6	A6/07	-	W12x79	F	FDN-1	18	ABTP-1
788	ADD6	A6/08	-	W12x79	F	FDN-1	18	ABTP-1
789	ADD6	A6/09	-	W12x79	F	FDN-1	18	ABTP-1
790	ADD6	A6/10	-	W12x53	F	FDN-1	16	ABTP-1
791	ADD6	A6/11	-	W12x53	F	FDN-1	16	ABTP-1
792	ADD6	A6/12	-	W12x53	F	FDN-1	16	ABTP-1
793	ADD6	A6/13	-	W12x53	F	FDN-1	16	ABTP-1
794	ADD6	A6/14	-	W12x53	F	FDN-1	16	ABTP-1
795	ADD6	A6/15	-	W12x53	F	FDN-1	16	ABTP-1
796	ADD6	A6/16	-	W12x53	F	FDN-1	16	ABTP-1
797	ADD6	A6/17	-	W12x53	F	FDN-1	16	ABTP-1
798	ADD6	A6/18	-	W12x53	F	FDN-1	16	ABTP-1
799	ADD6	A6/19	-	W12x53	F	FDN-1	16	ABTP-1
800	ADD6	A6/20	-	W12x53	F	FDN-1	16	ABTP-1
801	ADD6	A6/21	-	W12x53	F	FDN-1	16	ABTP-1
802	ADD6	A6/22	-	W12x53	F	FDN-1	16	ABTP-1
803	ADD6	A6/23	-	W12x53	F	FDN-1	16	ABTP-1
804	ADD6	A6/24	-	W12x53	F	FDN-1	16	ABTP-1
805	ADD6	A6/25	-	W12x53	F	FDN-1	16	ABTP-1
806	ADD6	A6/26	-	W12x53	F	FDN-1	16	ABTP-1
807	ADD6	A6/27	-	W12x53	F	FDN-1	16	ABTP-1
808	ADD6	A6/28	-	W12x53	F	FDN-1	16	ABTP-1
809	ADD6	A6/29	-	W12x79	F	FDN-1	18	ABTP-1
810	ADD6	A6/30	-	W12x53	F	FDN-1	16	ABTP-1
811	ADD6	A6/31	-	W12x53	F	FDN-1	16	ABTP-1
812	ADD6	A6/32	-	W12x53	F	FDN-1	16	ABTP-1
813	ADD6	A6/33	-	W12x79	F	FDN-1	18	ABTP-1
814	ADD6	A6/34	-	W12x79	F	FDN-1	18	ABTP-1
815	ADD6	A6/35	-	W12x79	F	FDN-1	18	ABTP-1

ITEM NO.	ALIGNMENT	POLE NUMBER	BASE PLATE TYPE	SOIL PROFILE	FDN TYPE	FDN DEPTH (FT)
187	ADD6	A6/01	ABDG-1	F	FDN-1	12
188	ADD6	A6/02	ABDG-1	F	FDN-1	12
189	ADD6	A6/04	ABDG-1	F	FDN-1	12
190	ADD6	A6/07	ABDG-1	F	FDN-1	12
191	ADD6	A6/29	ABDG-1	F	FDN-1	12
192	ADD6	A6/33	ABDG-1	F	FDN-1	12
193	ADD6	A6/34	ABDG-1	F	FDN-1	12
194	ADD6	A6/35	ABDG-1	F	FDN-1	12

NOTES:

1. POLE LOCATIONS, TYPE, FOUNDATION TYPE, AND DEPTH ARE PRELIMINARY AND WILL BE FURTHER VALIDATED AND COORDINATED WITH ALL DISCIPLINES DURING FINAL DESIGN.
2. POLES SHALL BE SUFFICIENT LENGTH SUCH THAT TOP OF POLE IS A MINIMUM OF 30'-0" ABOVE TOP OF RAIL ON ALL LOCATIONS WHERE PARALLEL FEEDERS ARE CARRIED. POLE CAN BE REDUCED SUCH THAT TOP OF POLE IS A MINIMUM OF 24'-0" ABOVE TOP OF RAIL IF NO ADDITIONAL WIRES ARE CARRIED ABOVE THE MESSENGER.

POLE ROUTE NUMBERS	
285	LECHMERE VIADUCT
364	MEDFORD BRANCH
365	UNION SQUARE BRANCH
366	RED BRIDGE/ COBBLE HILL YARD
ADD6	ADDITIVE OPTION

10 0 10 20
SCALE IN FEET

PROPOSAL

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GREEN LINE EXTENSION PROJECT
MBTA CONTRACT NO. E22CN04
CAMBRIDGE/SOMERVILLE, MASSACHUSETTS

VEHICLE MAINTENANCE FACILITY
POLE AND FOUNDATION SCHEDULE
- ADDITIVE OPTION 6

STV 100 Years

massDOT Massachusetts Department of Transportation

GLX CONSTRUCTORS

ISSUE	DATE	DESCRIPTION	BY	CHK'D	APP.

SCALE: AS NOTED	DRAWN BY	DESIGN BY	CHECK BY	PLAN NO. .	ISSUE
DATE: SEPT. 28, 2017	BT	BT	ND	SHEET: OPT6-11	.

EXHIBIT 1S

SUBCONTRACTOR APPROVAL REQUEST

SUBCONTRACTOR APPROVAL REQUEST

Date: ___________________
Contract No. _____________
Contract Title: ____

Subcontractor Name: ________________________________
Address: ____________________________
____
Phone No.: _______________________
Project Superintendent: ______________________
Project Superintendent E-Mail Address: _________________________
Sub-Contractor's Company Tax ID Number: _____________________

Specification Section and Scope of Work :
____
____

Estimated Contract Value: $ ______________

Form A – Work History Attached ______

MBTA Authorized Representative

MBTA Review:

_____ Approved _____ Not Approved

-- ------------------
MBTA Director QA/QC Date

Reason for Disapproval: ____

032014

FORM A

SUBCONTRACTOR WORK HISTORY

Date Project Completed (Month/Year)	Project Title/Location (City, State)	Contract Value ($)	Description of Work	Client Name/Phone Number

<u>Sub-Contractor Approval Request Instructions</u>

1. The DB Entity shall submit to the MBTA the required Subcontractor information including general company information, and a completed Form A Work History. All blanks on page 1 of the request need to be completed.

2. The Form A Work History should include a minimum of five (5) completed projects finished within the last ten (10) years. The completed projects listed in Form A should be relevant to the proposed work, and the project information should be complete and accurate. Both MBTA projects and non-MBTA projects can be submitted for review. A Subcontractor prepared work history list that includes all the required information is an acceptable alternative to completing the Form A – Work History attachment if all the required Form A information is included in the sub-contractor work history list.

3. The MBTA completes the top section of the Subcontractor Approval Request based on information provided by DB Entity. First tier Subcontractors must be submitted for approval. The following second tier Subcontractors must also be submitted for approval:

   A. Structural Steel Fabricators and Erectors
   B. Miscellaneous Metal Fabricators and Erectors

4. The MBTA should be contacted if there are any questions on which Subcontractors should be submitted for approval.

5. All Subcontractor approval requests should be submitted to the MBTA a minimum of one week prior to the Subcontractor starting work.

6. The MBTA Authorized Representative shall review the Subcontractor approval request prior to submission, verify the Form A is attached and filled out correctly, and sign the request, and forward to MBTA QA/QC.

7. The MBTA QA/QC will review the request and forward a decision to the MBTA Authorized Representative. If the request is not approved, DB Entity shall make the necessary corrections and re-submit for approval.

8. Once approved, the MBTA QA/QC will forward all Subcontractor approvals to the MBTA Authorized Representative.

9. If the MBTA observes an unapproved Subcontractor starting work, the Subcontractor must stop work, and a Subcontractor Request must be submitted.