



MEMORANDUM

To: Ms. Nora Loughnane,
Town Planner, Town of Westwood

Fr: Nancy B. Doherty, PE.
Jeffrey S. Dirk, PE, PTOE, FITE

Re: **University Station – Canton Street/University Avenue Design Options**

Dt: January 16, 2013

Tetra Tech and Vanasse & Associates, Inc. (Tt/VAI) have prepared conceptual plans and analyses in response to the Town of Westwood's request to evaluate two alternative designs for improvements to the Canton Street/University Avenue intersection. The objective of these alternatives is to discourage use of the Canton Street corridor between University Avenue and the East Street Rotary in order to by-pass the I-93/I-95 Interchange. As requested by the town, the two alternatives (options) include:

- Option 1 - Configure the westbound approach of Canton Street to include a shared left/through lane and two exclusive right turn lanes.
- Option 2 – Restrict a portion of Canton Street to one-way eastbound (toward University Avenue) and provide a new connector road between Harvard Street and Canton Street.

Both concepts are modifications of the Canton Street/University Avenue design developed during the preparation of the November 2012 *University Station Traffic Impact Study* (the "November 2012 TIS") prepared by Tt/VAI and the design that is currently being advanced by MassDOT as a part of their Dedham Street Corridor Improvement Project. This memorandum provides a brief summary of traffic operations, right-of-way requirements and drainage impacts associated with each option.

Based on a review of traffic operations, right-of-way requirements and drainage impacts resulting from both options, it has been determined that, while both options would appear to potentially achieve the defined goal of reducing the use of Canton Street by traffic travelling between I-95 and Route 128, the resulting negative impacts to traffic operations at the Canton Street/University Avenue corridor, the significant impacts to private property and the additional stormwater and potential environmental impacts would appear to off-set the potential traffic reduction. As such, advancement of the current MassDOT Canton Street/University Avenue improvement project coupled with implementation of strategic traffic calming along the Canton Street corridor continues to be the most advantageous option to achieve the goal of reducing Canton Street traffic related to I-95.

The following provides a summary of the evaluation of the two options for the Canton Street/University Avenue intersection.

Option 1 – University Avenue/Canton Street with Two Right Turn Lanes

The concept plan for Option 1 is shown on Figure 1. Option 1 modifies the current design to provide a shared left/through lane and two exclusive right turn lanes on the westbound Canton Street approach. The two exclusive right turn lanes are approximately 180 feet in length with a 300 foot long taper. At the point where the two westbound right turn lanes meet the east side of University Avenue, three northbound lanes would be provided for approximately 130 feet with a 600 foot long taper to transition from a three lane cross-section to a single travel lane. The three lanes are required to facilitate a free right turn from Canton Street onto University Avenue. As described below, this option was shown to: i) result in significant negative impacts on traffic operations due to the elimination of the westbound left-turn lane (converted to the left/through lane); ii) require additional private property acquisition in order to provide the necessary right-of-way; and iii) necessitate additional drainage system improvements.

Traffic. By 2022 it is expected that the new I-95 northbound off-ramp to Dedham Street would be constructed resulting in higher westbound traffic on Canton Street. Therefore, the 2022 Build weekday morning, weekday afternoon and Saturday mid-day peak hour volumes from the November 2012 TIS were used to conduct intersection capacity analyses of Option 1. The analyses are provided in Attachment A and summarized in Table 1. By 2022, approximately 600 vehicles are projected to turn left from westbound Canton Street onto southbound University Avenue during the morning peak hour. With this high volume of left turns and only a shared left/through lane on the approach, the overall intersection would be expected to operate at LOS F during the morning peak hour. Additionally, the average vehicle queue on westbound Canton Street would increase from approximately 300 feet to over 1,000 feet without the benefit of an exclusive left turn lane. In contrast, the westbound right turn lanes would operate at LOS A; however, they would be frequently blocked by the residual vehicle queue in the shared left/through lane and would not be functional under such conditions. The intersection would operate at LOS E and B for the weekday afternoon and Saturday midday peak hours. The intersection capacity analyses indicate that for the intersection to operate at reasonable levels of service, an exclusive left turn lane is required on the westbound approach rather than a second right turn lane.

The two receiving lanes on northbound University Avenue, required to accommodate the two right turn lanes on Canton Street, may potentially impact access to and from the Carruth property located at the northeastern quadrant of the intersection. The property's southern driveway currently exists as a full access and egress driveway. Under this option, turning movements at the southern driveway would need to be limited to right turns in and out, impeding circulation within the subject property. Grading associated with the intersection improvements may also extend into the Carruth parking area and could result in a loss of parking spaces and the ability for vehicles to circulate around the building, an important consideration for emergency vehicle response.

Right-of-Way. To accommodate the two exclusive right turn lanes from Canton Street onto University Avenue, additional right-of-way would be required as depicted on Figure 1. Right-of-



way acquisition/takings are anticipated to total approximately 18,164 s.f. on the Carruth property (376-392 University Avenue) and 1,124 s.f. on the property north of the Carruth property. The additional 1,124 s.f. taking is on land not within the boundaries of the MassDOT Dedham Street/Canton Street Corridor Improvement Project and, as such, would need to be acquired by the Town of Westwood for such purposes. It is also unlikely that the Norwood County Commissioners would approve the additional right-of-way requirements.

Drainage. The roadway widening required to accommodate the two exclusive right turn lanes on westbound Canton Street would require extension of the existing box culvert that runs beneath the current intersection. Additional storm water storage may be needed on site to accommodate the increase in run-off from the additional pavement. The roadway widening would also place the edge of pavement and guardrail close to the existing drainage ditch which is parallel and adjacent to the north side of Canton Street. As Canton Street is approximately eight (8) feet above the bottom of the ditch, sufficient space may not be available to create a stable slope, and a retaining wall may be required to maintain the capacity of the ditch, further increasing costs to the MassDOT project.

Option 2 – University Avenue/Canton Street with One-Way Restriction on Canton Street

The conceptual design developed for Option 2 is shown on Figures 2A and 2B. Option 2 includes Canton Street restricted to one-way eastbound between the existing Citizen's Bank easterly driveway and University Avenue. Option 2 also includes a new roadway which would connect Harvard Street to Canton Street.

Canton Street between the bank driveway and University Avenue would be reduced in width to provide a single westbound travel lane by way of painted chevron stripping in order to maintain the width of the bridge over the Neponset River.

As described below in the traffic section, a significant increase in the Canton Street westbound right turn volume onto University Avenue would result from the Canton Street one-way restriction. This additional volume would require a second westbound right turn lane on Canton Street (similar to Option 1) and a second northbound through lane on University Avenue from Canton Street to a point at least 300 feet north of Harvard Street. In essence, this option requires the replacement of Canton Street roadway capacity on University Avenue.

Beyond the additional capacity requirements described for the University Avenue/ Canton Street intersection and University Avenue shown in Figures 2A and 2B, additional roadway/ intersection capacity may be required north of Harvard Street due to the aforementioned increased traffic volume along University Avenue resulting from this option at the intersections of University Avenue with the University Station South and North Site Drives, Relocated Rosemont Street, Blue Hill Drive/Green Lodge Street and MBTA Driveway. This required additional capacity would likely take the form of a further increase in the cross-section of University Avenue to provide additional through travel lanes, and would impinge upon the buildable area within the University Station project site and significantly reduce or eliminate central elements of the project that are of importance to both the Town and the viability of the



project. If the town decides to further explore this option, additional analyses would be necessary to fully determine the extent of the necessary expansion of University Avenue and the associated cost to the Town, State and the University Station project.

The new road between Harvard Street and Canton Street, called “Connector Road” for purposes of this memorandum, would intersect the north side of Canton Street approximately 900 feet west of University Avenue. The right-of-way available to accommodate Connector Road between Harvard Street and Canton Street has fairly steep terrain and could require side slopes that approach 45 degrees and 20-foot to 30-foot high retaining walls.

It is assumed that Connector Road would be designed as a one-way road accommodating only southbound travel from Harvard Street to Canton Street. The Connector Road approach to Canton Street would allow left and right turn movements and would be under STOP sign control. The left turn from Connector Road would provide access to the easterly Citizen’s Bank driveway for traffic arriving from the north via University Avenue.

As described below, this concept would have significant impacts to traffic flows, traffic operations, right-of-way requirements and drainage design in the vicinity of the Canton Street/University Avenue intersection of similar magnitude to or exceeding those associated with Option 1.

Traffic. It understood that one of the goals of this concept is to discourage vehicles from using the proposed I-95 northbound off-ramp to Dedham Street, the Canton Street corridor and the East Street Rotary as an alternative route to travel from I-95 northbound to I-95/Route 128 northbound. Therefore, the intersection analyses for this concept were performed for the 2022 Build condition peak hours.

As a result of an eastbound one-way restriction on Canton Street, the following maneuvers and 2022 peak hour volumes (as shown in Figures 38 through 40 in the November 2012 TIS) would not be accommodated at the Canton Street/University Avenue intersection:

- Left turns from northbound University Avenue onto Canton Street (AM = 49 vph, PM = 28 vph, SAT = 9 vph)
- Westbound through movements on Canton Street (AM = 595 vph, PM = 199 vph, SAT = 105 vph)
- Right turns from southbound University Avenue onto Canton Street (AM = 156 vph, PM = 176 vph, SAT = 168 vph)

These volumes are comprised of: i) existing traffic; ii) traffic generated by proposed off-site development; iii) traffic generated by proposed the University Station Project; and iv) traffic generated by the new I-95 northbound off-ramp to Dedham Street.

Sketches are provided in Attachment B that depict the expected new travel paths that will replace the existing travel paths (along with the estimated 2012 existing peak hour volumes for each



path) for these maneuvers. Attachment B also provides back-up data for estimating peak hour volumes at the Canton Street/Connector Road intersection. As seen in the sketches, it is assumed traffic with destinations on Canton Street, including commercial buildings, local streets, and residences, would divert onto University Avenue northbound, turn left onto Harvard Street, and then turn left (to the easterly Citizen's Bank Driveway) or right onto Canton Street. Existing traffic which currently uses the Dedham Street/Canton Street corridor to travel to I-95/Route 128 northbound (mostly arriving from the Town of Canton) is expected to turn right from westbound Canton Street onto northbound University Avenue and enter I-95/Route 128 via the University Avenue northbound on-ramp.

For projected traffic related to the University Station Project, only Project trips exiting the site would be affected by the one-way restriction on Canton Street. Specifically, project trips turning from southbound University Avenue onto Canton Street (AM = 46, PM = 121 and SAT = 135) would be diverted. These project trips would instead enter Connector Road at Harvard Street and turn right from Connector Road onto Canton Street.

Without the one-way restriction on Canton Street, it is estimated that new I-95 northbound off-ramp to Dedham Street would increase morning peak hour traffic volumes on northbound Canton Street by approximately 60 vehicles. These are vehicles which might have diverted onto Canton Street to access I-95/Route 128 northbound until the full I-95/I-93 interchange project is complete. With Canton Street restricted to one-way eastbound, these vehicles would most likely remain on northbound I-95 rather than exit onto Dedham Street/Canton Street and turn right onto University Avenue. As I-95 northbound generally operates with little delay during the weekday afternoon and Saturday peak hours, no diversions from the new ramp onto Dedham Street were projected for those hours.

The estimated 2022 peak hour traffic volumes at the Canton Street/University Avenue, Canton Street/Connector Road and University Avenue/Harvard Street intersections are shown on Figure 2A for Option 2. In total, it is estimated that the morning peak hour right turn volume from westbound Canton Street to northbound University Avenue would increase by approximately 500 vph (from 700 vph to 1,200 vph) and require a second westbound right turn lane on Canton Street (similar to Option 1) and a second northbound through lane on University Avenue from Canton Street to a point at least 300 feet north of Harvard Street.

Intersection capacity analyses of the Canton Street/University Avenue, University Avenue/Harvard Street and Canton Street/Connector Road intersections were performed with the estimated 2022 Build volumes shown on Figure 2A. The analyses are provided in Attachment C and summarized in Table 2.

As described for Option 1, the two receiving lanes on northbound University Avenue required to accommodate the two right turn lanes on Canton Street may potentially impact access to and from the Carruth property located at the northeastern quadrant of the intersection. The property's southern driveway currently exists as a full access and egress driveway and would need to be limited to right turns in and out, impeding circulation within the subject property. Grading associated with the intersection improvements may also extend into the Carruth parking area and

could result in a loss of parking spaces and the ability for vehicles to circulate around the building, an important consideration for emergency vehicle response.

The additional through lane would require modifications to the existing at-grade rail crossing on University Avenue.

Right-of-Way. To accommodate the two exclusive right turn lanes from Canton Street onto University Avenue, additional right-of-way would be required as depicted on Figure 2A and 2B. Right-of-way takings are anticipated to total approximately 13,343 s.f. on the Carruth property (376-392 University Avenue) and 10,789 s.f. on the two properties north of the Carruth property. The additional 10,789 s.f. taking is on land not within the boundaries of the MassDOT Dedham Street/Canton Street Corridor Improvement Project and, as such, would need to be acquired by the Town of Westwood for such purposes.

Drainage. As described for Option 1, the roadway widening required to accommodate the two exclusive right turn lanes on westbound Canton Street would require extension of the existing box culvert that runs beneath the current intersection. Additional storm water storage may be needed on site to accommodate the increase in run-off from the additional pavement. The roadway widening would also place the edge of pavement and guardrail close to the existing drainage ditch which is parallel and adjacent to the north side of Canton Street. As Canton Street is approximately eight (8) feet above the bottom of the ditch, sufficient space may not be available to create a stable slope, and a retaining wall may be required to maintain the capacity of the ditch, further increasing costs to the MassDOT project.

Attachments:

Figures

Attachment A - University Ave./Canton St. Capacity Analyses w/WB Double Right Turn Lanes

Attachment B - Canton Street One-way Restriction Traffic Redistribution

Attachment C - University Avenue/Canton Street Capacity Analyses with One-Way Restriction

Table 1 2022 Build Condition Capacity Analyses Summary – Option 1

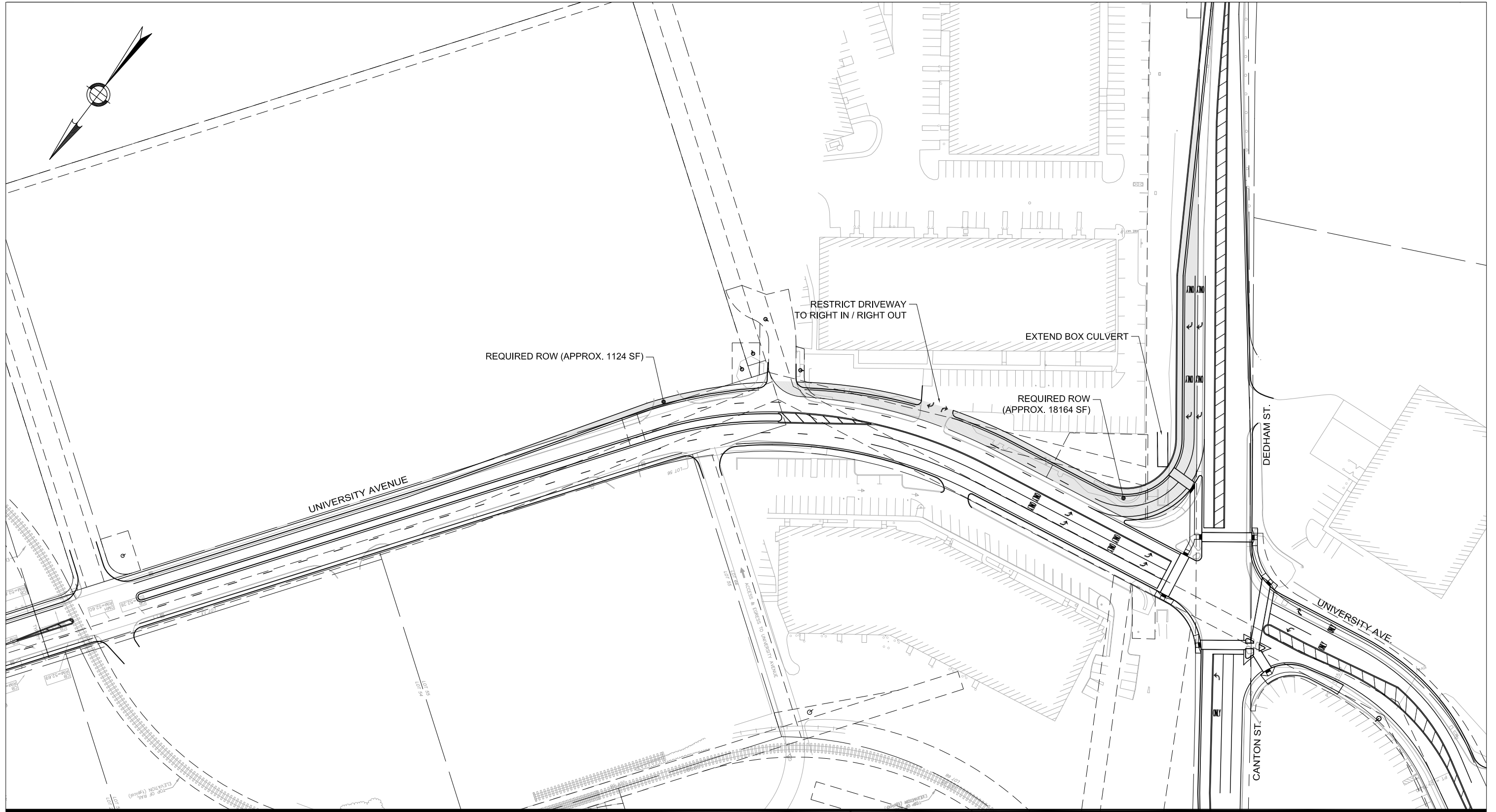
Location	AM					PM					SAT				
	V/C ¹	DELAY ²	LOS ³	50th Q ⁴	95th Q ⁵	V/C ¹	DELAY ²	LOS ³	50th Q ⁴	95th Q ⁵	V/C ¹	DELAY ²	LOS ³	50th Q ⁴	95th Q ⁵
University Avenue/Canton Street															
Canton St. EB L	0.61	26	C	25	#144	0.61	26	C	88	#248	0.45	20	C	52	#160
Canton St. EB TR	0.13	13	B	31	82	0.67	33	C	194	#408	0.24	25	C	30	78
Canton St. WB LT	>1.20	>120	F	~1076	#1743	1.16	>120	F	~211	#513	0.69	31	C	72	#233
Canton St. WB R	0.28	0	A	0	0	0.23	0	A	0	0	0.21	0	A	0	0
University Ave. NB L	0.77	82	F	31	#126	0.49	43	D	16	#73	0.05	21	C	3	19
University Ave. NB T	>1.20	>120	F	~240	#530	1.20	157	F	~306	#655	0.74	31	C	123	#362
University Ave. NB R	0.14	34	C	0	44	0.77	39	D	142	#276	0.08	17	B	0	19
University Ave. SB L	1.08	123	F	~95	#241	1.14	123	F	~244	#489	0.74	32	C	88	#230
University Ave. SB TR	1.40	234	F	~474	#907	0.98	60	E	375	#862	0.61	15	B	115	#373
Intersection	>1.20	>120	F			1.09	67	E			0.65	19	B		

¹ v/c = volume-to-capacity ratio ² Delay = Average delay expressed in seconds per vehicle ³ LOS= Level of Service ⁴ 50th Percentile Queue in feet ⁵ 95th Percentile Queue in feet, # = 95th percentile volume exceeds capacity, queue may be longer, ~ = Volume exceeds capacity, queue is theoretically infinite"

Table 2 2022 Build Condition Capacity Analyses Summary – Option 2

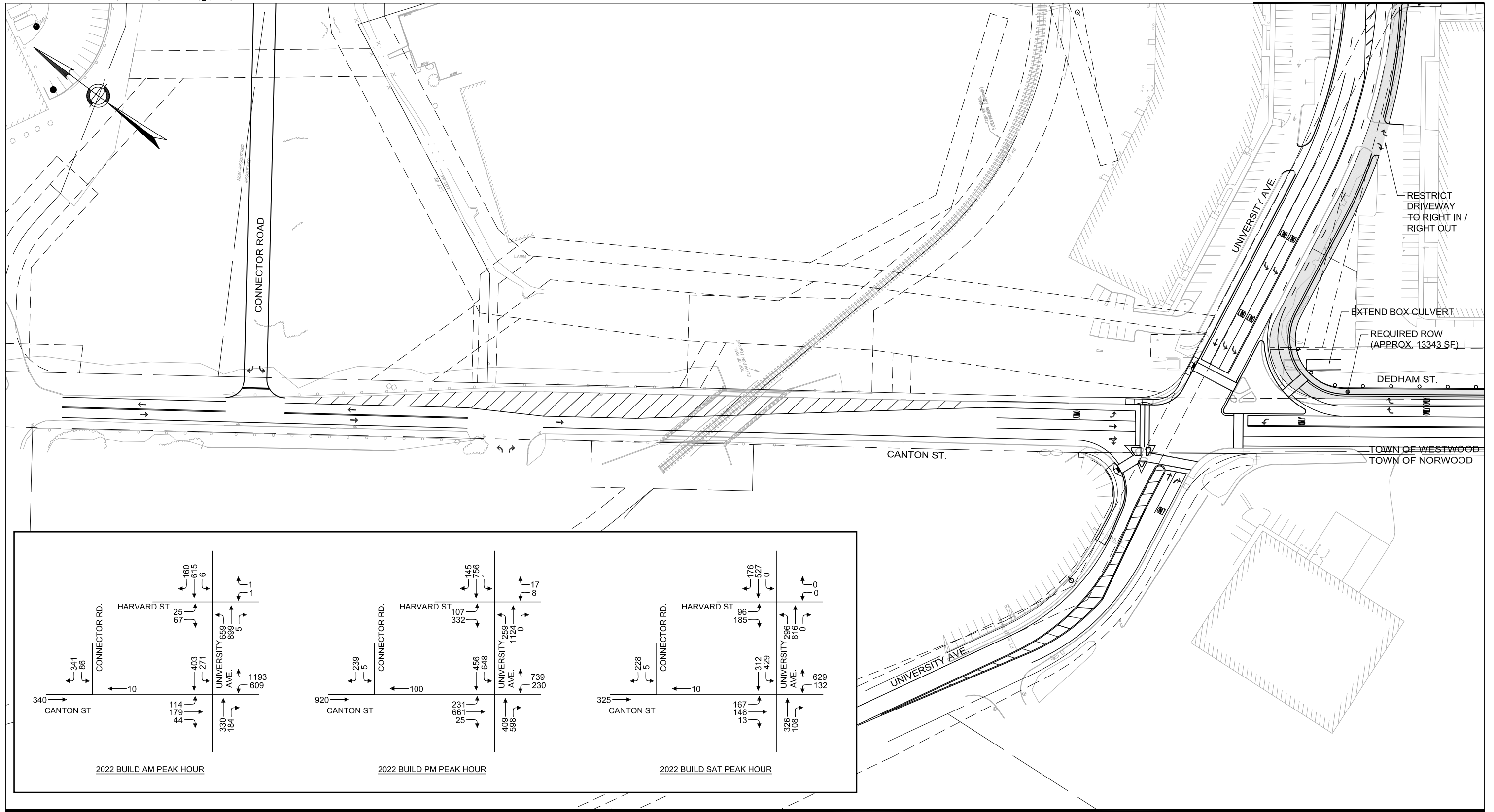
Location	AM					PM					SAT				
	V/C ¹	DELAY ²	LOS ³	50th Q ⁴	95th Q ⁵	V/C ¹	DELAY ²	LOS ³	50th Q ⁴	95th Q ⁵	V/C ¹	DELAY ²	LOS ³	50th Q ⁴	95th Q ⁵
University Avenue/Canton Street															
Canton St. EB L	0.93	102	F	75	#235	0.67	41	D	137	#319	0.68	35	D	68	#220
Canton St. EB TR	0.81	63	E	71	#180	0.90	51	D	226	#463	0.29	27	C	30	77
Canton St. WB L	0.91	44	D	351	#806	1.03	109	F	152	#404	0.73	43	D	55	#195
Canton St. WB R	0.47	1	A	0	0	0.29	0	A	0	0	0.24	0	A	0	0
University Ave. NB T	0.95	73	E	212	#514	1.03	92	F	268	#631	0.76	33	C	127	#377
University Ave. NB R	0.14	8	A	0	25	0.68	30	C	49	#278	0.08	15	B	0	25
University Ave. SB L	0.96	87	F	92	#229	1.02	80	F	218	#465	0.73	32	C	88	#230
University Ave. SB T	0.73	34	C	222	#502	0.60	21	C	201	452	0.39	12	B	72	226
Intersection	0.90	35	C			0.94	47	D			0.68	20	C		
University Avenue/Harvard Street															
Harvard St. EB LT	0.18	21	C	5	23	0.57	44	D	69	126	0.57	37	D	49	97
Harvard St. EB R	0.05	10	A	1	15	0.68	37	D	153	213	0.40	25	C	46	95
Driveway WB LTR	0.01	20	B	0	4	0.05	37	D	5	29	0.01	30	C	0	6
University Ave. NB L	1.06	61	E	61	#478	0.57	7	A	36	77	0.46	4	A	27	64
University Ave. NB TR	0.40	3	A	0	137	0.45	4	A	112	190	0.31	3	A	58	106
University Ave. SB LTR	0.63	13	B	54	#226	0.48	11	B	149	292	0.39	8	A	103	190
Intersection	0.92	22	C			0.58	12	B			0.47	9	A		
Canton Street/Connector Road															
Connector Road	0.50	13	B	71		0.30	11	B	31		0.24	10	A	23	

¹ v/c = volume-to-capacity ratio ² Delay = Average delay expressed in seconds per vehicle ³ LOS= Level of Service ⁴ 50th Percentile Queue in feet ⁵ 95th Percentile Queue in feet,
 # = 95th percentile volume exceeds capacity, queue may be longer



University Station
Westwood, Massachusetts

Option 1 Concept Plan
University Ave / Canton St
with Double Right Turn Lanes

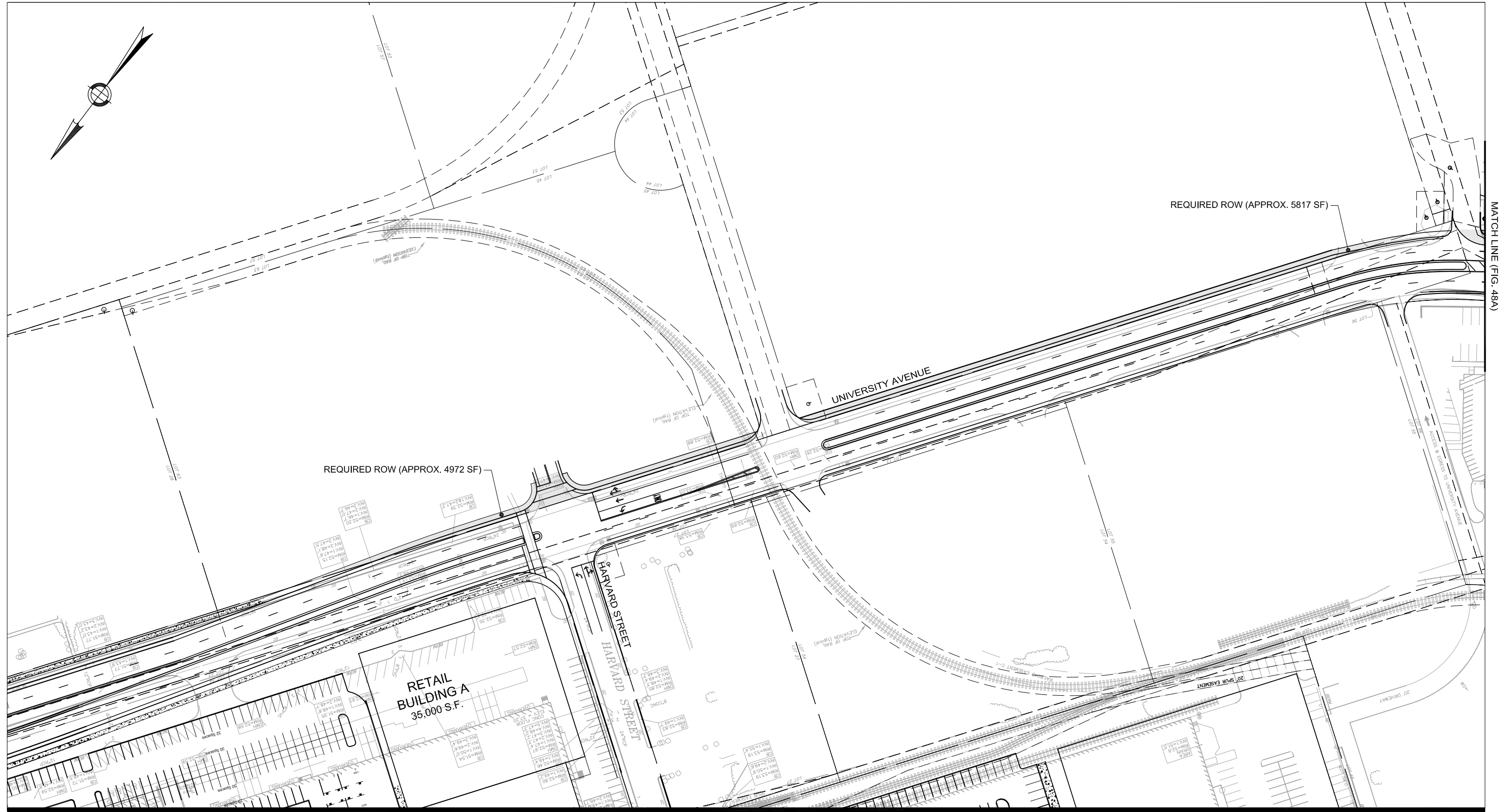


University Station
Westwood, Massachusetts

Option 2 Concept Plan
University Ave / Canton St
with One-Way Restriction

Figure 2A





University Station
Westwood, Massachusetts

Option 2 Concept Plan
University Ave / Canton St
with One-Way Restriction

Figure 2B