

**To:** Giancarlo G. Patino, P.E., City Engineer  
City of Bee Cave, Texas

**From:** Kerri M. Collins, P.E., PTOE, LEED AP

**Date:** March 18, 2015

**Subject:** 3rd TIA Review, 3rd Submission – Hill Country Indoor – March 2015

Following the City Council meeting on March 10, 2015, PB was requested to review the Hill Country Indoor TIA – March 2015 which was submitted by Klotz Associates with a revised trip generation calculation. We offer the following comments.

**Trip Generation Calculation**

1. Klotz Associates revised the trip generation calculation by splitting the uses and associated square footage between two land use codes – LUC 493 Athletic Club and LUC 492 Health/Fitness Club. The square footage was split 48% to LUC 492 and 52% to LUC 493. The result was a reduction in overall trips generated. After reviewing the trip generation calculation and comparing with the previous calculation in the earlier two TIA submissions, it was noticed that the overall development square footage was reduced from 134,320 SF to 128,253 SF or by 6,067 SF. It may be that the Applicant is excluding the food court, concessions and entry area (about 5,750 SF) but this is not appropriate. The rates developed in the ITE Trip Generation Manual include similar ancillary space which was incorporated in the equation that developed the rate to be used for calculating trip generation. Please clarify why the overall SF of the development was reduced for the trip generation calculation and if as stated above, please correct the calculation to include the total area of the development.

**Access**

2. Our recommendation is that with a posted speed of 45 mph and a right-turn volume of 174, the TxDOT Roadway Design Manual design standards should be followed. The right-turn lane should be constructed on Bee Cave Parkway at Skaggs Drive to include 30 feet for storage and 215 feet for deceleration for a total length of 245 feet. The taper length, which is part of the deceleration length, should be 100 feet. This design allows for vehicles to slow down by 20 mph in the through lane before fully entering the deceleration lane. If the standard 10 mph were used, the suggested length would be longer. The TIA recommends that "a dedicated right turn lane should be considered in accordance with guidelines specified by either the City of Austin Transportation Criteria Manual or the Texas Department of Transportation. Please change "should be considered" to "will be constructed".
3. Page 14 of the TIA refers to "left-turn bay principles" from the City of Austin Transportation Criteria Manual to size the right-turn deceleration lane at Skaggs Drive. This is not appropriate since left-turn movements are delayed by traffic and right-turn movements are not. The left-turn storage calculation should not be applied to right turn lanes. Furthermore, the TIA goes on to state "... or the required minimum storage length of 150 feet plus a taper length of 118 feet". Based on Klotz's second statement the right turn lane length would be 268 feet which is more



than what was cited by PB per TxDOT's Roadway Design Manual. Please revise TIA to reflect the TxDOT requirement of 245 feet.

4. The City of Bee Cave staff field measured the left-turn bay on Bee Cave Parkway at Skaggs Drive. The total full-lane length is 190 feet with a 50-55 foot taper for a total of 240 to 245 feet. We recommend extending the left-turn bay based on the requirements in TxDOT's Roadway Design Manual. The left-turn bay should be extended to 375 feet (deceleration length of 275 feet and storage length of 100 feet minimum). We recommend the use of the TxDOT criteria based on the following reasons:

- ***It is a safety issue and the TxDOT guidelines are more conservative.***
- ***The storage length in the Austin Transportation Criteria Manual is based on a uniform arrival rate for the left-turn traffic during the peak hour. This land use will likely experience more compressed arrivals since athletic events have established start and end times. This supports a more conservative approach.***

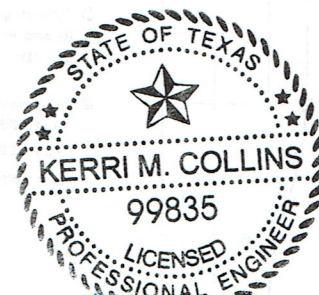
#### **Identification of Impacts & Mitigation**

5. The March 2015 TIA identifies impacts at both study intersections. Mitigation improvements are not suggested for the intersection of Bee Cave Parkway and SH 71. The TIA states that a second eastbound left-turn lane is needed but cites a design rule-of-thumb as a reason not to construct the second left turn lane. A design rule of thumb is not appropriate to address when mitigation should be implemented. A TIA and detailed analysis supercedes a design rule-of-thumb as a TIA identifies where impacts occur and what improvement is needed to mitigate an impact. The Applicant must construct the second eastbound left turn lane or an alternative improvement, such as adding a second northbound right turn lane.
6. The March 2015 TIA identifies an impact at the intersection of RM 620 and Bee Cave Parkway. The TIA proposes that "...either the eastbound approach could be restriped to allow for a proposed configuration comprising of dual left turn lanes and a shared through-right turn lane or add a dedicated left turn lane to create dual left turns." Restriping the eastbound approach reduces the capacity of the eastbound through movement, leaving only a shared through/right turn lane to serve the through traffic. For that reason it is not advised that the City accept this improvement as mitigation. The city should ask for the second left turn lane to be constructed or consider another improvement that mitigates the impact.
7. The revised Synchro/SimTraffic files were reviewed. There was no analysis submitted for the Build with Improvements scenario for the PM peak hour. We modified the Build PM peak hour file to include the proposed restriped eastbound left turn lane as proposed in the TIA. The results show that although the proposed improvement brings the Build LOS up from an F to an E during the AM peak hour it does not reduce the delay to the No Build level. More importantly, when the PM peak hour analysis is reviewed, it becomes apparent that the proposed restriping does little to improve the LOS and delay.

RM 620 & Bee Cave Parkway LOS/Delay			
Time Period	No Build 2015	Build 2015	Build with Improvements 2015
PM Peak Hour	F/148.6	F/174.1	F/172.6
AM Peak Hour	E/56.3	F/81.5	E/77.6

8. The estimated cost of the proposed improvements submitted does not appear to include ROW acquisition, utility relocation, and survey or a contingency to cover these items if needed. Also, the area of paving does not appear to be sufficient since adding a second left turn lane typically requires widening both sides of the intersection in order to maintain the alignment of the through lanes across the intersection. Please revise to include widening both sides of the intersection or prepare a layout, at scale, to show how the improvement is to be implemented. Please explain how the lengths of the left turn lane improvements were determined. The Austin Transportation Criteria Manual for unsignalized left turn bays appears to have been used. There is a different formula for signalized intersections. More importantly, if you are adding a 2<sup>nd</sup> left turn lane, it should be as long or longer than the existing one, for design purposes.

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*Kerri M. Collins*  
3/18/15



## City of Austin Transportation Criteria Manual:

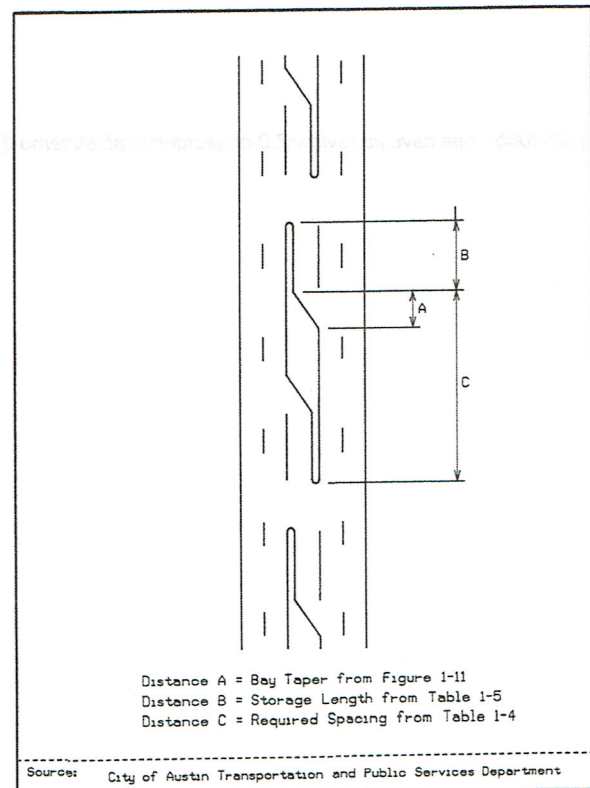
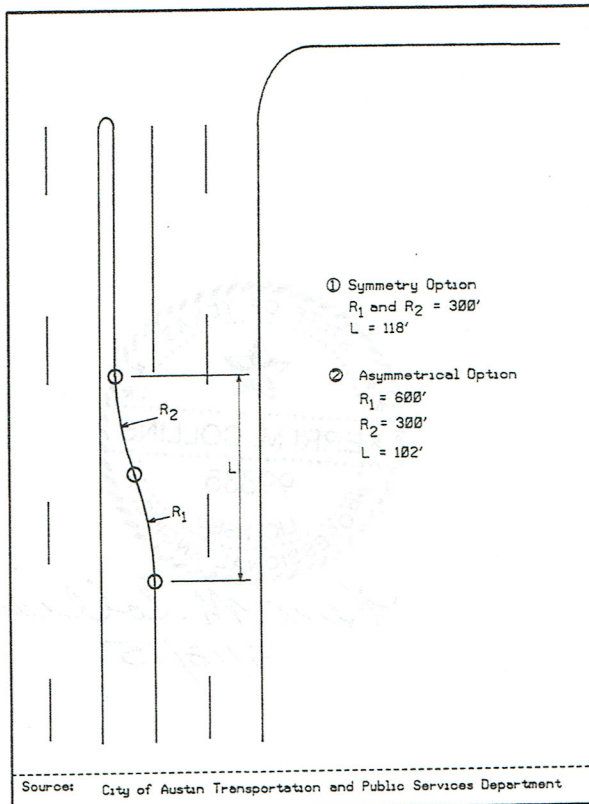
**TABLE 1-5 STORAGE LENGTH OF LEFT TURN BAY  
(FOR ARTERIAL)\*\***

Lmax(av)	City of Austin Standard	City of Austin Dual Left Standard
0	0	-
6	150	-
8	200	-
10	250	-
12	300	200
14	340	200
16	370	200
17	400	300
18	425	300
20	450	300
21	475	300
22	500	300
23	525	300

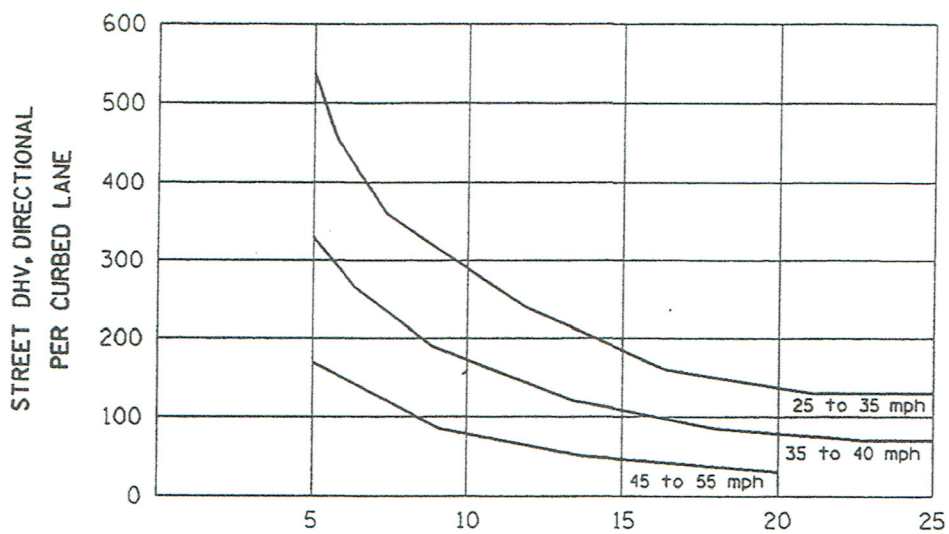
At a minimum, storage lengths should be 150 feet when turning into a collector or an arterial and 100 feet when turning into a local street. At any unsignalized intersections, the storage length, exclusive of taper may be based on the number of turning vehicles likely to arrive in an average two (2) minute period within the peak hour with each vehicle accounting for approximately 20 feet of storage. At signalized intersections, the storage length depends on the signal cycle length, the signal phasing arrangement and the rate of arrivals and departures of left-turning vehicles (see Table 1-5).

$L_{max}(av) = 5.5 (L_{avg})^{0.58}$  (based on average condition)

Source: Based on Research Report 258-1, University of Texas Center for Transportation Research, 1984



Right-turn deceleration lanes should be considered on approach to driveways when criteria indicated in Figure 5-3 in Appendix H of this manual is met.



- DHV OR AVERAGE PEAK HOUR VOLUME OF VEHICLES TURNING RIGHT INTO ACCESS
- DESIGN HOUR VOLUME: Hourly traffic volumes used for street design and capacity analysis; usually one or more peak hours during a 24 hour period.

Source: Based on City of Lakewood Transportation Engineering Design Standards, 1985