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MEMORANDUM

To:	Lindsey Oskoui, City of Bee Cave
From:	Kerri M. Collins, PE, PTOE, LEED AP
Date:	April 28, 2017
Project Name:	Hill Country Indoor
Project Number:	28406 – WO 2
Subject:	Land Use/Trip Generation Modification

Some of the proposed changes in the uses and programming of the space for the Hill Country Indoor development are not of similar type to the prior uses and may not have been accounted for in the ITE Trip Generation Land Use Codes applied in the TIA. As such, they raise some concerns regarding the trips generated. The uses seem to be of a type associated with hosting parties and/or classes for children. Please provide additional information about how the spaces will be utilized, how many parties can be accommodated, how many children attending parties, what age groups are targeted and when the parties would be scheduled. Also provide similar information on classes offered for these new uses.

The TIA previously used an approach that applied trip rates per one Land Use Code: 493 Athletic Club, which provided the most conservative trip generation estimate. Later, a request was made to split some of the square footage/uses into a second Land Use Code: 492 Health/Fitness Club and apply a revised trip generation calculation resulting in a reduction in trips. The City of Bee Cave agreed to allow this modification and reduction in trips based on the health club being an accessory use to field/team sports component.

At this time the City is not requiring the TIA to be revised but is requesting that the applicant contribute the pro rata funds towards the mitigation identified for the two study intersections – SH 71 at Bee Cave Parkway and RM 620 at Bee Cave Parkway. The mitigation consists of a 2nd EB left turn lane at SH 71 and Bee Cave Parkway and a 2nd EB left turn lane (not restriping) at RM 620 and Bee Cave Parkway per comments provided in the WSP | PB memo dated 2/24/2015.

The pro rata share calculations as shown in the memo from Klotz Associates dated 3/2/2015 should be corrected to show the greatest percentage resulting from calculations using each of the two peak hour volumes. In the case of RM 620 at Bee Cave Parkway, the pro rata share using the PM peak hour volume would be around 33%.

The cost estimates provided for adding the 2nd left turn lanes at each intersection seem low and should be revised to include widening that is needed on both sides of each intersection to account for alignment of through lanes across the intersection.

A revision of the TIA and analysis may be required if the City of Bee Cave finds that a significant increase in trips is possible due to the proposed changes in uses and the programming of that space.

Attachments

j:\28406a bee cave tia review\hill country indoor\4 7 17\wsp memo 4 28 17.docx

Kerri M. Collins
4/28/17

Hill Country Indoor
4317 Skaggs Dr., Bee Cave, Texas 78738

Considerations for Council Approval of the Site and NPS Plan

- Traffic: Execution of '*Highway Improvement and Escrow Agreement*' based on revised TIA and required traffic improvements as follows:

  - BCP and Skaggs Dr. - Extending WB left-turn bay at Bee Cave Parkway.
  - BCP and SH 71 - 2nd EB left turn lane or alternative improvement.
  - BCP and RM 620 – 2nd left turn lane or consider another improvement.
  - Update cost estimates for Pro-rata share for improvements at RM 620 & BCP.

- Drainage Easement: Execution and recordation of the "*First Amended Stormwater Drainage Easement*".

- Impervious Cover: Execution and recordation of the "*Acknowledgement of Owner of Adjacent Property Regarding Impervious Cover for Shared Improvements*".

- Maintenance Plan: Recordation of the "*Maintenance Plan"* including the "*Integrated Pest Management Plan"* for the Rainwater Harvesting System.

- *Trail system: Finalize '*Access Easement Agreement*' draft for Trail and Pedestrian access.

  ***Note:** At the last meeting there was discussion by council regarding a requirement that the developer provide pedestrian connectivity. The PDD Ordinance already requires the Developer to construct and maintain a "trail system" that connects to trails on adjoining property and that is accessible by the public without charge. If the developer is held to the requirements of the current PDD the above referenced *"Agreement"* should be required. If however, council is more interested in a "connectivity" type trail for pedestrian and bike ingress and egress to adjoining property, the Developer would need to agree and the *Agreement* referenced above would need to be modified to provide for an access easement to be dedicated to the City and the City would construct and maintain the trail. To date, developer has not provided either scenario.

Prior to Site Permit issuance

- Site Plan: *If approved*, the Site and NPS Plan set will require updates to demonstrate all traffic related improvements. The Cover Sheet requires update to add a note** related to TIA, participant limits, and parking. Relevant sheets will require updates to reflect proposed trail system connectivity. Relevant sheets require updates depicting location of pedestrian crosswalk and specification for lighting fixtures in overflow parking area.

  ****Note to be added to the Site Plan Cover Sheet:** "*In the event that the assumptions used in the Traffic Impact Analysis approved in conjunction with this site plan exceed or are in conflict with the parameters set forth in Ordinance 14-201, the requirements in Ordinance 14-201 govern. The Permitted uses may not be adjusted, nor the Participant Load increased without an amendment to*

Ordinance 14-201. Participant Load includes players, referees, coaches, and others involved in the conduct of games or practices; users of the batting cages and practice areas; all on-site facility staff; users of all gym or fitness areas, including but not limited to a jogging track, health club, or weight room; and staff and patrons of the retail space, including but not limited to all concession areas. Spectators are not included in the Participant Load count. However, consistent with the assumptions presented in the application for Ordinance 14-201, they must arrive in the same vehicle as the Participant. Pursuant to Ordinance 14-201 Exhibit C Section 4(a), the 'City shall have the authority to reduce the participant limit below 198, require additional on-site or off-site parking or take other appropriate action if the parking provided herein proves to be routinely insufficient to accommodate the parking needs of the Project.'"

- Post fiscal security for NPS, tree protection and erosion controls in the total amount of the engineer's estimate $118,830.00.
- Payment of *'Tree Replacement"* fee in the total amount of $20,000.00.
- Payment of '*Landscape Plan Review*' fee in the total amount of $7,523.70
- Payment of '*Exterior Lighting Plan Review*' fee in the total amount of $300.00.
- Payment of applicable remaining fees for review of '*Traffic Impact Analysis*'; (prepaid $2500 amount has been exceeded).
- Payment of applicable remaining fees for review of the legal documents by the City Attorney.

klotz associates

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Memo

To: Mr. Jude Langle

From: Elizabeth Shelton, P.E.

Date: March 2, 2015

Re: Hill Country Indoor TIA Pro-Rata Share

The pro-rata share calculations for the improvements contained within the Hill Country Indoor Traffic Impact Analysis dated March 2, 2015 have been completed. The possible improvements and the estimated construction cost are below. Appendix A shows a more detailed breakdown of the cost estimates.

RM 620 at Bee Cave Parkway

- Add a left turn lane to create Eastbound dual left turns - $126,605

Bee Cave Parkway at Skaggs Drive

- Westbound left turn lane taper modification - $21,840
- Construct eastbound right turn lane - $55,965

SH 71 at Bee Cave Parkway/Hamilton Pool Road

- Add a left turn lane to create Eastbound dual left turns - $113,935

The developer's pro-rata share of the construction cost is based on the projected percentage of traffic from the proposed development utilizing the individual improvement in the case of turn lane improvements. Table 1 shows the projected 2015 Build Condition peak hour utilized for the pro-rata calculation, total projected traffic volumes, site specific traffic volumes, and percent of development traffic utilizing the movement.

The developer's pro-rata share based on the percentage of site specific traffic utilizing the proposed improvements is $104,200.

Table 1 – Pro-Rata Share

Location	Peak Hour	Improvement	Total Traffic Volume (veh)	Site Specific Traffic Volume (veh)	Pro-Rata Share (%)
RM 620 at Bee Cave Pkwy	AM	EB dual left turn	PM 219 476 AM ~~428~~ 468	~~45~~ 48 ~~40~~	~~10~~ 8.5%
Bee Cave Pkwy at Skaggs Dr	-	WB left turn lane taper modification	241	241	100 ✓
	PM	EB right turn lane	130	130	100 ✓
SH 71 at Bee Cave Pkwy / Hamilton Pool Rd	AM	EB dual left turn	272	33	12

620 @ Bee Cave

AM NB 428 476 — 48 — 10.08%

PM NB 219 328 — 109 — 33.2%

SH 71 @ Bee Cave

AM NB 239 272 — 33 — 12%

PM NB 137 156 — 19 — 12.2%

Appendix A

RM 620 @ Bee Caves Parkway - Left Turn Lane

55 mph
Taper = 118'
Deceleration = 0'
Storage = 150'
Total Length = 268'

Description	Units	Quantity	Unit Cost	Cost
Removal	SY	60	$ 100.00	$ 6,000.00
HMAC	TON	80	$ 140.00	$ 11,200.00
Base	TON	160	$ 75.00	$ 12,000.00
Signing	EA	2	$ 500.00	$ 1,000.00
Curb & Gutter	LF	270	$ 12.00	$ 3,240.00
Pavement Markings	LS	1	$ 5,000.00	$ 5,000.00
Subgrade Widening	STA	3	$ 315.00	$ 945.00
Signal Improvements	LS	1	$ 5,000.00	$ 5,000.00
Sodding	SY	300	$ 10.00	$ 3,000.00
SW3P	LS	1	$ 2,000.00	$ 2,000.00
Remove Existing 5' Retaining Wall	SF	1,100	$ 10.00	$ 11,000.00
5' Retaining Wall	SF	1,100	$ 30.00	$ 33,000.00
Sidewalk	SY	170	$ 46.00	$ 7,820.00

Subtotal				$ 101,205.00
Mobilization	LS	10%		$ 10,200.00
Contingency	LS	15%		$ 15,200.00
			Total	**$ 126,605.00**

SH 71 @ Bee Caves Parkway - Left Turn Lane

55 mph
Taper = 118'
Deceleration = 0'
Storage = 150'
Total Length = 268'

Description	Units	Quantity	Unit Cost	Cost
Removal	SY	60	$ 100.00	$ 6,000.00
HMAC	TON	65	$ 140.00	$ 9,100.00
Base	TON	130	$ 75.00	$ 9,750.00
Signing	EA	4	$ 500.00	$ 2,000.00
Curb & Gutter	LF	270	$ 12.00	$ 3,240.00
Pavement Markings	LS	1	$ 10,000.00	$ 10,000.00
Subgrade Widening	STA	3	$ 315.00	$ 945.00
Signal Improvements	LS	1	$ 45,000.00	$ 45,000.00
Sodding	SY	300	$ 10.00	$ 3,000.00
SW3P	LS	1	$ 2,000.00	$ 2,000.00

Subtotal				$ 91,035.00
Mobilization	LS	10%		$ 9,200.00
Contingency	LS	15%		$ 13,700.00
			Total	**$ 113,935.00**

Skaggs Driveway @ Bee Cave Parkway - Right Turn Lane

45 mph
Taper = 118'
Deceleration = 0'
Storage = 150'
Total Length = 268'

Description	Units	Quantity	Unit Cost	Cost
Removal	SY	70	$ 100.00	$ 7,000.00
HMAC	TON	75	$ 140.00	$ 10,500.00
Base	TON	150	$ 75.00	$ 11,250.00
Signing	EA	2	$ 500.00	$ 1,000.00
Curb & Gutter	LF	300	$ 12.00	$ 3,600.00
Pavement Markings	LS	1	$ 5,000.00	$ 5,000.00
Subgrade Widening	STA	3.00	$ 315.00	$ 945.00
Sodding	SY	340	$ 10.00	$ 3,400.00
SW3P	LS	1	$ 2,000.00	$ 2,000.00

Subtotal				$ 44,695.00
Mobilization	LS	10%		$ 4,470.00
Contingency	LS	15%		$ 6,800.00
			Total	**$ 55,965.00**

Skaggs Driveway @ Bee Cave Parkway - Left Turn Lane

45 mph
Taper = 118'
Deceleration = 0'
Storage = 0'
Existing Taper = 80'
Total Length = 118'

Description	Units	Quantity	Unit Cost	Cost
Removal	SY	30	$ 100.00	$ 3,000.00
HMAC	TON	6	$ 140.00	$ 840.00
Base	TON	12	$ 75.00	$ 900.00
Taper Removal	LF	80	$ 15.00	$ 1,200.00
Proposed Taper Curb Work	LF	120	$ 15.00	$ 1,800.00
Signing	EA	2	$ 500.00	$ 1,000.00
Pavement Markings	LS	1	$ 5,000.00	$ 5,000.00
Subgrade Widening	STA	1.20	$ 500.00	$ 600.00
Sodding	SY	100	$ 10.00	$ 1,000.00
SW3P	LS	1	$ 2,000.00	$ 2,000.00
Subtotal				$ 17,340.00
Mobilization	LS	10%		$ 1,800.00
Contingency	LS	15%		$ 2,700.00
			Total	**$ 21,840.00**

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Memorandum

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 2nd 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

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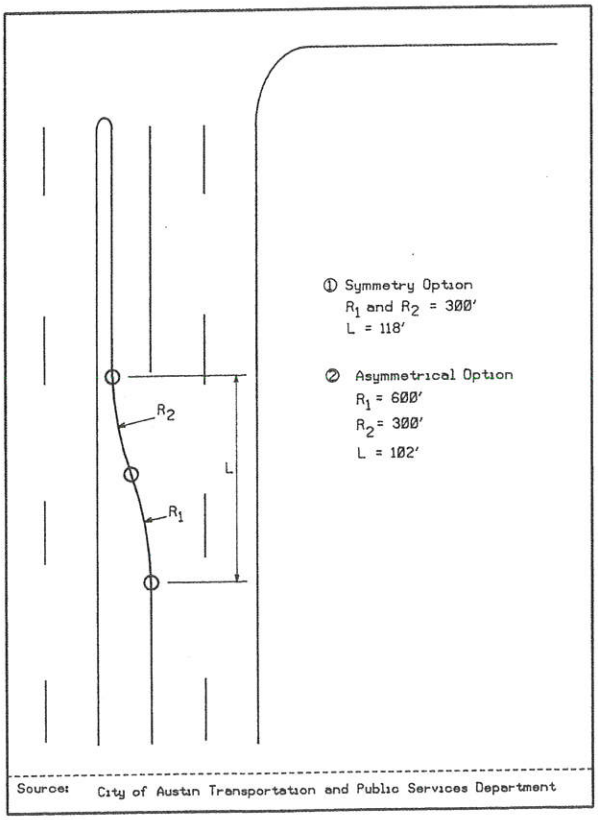
City of Austin Transportation Criteria Manual:

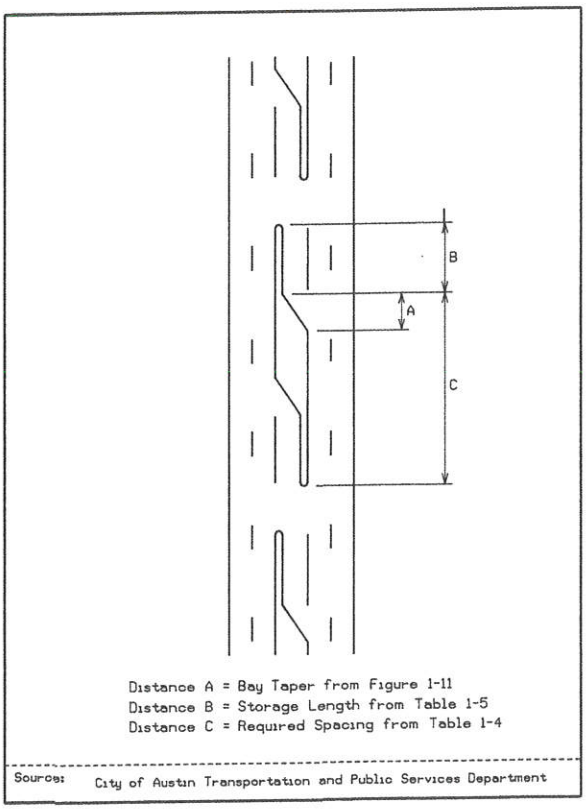
TABLE 1-5 STORAGE LENGTH OF LEFT TURN BAY (FOR ARTERIAL)**

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

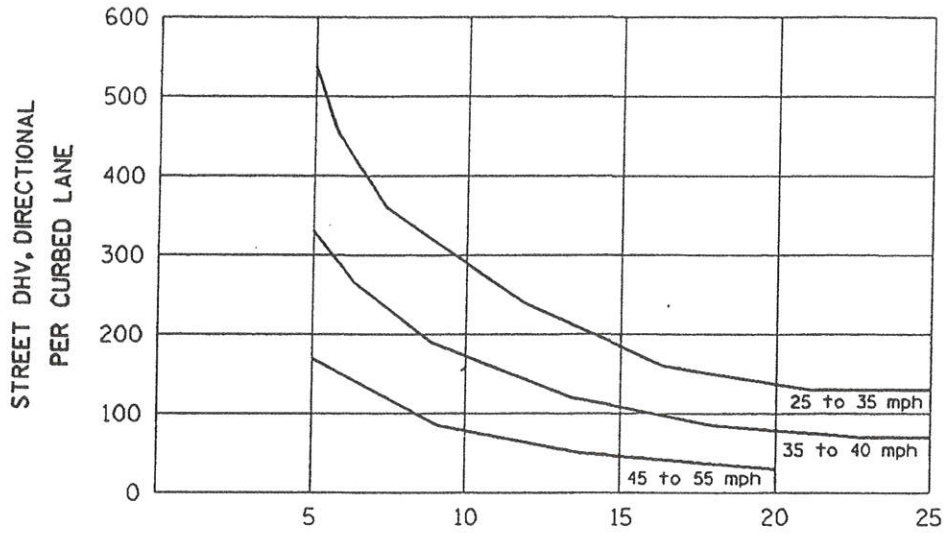
Lmax (av) = 5.5 (Lavg $^{0.58}$) (based on average condition)
Source: Based on Research Report 258-1, University of Texas Center for Transportation Research, 1984

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).





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 peek hours during a 24 hour period.

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