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To:	Ian Griffis
From:	Brian J. Horan, P.E. Kevin R. Fellin, P.E.
Cc:	Caitlin S. Quander
Date:	June 12, 2025
Re:	**Proposed Palmer Lake, Co - Buc-ee's**
Subject:	**Traffic Impact Study Review**

The purpose of this memorandum is to summarize a review of the traffic impact studies that have been prepared for the Buc-ee's travel center that is proposed to be located in the southwest quadrant of the I-25/County Line Road interchange in what is now part of El Paso County, Colorado. **This memorandum does not support or oppose the proposed project, however, it provides a technical review of the submitted traffic impact studies to highlight any potential critical traffic related considerations that may have not been fully addressed.**

As such, the following documents were reviewed in detail by our traffic engineering team:

TRAVEL CENTER PALMER LAKE – TRAFFIC IMPACT STUDY
Dated: November 19, 2024
Prepared by: Kimley-Horn and Associates, Inc.
Prepared for: Ratcliff Engineering Services, LLC

TOWN OF PALMER LAKE – TRAFFIC IMPACT STUDY
Dated: February 27, 2025
Prepared by: Stolfus & Associates, Inc.
Prepared for: Town of Palmer Lake, CO

This assessment was undertaken at the request of Ian Griffis who represents a consortium of local landowners and entities that depend on safe and convenient access to their local/regional road network to meet their transportation needs. As a result, this memorandum assesses the traffic impact studies that were prepared to evaluate this new use with respect to best practices and sound assumptions.

OVERVIEW

Overall, we found that each traffic study reviewed generally followed typical guidelines and practices in preparation of a traffic impact study.

Traffic Counts. Both traffic studies conducted existing traffic counts during acceptable periods (weekday AM and PM periods) with the Stolfus study also collecting traffic counts during a peak weekend period.

Given the highlighted impacts to the existing Tri Lakes Church of Christ, an additional traffic count collected on a Sunday that correlated with their Sunday service would better demonstrate the Buc-ee's impact and emphasis to maintain adequate access for the church beyond a right-in/right-out access point as currently provided in the future.

Spot checks of the existing traffic count figures would suggest traffic balancing was warranted at certain locations, but it should be noted such balancing would ultimately not fundamentally impact the reported results.

Trip Generation. Both studies relied on actual field measurements at existing Buc-ee's sites which does provide the most accurate representation of the traffic generated by this unique use given the Institute of Transportation Engineer's (ITE) Trip Generation Manual does not provide equivalent data.

The Kimley-Horn study utilized a more conservative trip generation assessment based on existing sites across the country while the Stolfus study concentrated on an existing Buc-ee's in Colorado.

The Kimley-Horn study assumed that 85 percent of the future site traffic would predominately already exist on I-25 and then divert their trip to Buc-ee's on the way to their final destination. The Stolfus study assumed 75 percent. For both studies, these assumptions appear to be based on the ITE Trip Generation Handbook for a typical gasoline station with convenience store. Based on our knowledge of a Buc-ee's travel center, this type of facility acts more as a destination than a typical travel center so it should be expected that a lesser percent of site trips will be attracted from the adjacent roadways and that a greater percentage will be new trips added to the road network as destination trips. The difference between diverted link and destination trips does not materially impact the study intersections given all trips (primary and diverted link) show up at the site entrances. It should be expected the overall volume of traffic on I-25 will increase in the area as a result of the Buc-ee's site.

Site Access. The site access for the proposed Buc-ee's site is proposed to include two (2) full-movement access points on Beacon Lite Road and one (1) right-out only on County Line Road. In review of other Buc-ee's sites, they typically provide more access opportunities to support efficient circulation into and out of the site.

The limited access line should be verified for the proposed right-out access on County Line Road. Also, the proposed right-out was identified to require a deviation from access management minimum spacing standards. Impacts should be evaluated if the deviation is not approved.

Site Distribution. Both studies assumed that approximately 90 percent or more of the site trips will be oriented to/from I-25. This evaluation concurs and as a result focuses in part on the I-25/County Line Road interchange in the subsequent Traffic Operations section of this memorandum.

TRAFFIC OPERATIONS

I-25/County Line Road Interchange

As noted in both traffic studies, nearly all of the site generated traffic would be oriented to/from the I-25/County Line Road interchange. Therefore, the analysis and recommendations from the previously prepared traffic studies were reviewed in detail. The results are summarized below.

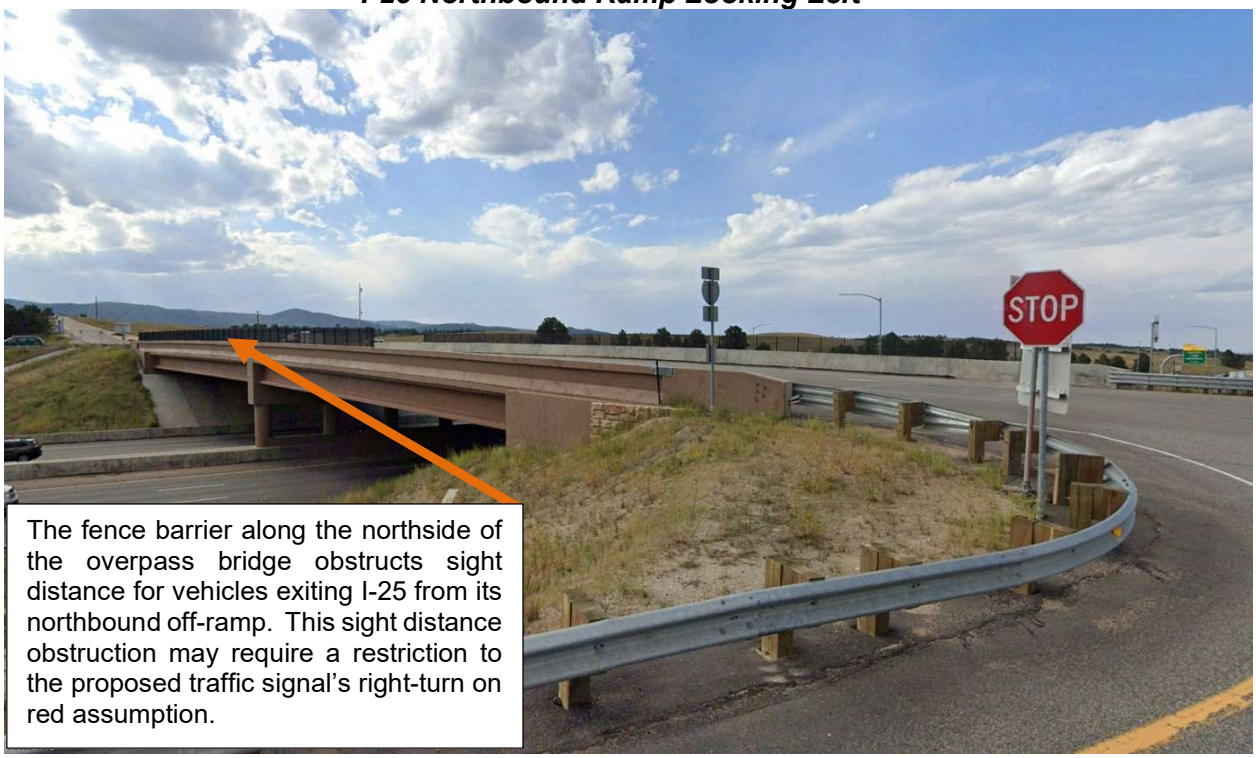
Roadway Geometry. The previously prepared traffic studies provided the following improvements at the I-25/County Line Road interchange:

- Restripe the existing bridge lanes to provide three (3) westbound and two (2) eastbound lanes.
- Construct an additional lane on the I-25 NB off-ramp and the I-25 SB off-ramp at their intersection with County Line Road.
- Reconstruct the eastbound approach to provide a total of three lanes at the intersection with the I-25 SB off-ramp.
- Install traffic signals on County Line Road at both I-25 off-ramp intersections.

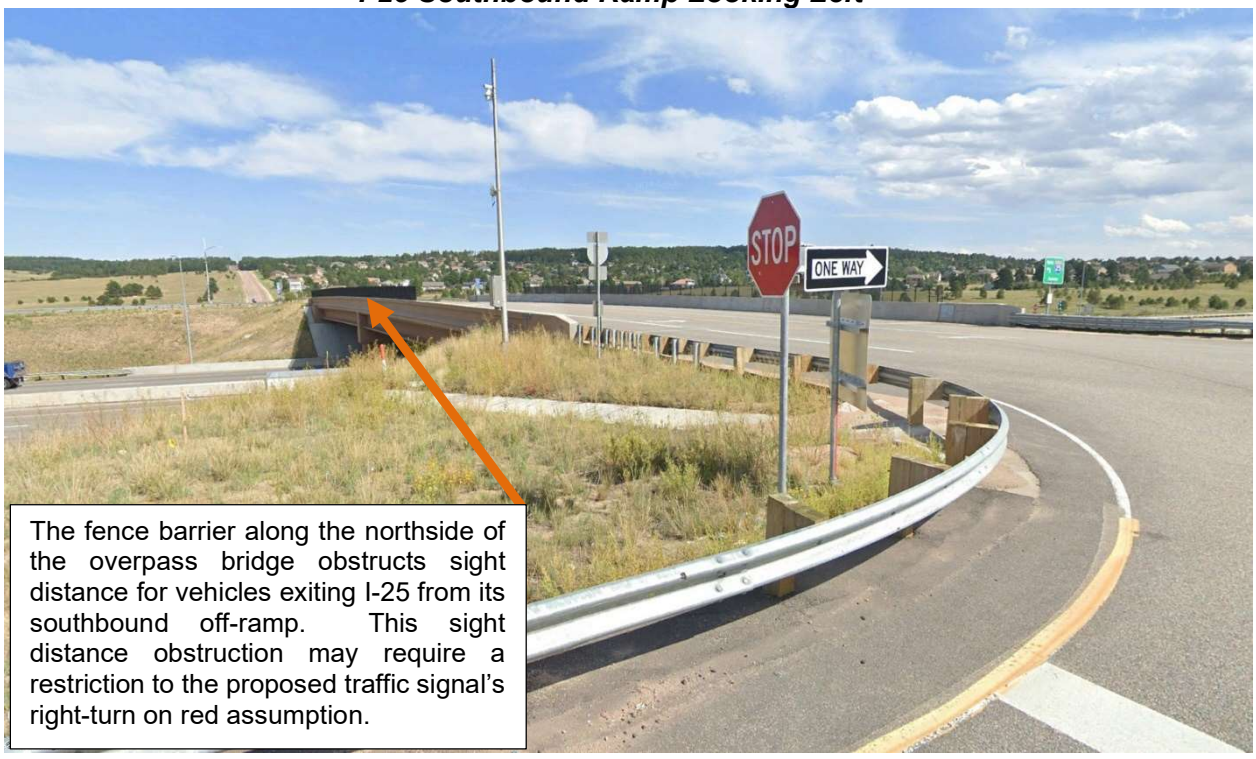
The fifth travel lane on the interchange bridge would require the reduction of existing striped shoulders. Therefore, the lateral offset requirements from the bridge wall need to be considered to ensure proper clearance from heavy vehicles. Additionally, the alignment of the relocated through lanes with the corresponding receiving lanes would need to be reviewed.

The relocation of the roadway edge lines would also impact sight distance considerations. The driver's viewing (eye) location would need to be shifted further back on each of the I-25 off-ramps. As shown below, with the shift in viewing location, the bridge wall and fence on top of the wall would likely obstruct the line on sight. While the installation of a traffic signal would help resolve sight distance concerns, right-turn-on-red (RTOR) maneuvers would likely be prohibited which would impact vehicle throughput and increase vehicle queues exiting the off-ramp.

I-25 Northbound Ramp Looking Left



I-25 Southbound Ramp Looking Left



Traffic Analysis. While a traditional macroscopic analysis using Highway Capacity Manual methodologies was used in both studies to assess the lane use configuration at the I-25 ramp intersections at County Line Road, a more detailed microsimulation would be required to fully evaluate how the interchange operates due to the following reasons:

- The two I-25 ramp intersections are in close proximity to each other (less than 400 feet centerline-to-centerline) and may experience impacts due to queue spillback.
- The proposed traffic signals would likely operate under clustered or highly coordinated signal timing patterns, created platooning effects.
- The I-25 ramps would impact operations on I-25 at the merge and diverge points especially if traffic spills back into the mainline interstate travel lanes.

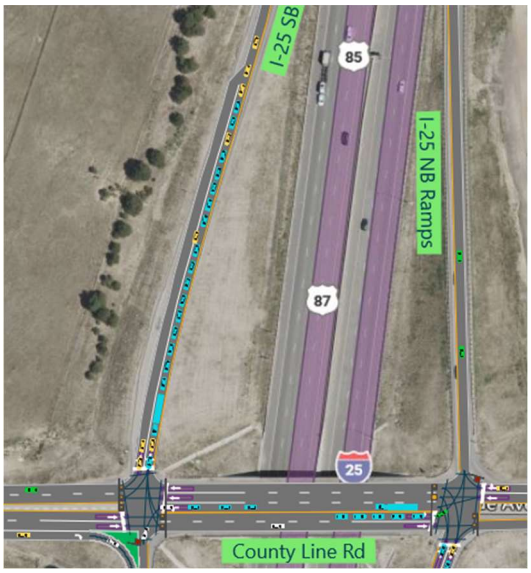
While a full analysis of the interchange and freeway operations would likely be required as part of the interchange modification process, a preliminary assessment was performed as part of this review. Specifically, the 2045 Synchro analysis from the Kimley Horn study was replicated based on the analysis worksheets and signal timing sheets provided in the report appendices. The following modifications were then made to support the SimTraffic model:

- The yellow and red times were increased from the Synchro default values (3.5 sec. yellow, 1.0 sec. red) to values (4.1-4.3 sec. yellow, 2.6 sec. red) consistent with CDOT's "Guidelines for Traffic Signal Vehicle Change and Clearance Intervals".
- Right-turns-on-Red (RTOR) was turned off for the I-25 Off-Ramp approaches to the proposed traffic signals for the sight distance constraints outlined above.
- The Link Origin-Destination settings were revised to account for the fact that few (if any) vehicles would exit I-25 at one intersection and re-enter at the adjacent intersection.

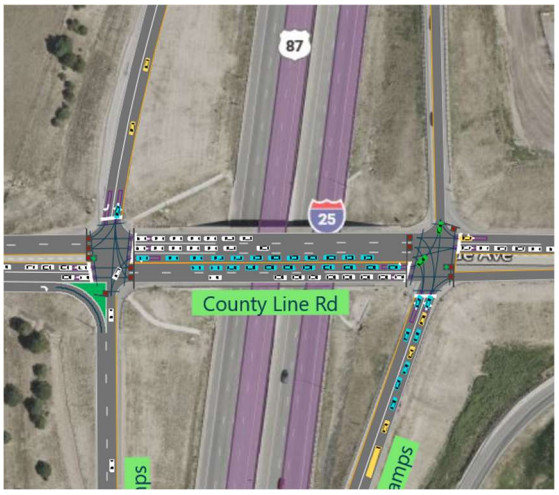
Using the revised Synchro files described above, a SimTraffic simulation analysis was performed, and the results are summarized below:

- During the PM peak hour, queues on the I-25 NB off-ramp would periodically extend to the gore point. It is noted that based on AASHTO standards and a design speed of 80 mph (posted 75 mph + 5 mph), an additional 705 feet of deceleration distance would be required to ensure mainline freeway operations are not impacted.

- The peak southbound left queue on the ramp would extend approximately 500 feet. The proposed right turn lane would need to be constructed to this length to avoid being blocked by the adjacent queue. The 705 feet of deceleration distance beyond the queue would extend to the taper area of the ramp.



- During the AM and PM peaks, queues for the eastbound and westbound left-turn movements onto I-25 would extend to the adjacent ramp intersection. Thus, the delays and queuing would likely be greater than the results presented in the traffic studies that did not account for vehicle spillback effects.



While the acceleration distance requirements for the on-ramps would not fundamentally be affected by the proposed interchange modifications, the traffic generated by the site would create the need for an increased number of gaps within the I-25 mainline traffic in order to adequately merge onto the highway. Neither study provided traffic volume data for I-25. Therefore, performing a traffic merge analysis to ensure I-25 traffic operations would be maintained is not possible at this time.

It is noted that items mentioned in the section above would be addressed during the formal interchange modification process. However, interchange modification reports are typically at the time of project funding and the timeline for this process is typically hard to predict. Given the need for the I-25/County Line Road interchange to adequately serve site project, a preliminary interchange and freeway traffic analysis is recommended as part of the project approval process.

CONCLUSIONS

Based on a preliminary review of the traffic impact studies prepared by Kimley-Horn and Stolfus, the following conclusions are presented:

1) In general, the traffic studies followed typical guidelines and practices in preparation of a traffic impact study. Minor errors and/or typos were observed but were determined to not fundamentally change the presented results.

2) Given the characteristics of Buc-ee's to draw destination trips beyond a typical gasoline station with a convenience store, it should be anticipated that a greater percentage of the total site trips will be destination and diverted in nature thereby adding more site trips to I-25 than assumed in each study.

3) The primary vehicular site impacts to the public road network will occur at the I-25/County Line Road interchange. Neither study focused nor provided adequate details to evaluate whether off-ramp vehicle queues would spill back into the mainline interstate travel lanes. Based on a preliminary SimTraffic model, critical attention should be given to the adequacy of this interchange beyond adding traffic signals at the end of the interstate ramps and adding turn lanes to the approaches of those traffic signals. This is critical to the future operation of this interchange and whether it is adequate to support the proposed new use. The following elements should also be considered:

    a. Available intersection sight distance for the exiting off-ramp approaches to the proposed traffic signals and likely prohibition of assuming right-turns on red to improve vehicle capacity and queuing.
    b. The spacing between the proposed interchange traffic signals and potential spill back of vehicle queues into each other.
    c. Lengths of the interstate off-ramps with respect to debilitating vehicle queues that may spill back in the interstate mainline.
    d. Review of historical crash data over the past 3-years to identify any existing issues that could be exacerbated by the project.

4) Analysis of the on-ramp merge area on I-25 is recommended to measure the adequacy of the freeway facility.

5) Given the need for the I-25/County Line Road interchange to adequately serve site project, a preliminary interchange and freeway traffic analysis is recommended as part of the project approval process.

6) Impacts should be evaluated if the deviation for the proposed right-out entrance on County Line Road is not approved.