

To: Shaun & Olga Morris, Culver's Franchise Owners
From: Julie Nolfo, PE, PTOE
Michelle Bresnahan
Date: February 23, 2021
Subject: Traffic Assessment for Proposed Culver's adjacent to Commerce Bank, Columbia, MO

Lochmueller Group (Lochgroup) is pleased to submit the following traffic assessment regarding the proposed Culver's Restaurant to be located immediately west of Commerce Bank along Bernadette Drive, within the southeast quadrant of its intersection with Stadium Boulevard in Columbia, Missouri. It is our understanding that the proposed quick serve restaurant would provide for a 4,100 square-foot (SF) building with a double drive-thru and is proposed to be accessed via the existing three access drives to Bernadette Drive on property controlled by Commerce Bank (cross access is provided). The westernmost access drive is limited to right turns only by a median on Bernadette Drive.

The need for this assessment was driven by Commerce Bank's desire to ensure that the proposed Culver's restaurant would not negatively impact their customer's experience with regards to arriving, exiting and circulating within the site itself. Therefore, as discussed with both the developers of the Culver's as well as representatives of Commerce Bank, it was agreed by all parties that this assessment would identify how much traffic would be generated by the proposed restaurant, address the peak queueing associated with the drive-thru, and assess the ability of motorists to circulate within the site. If warranted, improvements would be recommended to mitigate the impact of the restaurant's traffic and to accommodate the additional traffic.

It is important to note that the following assessment does not represent a traffic impact study. Given time constraints associated with the development, coupled with the City of Columbia's determination that a traffic impact study was not necessary, it was determined in the above referenced discussion with both of the parties that the following assessment addressing specific items of concern would be adequate.

Existing Site

The current site under consideration for the proposed Culver's restaurant is immediately west of the existing Commerce Bank located in western Columbia. Both sites are along the south side of Bernadette Drive, immediately east of Stadium Boulevard. The surrounding land uses are predominantly commercial in nature (except for Our Lady of Lourdes Church and Interparish school to the east), with Columbia Mall located just west of Stadium Boulevard. **Figure 1** depicts the overall site, shown in purple, as well as the adjacent Commerce Bank.

The subject site does not have any direct access to either Bernadette Drive or Stadium Boulevard, as is in keeping with good access management practices. Rather, the parcel has a cross access agreement with the adjacent property owned and operated by Commerce Bank. The Commerce Bank property has three access drives onto Bernadette Drive within approximately 325 feet of frontage, each drive measuring approximately 35 feet in width. The two easternmost drives are full access, meaning motorists can turn left or right into or out of the drives. A dedicated westbound left turn lane is provided on Bernadette Drive at the middle drive. The western drive is restricted to right turns only via the presence of signage and a raised median on Bernadette Drive. **Figure 2** illustrates the existing western drive with the median on Bernadette Drive and the "NO LEFT TURN" sign upon exiting.



Figure 1: Subject Site – Proposed Culver's Restaurant



Figure 2: No Left Turn from Western Drive

The Commerce Bank is situated on the site so that the front door into the building faces west and that the drive-thru teller (4 lanes) and ATM (one lane) is located along the south side of the building. There is a one-way (northbound) access drive along the east side of the building that allows for vehicles exiting the drive-thru and/or ATM to simply pull forward and exit to the left, with the drive ultimately ending at the easternmost access drive onto Bernadette Drive. **Figure 3** depicts the site's circulation.



Figure 3: Commerce Bank Circulation

Given the nature of the proposed Culver's restaurant, three time periods were considered in this analysis: the weekday midday peak hour, the weekday PM peak hour, and the Saturday midday peak hour. Traffic counts were not conducted as part of this assessment. However, representatives of Commerce Bank were able to share some of their available data. During a typical weekday midday or PM peak hour, the Commerce Bank has 25 to 30

vehicles accessing the site, not including those destined to the ATM (Commerce Bank did not have data specific for the ATM). Typically, about 62% of that traffic is destined to in-person transactions where the customer parks and enters the banking facility. During the Saturday peak hour, a total of 38 vehicles accessed the site (not inclusive of ATM traffic), with approximately 61% of the customers opting to park and walk into the bank. As stated above, Commerce Bank did not have data specific to the ATM usage at this location. However, Lochgroup has conducted observations at ATMs in the past and therefore, utilized the general ATM data for a point of reference. Previous ATM research has revealed that an ATM does an average of 100 transactions per day, which equates to about 8 to 10 transactions per hour during the busiest 12 hours of the day, with transactions times typically only requiring 2 to 3 minutes. Conservatively, it was estimated that the ATM adds another 10 vehicles entering the site during each of the weekday peak hours. Commerce Bank indicated that the ATM is often excessively busy on a Saturday during the midday hours so, this estimate was conservatively doubled to represent 20 vehicles destined to the ATM during the Saturday midday peak hour.

The typical stay at a bank is less than an hour, so conservatively it was assumed that all vehicles entering the site would leave during the same hour. As a result, there would be a total of approximately 80 trips total entering and exiting the Commerce Bank site during the weekday midday hour, 72 total trips entering and exiting the Commerce Bank site during the weekday PM peak hour, and approximately 116 total trips entering and exiting the Commerce Bank site during the Saturday midday peak hour. This level of traffic generation is well beneath the typical volumes that would be accommodated by three access drive, albeit that one is limited to right turns only. Therefore, it can be concluded that the access drives themselves have more than adequate capacity to accommodate the bank's traffic levels.

However, it is acknowledged that traffic on Bernadette Drive can inhibit the ability of a motorist to turn left from the site. All three drives are within 500 feet of the signalized intersection with Stadium Boulevard. It is not uncommon for westbound traffic on Bernadette Drive to queue back from the signalized intersection during peak periods. Furthermore, dismissal at 3:05 PM at the Interparish School at Our Lady of Lourdes Church can often cause congested conditions along Bernadette Drive as parents wait to pick up their students. All these factors can result in delays for motorists turn left from Commerce Bank onto Bernadette Drive. A detailed traffic analysis was not possible due to the lack of turning movement counts so the explicit delay associated with these movements was not able to be calculated.

Previous Use on Site

Currently, there is a vacant 5,600 SF restaurant building on the subject site, which previously operated as a Ruby Tuesday until it closed in March 2020. Ruby Tuesday would be classified as a "High Turnover, Sit Down Restaurant", which is defined as casual dining where the typical length of stay is approximately one hour. These types of restaurants tend to be moderately priced, do not take reservations, and are frequently associated with a restaurant chain.

Since the restaurant is no longer in operation, it was necessary to estimate the original restaurant's trip generation potential. The Trip Generation Manual, Tenth Edition, published by the Institute of Transportation Engineers (ITE), was utilized to forecast the trip generation of the 5,600 SF restaurant. Land Use Code 932 (High Turnover, Sit Down Restaurant) was utilized. Gross floor area square feet (GSF) was used as the independent variable to estimate the number of trips generated by the previous restaurant. As summarized in **Table 1**, a restaurant of this size would generate less than 100 trips in a peak hour.

TABLE 1. ESTIMATED RUBY TUESDAY TRIP GENERATION									
	Weekday Midday Peak Hour			Weekday PM Peak Hour			Saturday Midday Peak Hour		
	In	Out	Total	In	Out	Total	In	Out	Total
Total Trips	45	34	79	34	21	55	32	31	63

It is acknowledged that the estimate may be overstated for the previous Ruby Tuesday restaurant given that ultimately, the restaurant failed at this location. However, the exercise in estimating the potential trip generation is still pertinent as another user could have reoccupied the space and been successful in achieving these trip generation levels.

Proposed Culver's Restaurant

The proposed development would include a 4,100 SF quick serve restaurant with a double drive-thru with access via the existing three access drives to Bernadette Drive on the property controlled by Commerce Bank (cross access is provided). **Figure 4** illustrates the proposed Culver's restaurant. In conjunction with the development, the parking field located between Commerce Bank and the proposed Culver's would be reconfigured, as shown.

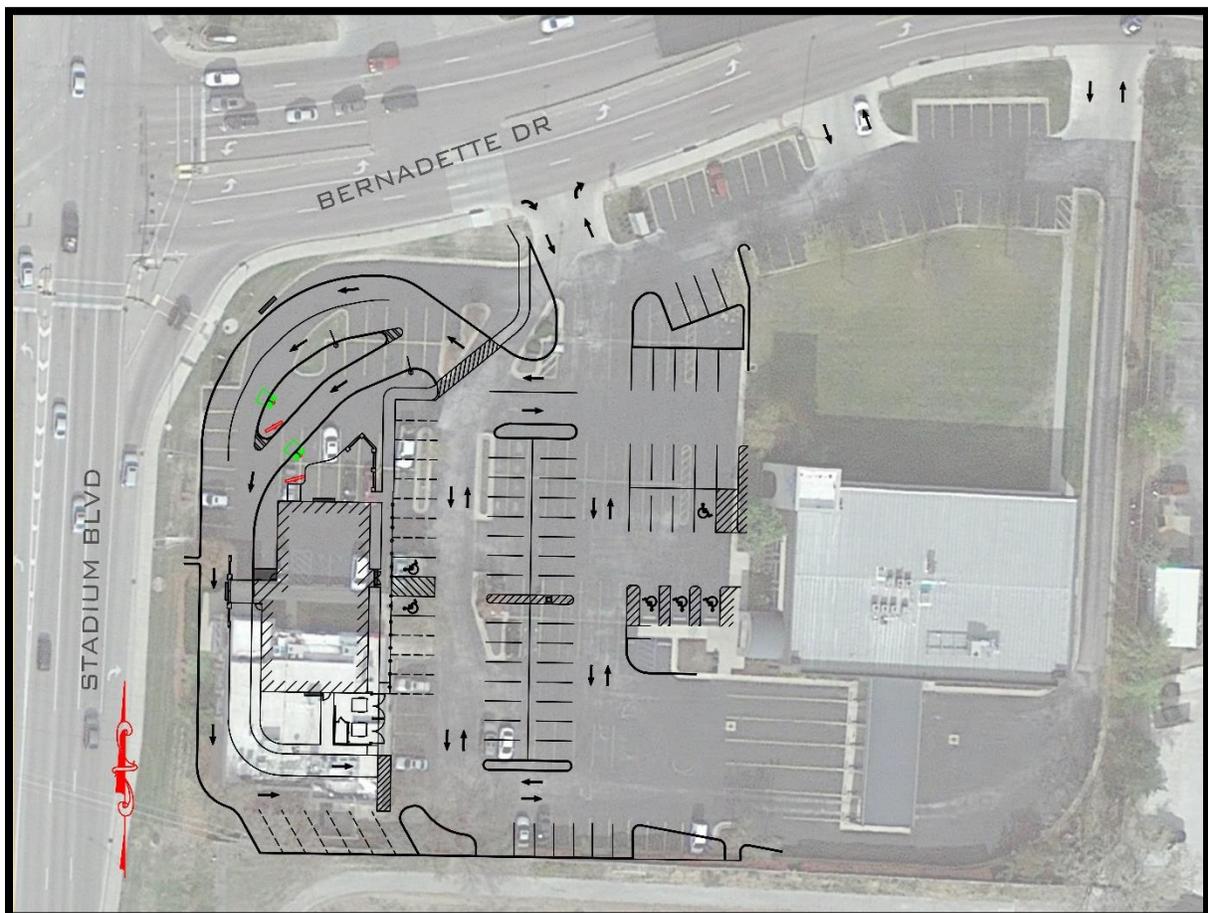


Figure 4: Proposed Culver's Restaurant & Parking Modifications

The Trip Generation Manual, Tenth Edition, published by the Institute of Transportation Engineers (ITE), was again used to forecast the trip generation of Culver's restaurant. Land Use Code 934 (Fast-Food Restaurant with Drive-Through Window) was used for the Culver's restaurant. The average rate was used to calculate the number of trips generated for the restaurant, as the data points were above six studies and the fitted curve equation was not provided for this land use. Gross floor area square footage (SF) was used as the independent variable for the development. As shown in **Table 2**, the proposed development would be expected to generate a total of approximately 209 and 134 trips during the weekday midday and PM peak hours, respectively, and 225 trips during the Saturday midday peak hour.

TABLE 2. PROPOSED CULVER'S RESTAURANT TRIP GENERATION									
	Weekday Midday Peak Hour			Weekday PM Peak Hour			Saturday Midday Peak Hour		
	In	Out	Total	In	Out	Total	In	Out	Total
Total Trips	109	100	209	70	64	134	115	110	225

As compared to the previous use on the site, the proposed Culver's would be expected to generate more traffic. During the midday hours, for both a weekday and a Saturday, the increase in trips would be 130 to 162 trips, respectively. During the weekday PM peak hour, the increase would equate to 79 additional trips.

TABLE 3. COMPARISON OF TRIP GENERATION – SIT DOWN RESTAURANT VS PROPOSED CULVER'S									
	Weekday Midday Peak Hour			Weekday PM Peak Hour			Saturday Midday Peak Hour		
	In	Out	Total	In	Out	Total	In	Out	Total
Previous Use – HTSD	45	34	79	34	21	55	32	31	63
Proposed Use – Culver's	109	100	209	70	64	134	115	110	225
Difference in Trips	+64	+66	+130	+36	+43	+79	+83	+79	+162

The Culver's trips will be assigned to the study area roadways in accordance with an anticipated directional distribution that reflects the market capture area of the proposed restaurant as well as existing traffic patterns. The proposed directional distribution percentages for the restaurant's trips are presented in **Table 4**.

TABLE 4. DIRECTIONAL DISTRIBUTION OF CULVER'S TRIPS	
Origin/Destination	Percentage
To/From the North on Stadium (including I-70 traffic)	35%
To/From the South on Stadium	40%
To/From the East on Bernadette (including traffic to Ash, Worley, Business Loop)	15%
To/From the West on Bernadette (including Columbia Mall)	10%

The distribution percentages above were multiplied by Culver's trip generation presented in Table 2 to obtain the site generated traffic assigned to each of the three access drives, as shown in **Figure 5**. It should be noted that in an effort to be conservative, all of Culver's traffic was assigned to the access drives rather than just the incremental increase in traffic reflected in Table 3 given Ruby Tuesday has been closed for nearly a year.

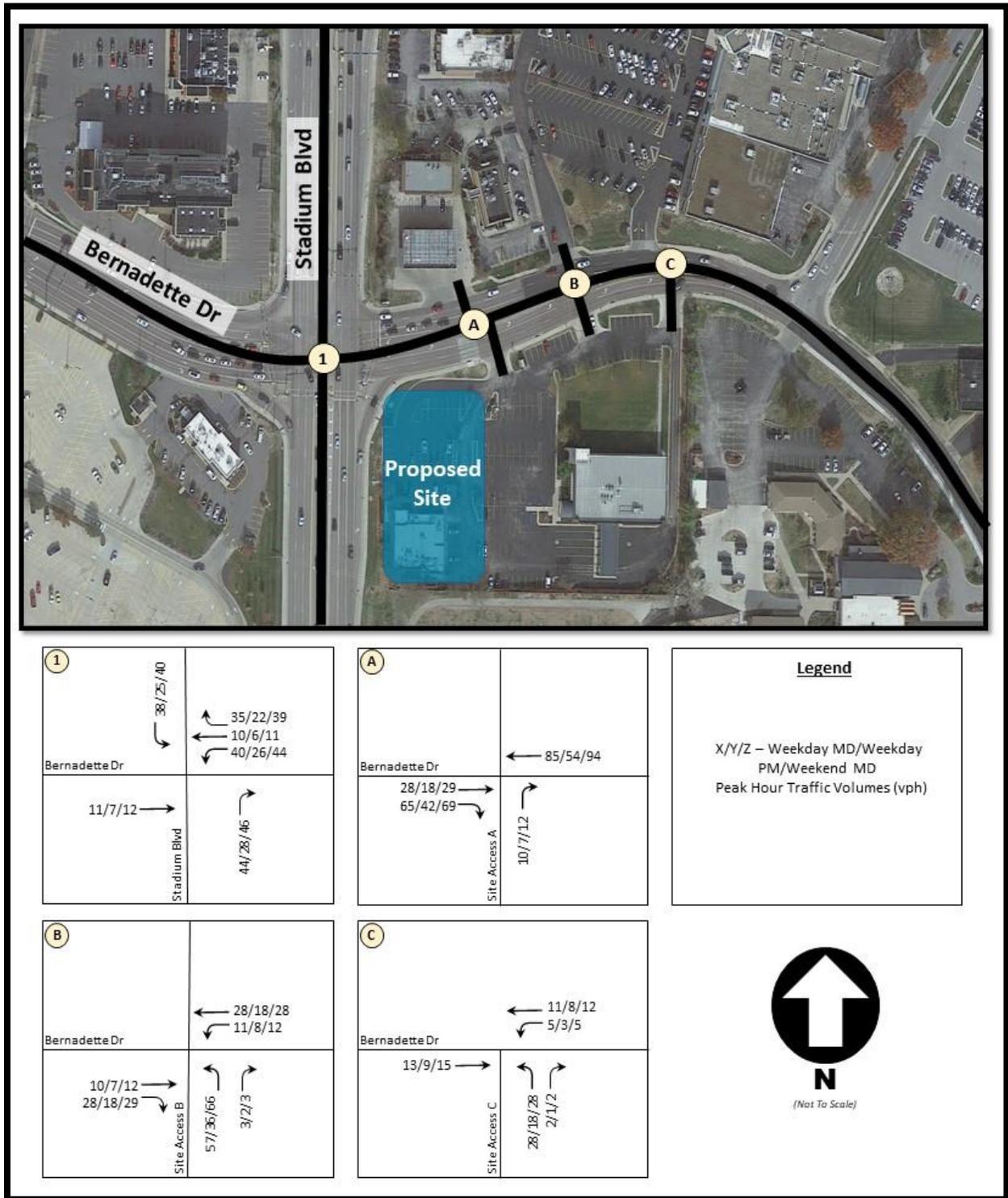


Figure 5: Proposed Culver's Restaurant Site Generated Trips

As can be seen, the proposed restaurant's traffic would distribute amongst the three existing drives. Most of the traffic originating from Stadium Boulevard or from the west would migrate to the westernmost drive, which would see an increase in turning movements of 75 additional vehicles during the weekday midday peak hour, 49 additional vehicles during the weekday PM peak hour, and 81 additional vehicles during the Saturday midday peak hour, the majority of which would be attributable to inbound trips given the left turn restriction. The middle access drive would experience the greatest increase in traffic with 99 additional vehicles during the weekday midday peak hour, 64 additional vehicles during the weekday PM peak hour, and 110 additional vehicles during the Saturday midday peak hour. The movement most impacted at this drive would be the outbound left turn, which would increase by as much as 66 additional movements during the Saturday midday peak hour. The easternmost drive would experience a nominal increase in traffic as compared to the other two drives; a total of 35 additional vehicles during the weekday midday peak hour, 22 additional vehicles during the weekday PM peak hour, and 35 additional vehicles during the Saturday midday peak hour.

The reader is reminded that this analysis represents an assessment only that evaluated specific issues of concern without the collection of data. Existing traffic volumes at the access drives was not collected as part of this effort (as agreed to by all parties) and therefore it is not possible to calculate the associated increase in delay associated with motorists attempting to enter or exit the site via any of the three drive. However, as a point of reference, the following increase in flow rates is offered:

- Western Drive
 - Approximately one additional vehicle entering the site every minute.
 - Approximately one additional vehicle exiting the site every five minutes.
- Middle Drive
 - Approximately one additional vehicle entering the site every one and half minutes.
 - Approximately one additional vehicle exiting the site every five minute.
- Eastern Drive
 - Approximately one additional vehicle entering the site every twelve minutes.
 - Approximately one additional vehicle exiting the site every two minutes.

On Site Circulation

Given the existing circulation patterns on the Commerce Bank site, coupled with the proposed layout for Culver's and the parking modifications, most of the traffic destined to and from either the Culver's or the Commerce Bank would travel through the internal intersection near the western drive. Furthermore, the Culver's drive-thru access is just west of this internal intersection. For this reason, a review of the internal traffic mobility within the site following the development of the Culver's was conducted to ensure safe and efficient circulation for both Culver's and Commerce Bank.

CULVER'S DRIVE-THRU

The proposed restaurant would have a one-way, counterclockwise circulatory drive around the restaurant itself to accommodate the drive-thru operation on the west side. A double drive-thru lane is proposed which allows customers to queue in two separate lanes to order, after which they alternate into a single line that proceeds to the payment and pick-up window. Adjacent to the drive-thru lane is a bypass/drive lane that will allow customers to exit the drive-thru prematurely or access the seven angled parking spaces provided on the south side of the building.

To determine the queue size associated with a Culver's drive-thru operations, observations were made in March 2020 during the three critical time periods at the existing Culver's located at 14444 Manchester Rd in St. Louis,

Missouri. Based upon discussions with Culver’s, the Manchester restaurant and the proposed restaurant would have comparable projected sales. It should be noted that these observations were taken during the COVID-19 pandemic, and therefore may be exaggerated as compared to normal queuing conditions. As such, the observations taken during the COVID-19 pandemic were compared to data from February 2020 (before the pandemic) at the Manchester restaurant, as provided by the operator.

The Manchester restaurant typically served anywhere from 35 to 45 customers in an hour, pre-pandemic, through the drive-thru during the three peak periods observed. During the early weeks of the pandemic, when no indoor dining was allowed, the number of customers served via the drive-thru swelled to as many as 48 vehicles in a peak hour. However, even with the dine-in option removed and a peak of nearly fifty customers served in the drive-thru, the peak queue did not exceed 12 vehicles back from the order board. The observed and adjusted drive-thru data is summarized in **Table 5** below.

TABLE 5. DRIVE-THRU OBSERVATIONS (RAW & ADJUSTED DATA)				
Time Period	Observed March 2020		Adjusted March 2020^{1/}	
	Average Queue	Peak Queue	Average Queue	Peak Queue
Weekday Midday Peak Hour	5 veh	10 veh	4 veh	8 veh
Weekday PM Peak Hour	6 veh	12 veh	4 veh	8 veh
Saturday Midday Peak Hour	5 veh	11 veh	5 veh	10 veh

1/ Adjusted to remove the impacts of the pandemic using February 2020 data for comparative purposes.

For the purposes of reviewing the provided plan, the adjusted average queue of five vehicles and peak queue of ten vehicles back from the order board were utilized. With the current site plan, a total of approximately ten vehicles (5 per lane) can be accommodated back from the order boards before the drive-thru queue begins to extend out of the drive-thru lanes, as shown in **Figure 6**. As such, the average and peak drive-thru queue lengths would be contained within the designated drive-thru area.

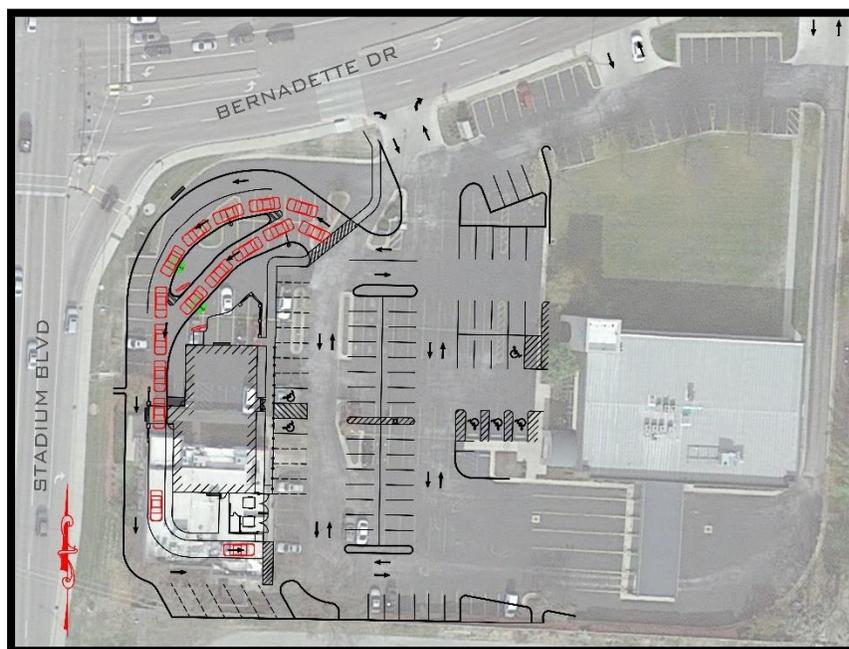


Figure 6: Culver’s Drive-thru with Ten Vehicles Queued Back from Order Board

It is important to note that the above analysis of the drive-thru is very conservative in nature. The Manchester restaurant currently has a single drive-thru lane rather than the more efficient double stack drive-thru as proposed in Columbia. Double drive-thru lanes effectively allow for the common bottleneck of ordering to be dissipated, which results in shorter queues at the drive-thru. An uncertain customer can no longer “hold up the line” and the queue in and of itself, is generally split in half between the two lanes. Once ordered, the customers alternate merging into one lane to advance to the payment/pick-up window. Should there be an issue that results in a lengthy delay at the window, the customer can simply be asked to pull forward for delivery of their food. In fact, the seven angled spaces on the south side of the building could be used for this purpose as well.

Another factor that directly impacts drive-thru queue lengths is the service time. Service time is the time from when a customer orders until the transaction is complete, food has been delivered and the customer is on their way. The shorter the service time, the shorter the overall queue is at the drive-thru. The Manchester restaurant averages 4.3 minutes in terms of pre-pandemic service time. However, the operators of the proposed Culver’s in Columbia, who also operate other Culver’s restaurants, average 4.2 minutes in terms of pre-pandemic at their current restaurants, all which are comprised of single lane drive-thrus. Furthermore, the double drive-thru is expected to reduce the service time, per Culver’s, by approximately 30 seconds per order, which would result in a further reduction in the drive-thru queue lengths.

Therefore, it is evident that the peak queue length of ten vehicles back from the order boards should be considered conservative and that the drive-thru at the proposed Culver’s would have more than adequate storage to accommodate typical, non-pandemic, drive-thru queues without spilling over into the parking area or internal drive aisles. Furthermore, it is not anticipated that the drive-thru queue during typical, non-pandemic operations would extend as far as to obstruct the western access drive from Bernadette Drive. Even if the peak queue of 12 vehicles observed during the pandemic when indoor dining was prohibited was realized, the queue would not extend to a point where it would interfere with traffic entering and exiting via the westernmost drive.

SITE PLAN MODIFICATIONS

In conjunction with the review of the internal circulation, Lochgroup collaborated with the developer’s civil engineer, A Civil Group, to incorporate suggested modifications into the site development plan. These recommendations were the result of evaluating various means of aligning the north/south drive aisle adjacent to Culver’s in such a way that it would achieve the following objectives:

- Clearly define that motorists entering the site from Bernadette Drive at the western drive would have the right-of-way.
- Maintain an unobstructed path for Commerce Bank customers to access parking, drive-thru tellers and/or ATM.
- Be perceived as an attractive route for customers exiting Culver’s drive-thru.
- Clearly define the entry to the Culver’s drive-thru.

The modifications incorporated into the site development plan were as follows:

- Replacement of a proposed painted island adjacent to Commerce Bank with a hardscape island to better define the drive aisle and the non-aligned east/west drive aisles. This hardscape also facilitates a refuge for proposed directional signage installation. In addition, the removal of one parking space was also proposed to minimize the potential for a customer to back out into the internal intersection. The throat depth at the western drive was modified slightly in order to create better definition of the drive aisles and the entry to the Culver’s drive-thru. **Figure 7** illustrates the original and the modified layout.

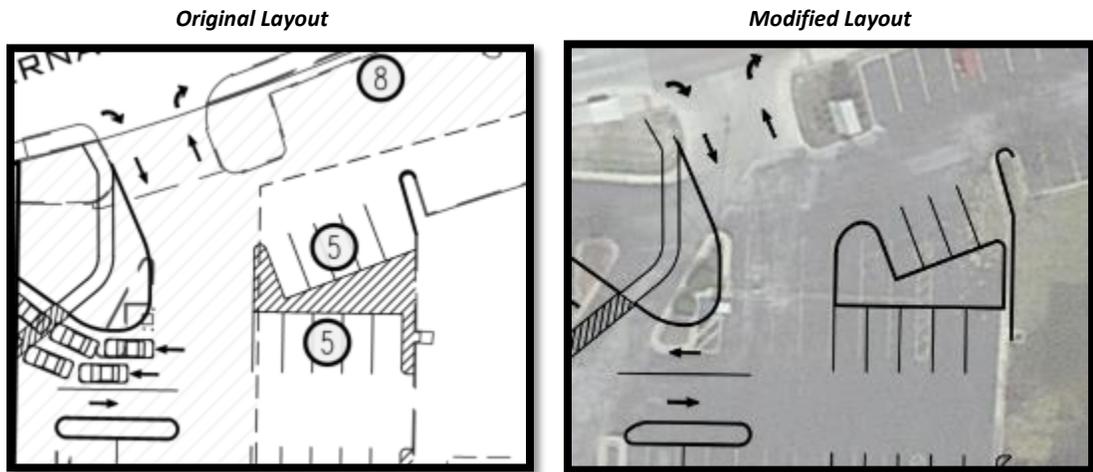


Figure 7: Modifications to the Western Access Drive and the Adjacent Internal Intersection

- Replacement of a proposed painted island along the south side of Commerce Bank property with a hardscape island to better define the drive aisles and clearly define a bypass to the Commerce Bank drive-thru tellers/ATM. In addition, this hardscape allows for refuge for the proposed directional signage installation. **Figure 8** illustrates the original and the modified layout.

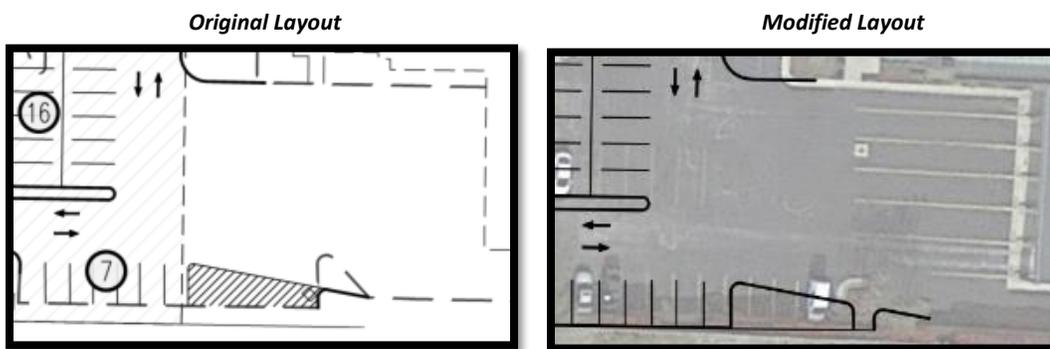


Figure 8: Modifications to Proposed Island Along South Property Line

TRAFFIC CIRCULATION IMPROVEMENTS

Beyond incorporating modifications to the proposed layout, Lochgroup also offered recommendations at three locations where the introduction of pavement markings and traffic control signage would be beneficial to establish right-of-way. The three locations where installation of a STOP bar and/or a STOP sign (does not have to be MUTCD compliant) were recommended were as follows:

- Provide a STOP bar and sign upon exit from Culver's drive-thru, as shown in **Figure 9**.

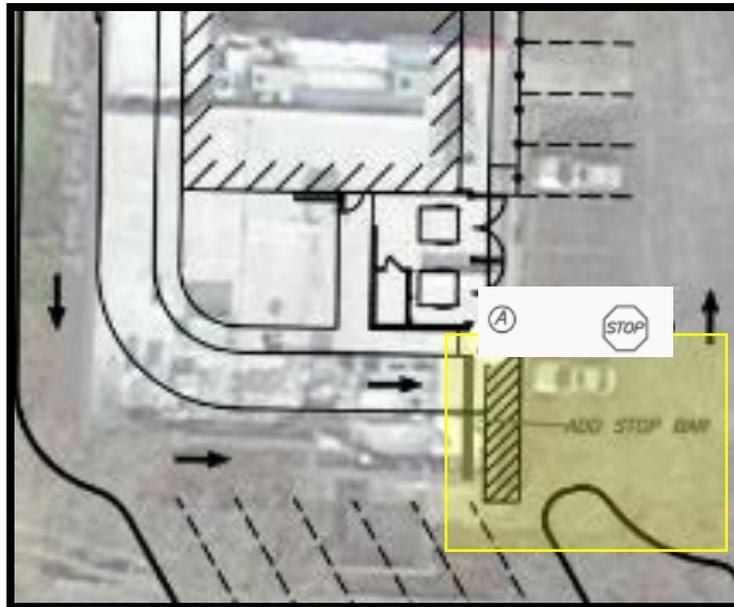


Figure 9: Proposed STOP Bar & Sign for Drive-Thru Exit

- At the internal intersection adjacent to the western access drive to the site, STOP bars and signs should be installed on the east and west approaches to reinforce that north/south traffic in the drive aisle or entering from the western drive has the right-of-way. **Figure 10** illustrates the proposed installation.

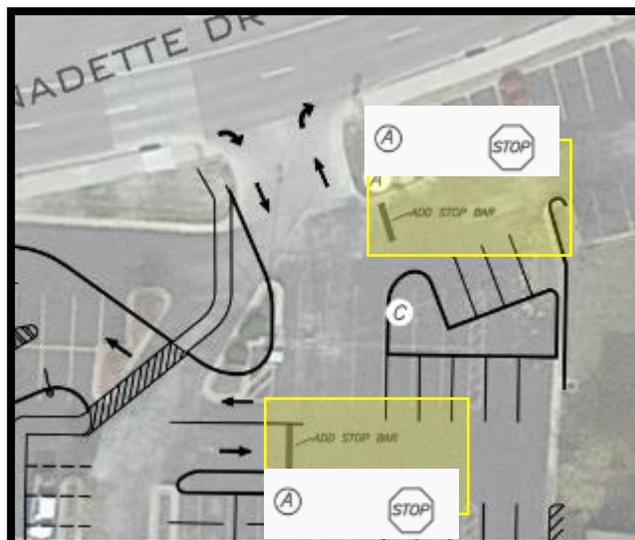


Figure 10: Proposed STOP Bar & Sign for Internal Intersection between Culver's and Commerce Bank

In addition, directional signage is recommended for the site to ensure that motorists exiting Culver's, and in particular the drive-thru, have a clear sense of direction with regards as to how best access Bernadette Drive. Given that the access drive in closest proximity to Culver's is restricted to right turns only, it is possible that a Culver's customer may be unsure as to how to access Bernadette in order to reach Stadium Boulevard (particularly given the presence of I-70 to the restaurant and the likelihood that a portion of the customers will be transient to Columbia).

The primary means of egress for Culver's customers, including those exiting the drive-thru, should be via the north/south drive aisle adjacent to the restaurant. Furthermore, every effort should be made to discourage Culver's traffic from utilizing the drive aisle adjacent to Commerce Bank's front door. Therefore, an EXIT sign (identified as (B)) is recommended to direct a customer to turn left upon departing the drive-thru, as shown in **Figure 11**. These motorists would then proceed to the internal intersection, where they would then need to make a left onto the main drive aisle. Given that the western drive does not provide access back to Stadium Boulevard, an additional directional sign (identified as (C)) is needed within the hardscape island to direct all motorists (Culver's and Commerce Bank's) to turn right towards the other two full access drives, both of which will allow customers to exit left towards Stadium Boulevard.

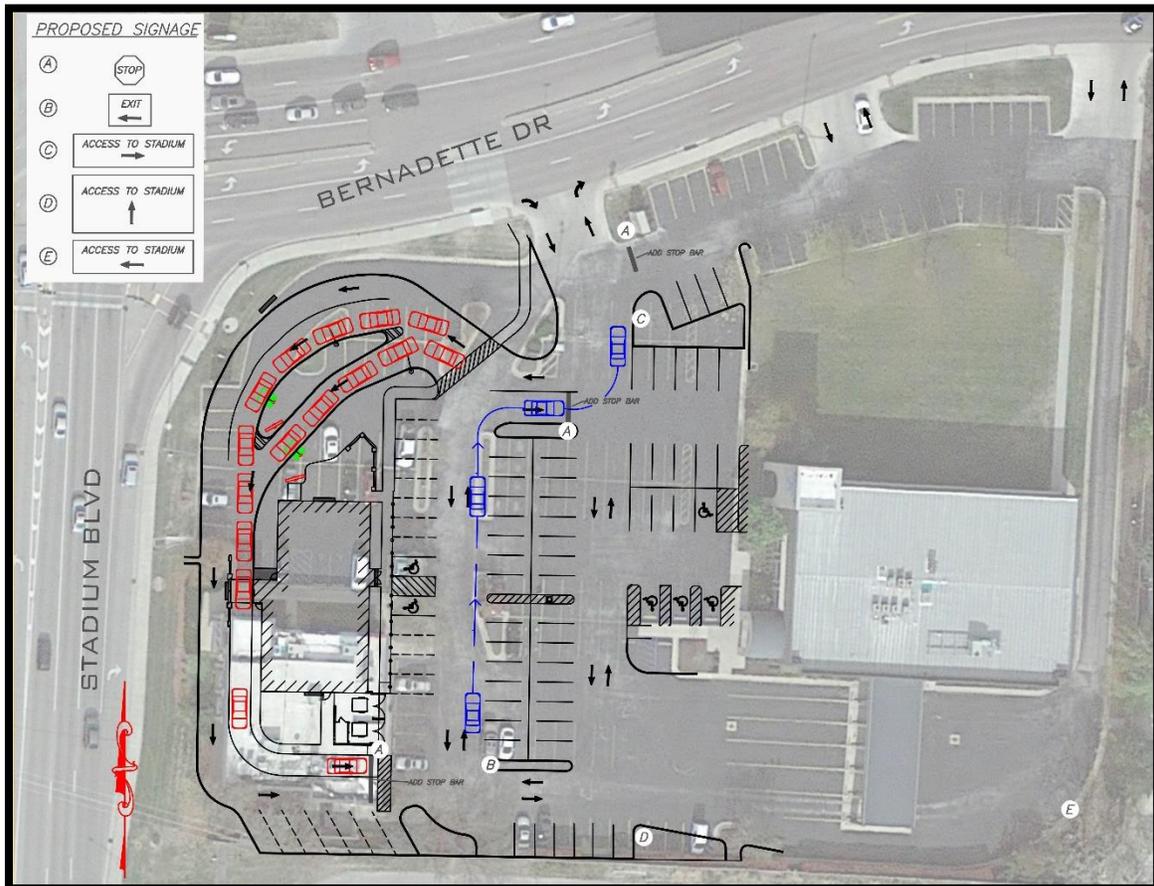


Figure 11: Proposed Directional Signage for the Primary Route from Culver's Restaurant

However, Commerce Bank operators have a concern that some of Culver's customers may opt to exit the drive-thru without turning left and would migrate towards the bank itself. Therefore, in order to discourage these motorists from traveling in front of Commerce Bank's front door, additional directional signage is recommended along the

southern perimeter of the Commerce Bank site to ensure any deviant motorists exiting Culver's drive-thru in this manner would be directed around Commerce Bank's drive-thru teller/ATM and towards the one-way northbound lane along the east side of the bank building, as shown in **Figure 12**. Specifically, two directional signs (identified as **D** and **E**) would be installed in the proposed hardscape island and within the landscaped area along the curve in the southeast portion of the bank site. It is suspected that that route may also be attractive to those Culver's drive-thru customers who are familiar with the bank and how to exit the existing tellers/ATM area.

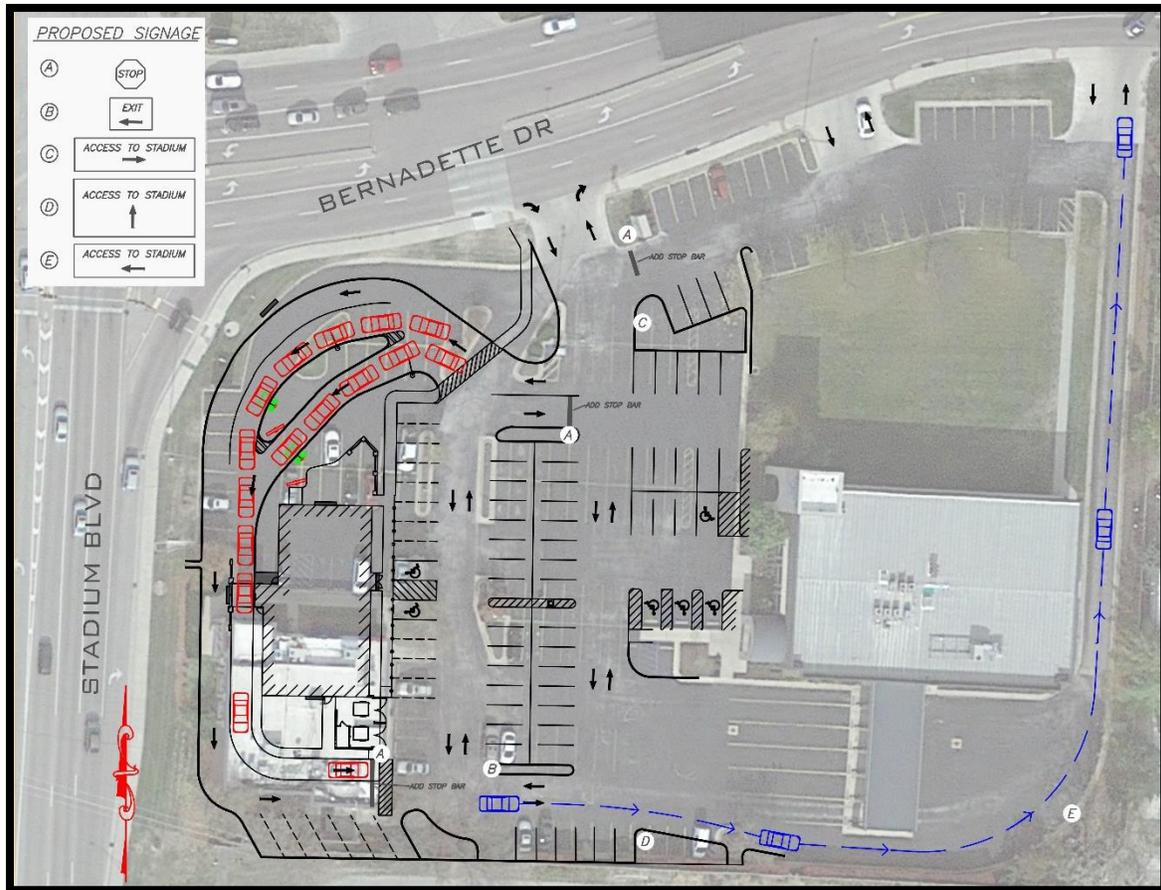


Figure 12: Proposed Directional Signage for the Secondary Route from Culver's Restaurant

Lastly, given that the ATM for Commerce Bank is located in the southernmost position, an effort was made to ensure that Culver's customers choosing to exit this way would not be hindered nor hinder bank customers queuing at the ATM. Based upon the proposed modifications in this area, three vehicles can easily queue at the ATM without obstructing the flow to bypass the bank's drive-thru lanes (it should be noted that three vehicles also represent the existing queue that can be accommodated at the ATM without hindering the bank's customers ability to bypass due to the presence of an island that will be removed as part of the modifications). Lochgroup has conducted previous observations at ATMs in the St. Louis area and has determined that, typically, the vehicular queue at an ATM is 2 or less vehicles. Therefore, it is unlikely that the queue extending back from the ATM would impede traffic flow in this area.

In closing, it is Lochmueller's opinion that the proposed Culver's restaurant can be successfully developed on the subject site without negatively impacting traffic flow for the existing Commerce Bank. It is undeniable that the introduction of the Culver's will increase traffic flow into, out of, and around the Commerce Bank site; particularly given that the previous restaurant (Ruby Tuesday) has been closed and was likely a low generator prior to closing. However, this increase in traffic can be accommodated assuming that the site layout modifications, pavement markings, and signage as outlined in this assessment are implemented. The proposed double drive-thru should have more than adequate capacity to accommodate typical, non-pandemic, peak queues without spilling back into the western access drive or the internal intersection. The island modifications, pavement markings, and signage will result in better defined traffic flow within the site and provide guidance to Culver's customers, some of which may be unfamiliar with the area, as how best to access Stadium Boulevard from the site.