

February 11, 2021

Mr. Chad Fairbanks, PE, LEED AP
CoreStates Group
6500 Chippewa Street, Suite 200
St. Louis, Missouri 63109

RE: Traffic Impact Study
Proposed Chase Bank
Lee's Summit, Missouri
CBB Job No. 85-20

Dear Mr. Fairbanks:

As requested, CBB has completed a traffic impact study pertaining to a proposed Chase bank in Lee's Summit, Missouri. The location of the site in relation to the surrounding road system is depicted in **Figure 1**.

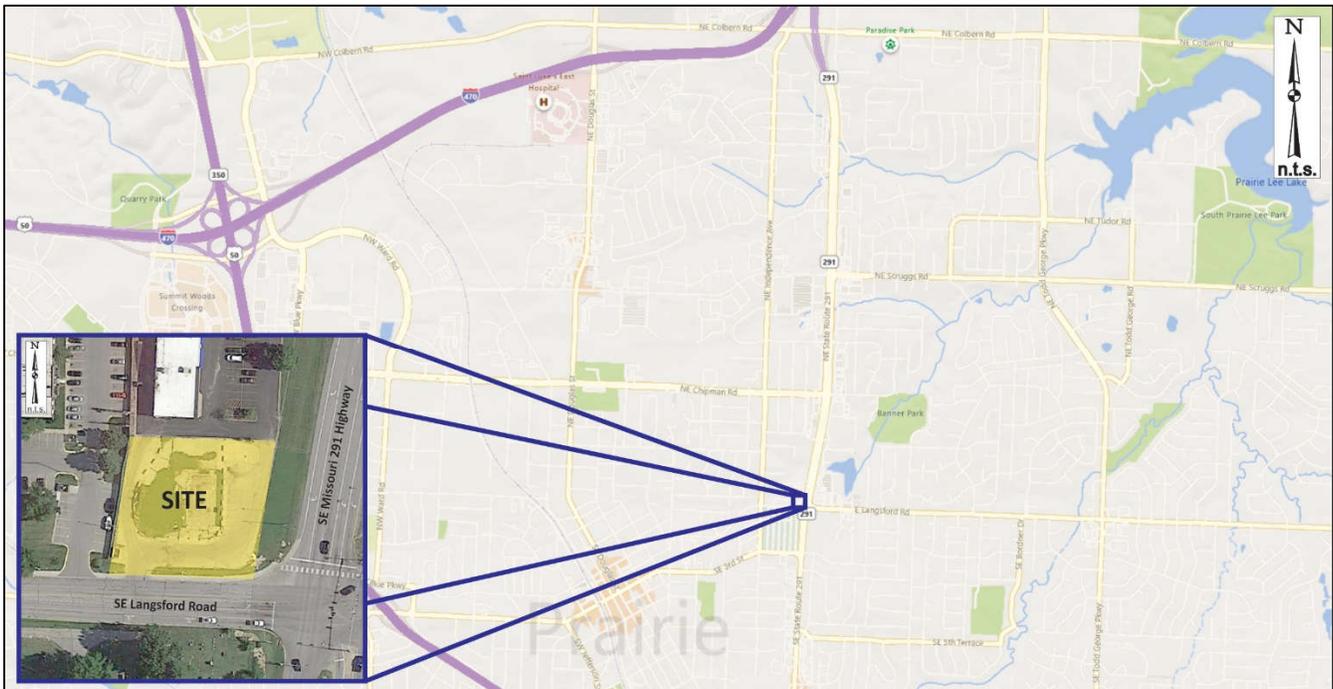


Figure 1: Project Location Map



The proposed development site is located in the northwest quadrant of the intersection of Missouri Highway 291 and Langsford Road (2nd Street). Based on the concept plan provided by you, the proposed development will consist of 3,320 square foot (SF) drive-in bank. Access to the development is proposed via the existing access drive on Langsford Road, as well as the existing cross access easement to the development to the north of the site which has a right-in/right-out (RIRO) drive on Highway 291. It is our understanding the city of Lee’s Summit will require the access on Langsford Road be restricted to RIRO. A schematic of the concept plan provided is shown in **Exhibit 1**.

CBB discussed the scope of work for this study with the City and MoDOT at the commencement of the study process. The purpose of this study was to determine the number of trips that would be generated by the proposed development, evaluate the impact of those trips on operating conditions along the adjacent roadways, and determine the ability of motorists to safely enter and exit the site. Where necessary, roadway improvements and/or traffic control modifications were recommended to mitigate the impact of the development. The focus of this study was the AM and PM peak hours of a typical weekday.

The following intersections were included in the study:

- Highway 291 and Langsford Road;
- Highway 291 and RIRO Commercial Drive
- Langsford Road and Independence Avenue; and
- Langsford Road and RIRO Site Drive.

The following analysis scenarios were considered:

- 2020 Base Conditions
 - Adjusted Existing Traffic Volumes (increased due to COVID-19 impacts)
- 2020 Build Conditions
 - 2020 Adjusted Traffic Volumes plus bank trips

The following report presents the methodology and findings relative to the 2020 Base and 2020 Build conditions.



EXISTING CONDITIONS

Area Roadway System: Highway 291 is a north-south Principal Arterial, owned and maintained by MoDOT, through Jackson County that runs from Liberty to Harrisonville. Through the study area, Highway 291 consists of four travel lanes, two in each direction separated by a grassy median north of Langsford Road. Auxiliary turn lanes are provided at major intersections. Sidewalks are not provided though there are large, paved shoulders on both sides of the road. The posted speed limit within the study area is 45 miles per hour (mph).

Langsford Road is a Major Arterial east of Highway 291 and a Minor Arterial west of Highway 291 adjacent to the proposed site. Langsford Road is owned and maintained by the City of Lee’s Summit. Through the study area, Langsford Road consists of four travel lanes, two in each direction with auxiliary turn lanes provided at most intersections. A sidewalk is provided along the north side of the roadway. Langsford Road has a posted speed limit of 35 mph.

Independence Avenue is a Minor Arterial owned and maintained by the City of Lee’s Summit. Independence Avenue consists of two travel lanes, one in each direction with auxiliary turn lanes provided at a few of the major intersections. A sidewalk is provided along the west side of the roadway. Independence Avenue has a posted speed limit of 35 mph.

The intersection of Highway 291 and Langsford Road is controlled by a traffic signal. The eastbound Langsford Road approach consists of a left-turn lane, a through lane and a shared through/right-turn lane. The westbound Langsford Road approach consists of a left-turn lane, two through lanes and a right-turn lane. The northbound approach of Highway 291 consists of a left-turn lane, two through lanes and a right-turn lane. The southbound approach of Highway 291 consists of dual left-turn lanes, two through lanes and a right-turn lane. The northbound and southbound left-turn movements operate under protected only phasing. The eastbound and westbound left-turn movements also operate under protected only phasing with typical leading lefts in the AM peak hour and split phase in the PM peak hour. Pedestrian accommodations are provided across the north leg of the intersection. **Figure 2** provides an aerial view of the Highway 291 and Langsford Road intersection.

The intersection of Langsford Road and Independence Avenue is controlled by a traffic signal. The eastbound and westbound Langsford Road approaches consist of a left-turn lane, a through lane and a shared through/right-turn lane. The northbound and southbound approaches of Independence Avenue consist of a shared single lane. The eastbound and westbound left-turn movements operate under protected plus permissive phasing. The northbound and southbound left-turn movements operate under a common permissive phase. Pedestrian accommodations are provided across the north and west legs of the intersection. **Figure 3** provides an aerial view of the Langsford Road and Independence Avenue intersection.



Figure 2: Aerial View of Highway 291 and Langford Road Intersection



Figure 3: Aerial View of Langford Road and Independence Avenue Intersection



2020 Existing Traffic Volumes: Video, turning movement traffic counts were conducted by CBB at the following intersections during the weekday morning (7:00-9:00 a.m.) and weekday afternoon (3:00-6:00 p.m.) peak periods on Tuesday, December 15, 2020:

- Highway 291 and Langsford Road; and
- Langsford Road and Independence Avenue.

The 2020 Existing peak hour traffic volumes collected by CBB are summarized in **Exhibit 2**. Based on the traffic data collected, the weekday morning peak hour occurred between 8:00 and 9:00 a.m. and the weekday afternoon peak hour occurred between 4:30 and 5:30 p.m.

It should be noted that the region is still recovering from the COVID 19 pandemic. As a result, the 2020 CBB traffic counts were also compared to traffic volumes collected by the City in May 2017 at the intersection of Langsford Road and Independence Avenue. MoDOT did not have any historical count data for the intersection of Highway 291 and Langsford Road.

The City’s count data for the signalized intersection of Langsford Road and Independence Avenue was compared to the 2020 traffic volumes collected by CBB. **Table 1** summarizes the total entering volume during the AM and PM peak hours at the intersection of Langsford Road and Independence Avenue.

Table 1: Total Entering Traffic Volume - Langsford Road and Independence Avenue

WEEKDAY AM PEAK HOUR		WEEKDAY PM PEAK HOUR	
CITY COUNT 2017	CBB COUNT 2020	CITY COUNT 2017	CBB COUNT 2020
735 vph	605 vph	1,305 vph	1,040 vph

As shown, during the AM peak hour the total entering volume at the intersection of Langsford Road and Independence Avenue from the 2017 City count is approximately 21% higher than the 2020 CBB count. During the PM peak hour, the total entering volume at the intersection of Langsford Road and Independence Avenue from the 2017 City count is approximately 25% higher than the 2020 CBB count.

Additionally, based on our experience when reviewing current counts as compared to pre-COVID counts, the AM peak hour volumes have been about 20% to 30% lower, while the PM peak hour volumes have been about 10% to 15% lower.

Given the traffic characteristics in the area and the anticipated trip generation for the proposed development, the peak periods identified would represent a “worst-case scenario” with regards to the traffic impact. If traffic operations are acceptable during these weekday peak hours, it can be reasoned that conditions would be acceptable throughout the remainder of the day.



Exhibit 2: Existing Count Data (2020)



Thus in an effort to be conservative, the 2020 existing traffic counts collected by CBB at the intersection of Highway 291 and Langsford Road were increased by 30% in the AM and PM peak hours to account for the lower traffic volumes as a result of the COVID-19 impacts. The 2020 Base, or adjusted existing, peak hour traffic volumes are summarized in **Exhibit 3**.

Since pre-COVID traffic counts were available for the Langsford Road and Independence Avenue intersection, the higher of the 2017 City count and 2020 CBB count for each movement was used for the Langsford Road and Independence Avenue intersection. Given the area is fairly developed, a specific growth rate was not used to convert the 2017 traffic volumes to 2020 volumes. Based on discussions with the City, a growth rate of one to one and half percent is often assumed. Given the relatively low volumes at the intersection (i.e., less than 100 vph for the turning movements and about 100 to 250 vph for the Langsford Road through movements) an annual growth rate of one percent would amount to less than 3 additional vehicles for the turning movements and less than 10 additional vehicles for the through movements. This minor difference in volume, if added, would not make a difference in the findings and recommendations discussed later in this report.



Exhibit 3: Base Traffic Volumes (2020)



PROPOSED SITE

Proposed Land Use: Based on the concept plan provided by you, the proposed development will consist of a 3,320 SF drive-in bank. A drive-up ATM machine is proposed but there would be no drive-thru customer service windows provided.

Site Access: Access to the development is proposed via the existing access drive on Langsford Road, as well as the existing cross access easement to the development to the north of the site which has a right-in/right-out (RIRO) drive on Highway 291. It is our understanding the city of Lee's Summit will require the access on Langsford Road be restricted to RIRO.

Site Review: As requested, the proposed site was reviewed for compliance with the City's Access Management Code with the respect to driveway width, driveway throat depth, intersection functional area encroachment and driveway spacing.

Driveway Width: Based on Table 18-1 in the Access Management Code, a driveway width of 28 feet (min) to 42 feet (max) is recommended for driveways with a peak hour volume less than 150 vph. The proposed site driveway is 28 feet wide.

Driveway Throat Depth: Based on Table 18-2 in the Access Management Code, a driveway throat depth of 100 feet is recommended for driveways with a volume greater than 50 vph on arterials. The existing site only has a total depth of about 150 feet so it is impractical to provide a driveway throat depth of 100 feet. The existing site drive has a non-compliant throat depth of about 15 feet. The proposed site drive would increase the throat depth to 25 feet which is less than recommended; but an improvement of the current condition. Furthermore, given the small lot size and required setbacks a longer throat depth is not practical.

Intersection Functional Area: The existing site drive is located within the functional area of the Highway 291 and Langsford Road intersection. However, the proposed site drive on Langsford Road is located as far from the signalized intersection as possible. Furthermore, it is recommended the site drive be restricted to RIRO only due to the close proximity to the signal at Highway 291 and Langsford Road.

Driveway Spacing: Based on Section 15.1 in the Access Management Code, it is recommended a RIRO drive be located outside the functional area of the nearest intersection. As mentioned previously, the proposed site drive on Langsford Road will remain in its existing location as far from the Highway 291 signal as possible.

Trip Generation: Forecasts were prepared to estimate the amount of traffic the proposed development would generate during the weekday AM and PM peak hours. These forecasts were based upon information provided in the *Trip Generation Manual, 10th Edition*, published by the Institute of Transportation Engineers (ITE). This manual, which is a standard resource for transportation engineers, is based on a compilation of nationwide studies documenting the



for transportation engineers, is based on a compilation of nationwide studies documenting the characteristics of various land uses. Estimates for the proposed development were based upon Land Use 912 – Drive-In Bank.

The average trip rate was used to estimate the trips for the proposed Chase bank. The peak hour of adjacent street traffic (one hour between 7:00 and 9:00 AM) was utilized for the AM peak hour and peak hour of adjacent street traffic (one hour between 4:00 and 6:00 PM) was utilized for the PM peak hour. The trip generation estimates for the proposed 3,320 SF Chase bank are summarized in **Table 2**.

Table 2: Trip Generation Estimate – Chase Bank

Land Use (ITE Land Use)	Size	Daily	Weekday AM Peak Hour			Weekday PM Peak Hour		
			In	Out	Total	In	Out	Total
Drive-In Bank (912)	3,320 SF	335	20	15	35	35	35	70
Pass-By Trips		100	5	5	10	10	10	20
New Trips		235	15	10	25	25	25	50

It should be noted that Chase banks do not typically open until 9:00 AM and close at 5:00 PM. Therefore, the use will not have a significant impact during the AM peak hour operations on the adjacent roadways. ITE’s trip rate during the AM peak hour generally reflects minimal traffic volumes, most of which would occur outside the typical AM commuter peak hour.

Additionally, some of the trips to the site would not represent “primary” trips. Instead, nationwide studies have found that a large percentage of banking trips are convenience-oriented or “pass-by” trips (i.e., vehicles already present on Highway 291 or Langsford Road) that turn into the site as part of a longer trip. The pass by trips would not increase traffic on the adjacent streets, but they would increase the turning movements at the site’s entrances.

Based upon statistical information provided in the “Trip Generation Handbook, Third Edition” the pass-by trip percentages for drive-in banks represent 29% of the AM peak hour volume and 34% the PM peak hour volume, which relates to approximately 10 pass-trips in the AM peak and 20 pass-by trips in the PM peak hour. Consequently, the proposed bank would only be expected to generate 25 “new” trips during the AM peak hour and 50 “new” trips during the PM peak hour.



Trip Distribution: The bank’s pass-by trips were assigned into and out of the site based on the existing travel patterns on the adjacent roadways. The bank’s new trips were assigned into and out of the site based upon an estimated directional distribution. Based upon the existing travel patterns in the area, it is anticipated the distribution of new site-generated trips would be oriented to the adjacent roads as summarized below:

- 15% to/from the west on Langsford Road;
- 20% to/from the east on Langsford Road;
- 35% to and from the north on Highway 291; and
- 30% to and from the south on Highway 291.

Since it is anticipated the site access will be limited to RIRO access on both Highway 291 and Langsford Road, the trips oriented to the north on Highway 291 were assumed to take a right onto Langsford Road, then head north on Independence Avenue to either Columbus Street or Chipman Road to access Highway 291 and head north. Based on the new trips estimated and the directional distribution, this equates to approximately 8 to 15 trips during the peak hours. This level of increase would be negligible along Independence Avenue north of Langsford Road.

The resulting assignment of site-generated trips for the weekday AM and PM peak hours is summarized in **Exhibit 4**.

2020 Build Traffic Volumes: The proposed site-generated trips (Exhibit 4) were added to the 2020 Base Traffic Volumes (Exhibit 3) to determine the total volumes in the forecasted scenario. The forecasted, or 2020 Build, traffic volumes for the AM and PM peak hours are shown in **Exhibit 5**.



Exhibit 4: Total Site Generated Traffic - Chase Bank



Exhibit 5: Build Traffic Volumes (2020)



2020 TRAFFIC ANALYSIS

Study Procedures: The 2020 Base and 2020 Build operating conditions were analyzed using SYNCHRO 10, a macro-level analytical traffic flow model. SYNCHRO is based on study procedures outlined in the *Highway Capacity Manual*, published by the Transportation Research Board. This manual, which is used universally by traffic engineers to measure roadway capacity, establishes six levels of traffic service: Level A ("Free Flow"), to Level F ("Fully Saturated"). Levels of service (LOS) are measures of traffic flow, which consider such factors as speed, delay, traffic interruptions, safety, driver comfort, and convenience. Level C, which is normally used for highway design, represents a roadway with volumes ranging from 70% to 80% of its capacity. Level D is often considered acceptable for peak period conditions in urban and suburban areas. However, the City of Lee’s Summit has a target goal of overall LOS C at the City owned intersections.

The thresholds that define level of service at an intersection are based upon the type of control used (i.e., whether it is signalized or unsignalized) and the calculated delay. For signalized and all-way stop intersections, the average control delay per vehicle is estimated for each movement and aggregated for each approach and then the intersection as a whole. At intersections with partial (side-street) stop control, delay is calculated for the minor movements only since motorists on the main road are not required to stop.

Level of service is directly related to control delay. At signalized intersections, the level of service criteria differ from that at unsignalized intersections primarily because varying transportation facilities create different driver expectations. The expectation is that a signalized intersection is designed to carry higher traffic volumes, and consequently may experience greater delay than an unsignalized intersection. **Table 3** summarizes the thresholds used in the analysis for signalized and unsignalized intersections.

Table 3: Level of Service Thresholds

LEVEL OF SERVICE (LOS)	CONTROL DELAY PER VEHICLE (SEC/VEH)	
	SIGNALIZED INTERSECTIONS	UNSIGNALIZED INTERSECTIONS
A	≤ 10	0-10
B	> 10-20	> 10-15
C	> 20-35	> 15-25
D	> 35-55	> 25-35
E	> 55-80	> 35-50
F	> 80	> 50



2020 Build Auxiliary Turn Lane Needs: The need for a westbound right-turn lane on Langsford Road at the proposed site drive was evaluated using the City's Access Management Code. Based on the City's Code, a right-turn lane is warranted when the right-turn volume at the drive/street is at least 60 vph on a Minor Arterial roadway. As shown in Figure 5, the right-turn volume is estimated at 20 vph in the AM peak hour and 34 vph in the PM peak hour which is well below the minimum threshold of 60 vph. Consequently, a westbound right-turn lane on Langsford Road at the proposed site drive is not warranted.

2020 Operating Conditions: The study intersections were evaluated using the methodologies described previously. **Table 4** summarizes the results of this analysis, which reflects the 2020 Base and 2020 Build operating conditions and average delay at the study intersections during the weekday AM and PM peak hours. The Synchro estimated 95th percentile queue for the eastbound Langsford Road approach at Highway 291 is also shown in the table. The existing lanes and traffic control for the study intersections were assumed for the existing intersections. The existing signal timings were also used for the signalized study intersections.

As shown in the table, all study intersection approaches currently operate at acceptable levels of service (LOS D or better) during both peak periods with the exception of the eastbound and westbound Langsford Road approaches at Highway 291 which operates at LOS E and F during the PM peak hour. Recall, that the 2020 existing traffic volumes were increased by 30% in the PM peak hour which may result in higher traffic volumes than may be present post-COVID. Additionally, the signals along Highway 291 operate under adaptive signal control which favors the mainline Highway 291 with long green times which results in longer delays on the side streets.

As shown in the table, the minimal trips added as a result of the proposed Chase bank make little to no difference at the study intersections and would not warrant any improvements.

As shown in the table, the eastbound left-turn movement has a Synchro estimated 95th percentile queue of about 75 feet in the AM peak hour and 175 feet in the PM peak hour. Based on the proximity of the site drive to Highway 291, there would be approximately 155 feet of storage provided before the eastbound queues at the Highway 291 signal would block the existing site drive on Langsford Road. Given, the PM peak hour queue is estimated at 175 feet it is reasonable to restrict the proposed site access on Langsford Road to right-in/right-out only.

It is important to note that based on discussions with the City, queues in excess of 200 feet are often observed for the eastbound approach of Langsford Road at Highway 291. The existing signals along Highway 291 run under an adaptive timing plan, meaning the timings are constantly changing to accommodate the volumes with a priority of moving traffic on Highway 291 often resulting in increased delay for the side-streets. Unfortunately, the analysis software does not accurately reflect the adaptive timing plans. Instead set timings were assumed based on the average time allotted for each phase which can result in differences in the reported versus actual delay and queues. Regardless of whether the eastbound queues are 175 feet or



over 200 feet, the recommendation of restricting the site access drive to RIRO remains the same.

Table 4: 2020 Capacity Analysis Summary

Intersection / Approach	Weekday AM Peak Hour		Weekday PM Peak Hour	
	2020 Base	2020 Build	2020 Base	2020 Build
Highway 291 and Langsford Road (signalized)				
Eastbound Langsford Road Approach	D (43.5) 95 th Q Left- 77' 95 th Q Thru- 77'	D (43.6) 95 th Q Left- 77' 95 th Q Thru- 77'	E (60.1) 95 th Q Left- 174' 95 th Q Thru- 182'	E (60.3) 95 th Q Left- 174' 95 th Q Thru- 182'
Westbound Langsford Road Approach	D (47.8)	D (48.3)	F (87.3)	F (89.9)
Northbound Highway 291 Approach	C (21.0)	C (21.2)	C (28.1)	C (28.3)
Southbound Highway 291 Approach	C (23.3)	C (23.3)	D (41.7)	D (42.3)
Overall Intersection	C (30.5)	C (30.6)	D (47.7)	D (48.4)
Langsford Road and Independence Avenue (signalized)				
Eastbound Langsford Road Approach	A (9.6)	A (9.6)	B (14.0)	B (13.9)
Westbound Langsford Road Approach	B (12.5)	B (12.5)	C (21.1)	C (21.1)
Northbound Independence Avenue Approach	B (13.4)	B (13.4)	B (16.8)	B (17.2)
Southbound Independence Avenue Approach	B (15.1)	B (15.1)	C (24.9)	C (25.6)
Overall Intersection	B (12.4)	B (12.4)	B (18.6)	B (18.7)
Highway 291 and Commercial RIRO Drive (Side-Street STOP)				
Eastbound RIRO Commercial Drive Right-Turn	B (11.6)	B (11.7)	C (22.7)	C (24.7)
Southbound Highway 291 Approach	Free Flow	Free Flow	Free Flow	Free Flow
Langsford Road and Site RIRO Drive (Side-Street STOP)				
Westbound Langsford Road Approach	Free Flow	Free Flow	Free Flow	Free Flow
Southbound RIRO Site Drive Right-Turn	A (9.5)	A (9.6)	A (9.9)	B (10.1)

X (XX.X) - Level of Service (Vehicular delay in seconds per vehicle)



SUMMARY

CBB completed the preceding study to address the traffic impacts associated with the proposed Chase bank located in the northwest quadrant of the intersection of Missouri Highway 291 and Langsford Road in Lee's Summit, Missouri.

The additional trips associated with the proposed drive-in bank would have minimal impact on the operating conditions at the adjacent intersections and would not warrant any roadway improvements to accommodate the proposed development.

We trust that this traffic impact study adequately describes the forecasted traffic conditions that should be expected as a result of the proposed Chase bank in Lee's Summit, Missouri. If additional information is desired, please feel free to contact me at 314-449-9572 or swhite@cbbtraffic.com.

Sincerely,

Shawn Lerai White, P.E., PTOE
Associate - Senior Traffic Engineer