



June 25, 2020

Mr. Brandon Garnett
Nelson Architecture, Inc.
30 West Monroe Street, Suite 200
Chicago, IL 60603

Re: Chambers and Colfax Bank of America
Traffic Generation and Site Circulation/Queuing Analysis Letter
Aurora, Colorado

Dear Mr. Garnett:

Introduction

This traffic study letter documents the results of a trip generation calculation, site circulation discussion, and drive through queuing analysis for the proposed Bank of America to be developed near the northeast corner of the Colfax Avenue (US-40) and Altura Boulevard intersection in Aurora, Colorado. The project is proposed within Chambers Plaza retail center located on the northwest corner of the Colfax Avenue and Chambers Road intersection. Chambers Plaza contains a King Soopers and support retail pads. The location of the proposed Bank of America is currently occupied by Yi Asian Express, a fast food restaurant with a drive through, and a small office building. Bank of America is proposing a building of approximately 4,500 square feet to be redeveloped and constructed in place of the existing development. A conceptual site plan of the proposed redevelopment is attached. This traffic study letter identifies the amount of traffic associated with the proposed redevelopment project. In addition, estimated project trips were compared to the estimated trips of the existing uses in the same development area.

Site Circulation and Drive Through Queuing Analysis

Regional access to the Bank of America will be provided by Interstate 225 (I-225) and I-70. Primary access will be provided by Colfax Avenue and Chambers Road. Direct access will be provided by an existing full movement access along the east side of Altura Boulevard and an existing right-in/right-out access along the north side of Colfax Avenue. The access along Altura Boulevard is located approximately 300 feet north of Colfax Avenue (measured center to center) while the access along Colfax Avenue is located approximately 450 east of Altura Boulevard. Cross access from the Chambers Plaza development is also currently provided and will remain with this redevelopment. Immediate access exclusive for Bank of America will be located in the northwest and northeast corners of the site from an east-west and north-south drive aisle within Chambers Plaza.

The entrance to the bank is on the southeast side of the building. Parking for the site is proposed on the east west sides of building. Vehicles will not be able to circulate around the entire building.

The Bank of America will contain a drive through window with two lanes for vehicle queuing. The drive through window is located on the north side of the project building and will circulate vehicles west to east through the drive through lanes. A total of approximately 180 feet (90 feet per lane) of vehicle queuing is proposed for the drive through prior to vehicles encroaching into the west parking aisle for the bank. This allows for a total of eight (8) vehicles queuing in the drive through lanes which meets the eight (8) vehicle design queue best practice standard for drive-in banks as referenced in the ITE Summer 2012, *Drive-Through Queue Generation*, 1st Edition, written by Mark Spack. The appropriate documents from this publication is attached.

Trip Generation

Site-generated traffic estimates are determined through a process known as trip generation. Rates and equations are applied to the proposed land use to estimate traffic generated by the development during a specific time interval. The acknowledged source for trip generation rates is the *Trip Generation Manual* published by the Institute of Transportation Engineers (ITE). ITE has established trip rates in nationwide studies of similar land uses. Trip generation for the proposed and existing uses is based on the ITE Trip Generation, 10th Edition (most current edition) average rates for Drive-in Bank (ITE Code 912), Office (ITE 710), and Fast Food Restaurant with Drive Through (ITE 934). The following table summarizes a comparison of the trip generation from the original land uses which consists of an approximate 2,750 square foot office and 2,700 square foot fast food restaurant to the currently proposed 4,500 square foot bank. Trip generation calculations are attached.

Project generated traffic volumes are identified on a weekday daily as well as on a morning and afternoon peak hour basis. The morning peak hour is the highest one-hour time period of adjacent street traffic during four consecutive 15-minute intervals during the morning peak hour, between 7:00 am and 9:00 am. The afternoon peak hour is the highest one-hour time period of four consecutive 15-minute intervals between the hours of 4:00 pm and 6:00 pm representing the afternoon peak hour.

Trip Generation Comparison: Original Development vs. Proposed Development

Use and Size	Daily Vehicle Trips	Weekday Vehicle Trips					
		AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Original Development							
Office (ITE 710) – 2,750 Square Feet	28	3	0	3	0	3	3
Fast Food Restaurant w/ DT (ITE 934) – 2,700 Square feet	1,272	56	53	109	46	42	88
Original Development Total Trips	1,300	59	53	112	46	45	91
Current Proposal – Bank of America							
Drive-in Bank (ITE 912) – 4,500 SF	452	25	18	43	46	46	92
Net Difference in Trips	-848	-34	-35	-69	+0	+1	+1

As summarized in the table, the currently proposed Bank of America is anticipated to generate 452 daily weekday trips with 43 of these trips occurring during the morning peak hour, and 92 trips occurring during the afternoon peak hour. The original development uses would be expected to generate 1,300 daily weekday trips with 112 of these trips occurring during the morning peak hour, and 91 trips occurring during the afternoon peak hour. Based on a comparison to the original development, the proposed Bank of America development is anticipated to generate 848 fewer daily trips, 69 fewer trips during the morning peak hour, and one (1) more trip during the afternoon peak hour than the previous development.

The threshold for needing to obtain a Colorado Department of Transportation (CDOT) access permit is when project traffic increases by more than 20 percent compared to existing traffic volumes. It is not anticipated that CDOT access permits will be required since project traffic is expected to decrease during the morning peak hour and increase by only one (1) vehicle during the afternoon peak hour when compared to the existing development in the same development area. There would have to be five (5) trips or less currently utilizing the existing right-in/right-out access along US-40 (Colfax

Avenue) and the north leg of Altura Boulevard at US-40 in order for the project to increase traffic volumes by more than 20 percent during the afternoon peak hour. It is highly likely and almost certain that five trips are currently utilizing these two locations during the afternoon peak hour. Therefore, CDOT access permits should not be required in association with this project.

Conclusions

These results show preliminary traffic information for the development of the proposed Bank of America project including trip generation, site circulation, and drive through queuing analysis within the existing Chambers Plaza retail center located on the northwest corner of the Colfax Avenue and Chambers Road intersection. Kimley-Horn believes the proposed Bank of America development traffic will be successfully incorporated into the existing roadway network. Further, vehicle queues from the drive through windows are expected to be adequately accommodated onsite. Lastly, CDOT access permits should not be required in association with this project. If you have any questions or require anything further, please feel free to call me at (720) 943-9962.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.



Jeffrey R. Planck, P.E.
Project Manager



Trip Generation Calculations

Project Chambers and Colfax BOA - Proposed
 Subject Trip Generation for Drive-In Bank
 Designed by JRP Date June 24, 2020 Job No. 096669004
 Checked by _____ Date _____ Sheet No. 1 of 1

TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 10th Edition, Average Rate Equations

Land Use Code - Drive-in Bank (912)

Independant Variable - 1000 Square Feet Gross Floor Area (X)

Gross Floor Area = **4,500** Square Feet

X = 4.500

T = Average Vehicle Trip Ends

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (900 Series Page 13)

Average Weekday Directional Distribution: 58% ent. 42% exit.
 T = 9.50 (X) T = 43 Average Vehicle Trip Ends
 T = 9.50 * 4.500 25 entering 18 exiting
 25 + 18 = 43

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (900 Series Page 14)

Average Weekday Directional Distribution: 50% ent. 50% exit.
 T = 20.45 (X) T = 92 Average Vehicle Trip Ends
 T = 20.45 * 4.500 46 entering 46 exiting
 46 + 46 = 92

Weekday (900 Series Page 12)

Average Weekday Directional Distribution: 50% entering, 50% exiting
 T = 100.03 (X) T = 452 Average Vehicle Trip Ends
 T = 100.03 * 4.500 226 entering 226 exiting
 226 + 226 (*) = 452

Saturday Peak Hour of Generator (900 Series Page 18)

Average Saturday Directional Distribution: 51% ent. 49% exit.
 T = 26.35 (X) T = 119 Average Vehicle Trip Ends
 T = 26.35 * 4.500 61 entering 58 exiting
 61 + 58 (*) = 119

Non Pass-By Trip Volumes (Per ITE Trip Generation Handbook, 3rd Edition September 2017-Page 207)

AM Peak Hour =	71%	Non-Pass By	PM Peak Hour =	65%	Non-Pass By
	IN	Out	Total		
AM Peak	18	13	31		
PM Peak	30	30	60		
Daily	147	147	294	PM Peak Hour Rate Applied to Daily	

Pass-By Trip Volumes (Per ITE Trip Generation Handbook, 3rd Edition September 2017 -Page 207)

AM Peak Hour =	29%	Pass By	PM Peak Hour =	35%	Pass By
	IN	Out	Total		
AM Peak	7	5	12		
PM Peak	16	16	32		
Daily	79	79	158	PM Peak Hour Rate Applied to Daily	

Project Chambers and Colfax BOA - Existing
 Subject Trip Generation for Office Building
 Designed by JRP Date June 24, 2020 Job No. 096669004
 Checked by _____ Date _____ Sheet No. 1 of 1

TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 10th Edition, Average Rates

Land Use Code - General Office Building (710)

Independant Variable - 1000 Square Feet (X)

SF = **2,750**

X = 2.750

T = Average Vehicle Trip Ends

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (700 Series Page 4)

(T) = 1.16 (X)		Directional Distribution:	86% ent.	14% exit.
(T) = 1.16 *	(2.8)	T = 3	Average Vehicle Trip Ends	
		3 entering	0	exiting
		3 + 0 = 3		

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (700 Series Page 5)

(T) = 1.15 (X)		Directional Distribution:	16% ent.	84% exit.
(T) = 1.15 *	(2.8)	T = 3	Average Vehicle Trip Ends	
		0 entering	3	exiting
		0 + 3 = 3		

Weekday (700 Series Page 3)

Average Weekday		Directional Distribution:	50% ent.	50% exit.
(T) = 9.74 (X)		T = 28	Average Vehicle Trip Ends	
(T) = 9.74 *	(2.8)	14 entering	14	exiting
		14 + 14 = 28		

Saturday, Peak Hour of Generator (700 Series Page 9)

Daily Weekday		Directional Distribution:	54% ent.	46% exit.
(T) = 0.53 (X)		T = 2	Average Vehicle Trip Ends	
(T) = 0.53 *	(2.8)	1 entering	1	exiting
		1 + 1 = 2		

Project Chambers and Colfax BOA - Existing
 Subject Trip Generation for Fast-Food Restaurant with Drive-Through Window
 Designed by JRP Date June 24, 2020 Job No. 096669004
 Checked by _____ Date _____ Sheet No. 1 of 1

TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 10th Edition, Average Rate Equations

Land Use Code - Fast Food Restaurant With Drive-Through Window (934)

Independant Variable - 1000 Square Feet Gross Floor Area (X)

Gross Floor Area = **2,700** Square Feet

X = 2.700

T = Average Vehicle Trip Ends

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (900 Series page 158)

Average Weekday
 T = 40.19 (X)
 T = 40.19 * 2.700

Directional Distribution: 51% ent. 49% exit.
 T = 109 Average Vehicle Trip Ends
 56 entering 53 exiting
 56 + 53 (*) = 109

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (900 Series page 159)

Average Weekday
 T = 32.67 (X)
 T = 32.67 * 2.700

Directional Distribution: 52% ent. 48% exit.
 T = 88 Average Vehicle Trip Ends
 46 entering 42 exiting
 46 + 42 = 88

Weekday (900 Series page 157)

Average Weekday
 T = 470.95 (X)
 T = 470.95 * 2.700

Directional Distribution: 50% entering, 50% exiting
 T = 1272 Average Vehicle Trip Ends
 636 entering 636 exiting
 636 + 636 = 1272

Saturday Peak Hour of Generator (900 Series page 163)

T = 54.86 (X)
 T = 54.86 * 2.700

Directional Distribution: 51% ent. 49% exit.
 T = 148 Average Vehicle Trip Ends
 75 entering 73 exiting
 75 (*) - 73 = 148

Non Pass-By Trip Volumes (Per ITE Trip Generation Handbook, 3rd Edition September 2017)

AM Peak Hour =	51%	Non-Pass By	PM Peak Hour =	50%	Non-Pass By
	IN	Out	Total		
AM Peak	29	27	56		
PM Peak	23	21	44		
Daily	318	318	636	PM Peak Hour Rate Applied to Daily	

Pass-By Trip Volumes (Per ITE Trip Generation Handbook, 3rd Edition September 2017)

AM Peak Hour =	49%	Pass By	PM Peak Hour =	50%	Pass By
	IN	Out	Total		
AM Peak	27	26	53		
PM Peak	23	21	44		
Daily	318	318	636	PM Peak Hour Rate Applied to Daily	

Drive Through Queue Generation Documents

Drive-Through Queue Generation

Mike Spack, PE, PTOE, Max Moreland, EIT, Lindsay de Leeuw, Nate Hood

1.0 Introduction

This report provides queuing data for businesses with drive-through services. It is intended to be an aid for site designers and reviewers, similar to the Institute of Transportation Engineers' *Trip Generation* and *Parking Generation* reports. The data presentation is modeled on the *Parking Generation* report and data is provided based on at least six sites, similar to data sets marked as statistically significant in *Trip Generation*.

Businesses with drive-through lanes are very common in the United States and having data that gives usage information for drive-through lanes will assist designers as well as cities in determining the appropriate amount of storage needed for proposed drive-through businesses. Data for drive-through queues was published by the ITE Technical Council Committee 5D-10 in 1995 based on information collected between the late 1960's and the 1990's. A paper was also published in 2009 by Mark Stuecheli, PTP giving updated information for bank and coffee shop drive-through lanes. The results from the 2009 study are incorporated into this paper (thank you Mark for your assistance).

2.0 Data Collection

Data was collected using COUNTcam video recording systems at a total of 30 drive-through locations in Minneapolis, MN and several surrounding suburbs between 2010 and 2012 (26 of the 30 videos were recorded in February of 2012, which should represent peak usage in the cold Minnesota winter). Videos of drive-through lanes were collected at banks, car washes, coffee shops, fast food restaurants and pharmacies. A total of six locations were selected for each of the five different land uses. Each location was recorded for between one and five days where the majority of locations were recorded for two consecutive days. The days of the week that each video was recorded on varies.

The 24-hour videos were watched at high speeds with the PC-TAS counting software and maximum queues throughout the day were noted. Most of the COUNTcams were set up such that the entire queue lane could be seen, but at a few locations the drive-through lanes wrapped around the building in a way that the entire queue length would not be able to be seen. For these situations, the COUNTcams were set up so that the ordering window and back of the queue could be seen and it was noted how many vehicles could fit between the ordering window and the front of the queue. For drive-through locations with multiple lanes, the number of lanes was noted but the maximum queue is defined as the sum of the queues at each lane for any given point in time, not the queue per lane. This approach provides overall demand, which may assist designers in determining how many drive through lanes are appropriate in addition to determining how long they should be.

Once the maximum queue for each day at each location was determined, the data was compiled and statistics for each land use were calculated. The average maximum queue, standard deviation, coefficient of variation, range, 85th percentile and 33rd percentile were calculated for each land use.

Data for drive-through coffee shops and banks from the Kansas City, Kansas metropolitan area was published in the 2009 paper New Drive-Through Stacking Information for Banks and Coffee Shops by Mark Stuecheli. This data is included in the analysis.

3.0 Data Analysis

Based on the peak queue lengths, it is apparent that each land use will require a different minimum drive through stacking distance. The results for each land use can be found below. The peak queue lengths for each location, broken down by land use and day of the week, can be found in the Appendix.

3.1 Banks

Data collection was done at six banks with drive-through services (including one credit union) in August 2011 and February 2012. Twelve days of data were collected. The banks were located in the cities of Minneapolis, Robbinsdale and St. Louis Park, MN.

All of the locations had a lane with a drive-through ATM and at least two other lanes. Though service times may differ for ATM lanes compared to the regular lanes, the maximum queues were counted together. This is because based upon what was observed, vehicles would occasionally switch the lane they were in. For example, a vehicle waiting in the ATM line with a queue of three vehicles may move over to a regular line with a queue of only one vehicle. Much of what can be done at the bank's drive-through lane can also be accomplished at that bank's ATM and vice versa. Vehicles being served were counted as being in the queue.

Nine days of data from the Kansas City, Kansas area is also included. This data does not factor in vehicles in ATM lanes.

Table 3.1 – Drive-Through Bank Maximum Queue Statistics

	Minnesota Data	Minnesota + Kansas Data
Number of Data Points	12	21
Average Maximum Queue (Vehicles)	5.83	5.76
Standard Deviation (Vehicles)	1.85	2.21
Coefficient of Variation	32%	38%
Range (Vehicles)	3 to 8	1 to 10
85th Percentile (Vehicles)	8.00	8.00
33rd Percentile (Vehicles)	5.00	5.00

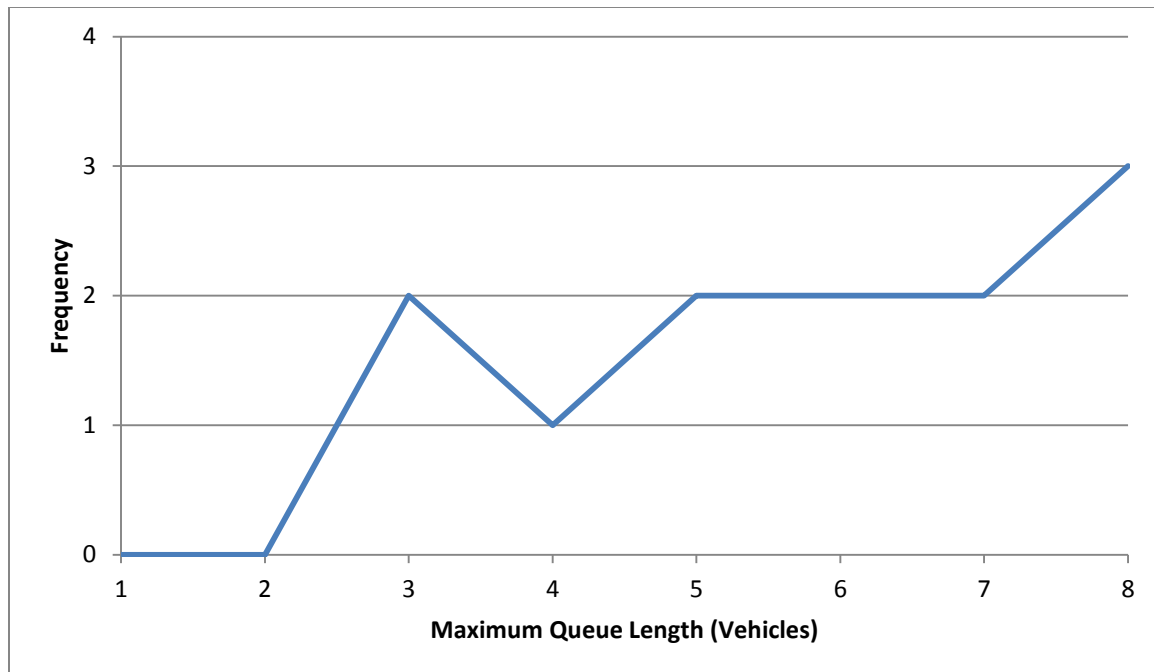


Figure 3.1.1 – Drive-Through Bank Maximum Queue Frequency – Minnesota Data

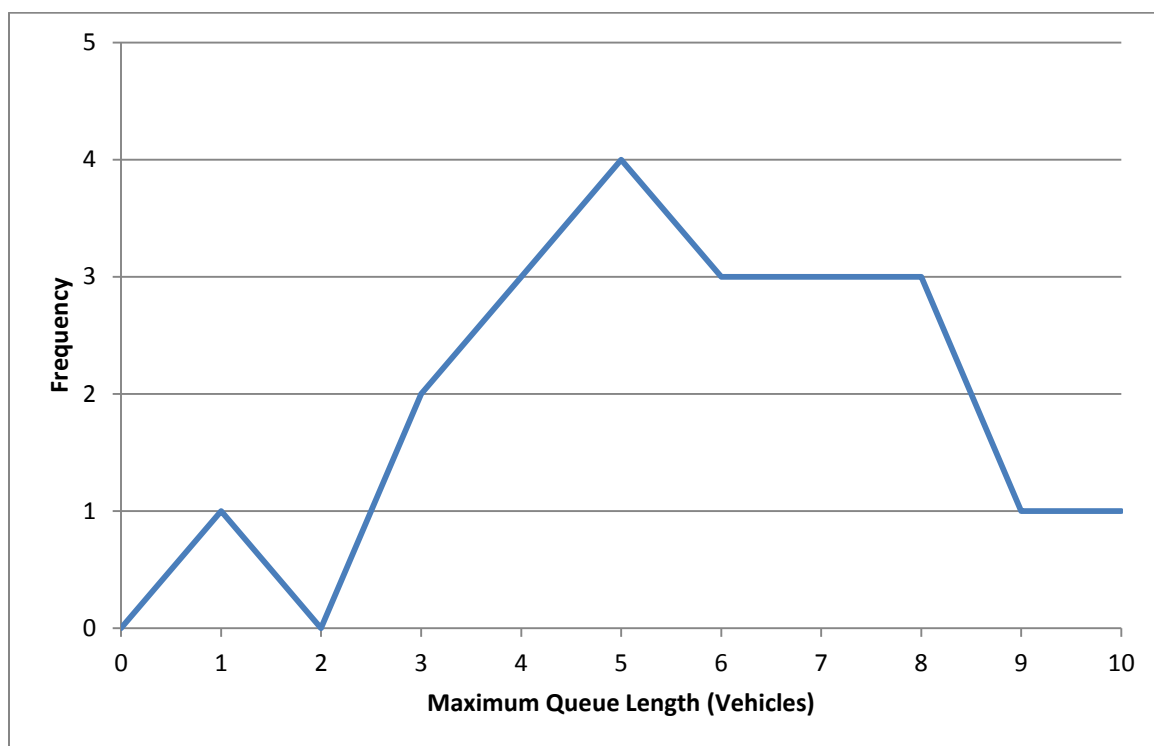


Figure 3.1.2 – Drive-Through Bank Maximum Queue Frequency – Minnesota + Kansas Data

The data for Kansas banks was collected between 4:30pm and 6:00pm. While many of the maximum queues for the data collected in Minnesota were between these times, maximum queues occurred between 8:30am and 5:30pm so it is possible that some of the Kansas data does not capture the actual maximum queues for the day.

The number of available lanes at banks, not including the ATM lane, ranged from two to seven lanes (though the most open at one time was five lanes). Even though plenty of lanes were available, cars often stacked at the lane closest to the building, thus additional lanes may not result in shorter queues. With an 85th percentile maximum queue of eight vehicles, the data suggests that banks with drive-through lanes should be able to accommodate 160 feet of vehicle stacking.

3.2 Car Washes

Data collection was done at six car washes with drive-through services (including one full-service car wash) in February 2012. Twelve days of data were collected. The car washes were located in the cities of Falcon Heights, Hopkins, Minneapolis, Roseville and St. Louis Park, MN. Five of the six car washes (excluding the full-service car wash) were located at gas stations. Only the vehicles waiting in line were counted; vehicles being washed were not added to the queue.

Table 3.2 – Drive-Through Car Wash Maximum Queue Statistics

Number of Data Points	12
Average Maximum Queue (Vehicles)	4.42
Standard Deviation (Vehicles)	2.31
Coefficient of Variation	52%
Range (Vehicles)	1 to 10
85th Percentile (Vehicles)	6.20
33rd Percentile (Vehicles)	3.00

Appendix A

Day of Week Maximum Queues

		Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Fast Food	Arby's				5	5		
	Burger King	6	12				10	8
	McDonald's				12	13		
	McDonald's				9	8		
	Taco Bell				10	8		
	White Castle				8	5		
Car Wash	BP				6	6		
	BP			1	3			
	BP			4	3			
	Holiday				3	4		
	Mister Car Wash				10	6		
	Mobil				4	3		
Coffee	Caribou				11	10		
	Caribou	7	10	12			12	8
	Starbucks				14	16		
	Starbucks				10	11		
	Starbucks			10	12			
	Starbucks				11			
Bank	Citizens Independent Bank			5	5			
	SharePoint Credit Union				3	3		
	TCF	4					8	8
	US Bank				7	7		
	Wells Fargo			8	6			
	Wells Fargo			6				
Pharmacy	CVS			1	2			
	CVS			4	4			
	CVS			2	2			
	Walgreens				4	5		
	Walgreens			3	3			
	Walgreens			3	2			

Conceptual Site Plan

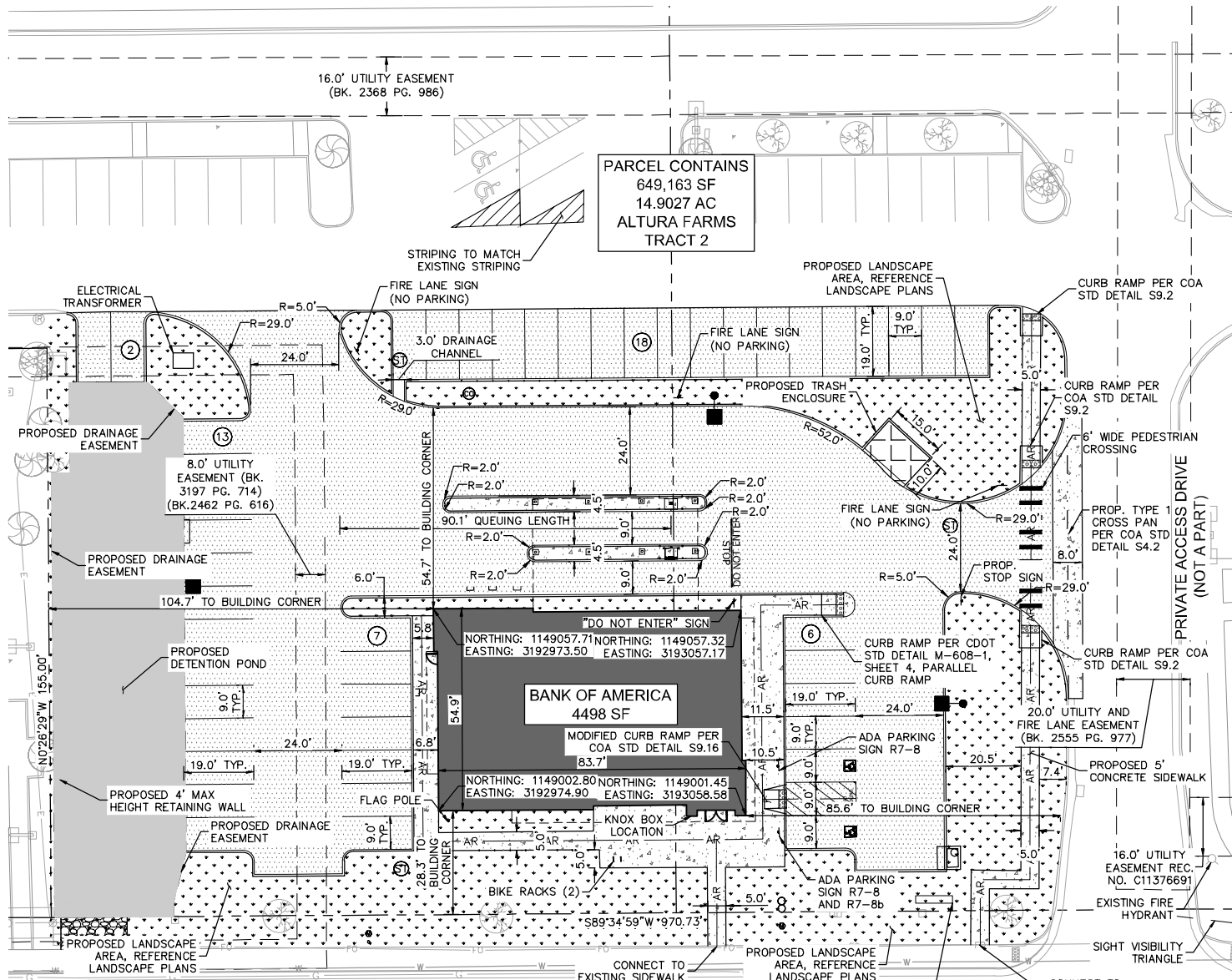
ALTURA FARMS TRACT NO. 2
BANK OF AMERICA AT CHAMBERS PLAZA
 CONTEXTUAL SITE PLAN AND CONDITIONAL USE WITH WAIVERS
 15077 EAST COLFAX AVENUE
 CITY OF AURORA, COUNTY OF ADAMS, STATE OF COLORADO

LEGEND

---	PROPERTY LINE
AR	ACCESSIBLE ROUTE
	STANDARD DUTY CONCRETE
	ASPHALT PAVEMENT
	HEAVY DUTY CONCRETE
	LANDSCAPE
	BUILDING
	BIKE RACK
	SITE LIGHT

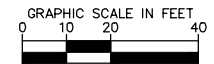
GENERAL NOTES

- DIMENSIONS AND RADII ARE TO FACE OF CURB UNLESS OTHERWISE NOTED.
- ALL RADII ARE 3' UNLESS OTHERWISE NOTED.
- SIGNS TO COMPLY WITH CITY OF AURORA AND MUTCD SIGN CODE UNLESS A SPECIFIC VARIANCE IS GRANTED.
- SIGNAGE NOT APPROVED WITH THIS PLAN.
- LIGHTING WITHIN THE PROJECT SHALL COMPLY WITH CITY OF AURORA REQUIREMENTS.
- SIDEWALKS AND RAMPS SHALL BE CONSTRUCTED IN COMPLIANCE WITH THE AMERICANS WITH DISABILITIES ACT AND CITY OF AURORA STANDARDS. HANDICAP ACCESSIBLE ROUTES SHALL SLOPE NO MORE THAN 1:20 IN DIRECTION OF TRAVEL AND NO MORE THAN 1:50 CROSS SLOPE.
- ALL ACCESSIBLE RAMPS SHALL HAVE TRUNCATED DOMES IN ACCORDANCE WITH APPLICABLE CITY OF AURORA STANDARDS.
- THESE PLANS ARE NOT FOR CONSTRUCTION. REFER TO THE FINAL APPROVED CONSTRUCTION PLANS.



E COLFAX AVE
(MAJOR ARTERIAL)
ROW VARIES

PROPOSED MONUMENT SIGN BY
 BANK VENDOR. FINAL SIGN LOCATION
 AND SIZE TO BE CONFIRMED UNDER
 SEPARATE PERMIT



Kimley»Horn
 KIMLEY-HORN AND ASSOCIATES, INC.
 Loveland, Colorado 80538 (303) 228-2200

ALTURA FARMS TRACT NO. 2
BANK OF AMERICA SITE PLAN
AURORA, COLORADO
 SITE PLAN

FILE NO.	8/7/2020
DESIGNED BY:	JPW
DRAWN BY:	JPW
CHECKED BY:	EPF
PROJECT NO.	09060904
SHEET NO.	2

NO.	REVISION	BY	DATE	APPR