

June 17, 2021

Mr. Jerry McGilsky
National Trade Contractors, LLC
2010 E. University Dr., Suite 24
Tempe, AZ 85281

Re: Fairways at Lowry Entry Gate Queuing Analysis
HKS Project No. 210433

Dear Mr. McGilsky:

Pursuant to your request, Harris Kocher Smith (HKS) has completed a vehicular queuing analysis for the proposed gated entries at the Fairways at Lowry residential apartments development located at 9913 E. 1st Ave. in Aurora, Colorado. Specifically, the study analyzes the three existing access driveways and develops recommendations for the locations of the automated entry gates. The following is a detailed summary of that analysis.

INTRODUCTION

Project Overview

The Fairways at Lowry apartment homes development is planning to install security fencing around the property which will include automated security gates at the three existing access driveways. Figure 1, enclosed herein, provides an aerial image of the development identifying the three subject access driveways.

Purpose of Study

The purpose of this study is to perform a vehicular queuing analysis for each of the entry driveways in order to develop recommendations for locating the proposed automated entry gates, such that the projected peak vehicle queues will not encroach into the adjacent roadways.

QUEUING ANALYSIS

In order to forecast the number of vehicles projected to utilize each of the proposed gated entries during the peak hours, vehicular trip projections were computed for the Fairways at Lowry development utilizing the publication *Trip Generation, 10th Edition*, by the Institute of Transportation Engineers (ITE). Forecasts of total daily traffic volumes and a.m. and p.m. peak hour traffic volumes were calculated. Trip generation reductions as a result of transportation demand management and/or multimodal travel options (i.e. transit, bicycle, pedestrian, etc.) were not considered.

For the purposes of this study, the vehicular trip generation projections were based on the Fairways at Lowry containing 450 dwelling units in nine 3-story buildings (ITE Land Use Code: 221). Based on these parameters, the Fairways at Lowry development is projected to generate 2,451 daily vehicle trips of which 149 are projected to be generated during the AM peak hour and 188 during the PM peak hour. A summary of the trip generation projections for the Fairways at Lowry development are provided in Table 1, below.

TABLE 1
FAIRWAYS AT LOWRY
VEHICULAR TRIP GENERATION SUMMARY

Land Use	Intensity	ITE Code	Daily (vpd)	AM Peak Hour (vph)				PM Peak Hour (vph)			
				Total	% In	% Out	In	Out	Total	% In	% Out
Multi-Family Housing (Mid-Rise) (3-10 Stories)	450 DU	221	2451	149	26%	74%	39	110	188	61%	39%
Total			2,451	149			39	110	188		

The distribution of the projected vehicular trips generated by the Fairways at Lowry development to/from each of the access driveways was established based on the following:

- Current and projected future traffic patterns on the surrounding transportation system.
- Efficiency of access to principal transportation corridors such as S. Havana St., Lowry Blvd., I-225, etc.
- Potential trip origins/destinations for the multifamily residential land use such as shopping centers, schools, employment centers, recreational amenities, etc.

Figure 2 graphically illustrates the trip distribution patterns developed for the Fairways at Lowry development access driveways.

The vehicular traffic volumes projected to be generated by the Fairways at Lowry development, shown in Table 1, were assigned to the three site access driveways utilizing the trip distribution methodology described above. Figure 3 graphically illustrates the site generated vehicular trip assignment for the Fairways at Lowry development access driveways.

The peak entering vehicle queues for the three Fairways at Lowry development access driveways were computed based on the following methodology:

- The peak vehicle queues are based on the p.m. peak hour entering traffic volumes for each of the three access driveways described above.
- Based on observation of similar automated entry gate operations and a gate operating speed of one foot/second, a vehicle entry cycle of one minute was assumed. This is the time from when a vehicle arrives at the gate card reader, activates the gate, the gate opens, and the vehicle passes through the gate.

- It was assumed that once the gate has opened multiple vehicle can pass through the gate without reactivation by each vehicle in a queue.
- In order to develop a peak vehicle arrival rate during the peak hour a Peak Hour Factor (PHF) of 0.5 was assumed. This allows for a conservative distribution of the peak hour entering traffic volume and development of a maximum entering vehicle queue.
- Incorporating these parameters, a Poisson distribution was utilized to determine the peak vehicle queues based on a 95% confidence level.

RECOMMENDATIONS

The recommended entry gate locations are based on three components, as follows:

- The rear end of a vehicle in the entry gate queue must clear the extension of the sidewalk (crosswalk) across the driveway. Based on existing conditions the following distances from the flowline of the intersecting roadway to the back of the crossing sidewalk were used for the three access driveways:
 - West Access Driveway: 16 feet
 - East Access Driveway: 6 feet
 - South Access Driveway: 6 feet (There is no existing sidewalk along the north side of E. 1st Ave. at this Location, however, it is assumed that a sidewalk may be constructed in the future.)
- The peak entry gate vehicle queues are based on 20-foot vehicle headways resulting in the following maximum projected vehicle queue lengths developing during the peak period:
 - West Access Driveway: The projected maximum vehicle queue developing is 60 feet (3 vehicles @ 20-foot headways).
 - East Access Driveway: The projected maximum vehicle queue developing is 40 feet (2 vehicles @ 20-foot headways).
 - South Access Driveway: The projected maximum vehicle queue developing is 80 feet (4 vehicles @ 20-foot headways). An 80-foot vehicle queue length will also accommodate a WB-67 design vehicle (moving van).
- The front end of a vehicle must clear the entry gate by 5 feet when it is activated and opening.

Based on these parameters the following automated entry gate locations are recommended for the Fairways at Lowry development:

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- **West Access Driveway** – The East Access Driveway automated entry gate should be located a minimum of 81 feet from the flowline of Dayton St.
- **East Access Driveway** – The West Access Driveway automated entry gate should be located a minimum of 51 feet from the flowline of Fulton St.
- **South Access Driveway** – South Access Driveway automated entry gate should be located a minimum of 91 feet from the flowline of Fulton St.

I trust that the information contained herein serves your needs as the project moves through the approval process. If you have any questions or require additional information please, do not hesitate to contact me at: phone: (303) 623-6300; e-mail: mkibbee@hkseng.com; or fax: (303) 623-6311.

Sincerely,

HARRIS KOCHER SMITH



Michael E. Kibbee, PE, PTOE

Enclosures



←→ Proposed Gated Access

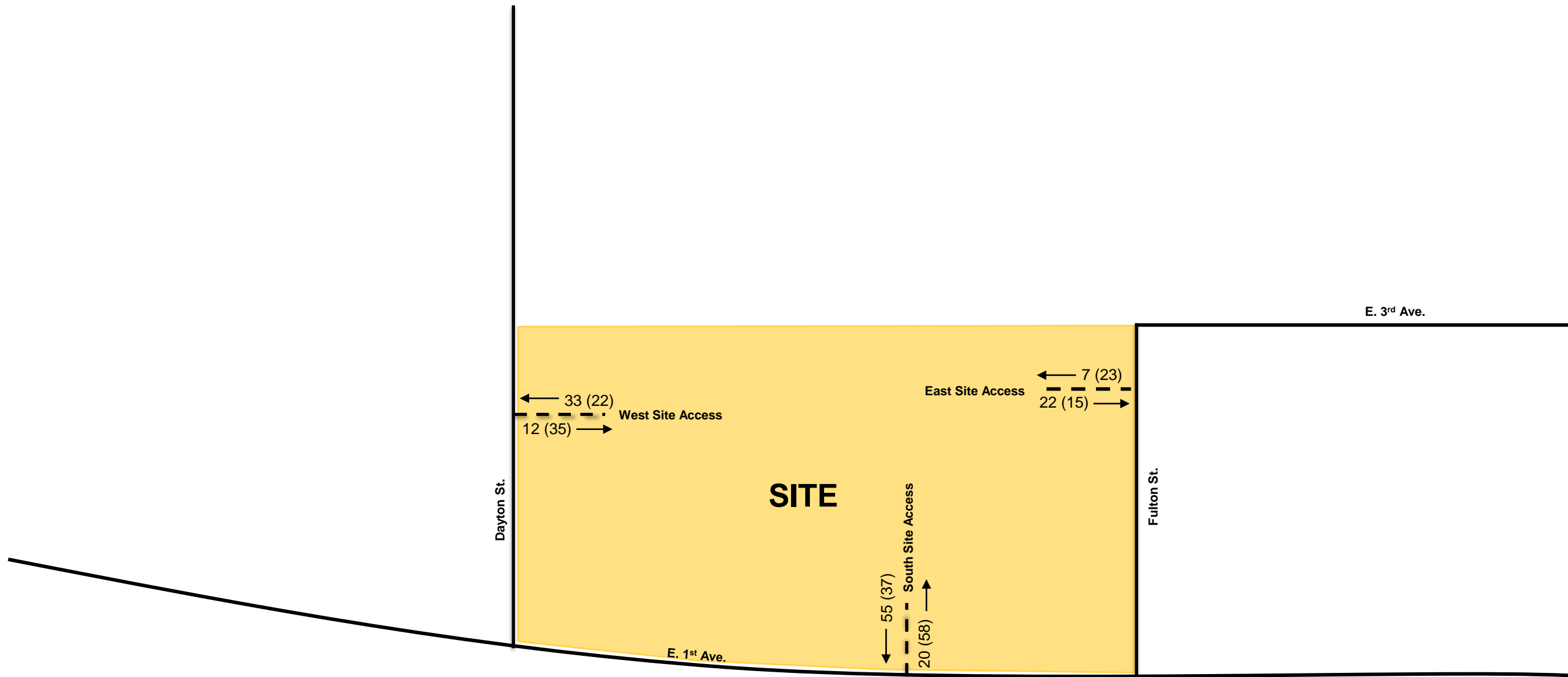


Legend:

Drawing Not To Scale

XX% Site-Generated Trip Distribution

Site Access



Legend:

Drawing Not To Scale

↖

5 (8)

↖

64 (50)

↖

8 (7)

Weekday AM (PM)

Peak Hour

Traffic Volumes, vph

Proposed Access