CITY OF MISSION PLANNING COMMISSION

AGENDA

April 27, 2020

7:00 PM

Virtual Through Zoom

1. Call to Order

2. Approval of Minutes from the February 24, 2020 Meeting

3. New Business

   A. Case # 20-02 Second Amendment of Final Site Development Plan for The Gateway Development - 4801 Johnson Drive
      An application for an second amendment to the final site development for the Gateway development project at 4801 Johnson Drive for the addition of a fifth floor to the office building
      a. Staff Report
      b. Site Plan and Elevation
      c. Memo from City's Traffic Engineer
      d. Updated Traffic Study

4. Old Business
   Discussion of Phase I Requirements For Projects When A Lender Is Not Involved

5. PC Comments

6. Staff Updates

Questions concerning this meeting may be addressed to staff contact,
Brian Scott, Assistant City Administrator at (913) 676-8353 or bscott@missionks.org.

MINUTES OF THE PLANNING COMMISSION MEETING
February 24, 2020
DRAFT

The regular meeting of the Mission Planning Commission was called to order by Chairman Mike Lee at 7:01 PM Monday, February 24, 2020. Members also present: Robin Dukelow, Burton Taylor, Charlie Troppito, Pete Christiansen, Jordan McGee and Frank Bruce. Stuart Braden and Brad Davidson were absent. Also in attendance: Jim Brown, Building Official, and Audrey McClanahan, Secretary to the Planning Commission.

Approval of Minutes from the November 25, 2019 Meeting

Comm. Troppito moved and Comm. Bruce seconded a motion to approve the minutes of the November 25, 2019, Planning Commission meeting, with two corrections noted by Comm. Bruce.

The vote was taken (5-0). The **motion carried**. Commissioners Christiansen and McGee abstained from the vote.

New Business

Election of New Officers

Comm. Dukelow moved and Comm. Troppito seconded a motion to elected Mike Lee as Chairman of the Planning Commission.

The vote was taken (6-0). The **motion carried**. Commissioner Lee abstained from the vote.

Chair Lee moved and Comm. Taylor seconded a motion to elect Commissioner Braden as Vice Chairman of the Planning Commission.

The vote was taken (6-0). The **motion carried**.

Case #20-01 Non-Conforming Situation Permit
5959 Broadmoor Street

Mr. Brown: I'm bringing you this evening Case #20-01, a request for a non-conforming situation permit for property located at 5959 Broadmoor Street. In attendance this evening is Russ Ehnen, the architect of this project, along with the owner. For specific design questions, landscaping elements, etc., they'll be able to respond to those. This property is comprised of three individual parcels identified. It's located at the northeast corner of Broadmoor Street and Martway Street and is addressed as 5959 Broadmoor Street. The existing one-story building is approximately 3,700 square feet, and a small garage for storage located toward the back of the property has been there for several years. I think they stored barbecue cookers and that sort of thing. The building has been a restaurant since its construction in 1973. It started out as Straw Hat Pizza, and most notably, it served as Johnny's Bar-B-Que for 25-plus years. In January, the restaurant closed due to the retirement of the owner. The applicant represents a prospective buyer that would like to continue to use the building as a restaurant. The buyer intends to open a restaurant known as The Other Place in the building.

The property is zoned "C-2B" Retail and Service District. A restaurant is an allowable use in this zoning district. This property is subject to the Mission, Kansas Design Guidelines for the Johnson Drive Corridor. It is also located in Block S of the West Gateway Overlay District and therefore subject to the West Gateway Form Based Code.

Surrounding properties are all zoned C-2B in this area, both north, east south and west, and both with various entities such as a post office, pet supply, retail stores, carwash, etc. The Comprehensive Plan Future Land Use Recommendation identifies the subject property for mixed use high density development to include a pedestrian friendly mix of offices, retail, service uses and medium to high density residential. The Form Based Code implements this via the requirement for mid-rise and high-rise structures.

The applicant is requesting approval for modifications to the exterior façade of the existing building by removing the existing mansard style roof elements and replacing with a parapet wall and new entry element, which will incorporate a modern and appealing architectural design. Materials to be used will include brick, native stone veneer and a metal trim overhang. A more detailed description will come a little later in the staff report under the analysis. All proposed exterior renovations are in keeping with the Johnson Drive Design Guidelines. There is no proposed expansion to the existing building or site. A building permit will also be required for the exterior renovation as well as the proposed interior modifications. We will handle that through the building department and permit issuance.

As noted above, the subject property is zoned C-2B, and the intent of this zoning district is for the purpose of permitting, regulating and encouraging retail and service establishments which serve a broad section of the general public. Products and services offered will vary, and in this case, the existing use is permitted within the zoning district. The structure and overall property comply with the stipulations of the zoning district in terms of height, setbacks and parking. In addition, this property is located in Block “S” of the West Gateway Form Based Code district, which stipulates mid-rise structures (2-4 stories in height) and high-rise structures (5-16 stories in height) with parking structures located behind. Upon the adoption of the FBC, the subject property no longer conformed to one or more of the regulations applicable to the Form Based Code. As such, it makes it a legal non-conforming situation.

There are three (3) types of non-conforming situations regulated by the Code. These are use, lot area, and site improvements. The type which applies to this property is the site improvement, which means that the property has improvements like, but not limited to, parking, storm water facilities, sidewalks and landscaping that no longer conform to the current codes that regulate the property. Section 410.340 (C) (1) of the Mission Municipal Code provides for the following:

> C. There is hereby incorporated herein by this reference the "Form Based Code for the West Gateway Study Area" ("Form Based Code"), copies of which are on file in the City offices.

1. Designs and uses set forth in the Form Based Code shall govern all facets of the development or redevelopment in the West Gateway Study Area, except as indicated in Sections 420.130 through 420.230.

Section 420.190 specific to non-conforming site improvements state that on lots with non-conforming site improvements, no additions to or repairs or renovations of any structure or site improvement may be made without first either bringing the non-conforming site improvements into complete conformity with the regulations applicable to the zoning district in which the lot is located, or obtaining a non-conforming situation permit, which is the reason before us this evening. However, this section does not apply to the following circumstances:

1. Repairs or restoration of a structure pursuant to Subsection (B) of Section 420.170; or

2. Minor repairs or renovation of a structure or site improvement.

Minor repairs or renovation are defined as renovation or repair costs that do not exceed ten percent (10%) of the structural value of a structure, or the site itself. When an addition to or repairs or renovation of any structure or site improvement is proposed on a lot with a non-conforming site improvements, the Planning Commission may approve the non-conforming situation permit allowing such addition or repairs or renovation if it finds that:

1. The non-conforming site improvement(s) is the only non-conforming situation pertaining to the property.

2. Compliance with the site improvement requirements applicable to the zoning district in which the property is located is not reasonably possible.

3. The property can be developed as proposed without any significant adverse impact on surrounding properties or the public health or safety.

The existing structure does conform to the underlying C-2B district zoning regulations. However, it does not conform to the Form Based Code relative to height and setbacks. In this particular case, Section 420.130 applies specifically to the non-conforming site, and it states:

> *“No additions to or repairs or renovations of any structure or site improvement may be made without first either bringing the non-conforming site improvements into complete conformity with the regulations applicable to the zoning district in which the lot is located, or obtaining a non-conforming situation permit.”*

Also, this section will not apply to the following circumstances: Repairs, as we’ve mentioned, whether minor, or pursuant to 420.170. Specifically, Section 420.170 states:

> *“Minor repairs to and routine maintenance of structures where non-conforming situations exist are permitted and encouraged. Major renovation, i.e., work estimated to cost more than fifty percent (50%) of the fair market value of the structure to be renovated shall not be permitted.”*

Any repairs, renovation or restoration of a structure pursuant to this Section which would require the issuance of any permit shall also require the issuance of a non-conforming situation permit. That's the reason that we're here. The cost of renovation or repair or restoration shall mean the fair market value of the materials and services necessary to accomplish such renovation, repair or restoration.

The Johnson County Appraiser's Office reflects the value of the structure as being $373,840. Fifty percent of this value is $186,920. The applicant has indicated the

exterior improvements will be valued at $275,000. Minor repairs or renovation of a structure is defined as anything less than 10%. Again, the appraisal is $373,840. Ten percent is $37,384. And again, exterior improvements will be valued at around $275,000. So, in this case doesn't apply. The 10 percent applies. So, what applies in this specific case I Subsection C of Section 420.190.

When an addition to or repairs or renovation of any structure or site improvement is proposed on a lot with a non-conforming site improvements, the Board of Zoning Appeals – or here, the Planning Commission – may approve the non-conforming situation permit. Following those three guidelines, those three bullet points we mentioned earlier, basically the findings define the parameters of whether the Planning Commission will be in favor, or not.

Suggested Findings of Fact for this particular case is applicable to those three items. When we look at item 1, the non-conforming site improvements is the only non-conforming situation pertaining to the property. In this case, the existing structure is the primary non-conforming situation on the property. The Form Based Code stipulates a mid-rise structure with a minimum height of two (2) stories and a setback of no more than ten feet. The existing structure is one story and the existing setbacks from the property lines are approximately 25 feet south, 65 feet west; 29 feet north and 132 feet to the east edge of the parking lot. Full compliance with the Form Based Code would necessitate substantial renovation or the demolition and re-building of the structure which is not reasonably possible or economically feasible.

Item 2. Compliance with the site improvement requirements applicable to the zoning district in which the property is located is not reasonably possible. Full compliance with the Form Based Code would necessitate substantial renovation or the demolition and re-building of the structure which is not reasonably possible. Item 3, the property can be developed as proposed without any significant adverse impact on surrounding properties or the public health or safety.

The existing structure was constructed in 1973 and has operated in its current capacity for 47 years without an adverse impact to surrounding properties or the public health and safety. The proposed improvements are cosmetic in nature and will greatly enhance the appearance of the building by providing a fresh modern look and reflect harmony with other recent façade improvements along the Johnson Drive corridor.

The proposed renovations to the existing structure will begin with removal of the current, faux mansard roofing element that goes around the building, which is discouraged in the Johnson Drive Design Guidelines. An approximately five (5) foot EFIS parapet will be added around the perimeter of the structure to hide the mechanical equipment on the roof. The top of the parapet will be approximately 15 feet in height. Trim accents at each of the corners of the building will help to visually scale down the height of the parapet. In addition to the parapet, an 18 foot accent wall, covered in a native stone, will be added to one side of each entrance, the east and west sides. Perpendicular to the façade and projecting out approximately two feet. From this accent wall a pre-finished metal canopy will extend approximately twenty feet across the east and west façades above the entrances. Altogether, this will create a visually appealing focal point, accenting each entrance to the building The entire building will be painted in a beige color, which you can see here. Including the current brick work, which is [inaudible].

A sign will be added to the wall above each entrance with the name of the proposed business. These are all signs you see here. The script on each one of these signs is 91 square feet, which is within 10% of the overall façade, which is 975 square feet. The sign does project slightly above the roof line – the parapet – which is not permitted in the City's sign regulation. However, this does not seem to detract from the overall appearance of the building, and staff would be supportive of the minor deviation, meaning this deviation here. We've removed the roof line. Any signage that's above the roof line. It's basically the word "The" and maybe just a portion of some of the letters. Furthermore, the applicant is proposing to remove the existing pole sign located at the corner of Broadmoor and Martway. In its place, the applicant proposes a monument sign, which is acceptable under the sign regulations in lieu of one of the allowable wall signs. Three wall signs are basically allowed, but the applicant is seeking only two, thereby allowing for the monument sign. Monument signs can be no more than six feet in height. The monument sign would be in this location here. Here are the monument sign details. Typically, they are six feet in height and they must be 10 feet back from the curb, in this case. For every additional 10 feet that you are back from the curb, you are allowed one foot in height increase. So, this monument sign is probably 25 feet back; therefore, seven feet as proposed is allowed. And then, all sign requirements in addition to, as far as approving the process, is going to be approved through City staff with a sign permit application.

The two existing sweet gum trees located will be removed and replaced with Heritage River birch, which is a preferred tree for Northeast Kansas. A western red cedar trellis is proposed to be constructed around the cooler that protrudes from the southside of the building. The trellis will have English Ivy with daylilies planted around the base, all to serve as a screen for the cooler, and break-up the massing of the south wall. Junipers will be placed around the perimeter of the outdoor patio on the west side of the building, which is this area here. In addition, the patio that you see here, that's also noted in the plan as having a future trellis [inaudible] developments of new concrete, but that's at a future date, and that's not going to be part of the immediate scope of work for the building.

All proposed renovations are in keeping with Johnson Drive guidelines, and staff recommends the Planning Commission adopt the findings of fact contained in this staff report and grant a non-conforming situation permit for Case #20-01, located at 5959 Broadmoor Street. There will be no City Council action required.

Chair Lee: Thank you. Would the applicant like to step forward?

Mr. Ehnen: Good evening, I'm Russ Ehnen, I'm the architect, here on behalf of The Other Place. I'd like to introduce Troy Stedman, the owner of the Owner Place, and Clayton Pressley (?), one of his colleagues. Troy will speak to you in a few minutes.

First, I'd like to commend City of Mission staff. Jim and Brian Scott, while they were very firm and professional in protecting Mission's interests, they were also very reasonable in recognizing that we have a 45-year-old building and development that's not been covered by very new and modern building code and zoning ordinance. They were very helpful and provided good guidance through the process. Thankful, that's a very welcome and refreshing change to what we experience in a lot of jurisdictions. I'd just like to extend kudos to them for doing a fine job.

Briefly, a couple words about the architecture. I had the good fortune to design the Cornerstone project just to the northeast of this, and we've picked up on a lot of the details and materials. While not exactly mimicking that project, we have a lot of the proportions and same hues and earth tones as that, and we think it makes for a nice homogenous addition to the area. In terms of the landscaping, we picked materials that are very hardy and durable. This is a semi-urban situation and there's not a lot of green space, and it's not irrigated, so we wanted things that you kind of have to work at to hurt, that kind of take care of themselves.

Lastly, one thing that we did that wasn't in the report, that we think is very important, the adjacent property about right here has a pretty big drop-off. This is a car wash, and right now, there's only some concrete wheel stops there. We're going to install a steel guardrail there so that people and cars don't, even though it's not on our property, where the hazard is, we think it's important to provide that margin of safety there. That's about all I had. I'm certainly willing to entertain any questions or comments. If not, I'll let Troy tell you a little more about his business.

Chair Lee: Any questions?

Comm. Troppito: I have a question. There's the building, and the improvements, and then there's the property. Who owns the property? Who will [inaudible] on the property? Will the applicant's lease the property, or acquire title to the whole property?

Mr. Ehnen: The Other Place is purchasing the property and the building.

Comm. Troppito: Okay, thank you.

Unidentified Commissioner: I have questions in regard to some of the existing fans that are located on the roof, particularly the grease fan. Will the parapet be above that grease fan? Will that grease fan be concealed?

Mr. Ehnen: That's one of the reasons why we raised these two elements, particularly on the main entry side [inaudible] parking. That roof top equipment is about right here, and this awning comes out of this raised height here, and will do a good job screening it.

Unidentified Commissioner: So from the street, the sidewalk, are people going to be able to see it?

Mr. Ehnen: It's not particularly visible from this direction now. It's more visible when you're coming in. So, we think this is the most effective way to do it. I'm not going to warrant to you that you'll never, ever see equipment up there because this existing parapet is really low. But within the bounds of what we can do, we thought that would be the most effective way to do it.

Comm. Dukelow: I have a couple questions as a follow up to what Commissioner [inaudible] said. When one is heading south on Martway from, say, the post office, I'm pretty sure you'd be able to see the roof. Because as you know, it goes up. So, my question would be, would you agree to screen the rooftop equipment as required by the City?

Mr. Ehnen: Your assessment is correct. We really can't raise the wall up high enough to screen it when you're looking from above. We can certainly put some metal panels that are maybe the same color as the band, or something like that, to screen it. You wouldn't see the veins, or the grills, or all the parts of the mechanical equipment itself, but you would see the metal screens.

Comm. Dukelow: That would be desirable, if you'd work with City staff to accomplish that. And I also have a question regarding the dumpster enclosure. I don't see any details, and if memory serves me, there currently is no enclosure for the dumpster. So, I'm wondering what the plan and the details are for that.

Mr. Ehnen: We would match the base of the building with the concrete slope block that's painted the gray. Or currently painted gray, will be beige.

Comm. Dukelow: [inaudible] painted [inaudible] fully grouted, details, I don't know…? Where are you going with it?

Mr. Ehnen: Well, the current building is made out of a concrete block product called slump block, and we would match that slump block veneer around the [inaudible] base. Of course, it would have gates. We'd match the base of the building, basically?

Comm. Dukelow: And a steel gate?

Mr. Ehnen: Typically we would do steel.

Comm. Dukelow: And the location of that? It looks like it might be in front of it.

Mr. Ehnen: It is. There's a pad here right now, and there was a wood enclosure there, but it was dilapidated, so we removed… We would just be replacing that in the same location with the hard material.

Comm. Dukelow: And is that adequate for both the trash dumpster and the grease container?

Mr. Ehnen: Yes, it is. Most of the restaurants anymore have a grease management system, where they have a couple of tanks. They don't generate the kind of grease they used to, so it's all filtered and run through those tanks.

Comm. Dukelow: Okay. So, I anticipate that any containers or refuse would fit inside whatever that detailed enclosure comes out to be?

Mr. Ehnen: Right. There's a 30 or 40 yard dumpster that will go in there, and the management is based on frequency, how often it gets serviced.

Comm. Dukelow: So that's another detail that we need to look at with City staff. It's not been represented in our documents today. Two more questions related to landscape. This may be in part a question for City staff, and it may be in part a question for the design team. The south side of the parking area along Martway, certainly that parking could be screened by low plant material. And I'm not sure exactly what the City has in mind. I know that we recently re-did the Broadmoor corridor there with site elements, sidewalks, and all of that. So, I'm not sure if there's been any dialog regarding the landscape screening, the screening of the parking along Martway, at this point.

Mr. Ehnen: Additional landscaping in this area?

Comm. Dukelow: Correct. It's, what, about 30 feet?

Mr. Ehnen: No, it's about 120 feet.

Comm. Dukelow: I'm looking at… Just the section where there are two…

[crosstalk]

Mr. Ehnen: This is 60…

Comm. Dukelow: Right…

[crosstalk]

Mr. Ehnen: … with a 30-foot drive… [crosstalk] So, 90 feet.

Comm. Dukelow: … certainly don't want to interrupt the triangle there. My third question has to do with, again, landscaping. The Heritage River birch. Is that one of the trees on our plant materials palette?

Mr. Ehnen: Preferred planning list, yes.

Comm. Dukelow: It is?

Mr. Ehnen: It is.

Comm. Dukelow: Thank you. That's all I have.

Comm. Troppito: I have a couple more questions. In this area where the shed is, and what's shown as green space there. I tried to get staff to pull the satellite picture there.

What I'm looking at is a satellite image taken by Google in January. And if anybody wants to verify it, [inaudible]. It shows around the shed what appears to be just a whole bunch of junk laying around. Maybe a car. Look at Johnny's Bar-B-Que. If you're using AIMS, I'm not sure you're going to see what I'm looking at.

Unidentified Female: This one?

Comm. Troppito: Click on satellite view, down on the lower left. Zoom in on Johnny's. Zoom in towards the shed, where the shed is. All right. It's kind of hard to see the same details I'm seeing because of the resolution on the screen, but what I'm seeing is some cars parked there, a bunch of miscellaneous, what appears to be junk laying around there. [inaudible] potential green space, once it was all cleaned up. You could do more plantings in there, I would think. To the left of the shed.

Mr. Brown: I can certainly warrant that The Other Place will pick up and remove any debris, anything that's abandoned. I can't speak to the landscaping. I'd like to look at the ordinance for both parking lot screening and that. But one of the things, for instance, that you're seeing here is dumpsters that will, one will go away, and one will go here and be enclosed. Frankly, I'm not sure what those circular things are on that map.

Comm. Troppito: Well, I'm kind of [inaudible] higher resolution image in my laptop. There, you can see a lot more. Nonetheless, the point I'm trying to make besides it needs to be cleaned up is there's potential to plant more trees there. More birch trees and landscaping. Depending on what use the new owners are going to make of it. I haven't seen anything addressed about what use that shed is going to be, or what it's going to be used for.

Mr. Brown: I'll let them speak in more detail to that. The property line us here, and there's really not enough breadth for a drive and more parking, so I don't think that's a feasible solution. But I don't know that they've got anything projected long term for that particular space at this time.

Comm. Troppito: I just see an opportunity to provide more planting here [inaudible] reduce CO-2 emissions. That's my main [inaudible]. Birch trees would be good for that.

Unidentified: Just to clarify, are you asking them to put trees there, or are we asking staff, if it's required by staff?

Comm. Troppito: Well, I'm asking if they're planning to do it, whether it's required or not.

Unidentified: We haven't discussed that area at all, and I don't know if they've contemplated anything. I'll let them speak to what they may or may not do in the future.

Comm. Troppito: I'd just like to see it.

Chair Lee: Other questions? Thanks.

Mr. Stedman: Good evening, everyone. Troy Stedman is my name. I'm the owner and operator of The Other Place restaurants here in Johnson County. I'm a big fan of trees, by the way, so I'll start with that. A little bit about myself. We've been in Johnson County since 1997. We had our first location in downtown Overland Park, and have been operating [inaudible] three years. Recently, we opened another store in western Shawnee. That's been fantastic for us. Now, truth be told, I've had my eye on the Mission community for quite some time. When this opportunity arose, I didn't hesitate to jump on it. I know it's big shoes to fill with Johnny's, which has been there for… 40 years now? Is that right? So, we will do our very best to contribute. I would love to take questions if you have any.

Comm. Troppito: Well, nothing but what I've already asked.

Mr. Stedman: Okay. Anything regarding the concept, or…?

Comm. Dukelow: I've been to The Other Place in Overland Park several times. I enjoy it. It seems to be a good use. The questions I had were really regarding the landscaping and the site development, which I already shared.

Comm. Bruce: What are your anticipated hours of operation?

Mr. Stedman: Eleven a.m. daily to probably midnight during the week. I would say until 1:00 or 1:30 on Friday and Saturday. The community will kind of dictate those hours. If it's worth our while, we'll stay open.

Chair Lee: Anything else? [None.] Thank you. Is there anyone else who would like to speak? [None.] I have a question for staff. When you address the sign extending above the roof line, these canopies that are going away, that are…. Sounds like [inaudible]. Do those not become the new roof [inaudible]….?

Mr. Brown: We'll be looking at all of that, yes.

Chair Lee: So that may not be a deviation.

Mr. Brown: It may not.

Chair Lee: Comments? Discussion? [None.]

Comm. Troppito: Mr. Chair, I move that the Planning Commission approve the Non-Conforming Situation Permit for Application #20-01; allowing the applicant to make modifications to the exterior facade of the building at 5959 Broadmoor Street once applicable City building permits have been reviewed and issued.

Mr. Bruce: Second.

Comm. Dukelow: Mr. Chairman, I'd like to make an amendment to the motion. The motion as stated, with: Work with City staff to get all the landscape plan along Martway; work with City staff on details of the dumpster and roof containment, enclosure, per City requirements; and work with City staff to screen rooftop equipment.

Comm. Troppito: And the dumpster?

Comm. Dukelow: That was dumpster and grease container.

Comm. Troppito: Second.

The vote was taken (7-0). The **motion as amended passed**.

The vote was taken (7-0). The **motion passed**.

Old Business

Mr. Troppito: At our last meeting in November, I requested staff to consult with the City Administrator and City Attorney regarding requiring Phase 1 environmental site assessments for certain applications coming before this commission by applicants whose property did not meet the subject of the [inaudible] sophisticated lenders. I asked for a report for that. I was advised by Brian by email that [inaudible] he couldn't get to it, [inaudible]. I just want to note for the record that I'm still looking forward to receiving that at our next meeting.

Mr. Brown: I'll make sure I pass that information on to Mr. Scott.

Staff Updates

Mr. Brown stated that a joint meeting between Planning Commission and City Council is scheduled for Thursday, March 12th. Also, interviews for a full-time planner are taking place.

ADJOURNMENT

With no other agenda items, **Comm. Bruce moved and Comm. Christiansen seconded a motion to adjourn.** (Vote was unanimous). The **motion carried**. The meeting adjourned at 7:47 P.M.

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Mike Lee, Chair

ATTEST:

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Audrey McClanahan, Secretary

STAFF REPORT
Planning Commission Meeting April 27, 2020

AGENDA ITEM NO.:	1
PROJECT NUMBER / TITLE:	Application # 20-02
REQUEST:	Second Amendment of Final Site Development Plan for The Gateway Development
LOCATION:	4801 Johnson Drive (Approx. 17 acres bounded by Johnson Drive Roeland Dr., Shawnee Mission Pkwy., and Roe Ave.)
APPLICANT:	Matt Valenti, Cameron Group, LLC.
PROPERTY OWNER:	Aryeh Realty, LLC 140 Broadway, Floor 41 New York, NY 10005
STAFF CONTACT:	Brian Scott, Assistant City Administrator
PUBLIC HEARING:	Not Applicable

Property Information:
The subject property is an approximately 17 acre parcel located at the southwest corner of Johnson Drive and Roe Avenue. It is the site of the former Mission Mall. The property is bounded by Johnson Drive on the north, Roe Avenue on the east, Shawnee Mission Parkway on the south and Roeland Drive on the west. The property is zoned Planned Mixed Use District "MXD." This district is intended to encourage a variety of land uses in closer proximity to one another than would be possible with more conventional zoning districts, and to encourage building configurations that create a distinctive and memorable sense of place. Developments in this district are allowed and expected to have a mixture of residential, office and retail uses, along with public spaces, entertainment uses and other specialty facilities that are compatible in both character and function. Developments are also expected to utilize shared parking facilities linked to multiple buildings and uses by an attractive and

logical pedestrian network that places more emphasis on the quality of the pedestrian experience than is generally found in a typical suburban development. Buildings are intended to be primarily multi-story structures with differing uses organized vertically rather than the horizontal separation of uses that commonly results from conventional zoning districts. The property is also subject to the Mission, Kansas *Design Guidelines* for the Johnson Drive Corridor.

Surrounding properties are zoned and developed as follows:

North: Roeland Park “OB” Office Building District-small offices, “PUB” Public Services - park, and “MXD” Mixed Use District - bank and micro-hospital

West: Mission “RP-3” Planned Townhome District-Roeland Court Townhomes, “MS2” Main Street District 2 - restaurant and vacant building, “R-1” Single Family Residential District-detached dwelling units,

South: Mission “RP-6” Planned High Rise Apartment District-vacant “C-1” Restricted Business District-bank, “C-O” Office Building District-dentist and other office uses.

East: Fairway ”R-1” Single Family Residential District-detached dwelling units.

Comprehensive Plan Future Land Use Recommendation for this area:

The Comprehensive Plan indicates this area is appropriate for Mixed Use High-Density to be composed of a pedestrian friendly mix of neighborhood and community office uses, retail-commercial and service-commercial uses, institutional, civic, and medium to high density residential.

Project Background:

The subject property was once the site of the Mission Shopping Center (AKA the Mission Mall), one of the first suburban shopping centers built in the region in the mid 1950s. In 2005 The Cameron Group, LLC, a development company from East Syracuse, New York, purchased the property with plans to demolish the mall and build a mixed-use development on the site. In 2006 the Planning Commission reviewed and approved the rezoning and preliminary site plan for the redevelopment of the subject property for urban development composed of retail, office, hotel, restaurant, and residential uses (Ordinance #1203).

Since the “MXD” zoning and preliminary site plan was first approved, the project has evolved through several iterations reflected in revised plans presented to the Planning Commission and City Council in 2007, 2008, 2012, 2015 and 2016. The current preliminary site development plan was approved by the City Council on January 20, 2016 after a public hearing and consideration before the Planning Commission on September 28, 2015. A final site development plan was approved by the Planning Commission in March of 2017.

At the time of approval, the plan encompassed three, connected apartment buildings (Buildings “C,” “D” and “E”) at the corner of Johnson Drive and Roeland Drive; a seven-story hotel at the corner of Roeland Drive and Shawnee Mission Parkway (Building “B”); an office building (Building “F”); and a large, somewhat undefined retail space (Building “A”). Each of these buildings surrounded a three-level parking structure within the interior of the site. The developer’s intent was to proceed with the development of the project in three, sequential phases beginning with the apartment buildings and then the hotel and garage, and finally the retail space. The office building would be constructed when a tenant was identified and specific needs for use defined.

Project Update:
Since the approval of the final development plan by the Planning Commision in March of 2017, the developer has been presented with opportunities that better defined the future retail component of the project and necessitated changing the phasing of the construction.

Construction plans were submitted a year ago for an approximately 90,000 square foot movie theater and entertainment venue known as Cinergy, a company based out of Texas and new to the Kansas City market. Construction plans were approved and a building permit issued last summer. Construction is currently underway and is expected to be completed late summer or early fall of this year.

Immediately adjacent to the Cinergy building, on the northside, will be a 39,995 square foot food hall. The building will be 2-stories. The first story will comprise a 4,300 square foot, sit-down restaurant and an 18,000 square foot, food hall providing approximately 14 stalls for independent food vendors around a communal dining area. The second story component will include a possible indoor golf experience (8,700 square feet) and restaurant terrace (1,000 square feet). The balance of the space is for kitchen, preparation and storage. This was approved with the amended FDP in October of 2019. Design work is currently underway.

As proposed in the originally approved FDP, there will be a parking structure in the middle of the development site that provides parking for all of the uses. The originally approved parking structure was a 3 level garage with 793 parking spaces. The parking structure connected directly to both the hotel and the office building. The parking structure has been redesigned to be a 4 level structure with 808 parking spaces, but with a smaller footprint on the site. This redesigned parking structure was approved with the amended FDP in October of 2019. Plans have been submitted and reviewed, and a building permit was issued the first week of March. Construction is expected to be completed in the fall.

Building “F” was initially proposed in the approved 2017 FDP to be a 3-story office building totalling 58,000 squre feet. This past fall the developer requested approval for an additional 4th-story bringing the total square footage to 76,487. This was approved with the amended FDP in October of 2019.

Building “B” on the southwest corner of the site is a 202 room, 7-story hotel. To the north, Buildings “C”, “D” and “E” along Roeland Drive and Johnson Drive are three, separate aparment buildings connected by an enclosed walkway between each. Each apartment building is 4-stories, three stories of residential units above small retail shops on the ground floor. There are 168 residential units between all three buildings. Both the hotel and the apartment buildings remain substantially the same since the original FDP was approved in March of 2017. Construction plans for both have been submitted and reviewed. These projects are expected to be initiated this summer once financing is secured.

Plan Review and Modifications
Since obtaining approval for the amended FDP this past October, the developer has secured another tenant for the office building (Building “F”), necessitating another floor to be added to the building. Thus, the developer is requesting a second amendment to the FDP.

As stated above, the office building was initially proposed in the approved 2017 FDP as a 3-story office building totalling 58,000 square feet. The developer requested approval for a 4-story office building totaling 76,487 square feet this past October, which was approved. The developer is now requesting approval for a 5-story office building with a total square footage of 103,557 square feet (an additional 27,070 square feet). The 4-story building was approved with a total height of 58 feet (all four stories). There is a mechanical screen on the roof bringing the overall height to 73 feet. The additional story will bring the overall height to 73 feet (all five stories). The mechanical screen would be an additional 17 feet bringing the overall height to 95 feet.

The overall design of the building remains the same as it was approved in October of 2019. The ground level of the building will be mostly open to allow for vehicle circulation underneath and future access to utilities. There will be a small entry point comprised of a vestibule, elevator, and stairway. Toward the back of the ground level there will be an area for service deliveries, storage, maintenance and mechanical equipment. A bike storage area for employees wishing to ride their bike to work will also be located here. The upper four levels are comprised of open office space. Floor plans are shown on sheet FDP-A114.

The exterior of the building (sheet FDP-A205) consists of an aluminum curtain wall system with different shades of glass windows throughout the upper four levels. This makes for an interesting interplay between the metal and glazing. A large prodema panel inset is proposed for the upper two levels of the east elevation of the building. This will create a point of interest for the building, especially for those driving west on Shawnee Mission Parkway. It will also soften the building and give it additional “texture.”

The mechanical equipment on the roof of the building will be screened in on all four sides with metal box-rib panels. The base of the building (ground level) will be board formed concrete that will match other elements on the site by the apartment buildings and hotel, again tying the entire site together.

A comparison of the modifications between the approved FDP and the amended FDP and the second amended FDP is shown in the table on the next page. The total floor area with the proposed second amendment has been increased by 27,070 square feet or 35% for the office building. The total floor area for the entire Gateway development has been increased by 5%. All design elements of the office building, the entire development project, remain unchanged.

An updated traffic study was submitted with the application to indicate the additional office tenant. The study’s calculations indicate that the additional trip generations will not have an impact on the overall traffic patterns, and the recommendations remain as they were with the traffic study that was completed with the amended FDP in October. The updated study has been reviewed by the City’s on-call traffic engineer, and he concurs with the recommendations.

Component	2017 Approved FDP	2019 Approved FDP Revisions	2020 Proposed FDP Revisions	Change
Apartment Buildings	168 Units	168 Units	168 Units	Same
	177,812 sq. ft.	178,878 sq. ft.	178,878 sq. ft.	
Hotel	200 Rooms	202 Rooms	202 Rooms	Same
	140,904 sq. ft.	147,244 sq. ft.	147,244 sq. ft.	
Retail (total)	173,778 sq. ft.	183,913 sq. ft.	183,913 sq. ft.	Same
Small Shop Retail	54,618 sq. ft.	54,618 sq. ft.	54,618 sq. ft.	
Jr. Anchor Tenants	119,160 sq. ft.	Not Included	Not Included	
Food Hall	Not Included	39,995 sq. ft.	39,995 sq. ft.	
Theater	Not Included	89,300 sq. ft.	89,300 sq. ft.	
Office Building	3 Levels	4 Levels	5 Levels	1 additional level
	58,516 sq. ft.	76,487 sq. ft. .	103,557 sq. ft. .	27,070 sq. ft.
Parking	1,528 Total Spaces	1,457 Total Spaces	1,457 Total Spaces	Same
	735 Surface Spaces	649 Surface Spaces	649 Surface Spaces	
	793 Garage Spaces	808 Garage Spaces	808 Garage Spaces	
	3 Levels	4 Levels	4 Levels	
OVERALL	**551,010 sq. ft.**	**586,522 sq. f.t.**	**586,522 sq. f.t.**	**613,592 sq. ft. (5%)**

Parking and Loading
The approved 2017 FDP provided for a total of 1,528 parking spaces over the entire project site. Surface parking (including on-street parking) totaled 735 spaces and structured parking totaled 793 spaces. The amended FDP that was approved this past October reduced the number of surface parking spaces to 649 while increasing the number of structured parking spaces to 808. The total number of parking spaces overall was reduced by 71 spaces to 1,457. A reduction of 5%.

Surface parking includes angled parking spaces along Johnson Drive adjacent to street-level retail in Building “E”, a surface parking lot along Roeland Drive adjacent to street-level retail in Buildings “C” and “D”, and interior to the site in front of and below the parking structure. Generally all of the surface parking is earmarked for the retail component of the development project.

Parking on the second level of the garage is primarily for hotel patrons and employees working in the office building. The walkway to the hotel is at this level. Parking on the third level is primarily for apartment building residents and office building employees. The four walkways to the apartment buildings are all on this level. Parking on the fourth level of the parking structure is for office employees and retail overflow. There is a walkway from each level of the parking structure to the office building.

MXD zoning provides the following parking requirements:
- 1 parking space for 4 seats in restaurants and theaters. This would equate to 345 parking spaces for both the Cinergy building and food hall.
- 1 parking space for each hotel room plus 1 parking space for each four employees. This would equate to approximately 220 parking spaces.
- 1.5 parking spaces for each residential unit. This would equate to 252 parking spaces for the three apartment buildings.

These three uses total 817 required parking spaces. The MXD zoning is silent on parking requirements for office uses or other retail uses.

Section 425.020 - Minimum Space Requirements of the City’s zoning code provides the following parking requirements:
- 2.84 parking spaces per 1,000 square feet for general offices. **This would equate to 217 parking spaces for the proposed office building as approved with the amended FDP in October. With the additional floor now being proposed, this will increase the parking count to 294 parking spaces.**
- 4 parking spaces per lane for bowling facilities. This would equate to 64 parking spaces for the bowling component of the Cinergy building.
- 3.5 parking spaces per 1,000 square feet of shopping center. This would equate to 189 for the small shop retail on the ground floor of the apartment buildings.

All uses above total ~~1,287~~ 1,364 parking spaces required. This is ~~170, or 13%~~, 93, or 7%, less than 1,457 parking spaces being proposed.

Access Management & Traffic Impact
Access into the site is proposed from six access points, three on Roeland Drive, one on Johnson Drive, and two on Roe Avenue. The driveway access to the back of the Cinergy building off of Roe Avenue has been narrowed. All street intersections surrounding the subject

property are currently signalized.

The applicant has submitted an update to the previous traffic impact study analyzing existing conditions, conditions in accordance with the approved 2017 FDP, ~~and~~ conditions with the ~~proposed amendment to the FDP~~ amended FDP approved in October of 2019, **and the now proposed second amendment to the FDP**. The traffic impact study has made the following recommendations, which can be found on page 37 of the study. These recommendations are the same as what was submitted with the approved amended FDP in October of 2019.

1. Lengthen the eastbound left turn lane at Shawnee Mission Parkway and Roeland Drive from the current 330 feet to 390 feet to provide for deceleration and additional queuing.
2. Re-time signals at the intersections of Shawnee Mission Parkway with Roeland Drive and Roe Avenue with Johnson Drive to accommodate development trips.
3. Re-stripe the north leg of the intersection of Shawnee Mission Parkway and Roeland Drive to provide a dedicated southbound left-turn lane, shared through/left-turn lane, and dedicated southbound right-turn lane.
4. Modify the curb radius in the northeast quadrant of the intersection of Shawnee Mission Parkway and Roeland Drive to support large trucks. Provide turning templates and specific demission to Kansas Department of Transportation with final design.
5. The existing pavement markings for the outside through lane along Shawnee Mission Parkway at Roeland Drive should be restriped to provide an appropriate taper for the existing outside westbound lane. Turn lane including taper should be 350’ in length to accommodate right-turn vehicles decelerating from 45 mph.
6. Extend the median along Roe Avenue to limit right-in/right-out access at Drives 5 and 6.
7. Provide appropriate corner radii at Drives 5 and 6 to accommodate truck traffic.
8. Provide a 100’ southbound right-turn lane at Drive 5 along Roe Avenue.
9. Minimum throat distance of 75’ should be provided at each proposed drive to allow for vehicles to stack internal the site without effecting vehicles maneuvering within the site.
10. Pedestrian accommodations should be provided along the north and west legs at the intersection of Shawnee Mission Parkway and Roeland Drive. Accommodations should conform with ADA standards, this includes adequate ramp design with detectable warnings and vibrotactile push buttons.

In addition, conditions should be re-evaluated in 15 to 20 years with the following possible recommendations in mind.

1. If volumes materialize in the future, it is recommended to consider the following improvements to improve operations at the intersection of Shawnee Mission Parkway and Roeland Drive:
2. Provide dual eastbound left turn lanes with 350’ of storage.
3. Provide dedicated northbound left-turn lane with 100’ of storage.
4. Provide dedicated westbound right-turn lane with 230’ of storage.
5. Update signal timings.

The City’s on-call traffic engineer, George Butler Associates (GBA), has reviewed the applicant’s revised Traffic Impact study and the final site plans as well as the Kansas Department of Transportation. GBA accepts the applicant’s proposed improvements as adequate for the expected traffic impacts of development of the site.

Stormwater Management

A multi-barrel reinforced concrete box (RCB) drainage system was installed across the site underground for this portion of Rock Creek. The RCB's were designed to convey the 100 year storm event and a letter of map revision (LOMR) has been approved by FEMA taking the property out of the flood zone. Therefore a floodplain permit is not required. Storm sewers for the site will direct water into this system at various locations and surface grading will direct overflows.

The City's on-call engineer at GBA has reviewed the Drainage Study and the proposed final site plans for storm water control. This included consideration of the amount of impervious surface in the development scenario, peak water flows after rain storms, and the location of below ground development features in relation to existing storm sewers. A reduction in the amount of impervious surface has been demonstrated by the addition of green space compared to the existing (pre-demolition) condition. The layout of any piers footings for the new buildings will be reviewed against the pier plan used during the construction of the RCB's. Venting for the proper function of the RCB's will be taken into consideration with the design of the parking structure and the food hall as part of building permit review.

There is no change to the storm water management as previously proposed.

Consideration of Final Site Plans (440.160 & 440.190)

Final site plans which contain modifications from the approved preliminary development plan but which are in substantial compliance with the preliminary plan, may be approved by the Planning Commission without a public hearing, provided that the Commission determines that the landscaping and screening plan is adequate and that all other submission requirements have been satisfied. In addition the site plan shall be approved by the Planning Commission if it determines that:

1. The site is capable of accommodating the building(s), parking areas and drives with appropriate open space.

-The building, parking area, driveways, and open space have been designed to meet codes and guidelines and have been reviewed by the City's on-call engineers.

2. The plan provides for safe and easy ingress, egress and internal traffic circulation.

-There is adequate space on the site to allow for on-site circulation of customer traffic and design vehicles. Impacts to traffic on adjacent public streets has been studied and the Traffic Impact Study (TIS) has been endorsed by City's engineers with stipulations.

3. The plan is consistent with good land planning and site engineering design principles.

-The proposed plan is consistent with the City's zoning and site development standards with the stipulations noted.

4. An appropriate degree of harmony will prevail between the architectural quality of the proposed building(s) and the surrounding neighborhood.

-The proposed project is of high quality design and adds to the diverse architecture of the surrounding area.

5. The plan represents an overall development pattern that is consistent with the Comprehensive Plan and other adopted planning policies.

-The proposed mixed use development is consistent in density and design with the City's adopted plans and policies.

6. Right-of-way for any abutting thoroughfare has been dedicated pursuant to the provisions of Chapter 455.

-A plat reflecting the proposed development pattern has not been submitted. One has been submitted to the City for review and is anticipated to be presented to the Planning Commission next month for consideration. Any required right-of-way changes for this site will be addressed at that time.

Staff Recommendation

Staff recommends that the Planning Commission approve the Second Amendment to the Final Site Development Plan Case # 20-02 for the Gateway development project with the following conditions:

1. Roadway construction plans will need to be presented to the City and/or the Kansas Department of Transportation in accordance with the recommendations outlined in the Traffic Impact Study.

Planning Commission Actions

Case # 20-02 - Second Amendment to the Gateway Final Development Plan will be presented to the Planning Commission for their consideration at their regularly scheduled meeting on March 23, 2020..

Sheet Index

FDP-001	SITE PLAN	FDP-A114	BUILDING F - FLOOR PLANS (LEVELS 1-4)
FDP-002	STACKING DIAGRAMS	FDP-A205	BUILDING F - EXTERIOR ELEVATIONS
FDP-003	BUILDING & SITE SECTIONS		
FDP-005	ARCHITECTURAL VIGNETTES		
FDP-006	ARCHITECTURAL VIGNETTES		
FDP-007	ARCHITECTURAL VIGNETTES		
FDP-A050	SITE PLAN		
FDP-A051	SITE PLAN (LEVEL 1)		
FDP-A052	SITE PLAN (LEVEL 2)		
FDP-A053	SITE PLAN (LEVEL 3)		
FDP-A054	SITE PLAN (LEVEL 4)		
FDP-A055	SITE PLAN (LEVELS 5 - 7)		

Mission Gateway

A Multi-Use Retail Development
Johnson Drive and Roe Avenue, Mission, Kansas

FINAL DEVELOPMENT PLAN
MARCH 17, 2017
REVISIONS
UPDATES TO APPROVED FDP 02.05.2020

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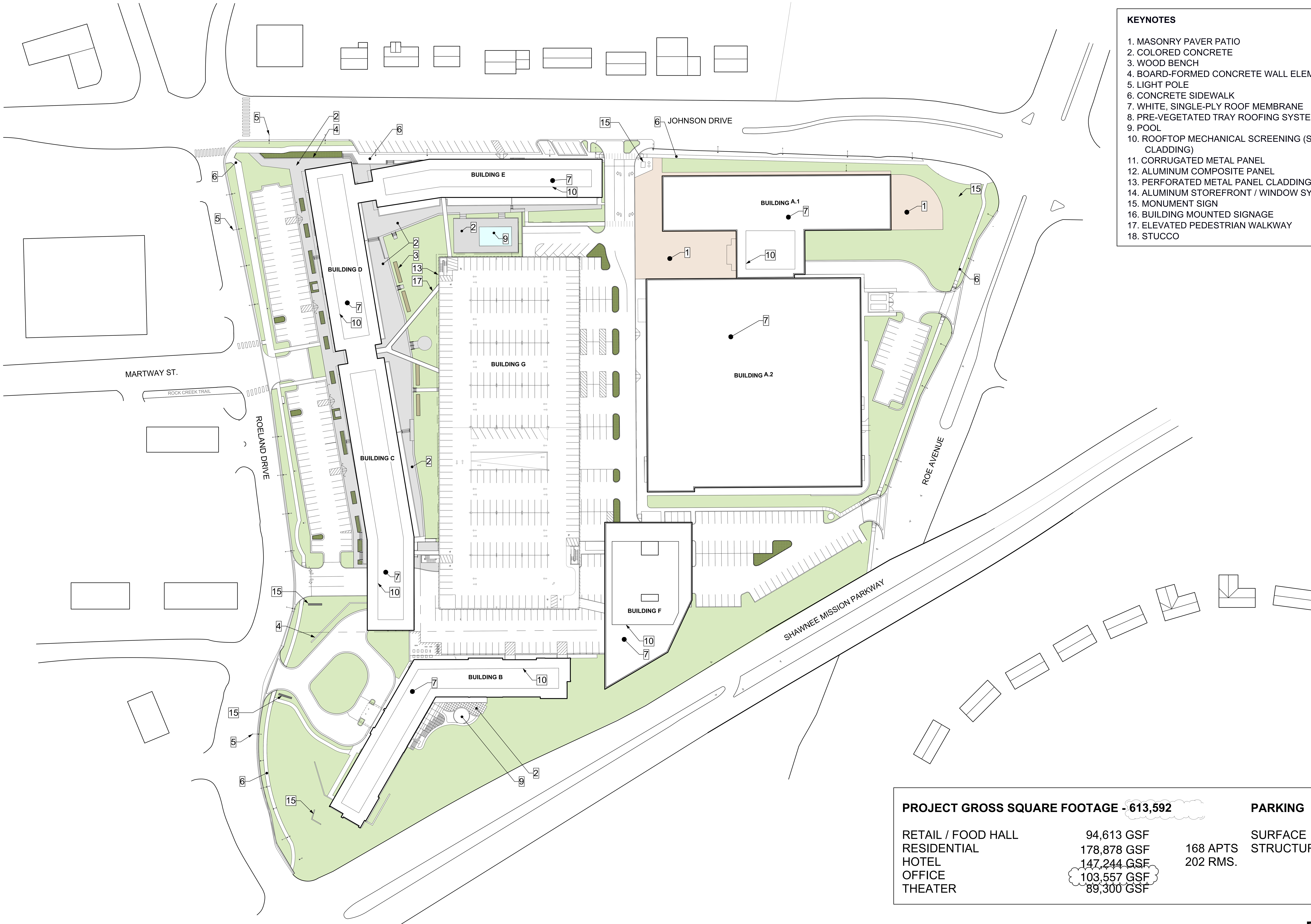

KEYNOTES

1. MASONRY PAVER PATIO
2. COLORED CONCRETE
3. WOOD BENCH
4. BOARD-FORMED CONCRETE WALL ELEMENT
5. LIGHT POLE
6. CONCRETE SIDEWALK
7. WHITE, SINGLE-PLY ROOF MEMBRANE
8. PRE-VEGETATED TRAY ROOFING SYSTEM
9. POOL
10. ROOFTOP MECHANICAL SCREENING (SAME AS BUILDING CLADDING)
11. CORRUGATED METAL PANEL
12. ALUMINUM COMPOSITE PANEL
13. PERFORATED METAL PANEL CLADDING SYSTEM
14. ALUMINUM STOREFRONT / WINDOW SYSTEM
15. MONUMENT SIGN
16. BUILDING MOUNTED SIGNAGE
17. ELEVATED PEDESTRIAN WALKWAY
18. STUCCO

PROJECT GROSS SQUARE FOOTAGE - 613,592 | **PARKING - 1457 STALLS**

RETAIL / FOOD HALL	94,613 GSF		SURFACE	649
RESIDENTIAL	178,878 GSF	168 APTS	STRUCTURED	808
HOTEL	147,244 GSF	202 RMS.		
OFFICE	103,557 GSF			
THEATER	89,300 GSF			

01 **SITE PLAN**

FDP-001

SITE PLAN

FINAL DEVELOPMENT PLAN
MARCH 17, 2017
REVISIONS
UPDATES TO APPROVED FDP 02.05.2020

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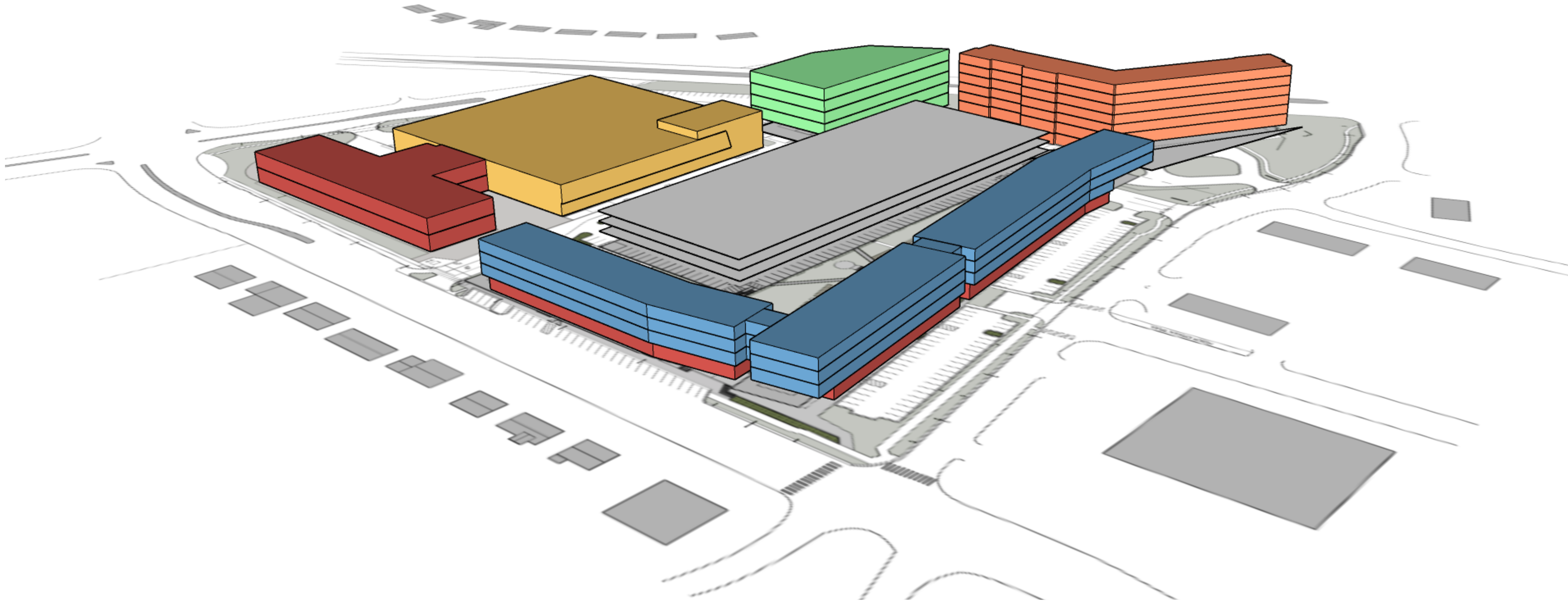
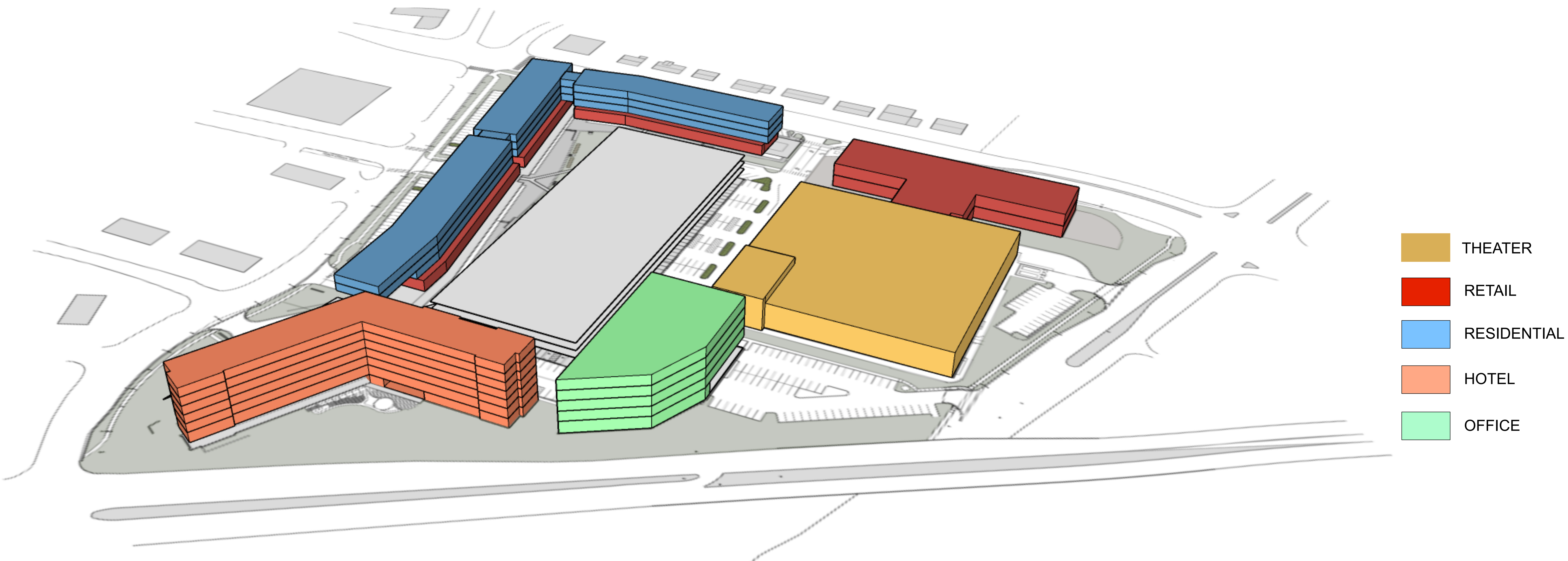


STACKING DIAGRAM



STACKING DIAGRAM

FDP-002

FINAL DEVELOPMENT PLAN
MARCH 17, 2017
REVISIONS
UPDATES TO APPROVED FDP 02.05.2020

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STACKING DIAGRAMS

MISSION GATEWAY

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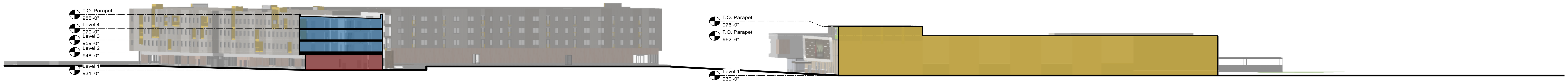
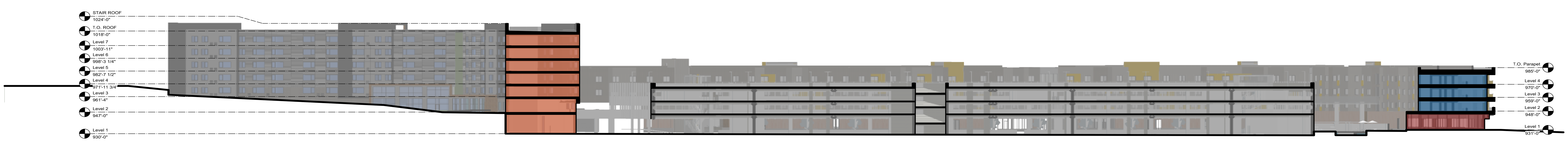


02 SITE SECTION



- THEATER
- RETAIL
- RESIDENTIAL
- HOTEL
- OFFICE

01 SITE SECTION

FDP-003

FINAL DEVELOPMENT PLAN
MARCH 17, 2017
REVISIONS
UPDATES TO APPROVED FDP 09.16.2019

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BUILDING & SITE SECTIONS

MISSION GATEWAY

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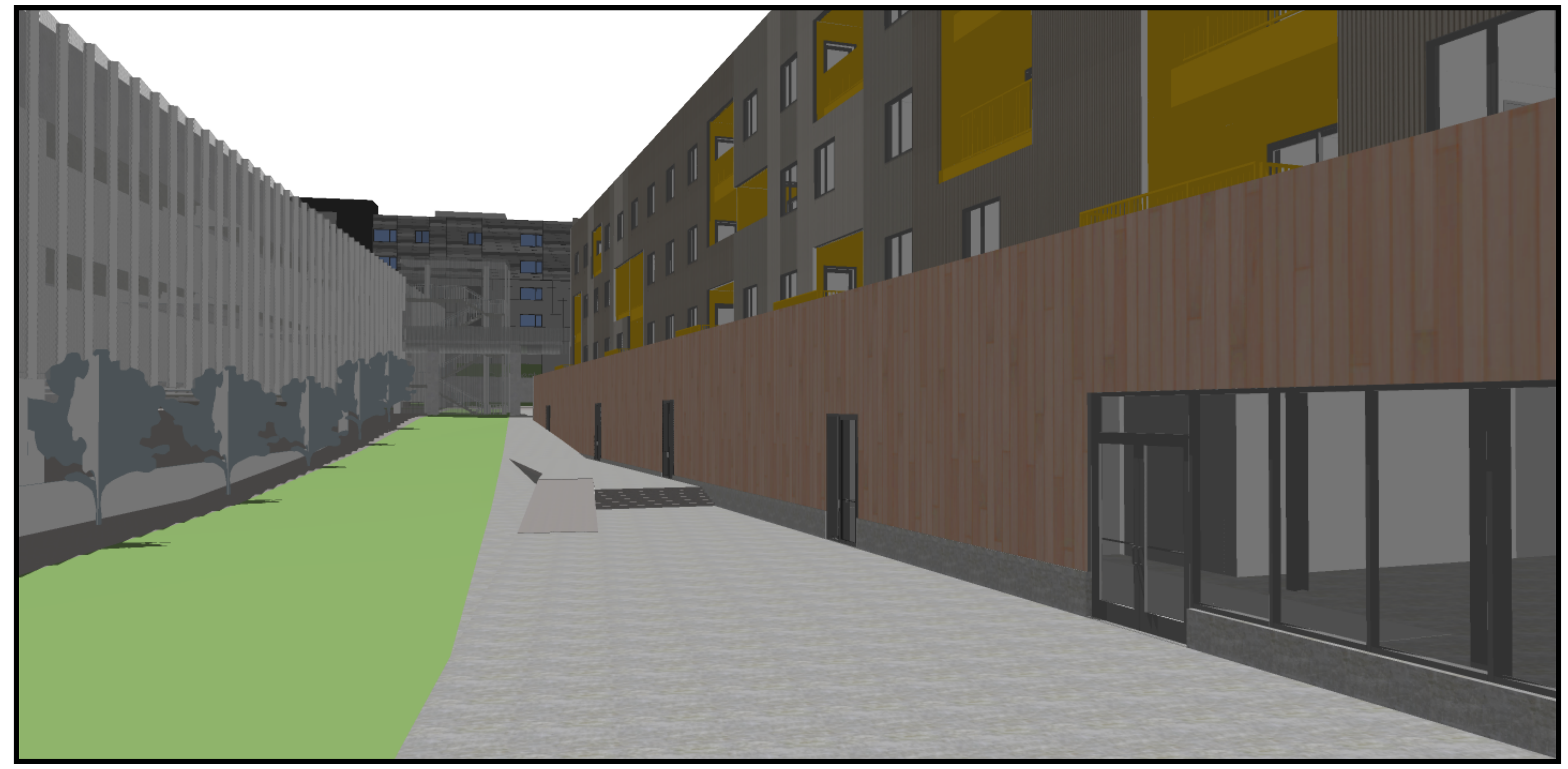
VIEW FROM NORTHWEST OF RETAIL / RESIDENTIAL



VIEW OF RETAIL / RESIDENTIAL COURTYARD

AERIAL FROM JOHNSON DRIVE ENTRY

VIEW OF POOL / RESIDENTIAL COURTYARD

FDP-005

FINAL DEVELOPMENT PLAN
MARCH 17, 2017
REVISIONS
UPDATES TO APPROVED FDP 02.05.2020

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ARCHITECTURAL VIGNETTES

MISSION GATEWAY

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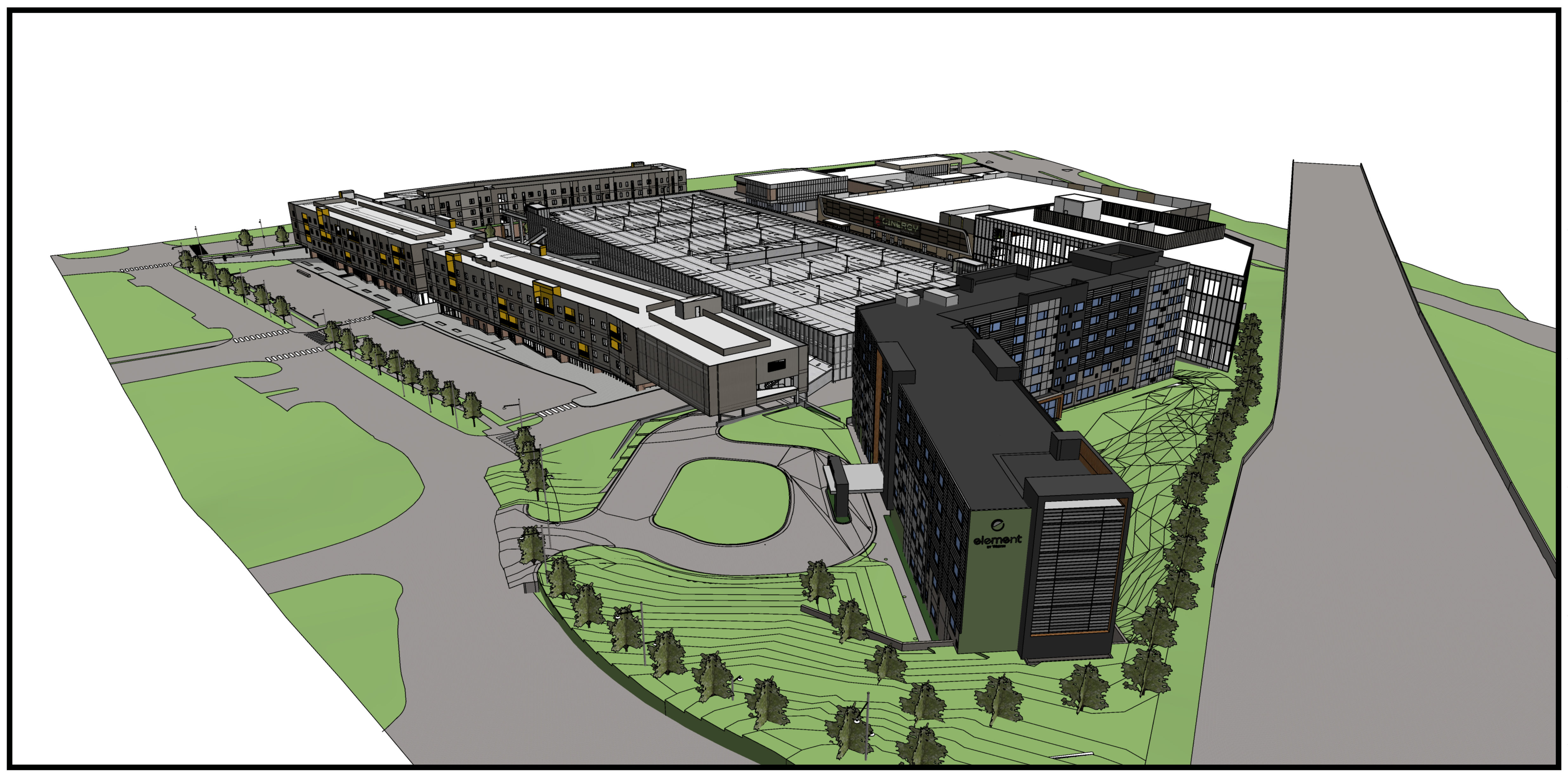
AERIAL FROM SOUTHEAST - PARK

AERIAL FROM NORTHEAST - ROE AVE. JOHNSON DRIVE



AERIAL FROM SOUTHWEST - ROELAND DRIVE AND SHAWNEE MISSION PARKWAY

AERIAL FROM NORTHWEST - JOHNSON DRIVE AND ROELAND DRIVE

FINAL DEVELOPMENT PLAN
MARCH 17, 2017
REVISIONS
UPDATES TO APPROVED FDP 02.05.2020

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FDP-006

ARCHITECTURAL VIGNETTES

MISSION GATEWAY

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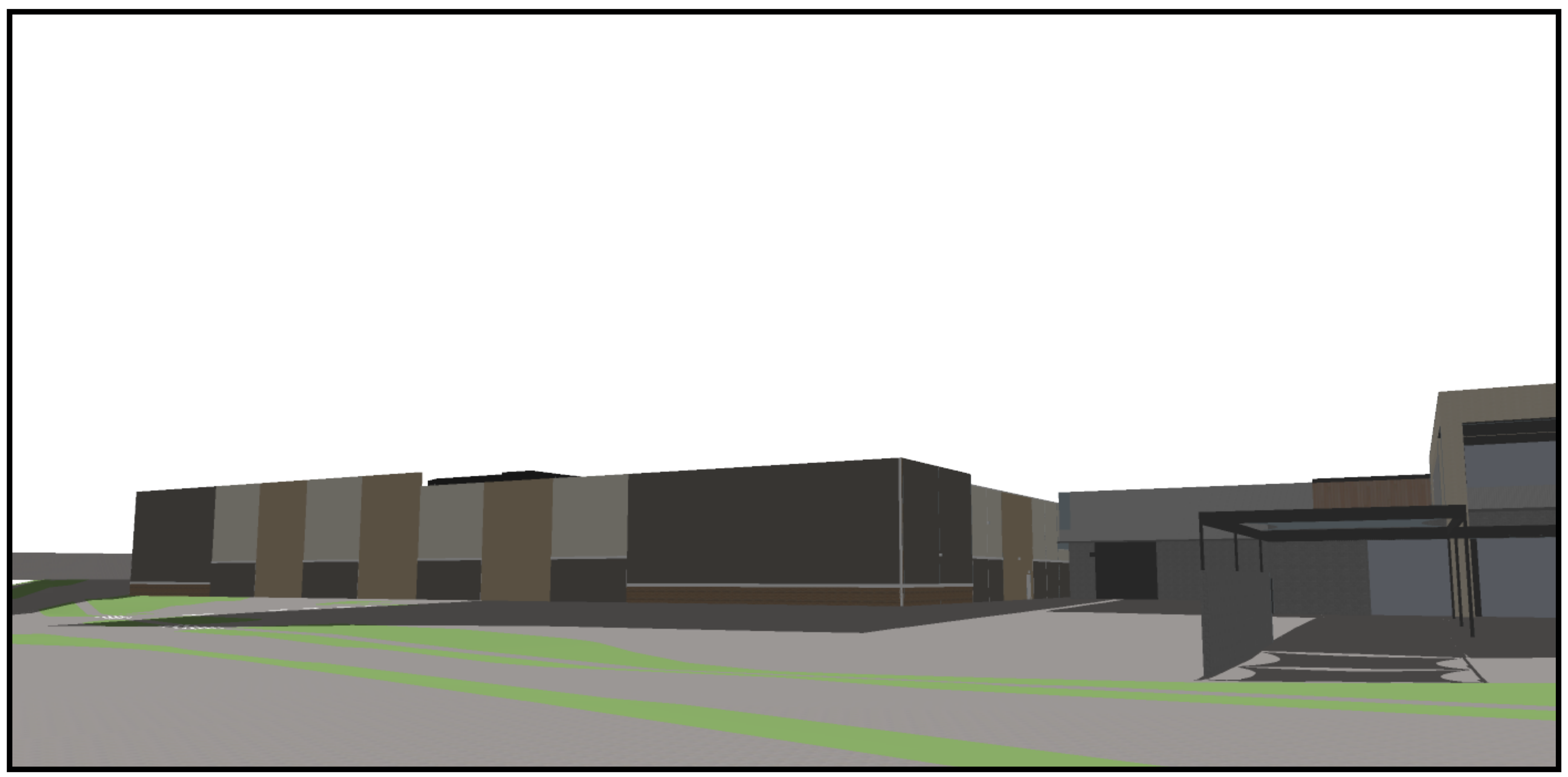
STREET LEVEL VIEW - ENTRY AT JOHNSON DRIVE

STREET LEVEL VIEW - VIEW OF SITE FROM SHAWNEE MISSION PARKWAY LOOKING WEST



STREET LEVEL VIEW - VIEW OF SITE FROM CORNER OF JOHNSON DRIVE AND ROE AVE,

STREET LEVEL VIEW - VIEW OF SITE FROM CORNER OF ROELAND AND SHAWNEE MISSION PARKWAY

FDP-007

FINAL DEVELOPMENT PLAN
MARCH 17, 2017
REVISIONS
UPDATES TO APPROVED FDP 02.05.2020

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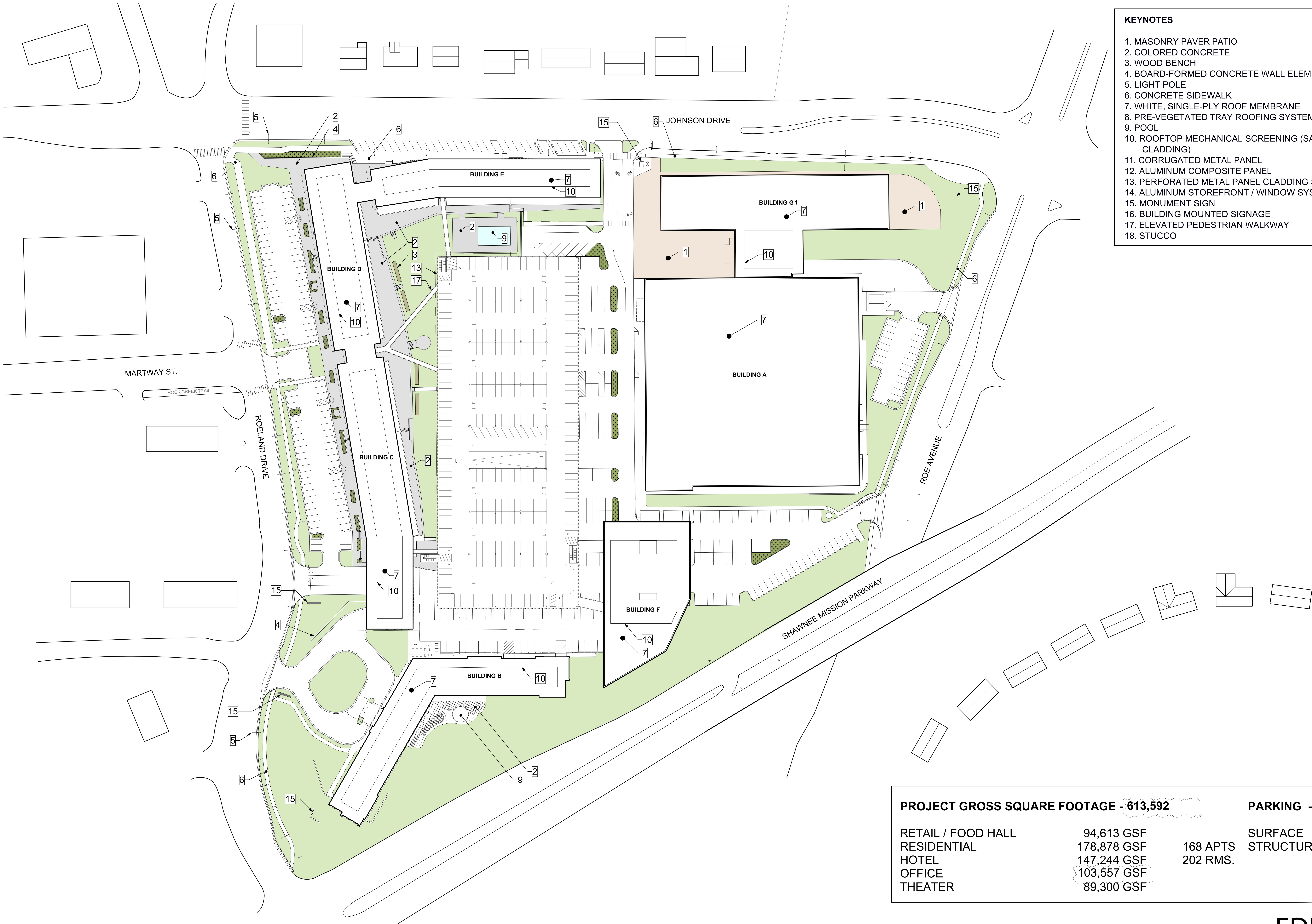

KEYNOTES

1. MASONRY PAVER PATIO
2. COLORED CONCRETE
3. WOOD BENCH
4. BOARD-FORMED CONCRETE WALL ELEMENT
5. LIGHT POLE
6. CONCRETE SIDEWALK
7. WHITE, SINGLE-PLY ROOF MEMBRANE
8. PRE-VEGETATED TRAY ROOFING SYSTEM
9. POOL
10. ROOFTOP MECHANICAL SCREENING (SAME AS BUILDING CLADDING)
11. CORRUGATED METAL PANEL
12. ALUMINUM COMPOSITE PANEL
13. PERFORATED METAL PANEL CLADDING SYSTEM
14. ALUMINUM STOREFRONT / WINDOW SYSTEM
15. MONUMENT SIGN
16. BUILDING MOUNTED SIGNAGE
17. ELEVATED PEDESTRIAN WALKWAY
18. STUCCO

PROJECT GROSS SQUARE FOOTAGE - 613,592			PARKING - 1457 STALLS	
RETAIL / FOOD HALL	94,613 GSF		SURFACE	649
RESIDENTIAL	178,878 GSF	168 APTS	STRUCTURED	808
HOTEL	147,244 GSF	202 RMS.		
OFFICE	103,557 GSF			
THEATER	89,300 GSF			

01 **SITE PLAN**

0" 25' 50' 100'

FDP-A050

FINAL DEVELOPMENT PLAN
MARCH 17, 2017
REVISIONS
UPDATES TO APPROVED FDP 02.05.2020

CONSULTANTS:

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SITE PLAN

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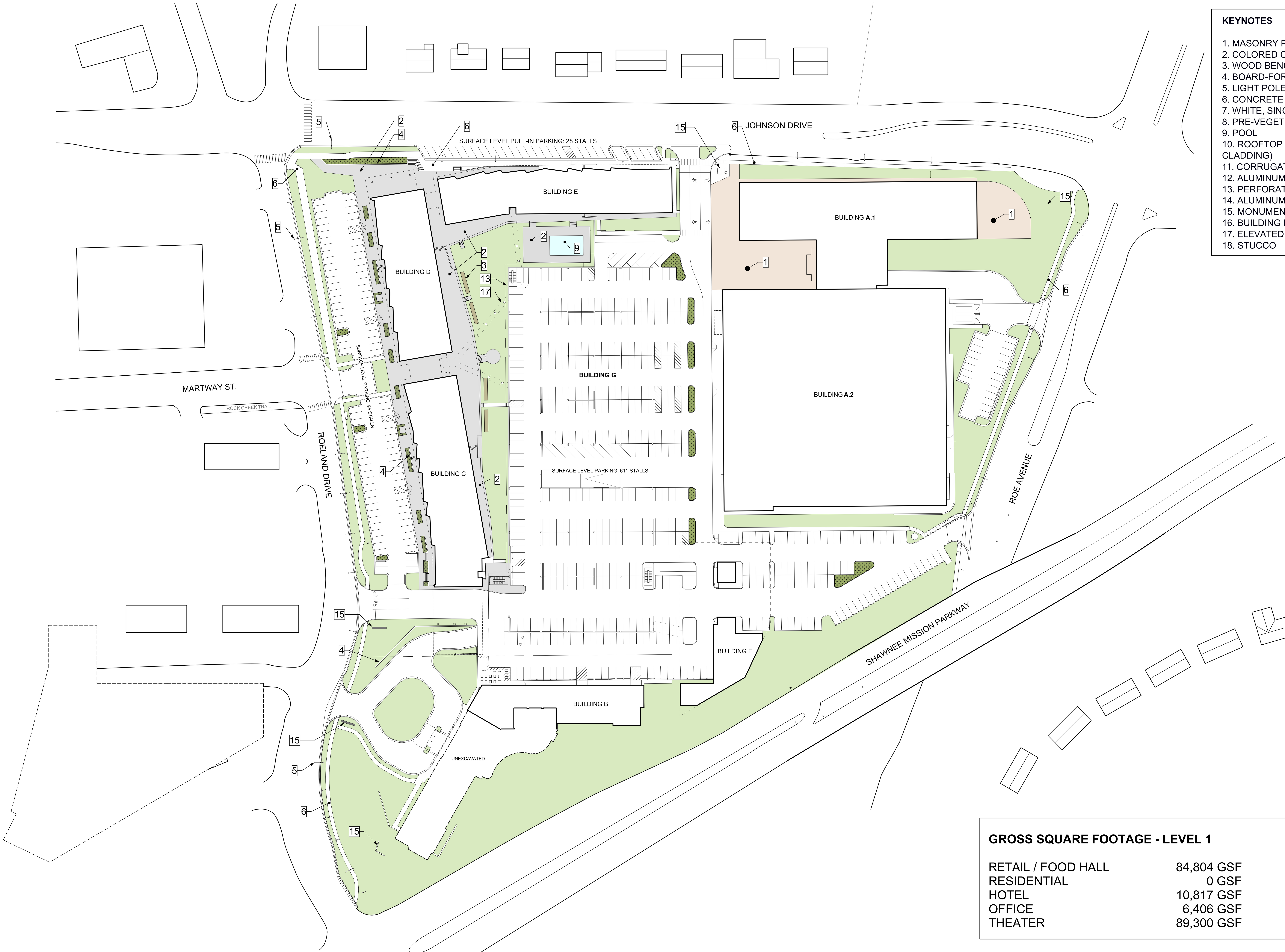

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18. STUCCO

GROSS SQUARE FOOTAGE - LEVEL 1			PARKING	
RETAIL / FOOD HALL	84,804 GSF		SURFACE	649
RESIDENTIAL	0 GSF	0 APTS	STRUCTURED	0
HOTEL	10,817 GSF	0 RMS.		
OFFICE	6,406 GSF			
THEATER	89,300 GSF			

01 **SITE PLAN - LEVEL 1**

0" 25' 50' 100'

FINAL DEVELOPMENT PLAN
MARCH 17, 2017
REVISIONS
UPDATES TO APPROVED FDP 02.05.2020

FDP-A051

SITE PLAN (LEVEL 1)

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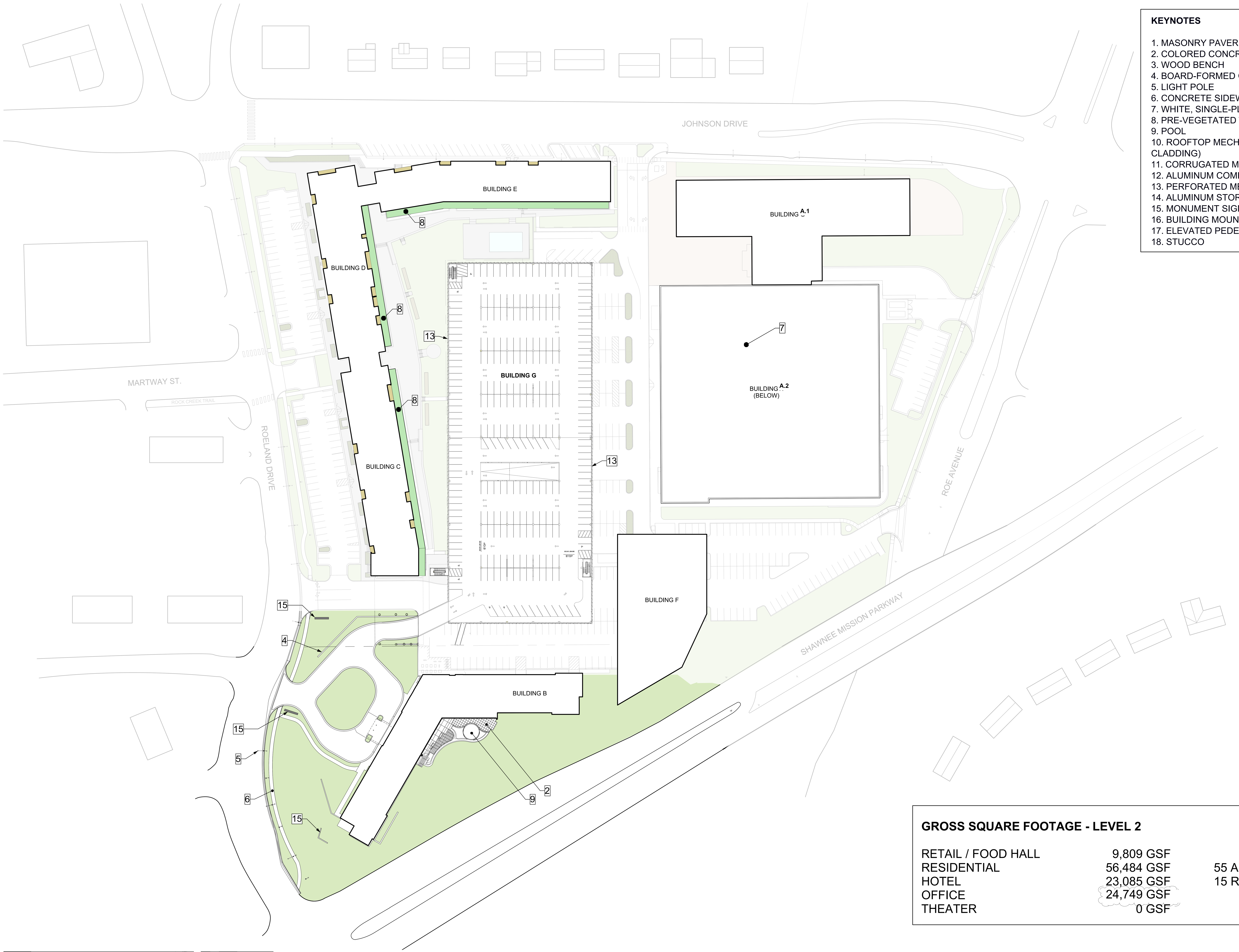

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GROSS SQUARE FOOTAGE - LEVEL 2			PARKING	
RETAIL / FOOD HALL	9,809 GSF		SURFACE	0
RESIDENTIAL	56,484 GSF	55 APTS	STRUCTURED	267
HOTEL	23,085 GSF	15 RMS.		
OFFICE	24,749 GSF			
THEATER	0 GSF			

01 SITE PLAN - LEVEL 2

0' 25' 50' 100'

FDP-A052

SITE PLAN (LEVEL 2)

FINAL DEVELOPMENT PLAN
MARCH 17, 2017
REVISIONS
UPDATES TO APPROVED FDP 02.05.2020

CONSULTANTS:

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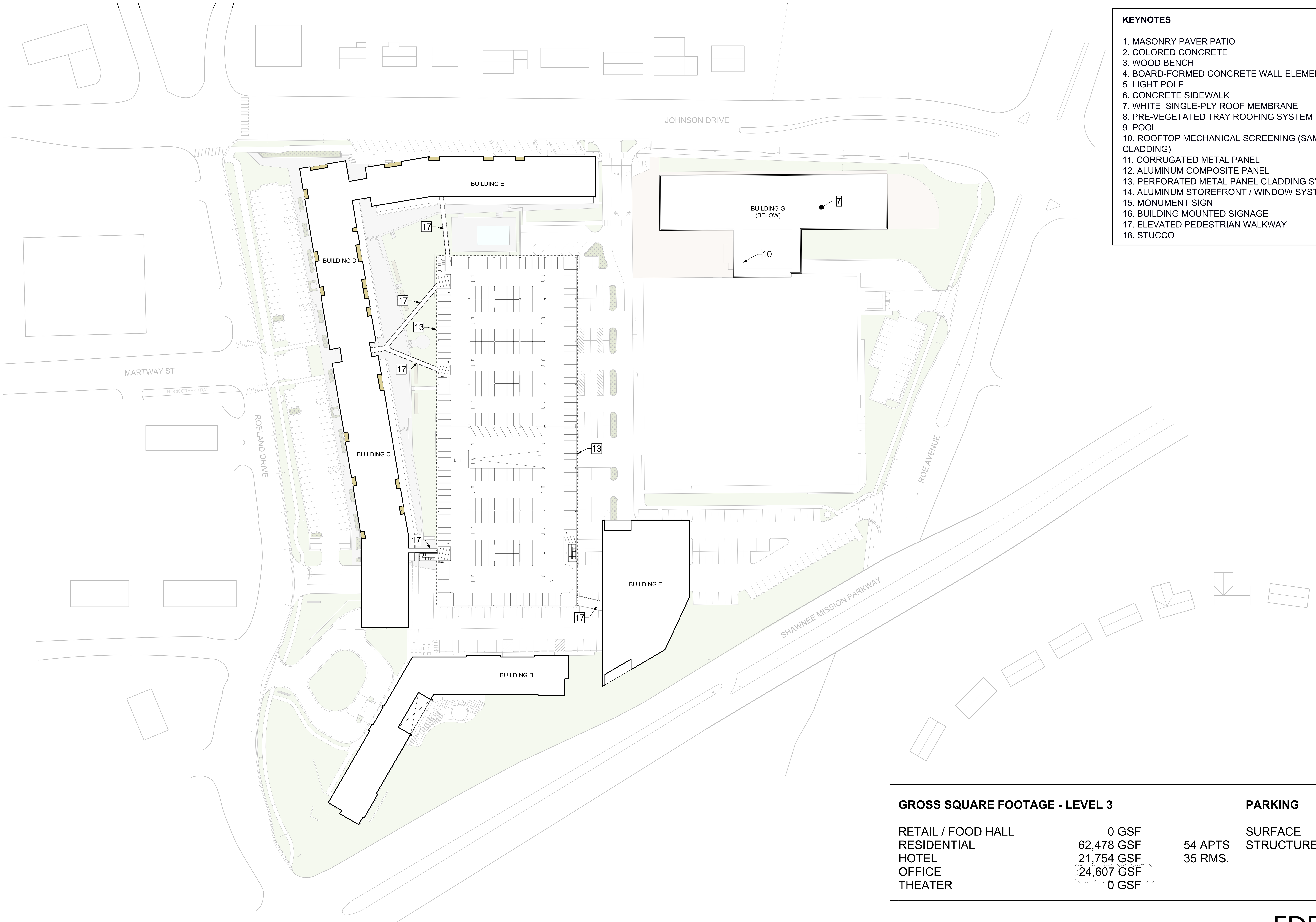

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GROSS SQUARE FOOTAGE - LEVEL 3			PARKING	
RETAIL / FOOD HALL	0 GSF		SURFACE	0
RESIDENTIAL	62,478 GSF	54 APTS	STRUCTURED	265
HOTEL	21,754 GSF	35 RMS.		
OFFICE	24,607 GSF			
THEATER	0 GSF			

01 SITE PLAN - LEVEL 3

FDP-A053

FINAL DEVELOPMENT PLAN
MARCH 17, 2017
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SITE PLAN (LEVEL 3)

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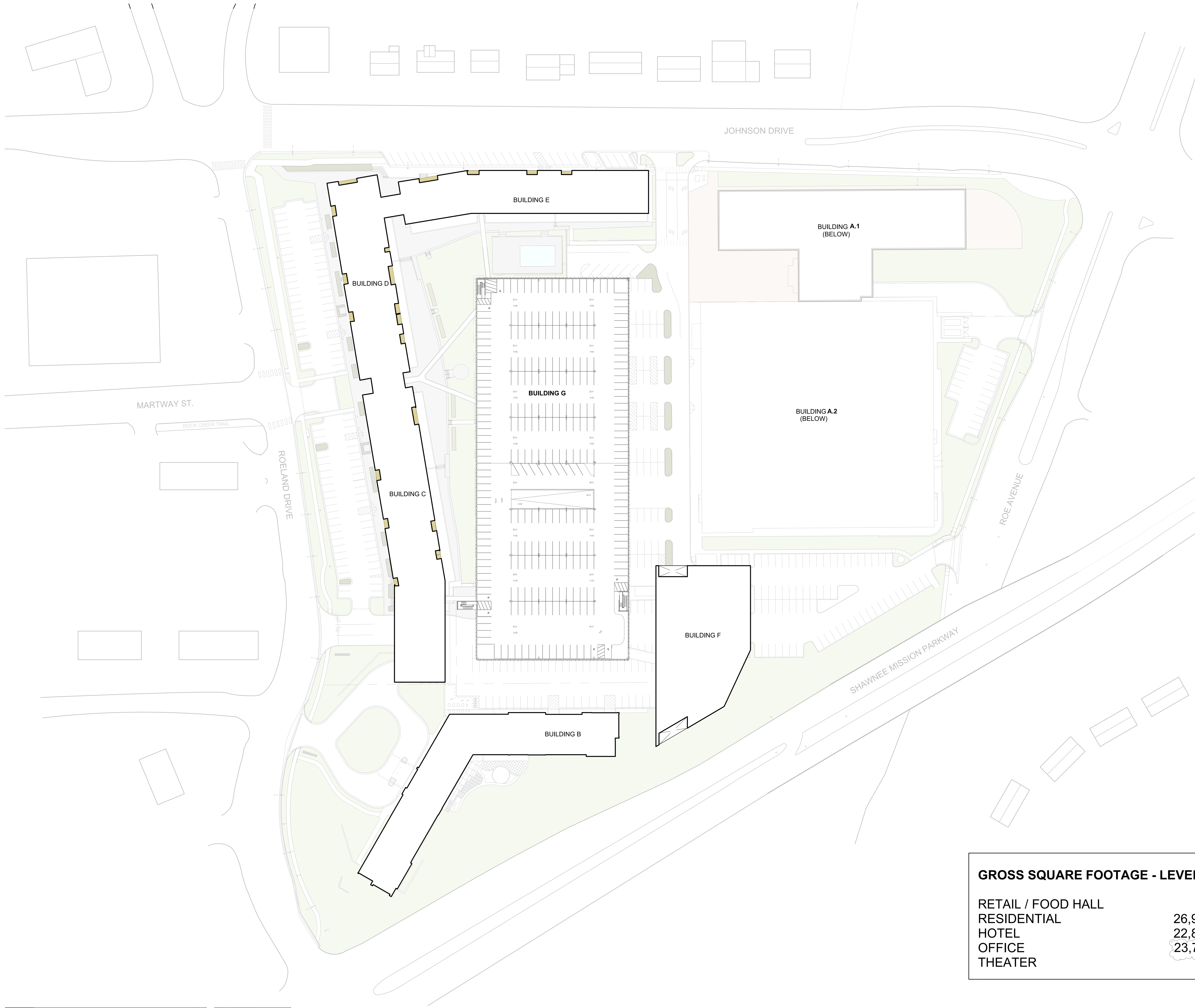

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GROSS SQUARE FOOTAGE - LEVEL 4			PARKING	
RETAIL / FOOD HALL	0 GSF		SURFACE	0
RESIDENTIAL	26,916 GSF	59 APTS	STRUCTURED	276
HOTEL	22,897 GSF	38 RMS.		
OFFICE	23,775 GSF			
THEATER	0 GSF			

01 SITE PLAN - LEVEL 4

0" 25' 50' 100'

FDP-A054

FINAL DEVELOPMENT PLAN
MARCH 17, 2017
REVISIONS
UPDATES TO APPROVED FDP 02.05.2020

CONSULTANTS:

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SITE PLAN (LEVEL 4)

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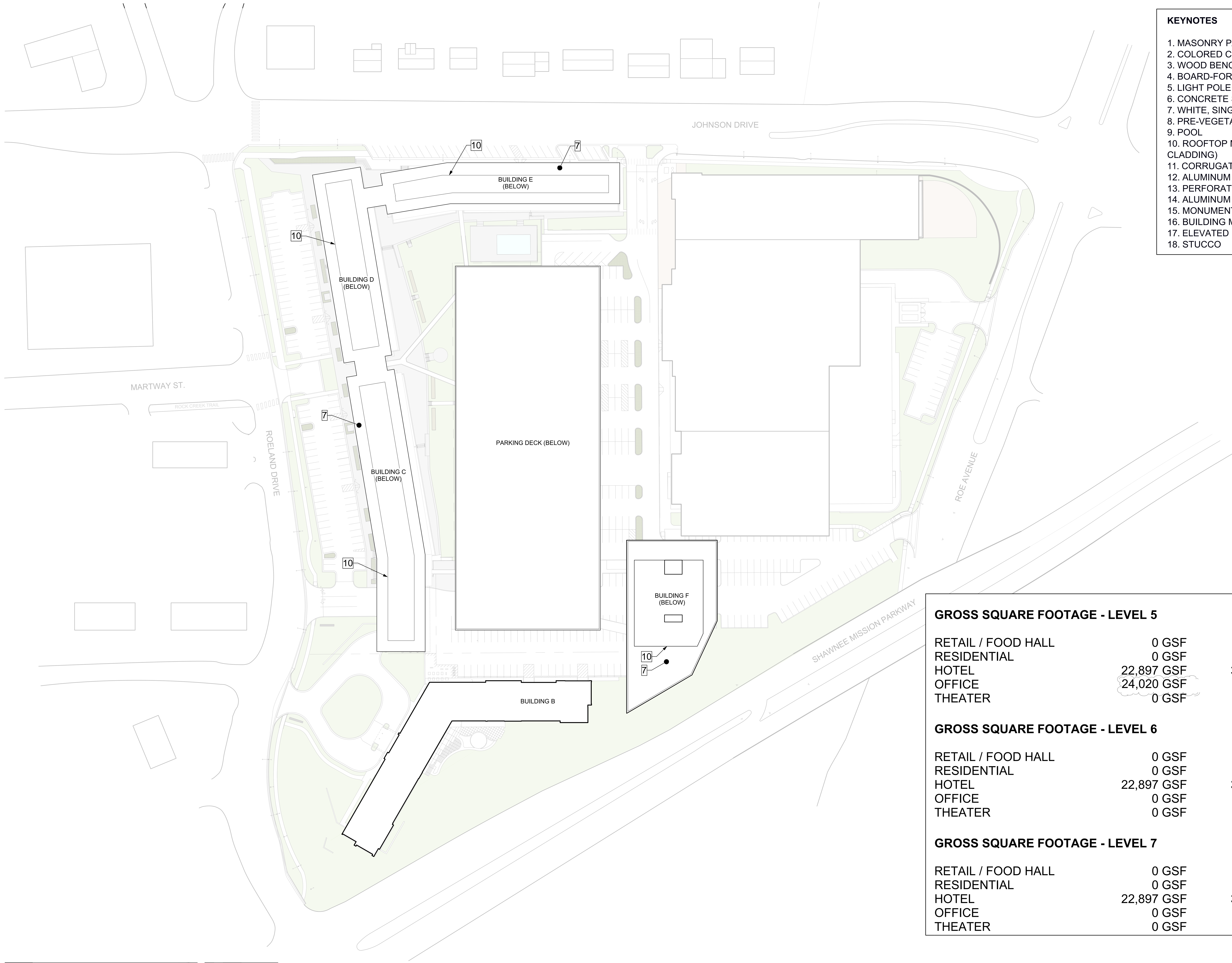

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18. STUCCO

GROSS SQUARE FOOTAGE - LEVEL 5			PARKING	
RETAIL / FOOD HALL	0 GSF		SURFACE	0
RESIDENTIAL	0 GSF	0 APTS	STRUCTURED	0
HOTEL	22,897 GSF	38 RMS.		
OFFICE	24,020 GSF			
THEATER	0 GSF			

GROSS SQUARE FOOTAGE - LEVEL 6			PARKING	
RETAIL / FOOD HALL	0 GSF		SURFACE	0
RESIDENTIAL	0 GSF	0 APTS	STRUCTURED	0
HOTEL	22,897 GSF	38 RMS.		
OFFICE	0 GSF			
THEATER	0 GSF			

GROSS SQUARE FOOTAGE - LEVEL 7			PARKING	
RETAIL / FOOD HALL	0 GSF		SURFACE	0
RESIDENTIAL	0 GSF	0 APTS	STRUCTURED	0
HOTEL	22,897 GSF	38 RMS.		
OFFICE	0 GSF			
THEATER	0 GSF			

01 **SITE PLAN - LEVEL 5-7**

0" 25' 50' 100'

FDP-A055

FINAL DEVELOPMENT PLAN
MARCH 17, 2017
REVISIONS
UPDATES TO APPROVED FDP 02.05.2020

CONSULTANTS:

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SITE PLAN (LEVELS 5 - 7)

MISSION GATEWAY

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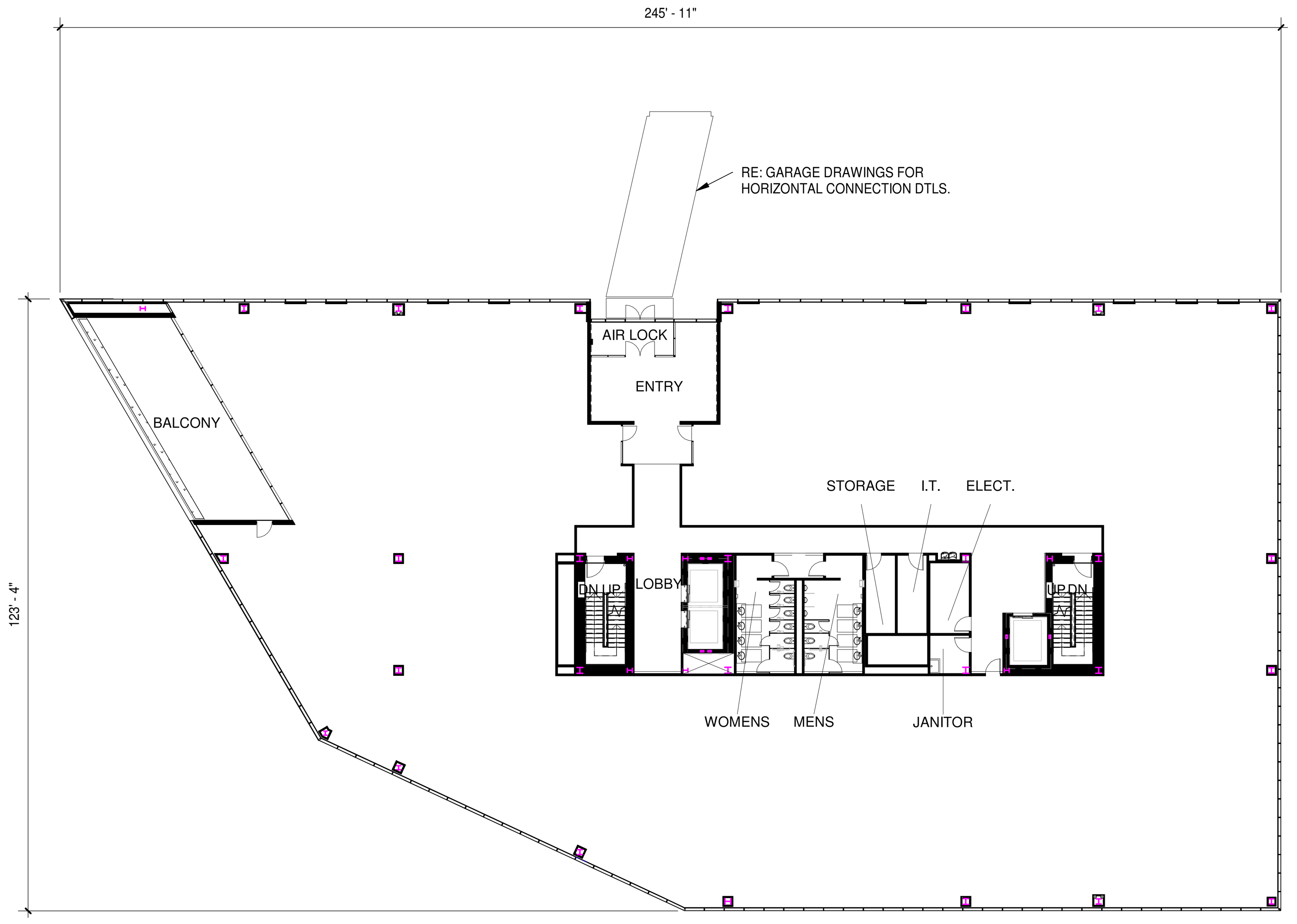
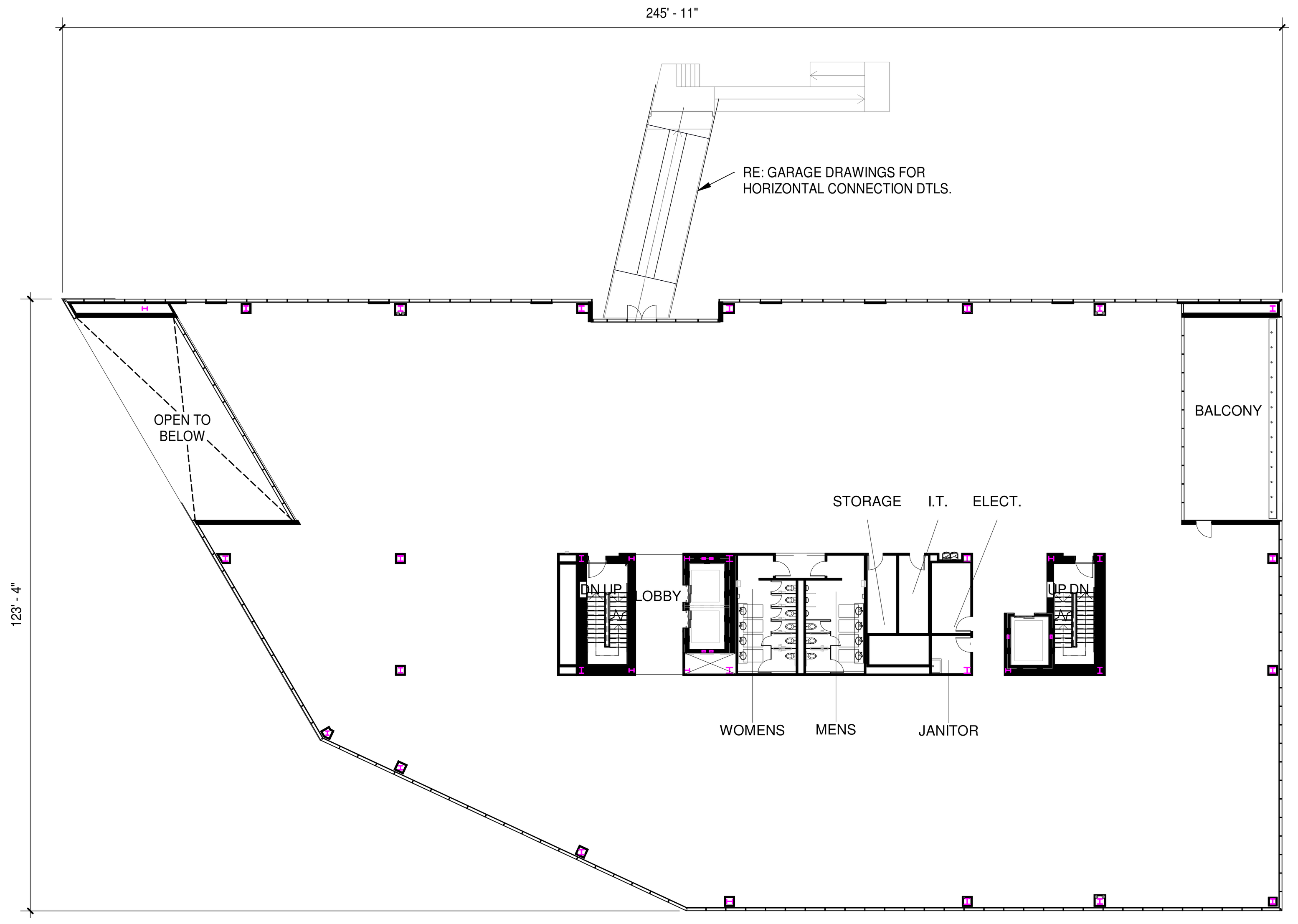


3 PLAN-LEVEL 03
R 01/A201
E:



4 PLAN - LEVEL 04
R 01/A201
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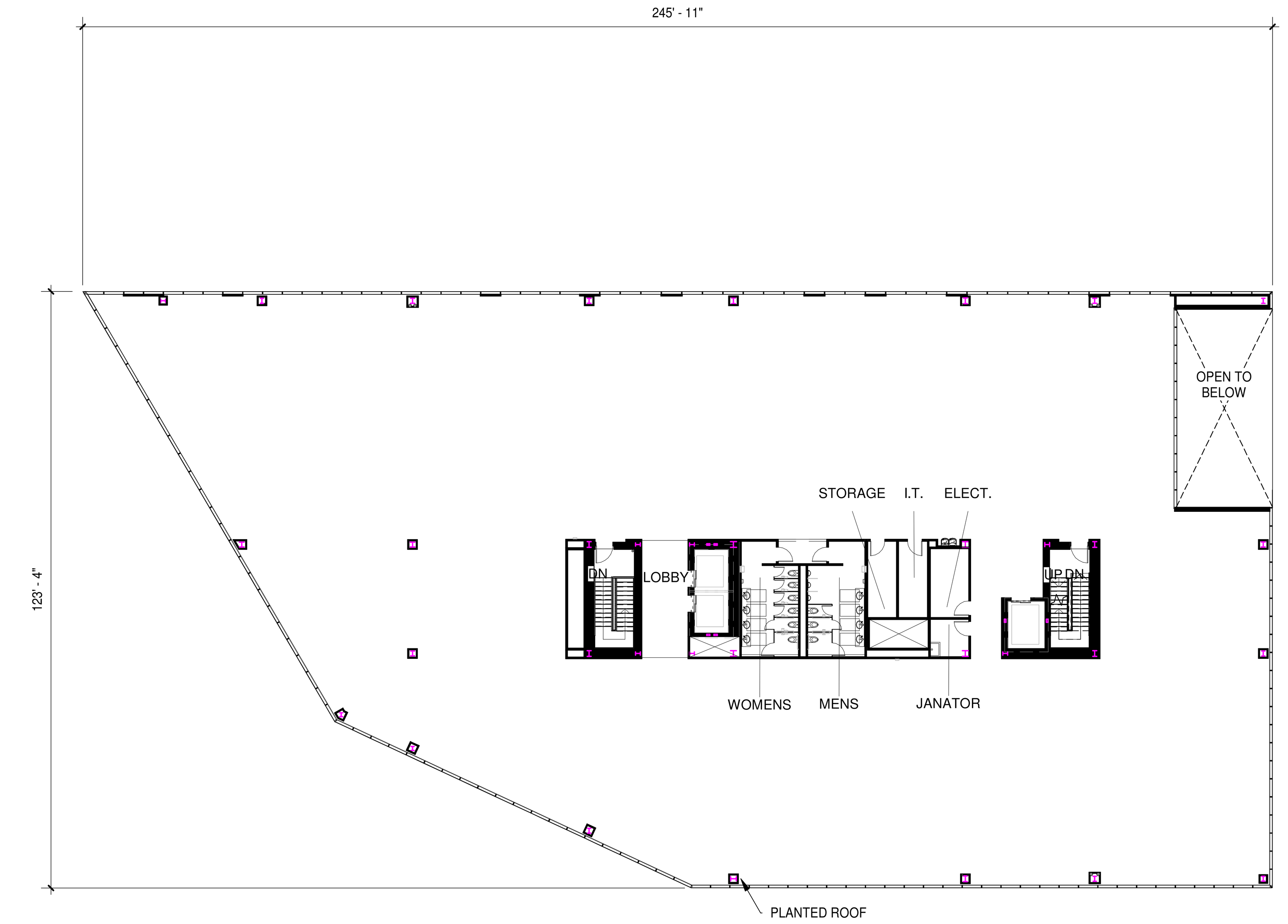

5 PLAN - LEVEL 05
R 01/A201
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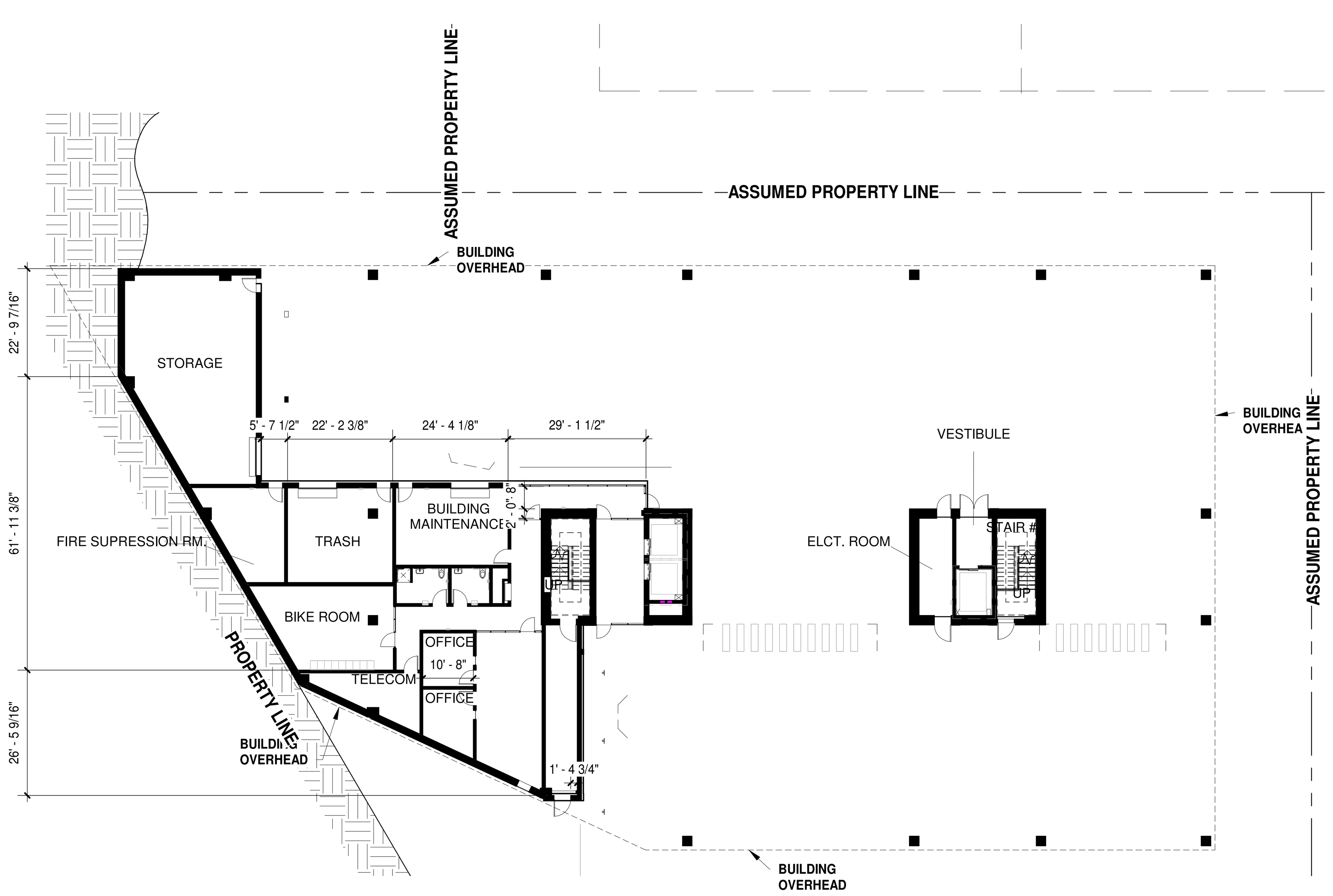

1 PLAN - LEVEL 01
R 01/A201
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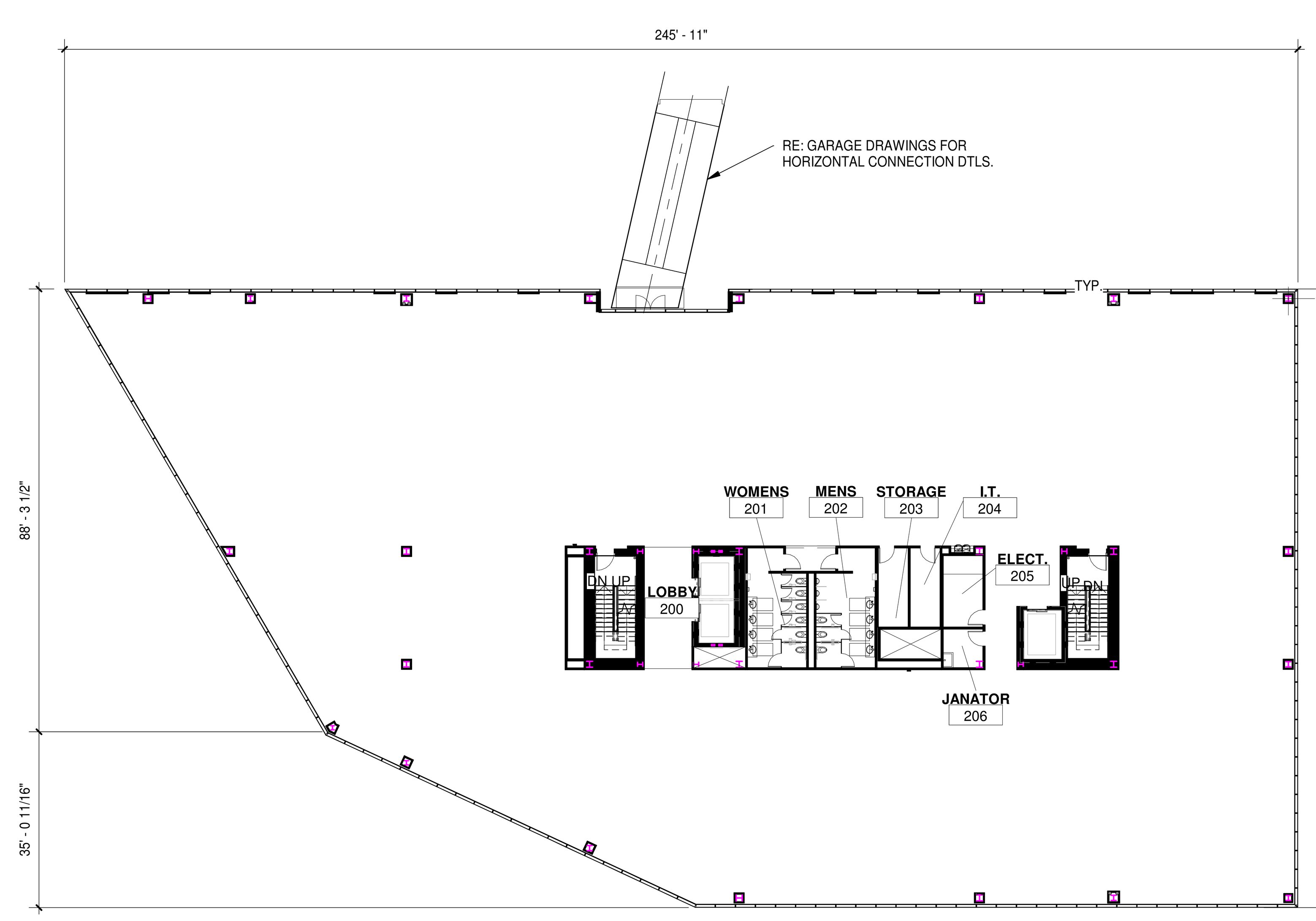

2 PLAN - LEVEL 02
R 01/A201
E:

FDP-A114

FINAL DEVELOPMENT PLAN
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BUILDINGS F - FLOOR PLANS (LEVELS 1-4 & ROOF)

MISSION GATEWAY

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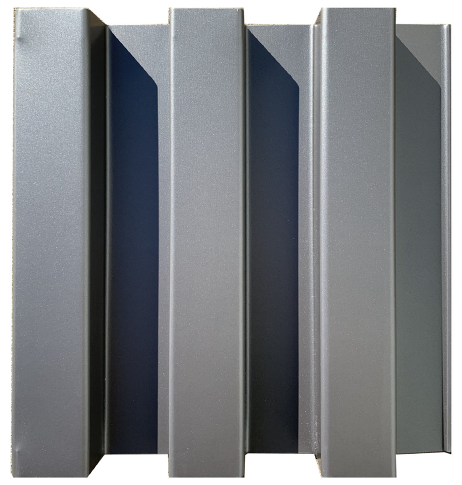
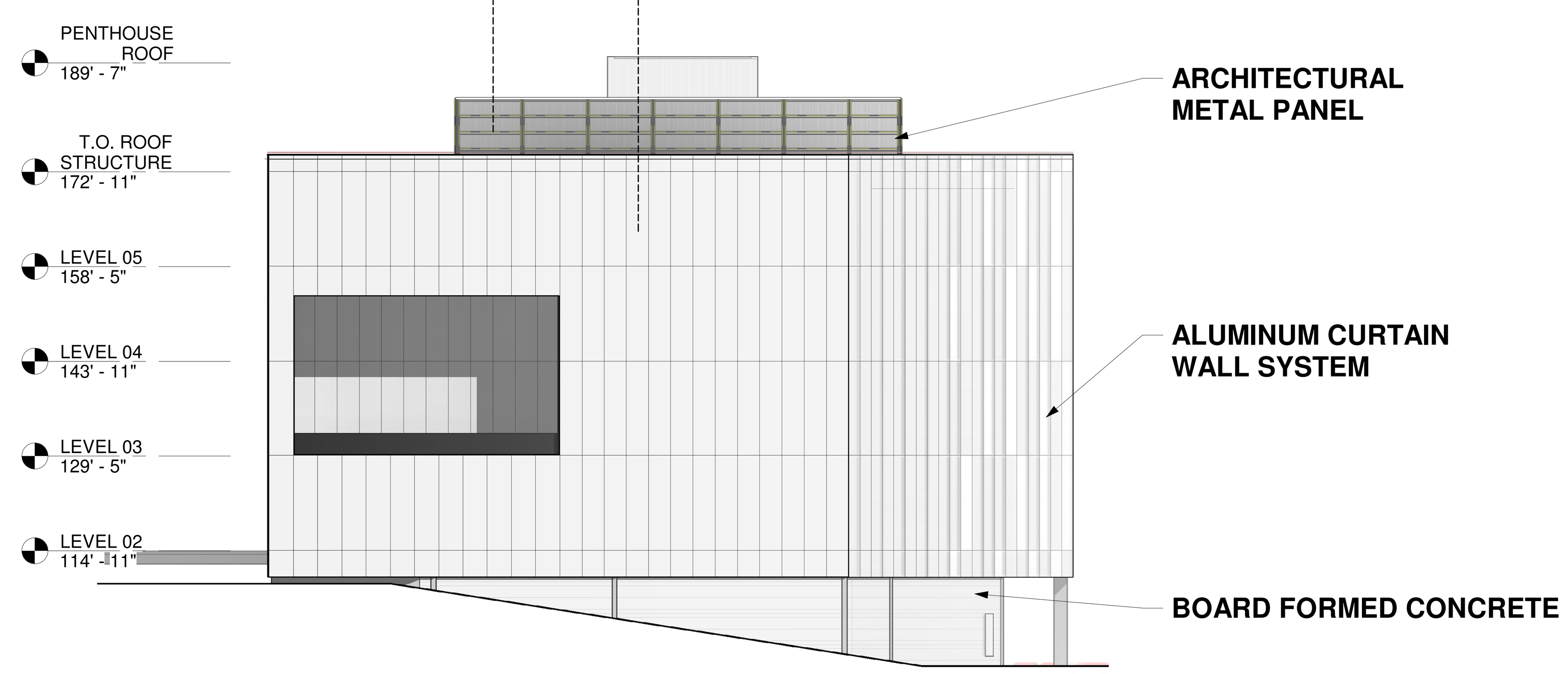
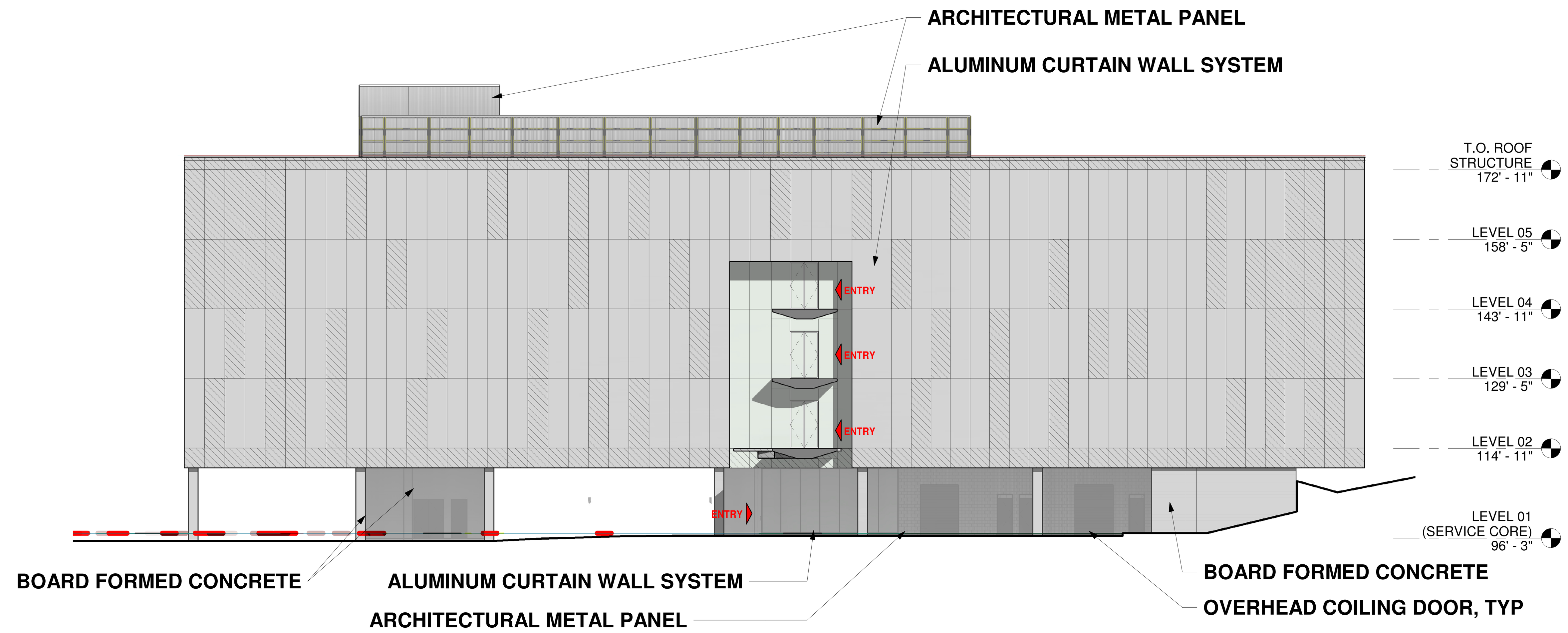


METAL BOX-RIB PANEL

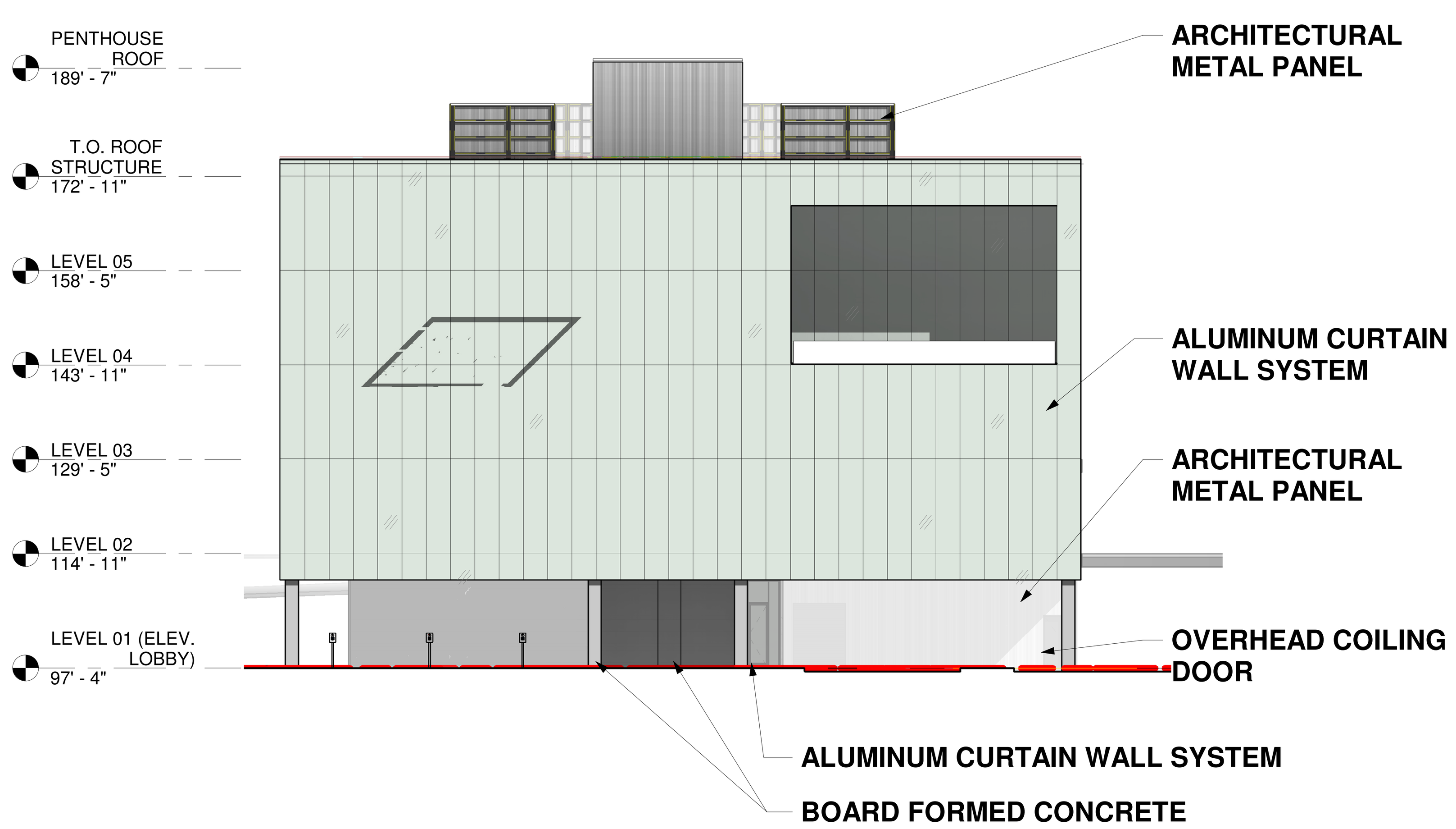
GLASS 1 GLASS 2

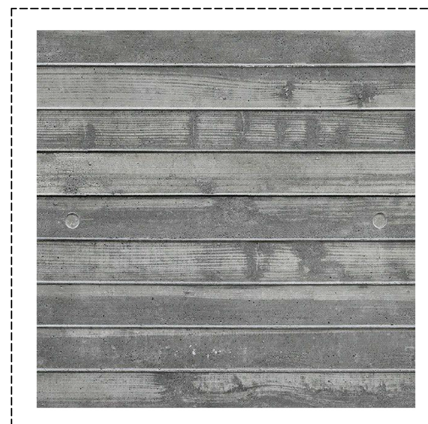


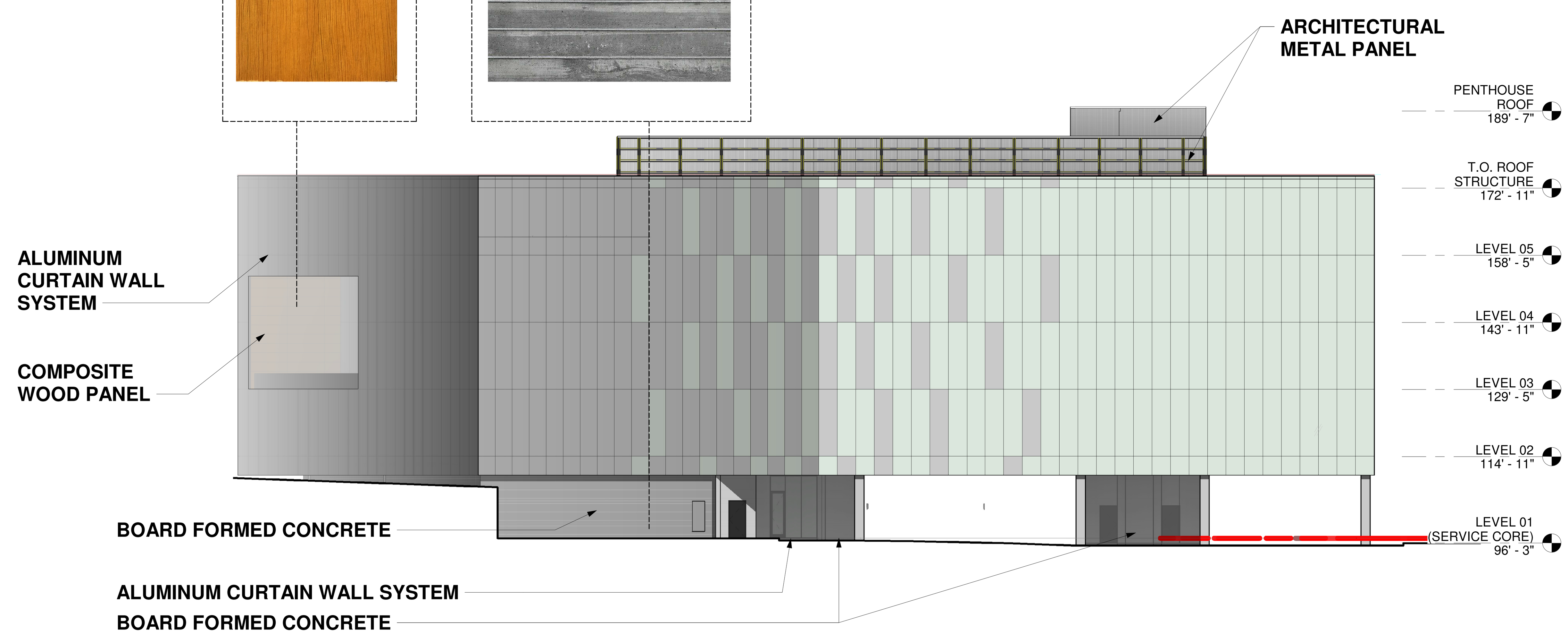
3 FDP - SOUTH ELEVATION



4 FDP - WEST ELEVATION







FDP-A205

FINAL DEVELOPMENT PLAN
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BUILDING F EXTERIOR ELEVATIONS

MISSION GATEWAY

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9801 Renner Boulevard
Lenexa, KS 66219

DESIGN MEMORANDUM

To: Brian Scott, MPPA, CPM (Assistant City Administrator / Finance Director)

From: David J. Mennenga, P.E., PTOE

Date: March 9, 2020

Subject: On-Call Traffic Engineering Review – Mission Gateway Traffic Impact Study

As you requested, GBA's traffic engineers have completed our review of the updated Traffic Impact Study (TIS) report submitted to the City of Mission by Olsson Associates (OA) on February 14, 2020. This design memorandum summarizes our review comments regarding the submitted TIS report.

- We continue to concur with the overall scope of this traffic study and find it to be appropriate for the large, mixed-use development that is proposed. As you are aware, the previous version of this TIS report was thoroughly reviewed by GBA and KDOT's Access Management staff during 2019, with final revisions made by OA and KDOT approvals finally granted in October 2019. In general, the impetus behind this current update of the TIS report is the developer's desire to provide an additional 30,000-square feet of proposed office space (i.e., one extra story on the proposed building).

- It should be noted that the OA traffic engineer-of-record for this TIS update is now Shannon Jeffries, whereas Todd Frederickson had sealed all previous TIS reports received by the City on this project. We have noted several instances where slightly different assumptions have now been made that have resulted in revised traffic assignments and phased traffic volumes. In particular, we noted that the pass-by trip distribution percentages on ***Figure 3*** and ***Figure 8*** were modified from previous TIS reports. It appears that a previous error regarding the future growth calculations along southbound Roe Avenue during the P.M. peak hour has now been rectified, as shown on ***Figure 12***. Finally, different allocations of additional green time for north-south vehicles on Roeland Drive versus the mainline east-west through traffic volumes at the intersection with Shawnee Mission Parkway have resulted in slightly worse Synchro Level of Service (LOS) results for the overall intersection, as shown on ***Figure 14***.

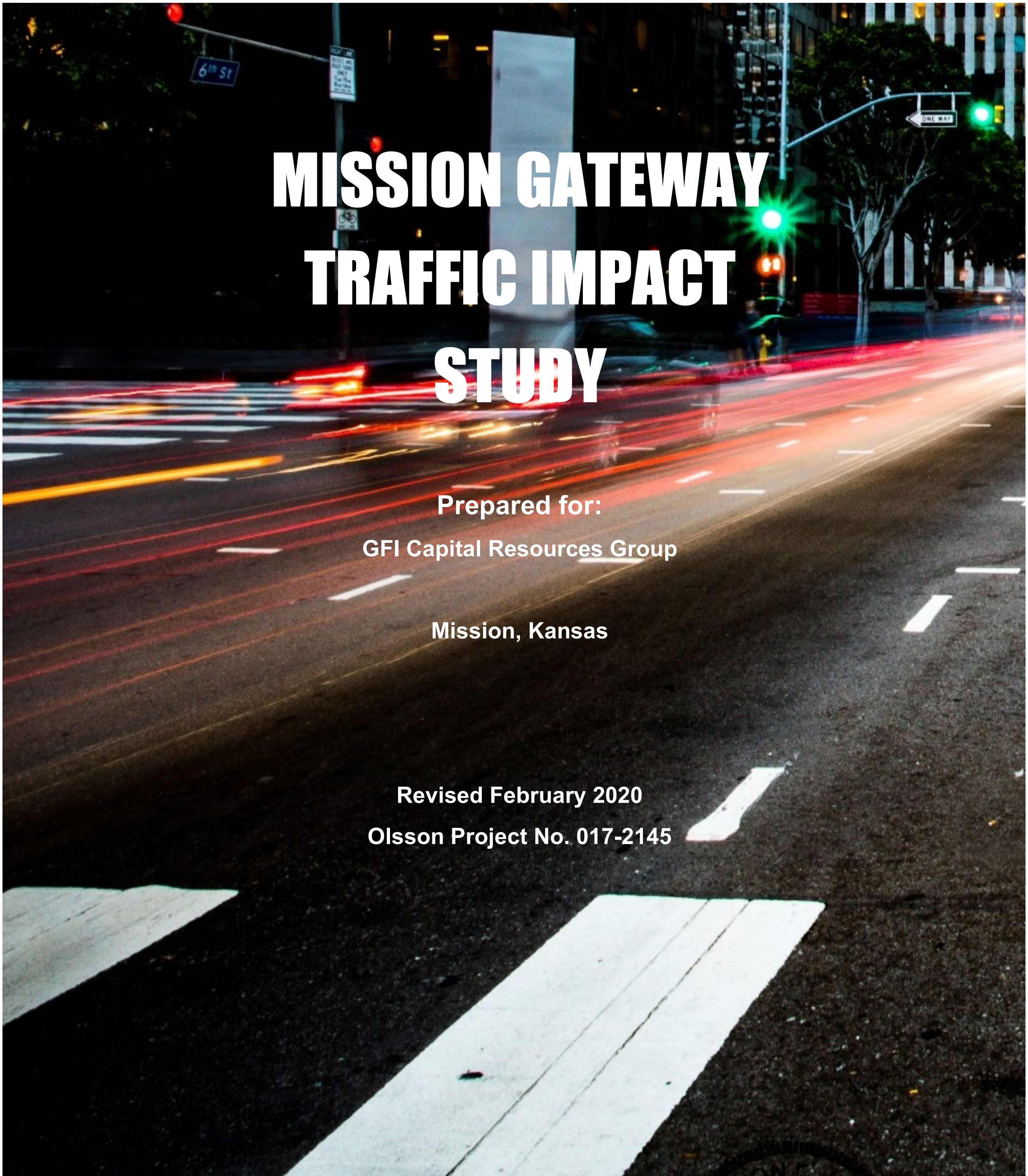
- As a result of the proposed land use changes, it was necessary for OA to provide new calculations regarding the expected trip generation estimates for the development site. In addition to the increase in proposed office space, more detailed information is also now available regarding the planned Cinergy entertainment venue and food hall concepts. Therefore, the revised land uses and sizes detailed in ***Table 9*** have now been utilized. When the appropriate internal trip capture rates and pass-by trip deductions are calculated, as shown in ***Table 10***, the revised development program creates a net overall decrease of 81 vehicles (i.e., -1 inbound trips and -80 outbound trips) during the A.M. peak hour and a net overall increase of 117 vehicles (i.e., +39 inbound trips and +78 outbound trips) during the P.M. peak hour. We concur with the trip generation estimates and calculations provided in these tables. As a result of these revisions, the phased traffic volumes for the "Existing plus Approved plus Development" scenario (see ***Figure 9***) and the Future Year 2038 scenario (see ***Figure 12***) have been logically modified. GBA's traffic engineers independently verified that the driveway assignments at the proposed development access points are consistent with the inbound, outbound, and overall trip totals listed in ***Table 10***.

- Although its need was not specifically indicated from an operational standpoint, this study now includes a 130-foot northbound right-turn lane into Drive 2 that is provided within the available rights-of-way. This additional turn lane should relieve some prior GBA / City staff concerns regarding the internal blockage of ingress vehicles at Drive 2, by ensuring that inbound vehicle blockages would not directly impact northbound through vehicle movements on Roeland Drive.

- As a result of these revised design traffic volumes for the proposed land uses, and the afore-mentioned differences in the green time allocations at several of the signalized study intersections, there are various changes – sometimes slightly better, sometimes slightly worse – in the LOS and vehicle queuing conditions for individual traffic movements (see ***Figure 11*** and ***Figure 14***). In general, most LOS changes for individual movements or overall intersection performances are limited to only one letter grade differences. Overall, in our opinion these minor differences are justified and do not materially change the outcome from this TIS process.

- The conclusions provided in the TIS summary are generally identical to those in the previously approved version of the report. This version of the study continues to appropriately identify several of the final comments addressed by OA in order to gain KDOT's final approval in October 2019, including the geometric extension of the eastbound left-turn lane on Shawnee Mission Parkway at the Roeland Drive intersection to meet KDOT requirements. This report again identifies several additional geometric improvements at this particular study intersection that may be required to satisfy the Future Year 2038 traffic conditions, noting that the "poor operations indicated during the future scenario can be attributed to background traffic growth and is (sic) not specifically attributed to trips associated with the proposed development."

cc: JCC, BAB, KGM, file



MISSION GATEWAY TRAFFIC IMPACT STUDY

Prepared for:

GFI Capital Resources Group

Mission, Kansas

Revised February 2020

Olsson Project No. 017-2145

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02.14.2020

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APPENDICES

1. INTRODUCTION

This report is an update to a traffic impact study submitted by Olsson in March of 2017, revised October 2019, titled 'The Gateway Development'. The study has been updated to account for a modification to the proposed site plan. The residential/retail portion of the proposed site has been approved by the City and is currently being constructed. This study will provide an update regarding the unconstructed hotel, office, and retail uses located on the south and east sides of the development.

This report studies traffic impacts regarding a proposed development located in the northeast quadrant of Shawnee Mission Parkway and Roeland Drive. A portion of the development including residential apartment units and shopping center has been approved with construction expected to be completed by Fall of 2020. The approved development also included office and retail land uses located south and east of the residential and shopping development. Modifications are proposed to the office and retail uses; thus, this study addresses traffic impacts of these proposed changes.

This report will review the impacts of the proposed development on the existing roadway network and will recommend additional turn lanes, storage bays, and intersection control methods as appropriate. Shawnee Mission Parkway (US-56) is maintained by the Kansas Department of Transportation (KDOT), thus KDOT's *Access Management Policy* was used to review Shawnee Mission Parkway (US-56) and Roeland Drive. The remaining study intersections and proposed site drives will be reviewed using KDOT criteria and engineering judgement.

- Roeland Drive and Martway Street
- Roeland Drive and Johnson Drive
- Johnson Drive and Roe Avenue
- Site driveways and access points, as appropriate

For this study, the following scenarios were analyzed:

- Existing plus Approved Development conditions*
- Existing plus Approved plus Proposed Development conditions*
- Future Conditions (2038)*

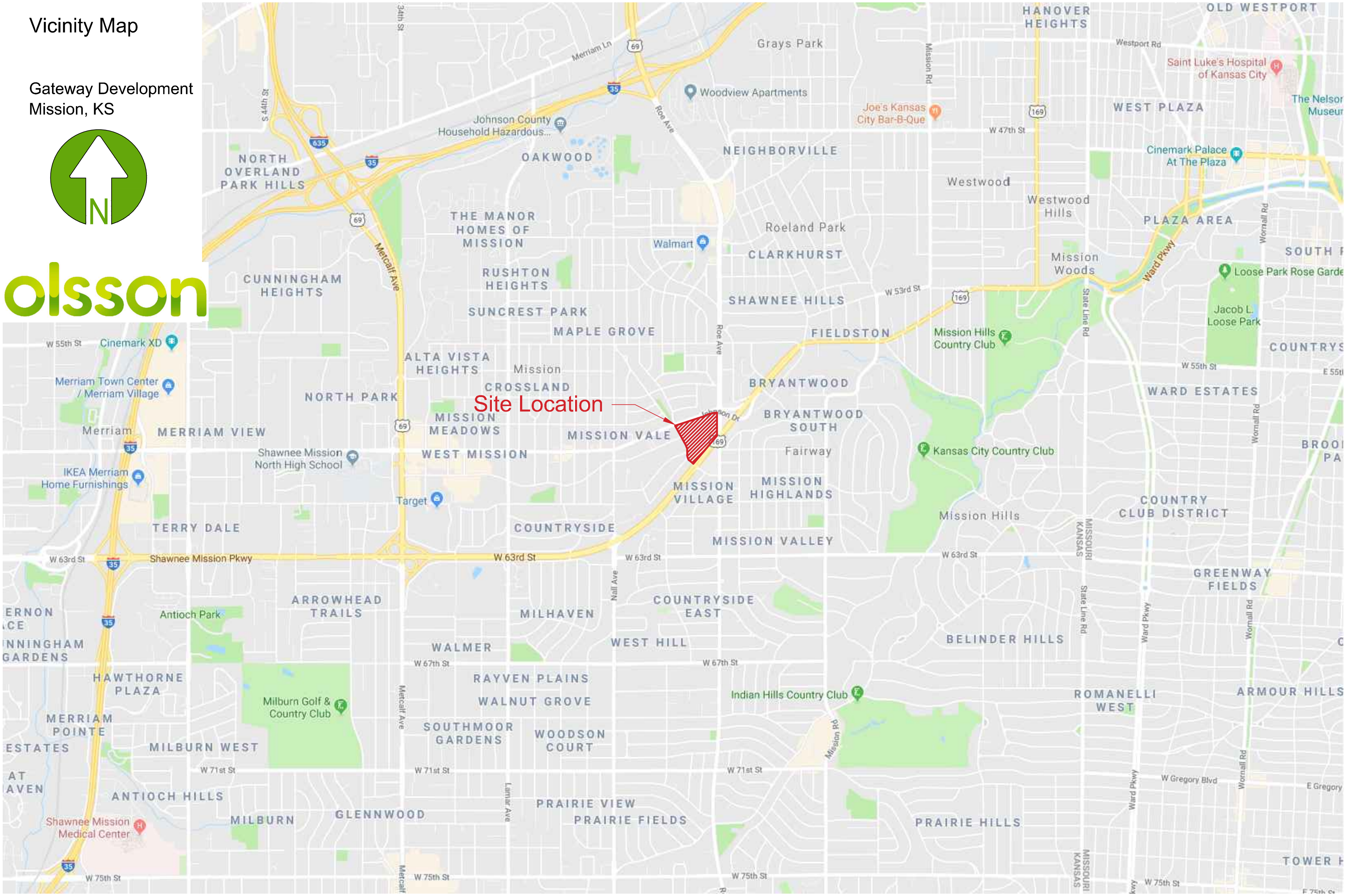
***** *Includes approved residential and retail development proposed in the existing plus development scenario of the previous report completed in 2017.*

The approximate location of the development is show on the vicinity map, **Figure 1.**

FIGURE 1

Vicinity Map

Gateway Development
Mission, KS



Source: Google Maps

2. DATA COLLECTION

The data collection effort included acquiring peak hour turning movement counts and documentation of current roadway geometrics. Traffic counts were collected on Tuesday, October 4th, 2018 at the study intersections listed in **Section 1.0**.

The counts were conducted during the typical weekday AM and PM peak periods from 7:00-9:00 AM and 4:00-6:00 PM. The AM peak hour period for the study intersections was determined to be from 7:30-8:30 AM. The PM peak hour period for the study intersections was determined to be from 5:00-6:00 PM. Existing peak hour count data is shown in **Figure 2.** Count data collected for this study can be found in **Appendix A**.

Existing signal timing information for the signalized intersections were obtained from Mid-America Regional Council (MARC), KCP&L and the previous study:

- Shawnee Mission Parkway (US-56) and Roeland Drive (MARC)
- Roeland Drive and Martway Street (Previous study)
- Roeland Drive and Johnson Drive (Previous study)
- Johnson Drive and Roe Avenue (KCP&L)

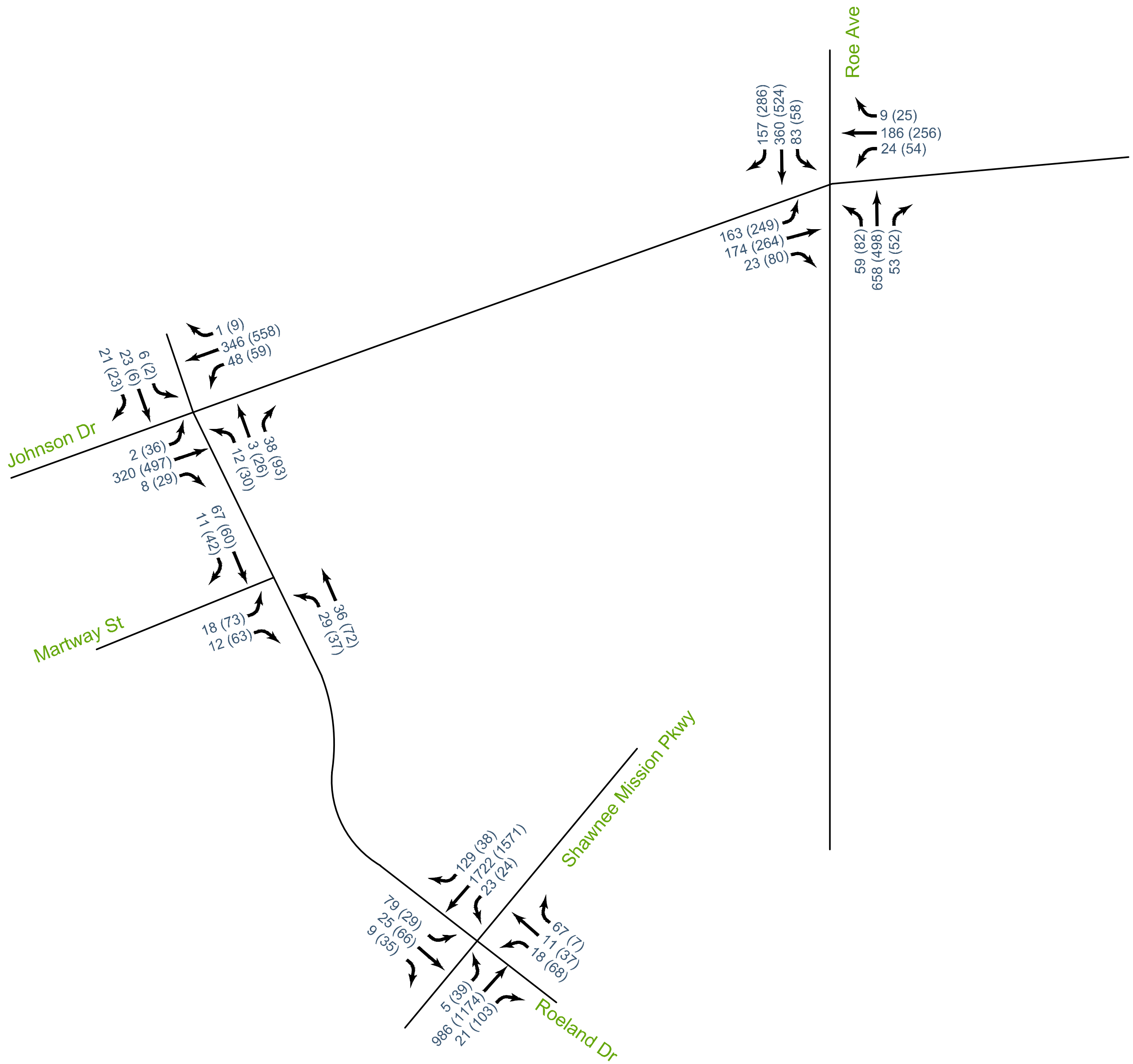
The signalized intersection of Roeland Drive with Martway Street is currently operating in “flash” mode. The northbound and southbound movements have the yellow “caution” indications, and the eastbound movement has the red “stop” indication. To account for improvements recommended in the 2017 study, the intersection of Roeland Drive and Martway Street was analyzed as a signalized intersection.

Signal timing information for the intersections mentioned above is provided in **Appendix A**.

FIGURE 2

Existing
Peak Hour Volumes

Gateway Development
Mission, KS



LEGEND

AM (PM) *Peak Hour Volume*

3. EXISTING PLUS APPROVED DEVELOPMENT CONDITIONS

To account for the approved development that is currently under construction, trips were generated and added to the existing traffic volumes. Roadway improvements that are associated with the City approved residential and retail development outlined in the 2017 study were accounted for in this scenario as discussed in **Section 3.2**. This scenario includes the addition of two proposed drives along Roeland Drive and one proposed drive along Johnson Drive. The existing plus approved development traffic conditions were evaluated to provide a baseline for comparative purposes.

3.1. Network Characteristics

Five roadways are located within the study area: Shawnee Mission Parkway (US-56), Roeland Drive, Johnson Drive, Roe Avenue, and Martway Street. Referencing the KDOT *Access Management Policy,* KDOT Functional Classifications map and National Highway System map, current network characteristics were determined and are summarized in **Table 1**.

Table 1. Existing Network Summary

Roadway	Functional Classification	KDOT Classification *	Section	Median Type	Posted Speed	NHS
Shawnee Mission Parkway (US-56)**	Principle Arterial	B	4-Lane	Painted/ Grass Median	45 MPH	Yes
Roeland Drive	Local Road	***	3-Lane	None	25 MPH	No
Johnson Drive	Minor Arterial	***	3-Lane	Partial Raised Median	30 MPH	No
Roe Avenue	Arterial Roadway	***	4-Lane	Raised/ Striped Median	35 MPH	No
Martway Street	Local Road	***	3-Lane	None	25 MPH	No

* Based on Table 4-1 of KDOT's Access Management Policy.
**Roadway referred to as Shawnee Mission Parkway for the purposes of this report.
***Roadway is not maintained by KDOT, thus KDOT Classification was not considered.

Signalized intersection geometric characteristics (number of turn lanes, pedestrian accommodations, etc.) are as follows:

Shawnee Mission Parkway and Roeland Drive

- Dedicated left-turn lanes are provided for all movements at the intersection except the south approach.
- Dedicated right-turn lanes are provided for the southbound and eastbound movements.
- No pedestrian accommodations are provided at the intersection.

Roeland Drive and Johnson Drive

- Dedicated left-turn lanes are provided for all movements at the intersection except the north approach.
- Dedicated right-turn lanes are provided for the eastbound and westbound movements.
- Pedestrian accommodations are provided along the west and south legs of the intersection and include marked crosswalks, pedestrian indications, and push buttons.

Roeland Drive and Martway Drive

- Dedicated left-turn lanes are provided for the northbound and eastbound movements at the intersection.
- Pedestrian accommodations are provided for the southbound movement at the intersection, including marked crosswalks, pedestrian indications, and push buttons.
  - Currently, this signalized intersection operates in “Flash” mode for all periods of the day. During “Flash” operation mode, no signalized pedestrian accommodations are provided.

Roe Avenue and Johnson Drive

- Dedicated left-turn lanes are provided for all movements at the intersection with dual left-turn lanes allocated for the eastbound movement.
- A dedicated right-turn lane is provided for the southbound movement. A channelized right-turn lane is provided for the northbound movement.
- Pedestrian accommodations are provided along the west and north legs of the intersection and include marked crosswalks, pedestrian indications, and push buttons.

3.2. Approved Development Roadway Improvements

Roadway improvements and driveway additions associated with the approved residential and retail portions of the development along City maintained streets (outlined in the traffic study completed by Olsson in 2017) were accounted for under the existing plus approved development scenario. These improvements and driveway additions are as follows and are expected to be completed in Fall of 2020 along with the retail and residential construction:

Roeland Drive and Drive 2

- Drive 2 is located 300’ south of the intersection of Roeland Drive and Martway Street.
- A separate left-turn and right-turn lane will be provided for exiting traffic.
- The north approach will be re-striped to provide a 75’ southbound left-turn lane plus taper using the existing two-way left-turn lane.
- A throat distance of 75’ was recommended at Drive 2. As stated in the 2017 report if adequate throat distance cannot be achieved “Do Not Block Intersection” signing for westbound vehicles approaching Roeland Drive is to be provided internal to the site along Drive 2 at the parking lot drive.
- Per request of the City of Mission, a 130’ northbound right-turn lane will be provided at Drive 2.

Roeland Drive and Martway Street/Drive 3

- Drive 3 will be constructed as the east leg of the intersection of Roeland Drive and Martway Street
- A separate westbound 75’ left-turn lane plus taper will be provided to mirror the west approach.
- The north approach will be re-striped to provide a 100’ southbound left-turn lane plus taper using the existing two-way left-turn lane.
- A throat distance of 75’ was recommended at Drive 3. As stated in the 2017 report if adequate throat distance cannot be achieved signing will be provided internal to the site to allow entering vehicles the right-of-way at the intersection of Drive 3 with the internal parking lots.
- Based on the previous study data collected, the Peak Hour Warrant (Warrant 3) was evaluated at Roeland Drive and Martway Street. Insufficient data to was available to perform the other signal warrants. Warrant 3 considers peak hour vehicular volume data to conduct the warrant and is vehicular focused. The signalized intersection of Roeland Street and Martway Street does not warrant a signal, however based on recommendations provided in the approved study a signal should be kept providing pedestrian accommodations for the Rock Creek Trail that crosses along the southside of the intersection. Modifications to the signal at this intersection will be completed with the approved development to accommodate both pedestrian and approved development traffic.

Johnson Drive and Drive 4

- Drive 4 will be constructed 575’ east of the intersection of Roeland Drive and Johnson Drive.
- A throat distance of 125’ will be provided at Drive 4.
- Separate left and right-turn lanes will be provided at Drive 4 for exiting traffic. The right turn lane will release traffic into the existing second eastbound through lane on the outside of Johnson Drive.
- An existing westbound left-turn lane will be used for access to Drive 4. The turn lane will have an approximate length of 150’ plus taper.

3.3. Existing Crash Data

Crash data from 2013-2017 was obtained from KDOT for the study intersection of Shawnee Mission Parkway and Roeland Drive. Crash data provided included crashes at the intersection and approximately 250 feet in the vicinity of the intersection along each approach. The crash summary statistics were used to develop an intersection crash rate at this location. Additionally, the individual crash reports were reviewed to identify any crash patterns and possible countermeasures for consideration.

Intersection Crash Rate

The crash data from 2013-2017 was used to determine the average crash rate at the study intersection. Crashes were reviewed and incidents that were considered non-correctible or non-intersection related (such as crashes due to alcohol impairment, animals, inclement weather, or construction) were removed. This review resulted in a total of 14 crashes at the intersection over the analyzed time period. The crash total was compared to the average daily entering volume for the intersection. The calculated crash rate, reported in the number of crashes per ten million entering vehicles (TMEV), for the study intersection is illustrated in **Table 2** below. The equation used to calculate the intersection crash rate is also provided below.

Table 2. Crash Rate Summary.

Intersection	Average Crash Rate 2013-2017 (Crashes/TMEV)
Shawnee Mission Parkway and Roeland Drive	2.0

$$Crash\ Rate\ \left(\frac{Crashes}{TMEV}\right) = \frac{5\ Year\ Crash\ Total}{\left(\frac{Total\ Entering\ Vehicles\ per\ Day}{10{,}000{,}000}\right) \times 365 \times 5}$$

Historically, the KDOT-reported statewide intersection crash rate is near 10.0 crashes/TMEV. To determine if the intersection is experiencing a higher number of crashes when compared to other intersections, the calculated intersection crash rate at the study intersection was compared to the KDOT average crash rate. When comparing the calculated rate to the statewide crash rates for non-interchange intersections, the Shawnee Mission Parkway and Roeland Drive intersection was found to be below the statewide average rate. The crash rate calculations are provided in **Appendix B**.

Crash Report Review – Shawnee Mission Parkway and Roeland Drive
As stated above, crashes that were considered non-correctible or non-intersection related were removed from the dataset; this resulted in 3 crashes being removed at this location. After removal of non-correctible/non-intersection related crashes, there were a total of 14 intersection related crashes observed from 2013-2017 at Shawnee Mission Parkway and Roeland Drive. These crashes were categorized by their observed crash pattern and summarized in **Table 3**. A graphical breakdown of observed crash pattern is illustrated in **Exhibit 1**.

Table 3. Crash Report Review Summary - Shawnee Mission Parkway and Roeland Drive.

Observed Crash Pattern	No. Crashes (2013-2017; Partial 2018-2019)	Percent	Comments
Following too Close / Rear End	9	90%	Rear end crashes are the most common trend seen at signalized intersections.
Angle – Side Impact	1	10%	One vehicle violated red signal.
Total	**10**	**100%**	

The most common crash type (90% of the total) was observed to be rear end crashes. Rear end crashes are typically the most common trend seen at signalized intersections occurring as vehicles are approaching stopped vehicles at a red signal indication. The remaining accident was a right-angle crash that was attributed to a vehicle violating the red signal. Overall the intersection of Shawnee Mission Parkway and Roeland Drive experiences fewer crashes than the statewide average and the crash pattern observed was consistent with crash types experienced at a signalized intersection.

3.4. Approved Development Trip Generation

To assess the impact of the approved development traffic on the roadway network, expected trips associated with the proposed site were generated and applied to the study network. The Institute of Transportation Engineers (ITE) provides methods for estimating traffic volumes of common land uses in the Trip Generation Manual (10th Edition). The land use that most resembles the approved development for this site is Land Use Code 220 (Apartment) and 820 (Shopping Center). *Expected trips associated with the approved development have been updated to reflect most current trip generation methodology.*

Based on the *ITE Trip Generation Manual*, trip generation characteristics were developed for the approved site. Trip generation characteristics expected for the site are shown in **Table 4**. Detailed ITE trip generation information can be found in **Appendix C**.

Table 4. Approved Development Trip Generation

Land Use	Size	Average Weekday	AM Peak Hour			PM Peak Hour		
			Total	Enter	Exit	Total	Enter	Exit
Apartment	168 DU	1,230	79	19	60	94	60	34
Shopping Center	54,594 SF	3,984	180	112	68	348	168	180
Total Trips		**5,214**	**259**	**131**	**128**	**442**	**228**	**214**

Consistent with the previous report, internal capture was determined for the approved site. Internal capture calculations were updated to reflect the most current methodology. The site contains multiple land uses, thus internal trip capture was determined for both the AM and PM peak hours. When a site consists of multiple land uses, total trips to a development can be reduced due to internal capture on the site. These are trips that stay within the development area and do not leave the site to travel to other developments. The multi-use reduction percentage is determined using various tables included in the *Trip Generation Manual*. Worksheets used to determine the multi-use reduction percentage are included in **Appendix C**. Based on the worksheet results, the internal capture percentage was determined to be 1% in the AM peak hour and 19% in the PM peak hour. To be conservative, it was assumed that internal capture trips would not occur during the AM peak hour, thus no internal capture rates were used.

Consistent with the previous report, pass-by was determined for the approved site. Pass-by calculations were updated to reflect the most current methodology. Pass-by characteristics were determined for the Shopping Center land use using the *ITE Trip Generation Handbook (10th Edition)*. Pass-by trips are made by traffic already on the roadway and passing the site, versus making a direct trip to the development (primary trips). According to the *ITE Trip Generation Handbook*, the pass-by trips during the AM and PM peak hour periods for the described land use varies from 20% to 74%. To be conservative, the average rate of 34% pass-by trips was used for this study and was only applied to the PM peak hour period. Trip generation data considering internal capture and pass-by trips for the approved land uses are illustrated in **Table 5**.

Table 5. Approved Development Trip Generation with Internal Capture and Pass-by.

Land Use	Average Weekday	AM Peak Hour			PM Peak Hour		
		Total	Enter	Exit	Total	Enter	Exit
Total Approved Development Trips	5,214	259	131	128	442	228	214
Total with Internal Trip Capture Reduction (19%)		-	-	-	358	186	172
34% Pass-by Reduction (Shopping Center)		-	-	-	122	57	61
Total External, Non-Pass-by Trips		**259**	**131**	**128**	**236**	**129**	**111**

Trips associated with approved development were distributed through the network based on the anticipated land use, the surrounding area, and the existing distribution of trips in the vicinity of the proposed site. Trip distribution is illustrated in **Table 6**. This distribution is slightly different than proposed with the previous study. The revised trip distribution considers distribution of existing (year 2018) traffic volumes. The expected trip distribution for the approved development is shown in **Figure 3**.

Table 6. Approved Development Trip Distribution.

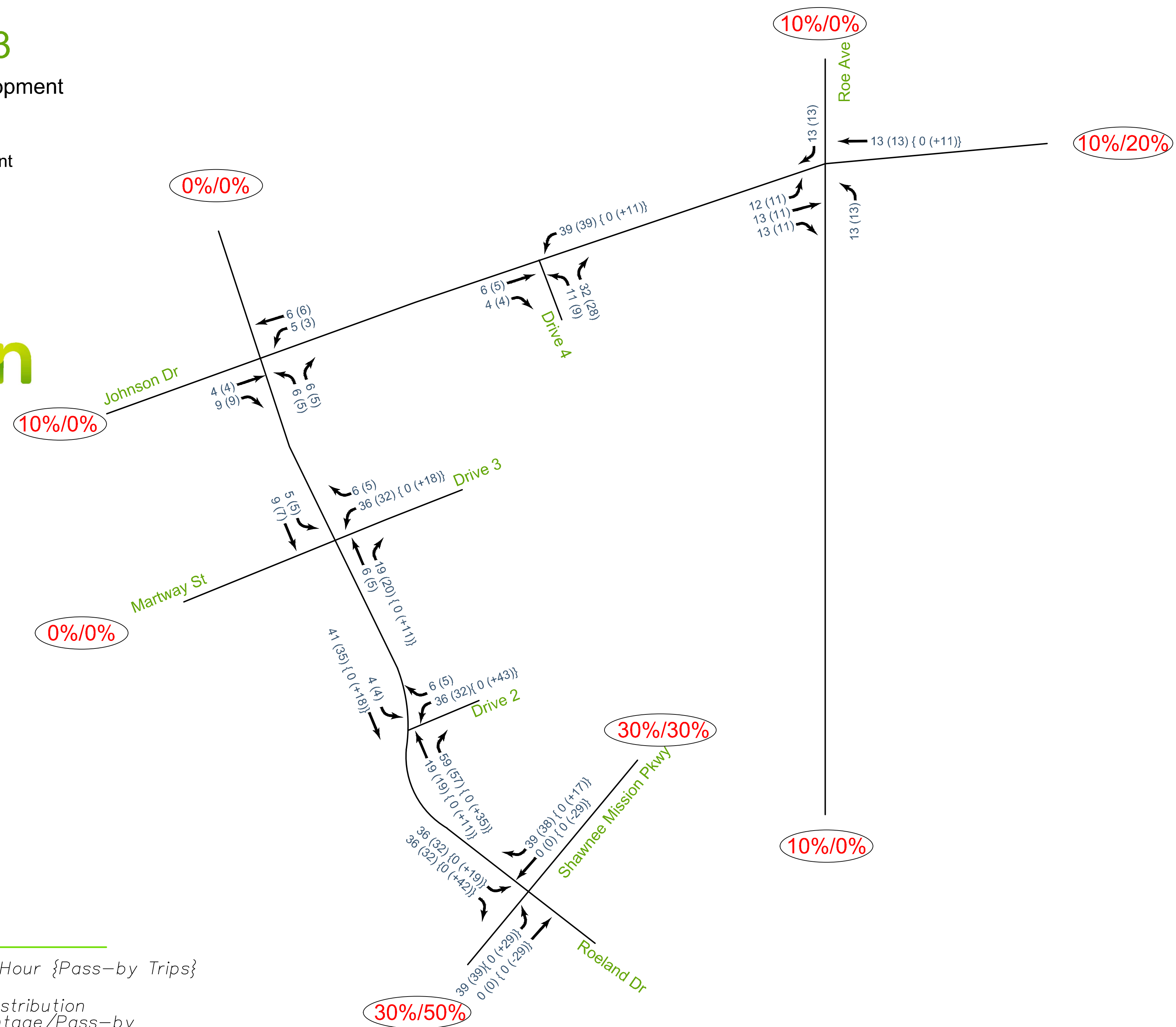
Direction	Trip Distribution
North (Roe Avenue)	10%
South (Roe Avenue)	10%
West (Shawnee Mission Parkway)	30%
West (Johnson Drive)	10%
East (Johnson Drive)	10%
East (Shawnee Mission Parkway)	30%

The resulting existing plus approved development volumes are illustrated in **Figure 4**.

FIGURE 3

Approved Development
Trip Distribution

Gateway Development
Mission, KS



LEGEND

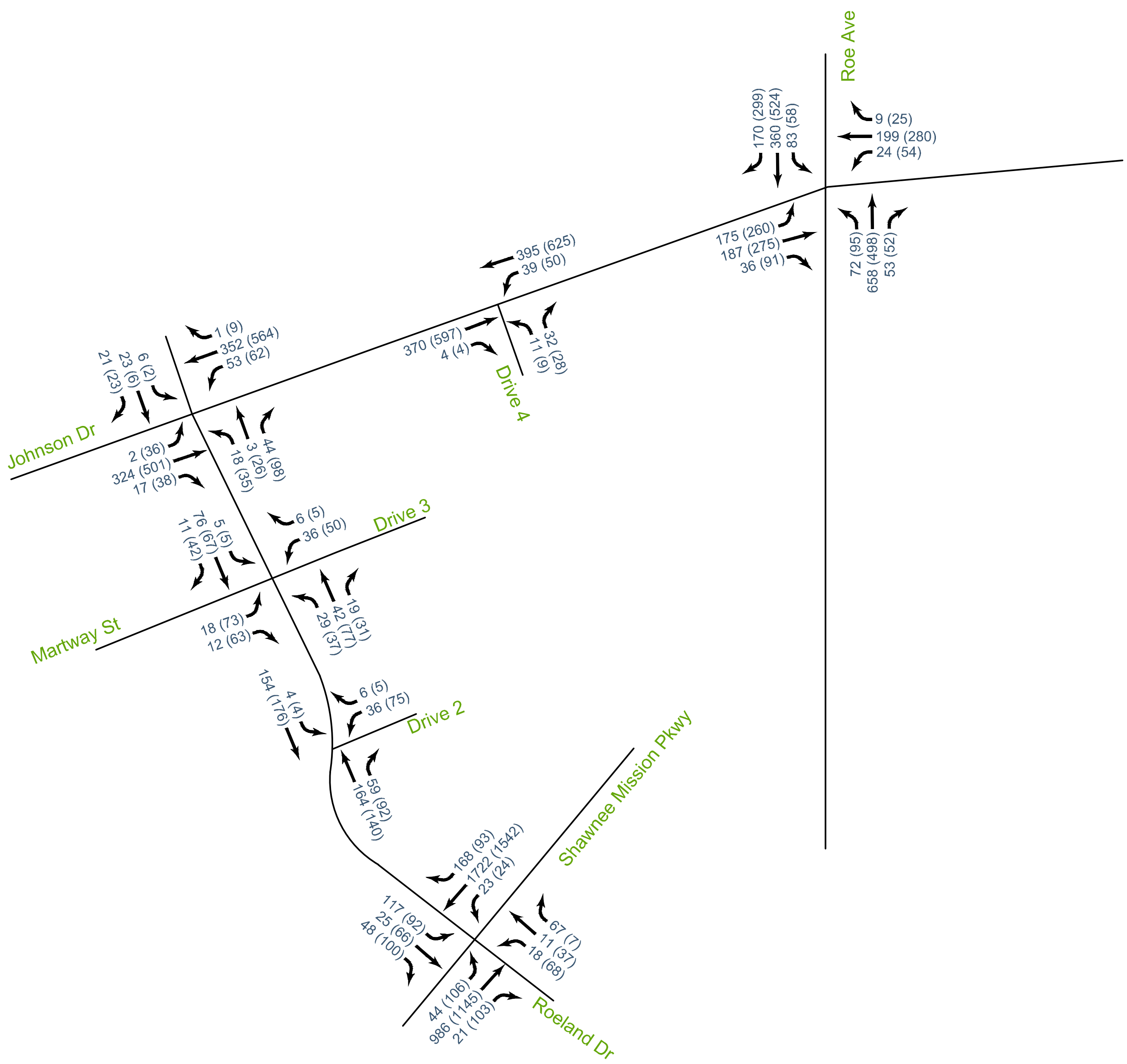
AM (PM) {AM (PM)} Peak Hour {Pass–by Trips}

X%/X% Trip Distribution Percentage/Pass–by Percentage

FIGURE 4

Existing plus Approved
Peak Hour Volumes

Gateway Development
Mission, KS



LEGEND

AM (PM) *Peak Hour Volume*

3.5. Existing plus Approved Capacity Analysis

Capacity analysis was performed for the study intersections utilizing the existing lane configurations and traffic control, including proposed access associated with approved development. Analysis was conducted using Synchro, Version 10, based on the Highway Capacity Manual (HCM) delay methodologies. For the purposes of this report, capacity analysis was updated to reflect the most current methodology. For simplicity, the amount of control delay is equated to a grade or Level of Service (LOS) based on thresholds of driver acceptance. The amount of delay is assigned a letter grade A through F, LOS A representing little or no delay and LOS F representing very high delay. **Table 7** shows the delays associated with each LOS grade for signalized and unsignalized intersections, respectively.

Table 7. Intersection LOS Criteria.

Level of Service	Average Control Delay (seconds)	
	Signalized	Unsignalized
A	< 10	< 10
B	> 10-20	> 10-15
C	> 20-35	> 15-25
D	> 35-55	> 25-35
E	> 55-80	> 35-50
F	> 80	> 50
Highway Capacity Manual (HCM 6th Edition)		

Results of the analysis indicate that the signalized intersections are expected to operate at a LOS C or better during the AM and PM peak hour periods. All individual movements at the intersections are expected to operate at a LOS D or better with acceptable queues during both peak hour periods with the exception of the following movements. The 95th percentile queue represents the queue length that has a 5 percent probability of being exceeded during the peak hour period.

<u>Shawnee Mission Parkway and Roeland Drive</u>

- During the AM peak hour period the eastbound left turn movement is expected to operate at a LOS E. During both peak periods the northbound movements are expected to operate at a LOS E.
    - High levels of delay for the eastbound left-turn movement is attributed to the timings at the intersection which cater to traffic along Shawnee Mission Parkway

during the peak hour periods. The 95th-percentile queue length is expected to be contained within the available storage length.
- Currently there is a lack of capacity for the northbound left-turn movement. Due to right-of-way constraints the northbound approach only has a single lane for all movements.

- The southbound left-turn movement is expected to operate at a LOS F during the AM peak hour period and LOS E during the PM peak hour period.
  - 95th-percentile queue lengths during the AM and PM peak hour are expected to exceed the available capacity; however, the queue is not expected to encroach on the adjacent intersection of Roeland Drive and Rock Creek Lane. This movement will be monitored in later scenarios to determine if geometric changes are needed to accommodate the queue length.
- During the PM peak hour, the southbound right-turn movement is expected to operate at LOS E.
  - The 95th-percentile queue length during the PM peak hour is expected to be contained within the available storage length.

<u>Roe Avenue and Johnson Drive</u>

- During both peak hour periods the westbound left-turn movements are expected to operate at a LOS E.
  - 95th-percentile queue lengths are expected to be contained within the available storage length.
- During the PM peak hour, the eastbound left-turn movement is expected to operate at a LOS E.
  - 95th-percentile queue length is expected to be contained within the available storage length.

All movements at the unsignalized intersections are expected to operate at LOS C or better during both peak hour periods.

Merge analysis was performed for the Johnson Drive to Shawnee Mission Parkway ramp using McTrans Highway Capacity Software, Version 7.8, based on HCM density methodologies. Similar to intersection LOS criteria, merge and diverge segment density is equated to a grade or LOS based on thresholds of driver acceptance. **Table 8** shows the density associated with each LOS grade for merge and diverge segments.

Table 8. Merge and Diverge Segment LOS Criteria

Level of Service	Density (pc/mi/ln)
A	< 10
B	> 10-20
C	> 20-28
D	> 28-35
E	> 35
F	Demand Exceeds Capacity
Highway Capacity Manual (HCM 6th Edition)	

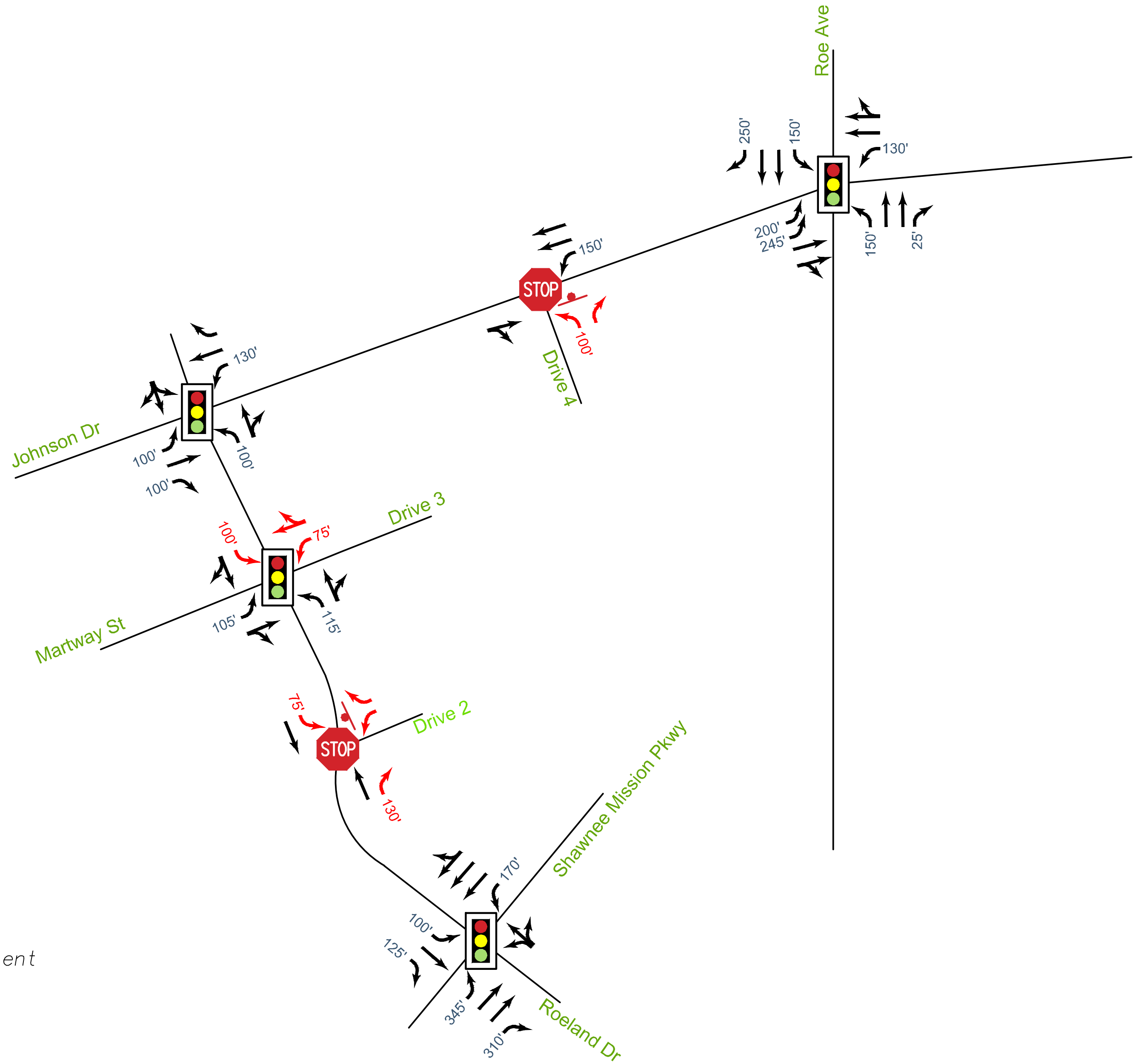
Results of the analysis indicate that the merge section is expected to operate acceptably at LOS B during both peak hour periods.

Existing lane configurations and traffic control for the study network are illustrated in **Figure 5**. The existing plus approved development conditions capacity analysis summary are illustrated in **Figure 6**. Detailed intersection and merge analysis results may be found in **Appendix C**.

FIGURE 5

Existing plus Approved
Lane Configurations
and Traffic Control

Gateway Development
Mission, KS



LEGEND

XX' — Lane Configuration & Storage Length

XX' — Approved Development Lane Configuration

Signalized Intersection

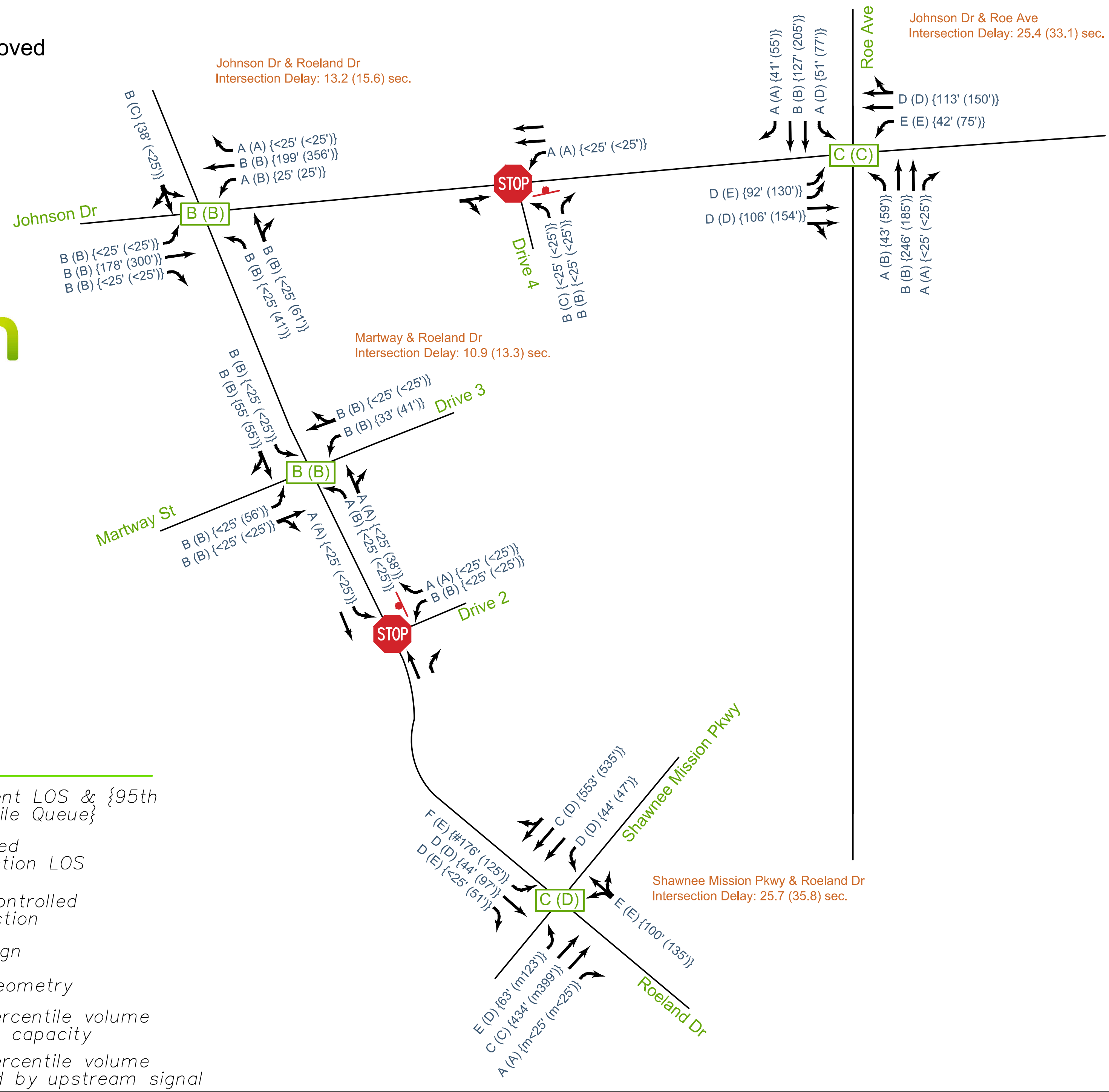
STOP — Stop Controlled Intersection

Stop Sign

FIGURE 6

Existing plus Approved
Level of Service

Gateway Development
Mission, KS



LEGEND

AM (PM) {AM (PM)} — Movement LOS & {95th Percentile Queue}

AM (PM) — Signalized Intersection LOS

STOP — Stop Controlled Intersection

Stop Sign

Lane Geometry

— 95th percentile volume exceeds capacity

m — 95th percentile volume metered by upstream signal

4. EXISTING PLUS APPROVED PLUS PROPOSED DEVELOPMENT CONDITIONS

Conditions with the remaining proposed development in place were evaluated to identify any potential geometric improvements that could be attributed to the additional traffic associated with the proposed development. Land use changes from the previously submitted plan (October 2019) include an increase of general office square footage and removal of the high-turnover (sit-down) restaurant and replacement with a mixed-use space.

The proposed development site will consist of 40,000 square feet of multipurpose recreational facility, an 18-lane bowling alley, a 10 screen movie theater, a 202 room hotel, 105,000 square feet of general office building and 60,076 square feet of space designated for food and entertainment purposes. The site is proposed in the northeast quadrant of the intersection of Shawnee Mission Parkway and Roeland Drive, south and east of the approved residential and retail development. The proposed site plan is illustrated in **Figure 7**.

4.1. Proposed Development Trip Generation and Distribution

Based on the *ITE Trip Generation Manual*, trip generation characteristics were developed for the proposed site using the methods described in **Section 3.3**. The land uses that most resembles the proposed development for this site are Land Use Code 310 (Hotel), Land Use Code 435 (Multipurpose Recreational Facility), Lane Use Code 437 (Bowling Alley), Land Use Code 445 (Movie Theatre) and Land Use Code 710 (General Office Building). The 60,076 square foot space designated as food/entertainment will consist of a food hall (shared seating area serviced by several food vendors), high-turnover (sit-down) restaurant, retail, mini golf, and indoor golf driving range. Land Use Code 930 (Fast Casual Restaurant) was determined to best represent the food hall. Land Use Code 932 (High-Turnover Sit-Down Restaurant), Land Use Code 820 (Shopping Center), Land Use Code 431 (Miniature Golf Course) and Land Use Code 432 (Golf Driving Range) represent the other planned uses. Trip generation for the proposed site is shown in

Table 9. Proposed Development Trip Generation.

Land Use	Size	Average Weekday	AM Peak Hour			PM Peak Hour		
			Total	Enter	Exit	Total	Enter	Exit
Fast Casual Restaurant	24,221 SF	7,634	51	35	16	343	189	154
High-Turnover (Sit-Down) Restaurant	6,348 SF	713	64	36	28	63	40	23
Shopping Center	984 SF	260	153	95	58	18	9	9
Miniature Golf Course*	18 Holes	60	-	-	-	6	2	4
Golf Driving Range	18 Bays	983	29	18	11	90	41	49
Multipurpose Recreational Facility *	40,000 SF	1,440	-	-	-	144	80	64
Bowling Alley*	18 lanes	234	27	26	1	23	16	7
Multiplex Movie Theater *	10 screens	1,380	-	-	-	138	71	67
Hotel	202 Rooms	1,854	96	57	39	126	65	61
General Office Building	105,000 SF	1,113	126	109	17	120	20	100
Total Proposed Trips		**20,885**	**805**	**507**	**298**	**1,513**	**761**	**752**

** Daily ITE trip generation information was not provided. It was assumed that PM trips accounted for 10% of the daily trips.*

Internal capture rates for the proposed development were calculated using methods described in **Section 3.3**. Reviewing the internal capture worksheet results, the internal capture percentage was determined to be 21% in the AM peak hour and 39% in the PM peak hour. Internal capture was updated to reflect the inclusion of approved development with proposed development internal capture calculations.

Pass-by reduction was considered for the retail portion of the development only due to the characteristics of the restaurant space (food hall concept). **Section 3.3** discusses determination of pass-by trips. Trip generation characteristics expected for the site are shown in **Table 10**. Detailed ITE trip generation information can be found in **Appendix C**.

Table 10. Approved Plus Proposed Development Trip Generation.

Land Use	Size	Average Weekday	AM Peak Hour			PM Peak Hour		
			Total	Enter	Exit	Total	Enter	Exit
Apartment*	168 DU	1,230	79	19	60	94	60	34
Shopping Center*	54,594 SF	3,984	180	112	68	348	168	180
Fast Casual Restaurant	24,221 SF	7,634	51	35	16	343	189	154
High-Turnover Sit-Down Restaurant	6,348 SF	713	64	36	28	63	40	23
Shopping Center	984 SF	260	153	95	58	18	9	9
Miniature Golf Course	18 Holes	60	-	-	-	6	2	4
Golf Driving Range	18 Bays	983	29	18	11	90	41	49
Multipurpose Recreational Facility	40,000 SF	1,440	-	-	-	144	80	64
Bowling Alley	18 lanes	234	27	26	1	23	16	7
Multiplex Movie Theater	10 screens	1,380	-	-	-	138	71	67
Hotel	202 Rooms	1,854	96	57	39	126	65	61
General Office Building	105,000 SF	1,113	126	109	17	120	20	100
Total Approved plus Proposed Trips		**20,885**	**805**	**507**	**298**	**1,513**	**761**	**752**
Total with Internal Trip Capture (AM 21%/PM 39%)			637	423	214	925	467	458
34% Pass-by (Approved Shopping Center)			-	-	-	103	50	53
Total External, Non-Pass-by Trips			**637**	**423**	**214**	**822**	**417**	**105**

**Trips were analyzed in existing plus approved scenario.*

Comparing trip generation to the October 2019 submittal, the modifications to proposed land use are expected to result in a decrease of 81 trips during the AM peak hour period and an increase of 117 trips during the PM peak hour period.

Trips were distributed through the network using the same trip distribution as developed for approved development as discussed in **Section 3.3.** The expected trip distribution for the approved and proposed development is shown in **Figure 8**. The resulting existing plus approved plus proposed development volumes are illustrated in **Figure 9**.

4.2. Access Characteristics

In addition to the drives constructed for the approved development, three additional access points are planned to serve the proposed development, as illustrated in the site plan (**Figure 7)**. Drive 1 is proposed to be located 350’ north of the intersection of Shawnee Mission Parkway and Roeland Drive. This access point will be the east leg of the unsignalized intersection of 60th Terrace and Roeland Drive. Drive 1 utilizes an existing curb cut at the intersection or Roeland Drive and 60th Terrace.

Two access points will be located along Roe Avenue, approximately 225’ (Drive 5) and 550’ (Drive 6) south of the intersection of Roe Avenue and Johnson Drive. Drive 6 corresponds with the location of an existing curb cut along Roe Avenue. All drives are proposed to provide two lanes, one lane each for egress and ingress traffic.

A raised median is currently provided along Roe Avenue south of Johnson Drive. Due to the presence of the median, access will be limited at Drives 5 and 6 to right-in/right-out movements only. It is recommended to extend the current median along the south leg of Roe Avenue and Johnson Drive south to the median under the Shawnee Mission Parkway overpass to ensure limitation of left-turn access at Drives 5 and 6 along Roe Avenue.

Minimum throat distance of 75’ should be provided at each proposed drive to allow for vehicles to stack internal the site without effecting vehicles maneuvering within the site.

Access Spacing: Access spacing recommendations outlined in KDOT’s AMP were reviewed to determine if the drives associated with the proposed development meet access spacing recommendations. Although Roe Avenue and Roeland Drive are not KDOT routes, access spacing requirements using KDOT policy were referenced. Roe Avenue was considered a Class C route, Roeland Drive was considered a Class D route.

According to the policy, access points along Class C and D routes in developed areas should be spaced 120’ along roadways with a speed limit of 25 mph (Roeland Drive), and 200’ along roadways with a speed limit of 35 mph (Roe Avenue).

Along Roeland Drive, Drive 1 meets minimum spacing guidance including acceptable spacing from the intersection of Shawnee Mission Parkway and Roeland Drive. The minimum upstream functional length for the intersection of Shawnee Mission Parkway and Roeland Drive was calculated to be 359’; the distance from Drive 1 to the stop bar of the southbound approach at Shawnee Mission Parkway and Roeland Drive is 360’. Corner clearance recommendations found in *Table 4-10* of the AMP requires 115’ of spacing from the edge of the curb line of Shawnee Mission Parkway to the edge of curb line of Drive 1. The location of Drive 1 exceeds recommended corner clearance. Detailed calculations can be found in **Appendix C**. In addition to reviewing intersection spacing, alignment with existing drives was reviewed. Drive 1 is proposed to align with an existing intersection which is a preferred condition.

Along Roe Avenue, Drive 5 meets minimum spacing guidance. Drive 6 meets minimum spacing guidance from Drive 5. The access spacing between Drives 5 and 6 is 315’ which is more than the recommended 200’.

<u>Truck Movements:</u> Considering the density of the development, truck and emergency access to and through the site should be considered when developing the site plan. It is indicated on the current site plan that Drive 5 may service large trucks (deliveries and trash disposal). It is recommended that the parking lot that is served by Drive 5 be modified to accept truck traffic. This includes providing proper corner radii at driveways to accept truck traffic and space to maneuver within the site.

A 100’ right-turn lane should be provided for the southbound movement at Drive 5 to accommodate anticipated truck traffic and to prevent truck traffic from impeding through traffic along Roe Avenue. Capacity analysis will be reviewed to determine if provided throat length at proposed drives is adequate to accommodate the expected vehicular traffic at each proposed access location.

FIGURE 7

Site Plan

Gateway Development
Mission, KS

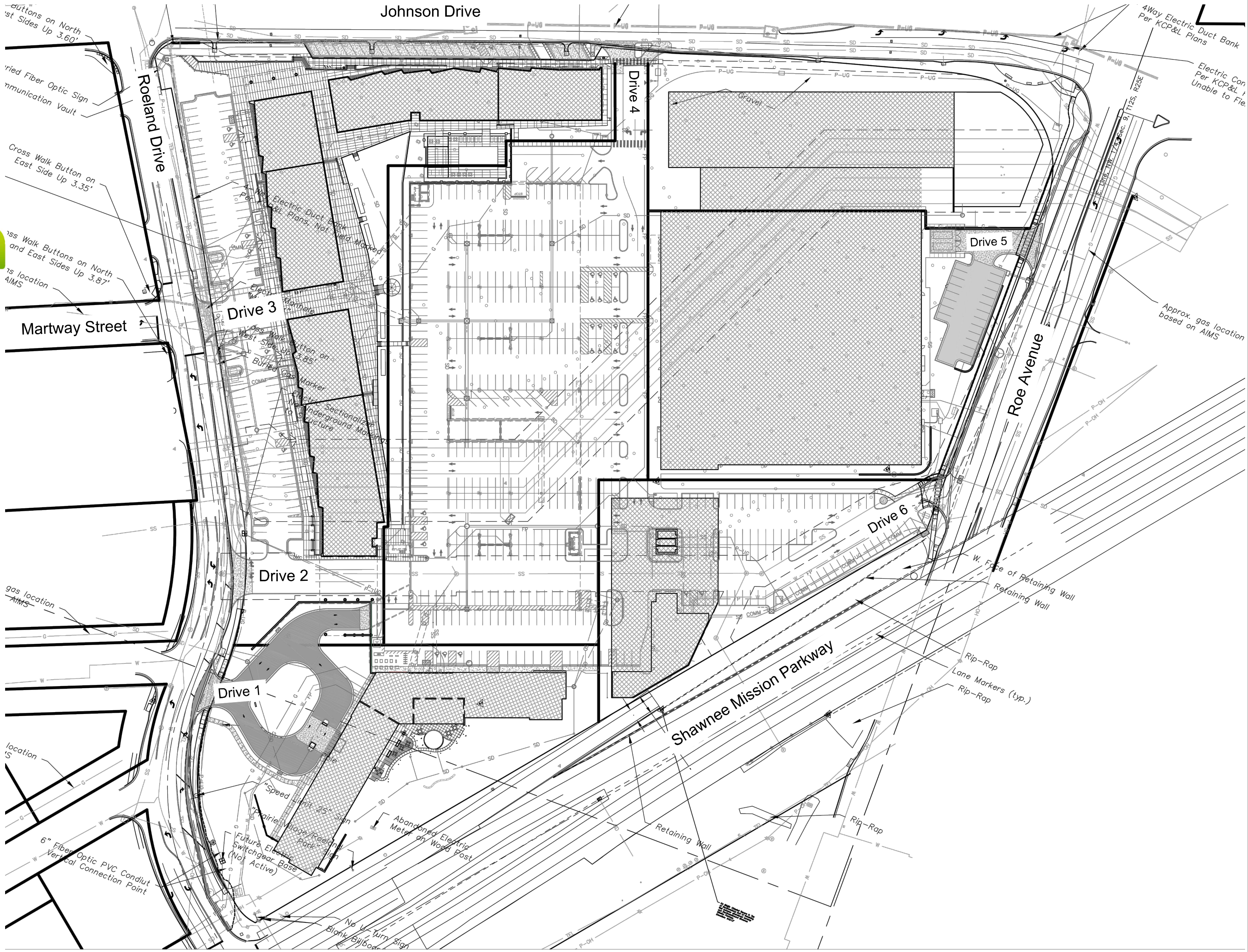
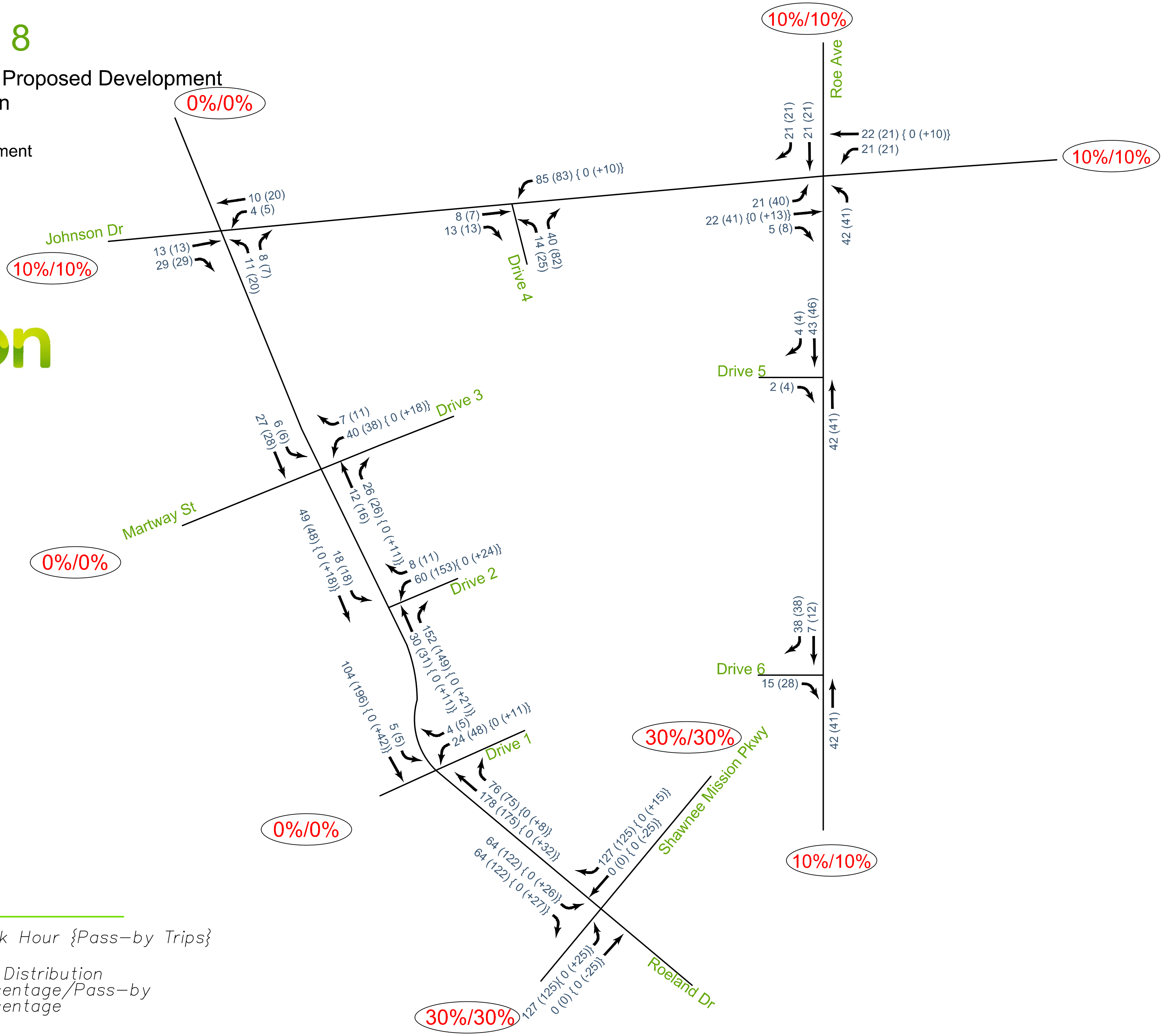


FIGURE 8

Approved plus Proposed Development
Trip Distribution

Gateway Development
Mission, KS



LEGEND

AM (PM) {AM (PM)} *Peak Hour {Pass–by Trips}*

X%/X% *Trip Distribution Percentage/Pass–by Percentage*

FIGURE 9

Existing plus Approved plus Development
Peak Hour Volumes

Gateway Development
Mission, KS

LEGEND

AM (PM) *Peak Hour Volume*

4.3. Existing Plus Approved Plus Proposed Development Warrant Analysis

Existing plus Approved plus Proposed Development Turn Lane Warrants: The KDOT AMP *Table 4-26* was used to determine whether an auxiliary right-turn lane is warranted at each study intersection. According to the table, a westbound right-turn lane is warranted at Shawnee Mission Parkway and Roeland Drive. Currently, a third through lane is added at the intersection. This through lane begins approximately 250' to the northeast of the intersection and is part of a ramp that previously provided access from Roe Avenue to Shawnee Mission Parkway. The ramp has been removed and is not operational, however the portion of the lane that merged with Shawnee Mission Parkway remains. Due to the configuration of the additional lane as it approaches the intersection (as a merge lane from the removed ramp), the lane is underutilized by through traffic in its current state and operates primarily as a right-turn lane. It is recommended to provide an appropriate taper along Shawnee Mission Parkway by restriping the existing pavement markings. The turn lane, including taper, should have a total length of 350' to accommodate right-turn vehicles decelerating from 45 mph.

Table 4-26 relates right-turn lane requirements to roadway speed; roadways with speed limits less than 35 mph will not require a right-turn lane. Operations will be reviewed to determine if additional right-turn lanes are recommended.

Table 4-27 and *Table 4-28* of KDOT's AMP was used to determine whether an auxiliary left-turn lane is warranted at each study intersection. According to the tables, no additional left-turn lanes are warranted under existing plus approved plus proposed development conditions.

Existing lane configurations and traffic control for the study network are illustrated in **Figure 10**. Turn lane warrant analysis sheets can be found in **Appendix C**.

4.4. Existing Plus Approved Plus Proposed Development Capacity Analysis

Capacity analysis was performed for existing plus approved plus proposed development conditions using the methodologies described in **Section 3.5**. Existing timings were not modified; however, it is recommended to retime the signals at the intersections of Roe Avenue with Johnson Drive and Shawnee Mission Parkway and Roeland Drive to accommodate the proposed development traffic. Timing updates are expected to increase the operations of the intersection of Shawnee Mission Parkway and Roeland Drive. Capacity analysis will be illustrated in the figures for any improvements recommend in this section. Peak hour factors observed under existing conditions were changed to represent an increase in traffic.

Results of the analysis indicate that the signalized study intersections are expected to operate at similar levels of service to the existing plus approved development conditions with the following exceptions:

<u>Shawnee Mission Parkway and Roeland Drive</u>

- AM peak hour period
  - Overall operations are expected to be remain at a LOS C.
  - The eastbound left turn movement is expected to operate at a LOS F and the southbound right-turn movement is expected to operate at LOS E. Side street and turning movements at the intersection may operate at a lower level of service due to signal timings accommodating higher volume through traffic along Shawnee Mission Parkway.
    - The southbound right-turn movement 95th-percentile queue length is expected to be minimal.
    - The eastbound left-turn movement 95th-percentile queue length is expected to be contained within the available storage length and is metered by the upstream signal at Shawnee Mission Parkway and Nall Avenue. However, the turn bay length does not meet current KDOT standards. To meet KDOT standard, it is recommended to extend the existing turn lane by 60’ from 330’ to 390’ to meet the required KDOT turn lane length.
- PM peak hour period
  - Overall operations are expected to remain at a LOS D.
  - The eastbound left-turn movement is expected to operate at a LOS E. The southbound left and right-turn movements are expected to operate at a LOS F. As stated for the AM peak hour period, lower level of service may occur for side street or turning movements at the intersection as high volume through traffic along Shawnee Mission Parkway is accommodated.
  - The southbound right-turn movement 95th-percentile queue length is expected to be minimal.
  - The eastbound left-turn movement 95th-percentile queue length is expected to be contained within the available storage length.
- It is recommended to increase capacity of the southbound left-turn movement. It is anticipated that queue lengths will extend past the existing intersection of Roeland Drive and Rock Creek Lane during portions of the AM and PM peak hour periods. Due to the existing proximity to the unsignalized intersection of Roeland Drive and Rock Creek Lane, it is not feasible to extend the existing single left-turn lane to provide additional storage. Dual southbound left-turn lanes should be provided at the intersection of

Shawnee Mission Parkway and Roeland Drive to accommodate the southbound left-turn movement. The intersection is currently operating under split phasing for the north and southbound movements, thus additional capacity can be added for the left-turn movement by re-striping the southbound through lane to a through/left-turn lane.

- The curb radius of the northeast quadrant of the intersection should be modified to support large trucks. Curb radii should match the recommend 25'-45' radius for curb and gutter sections found in Table 4-16 of KDOT's AMP.

All movements at the unsignalized intersections are expected to operate at LOS C or better during both peak hour periods, similar to existing plus approved development conditions.

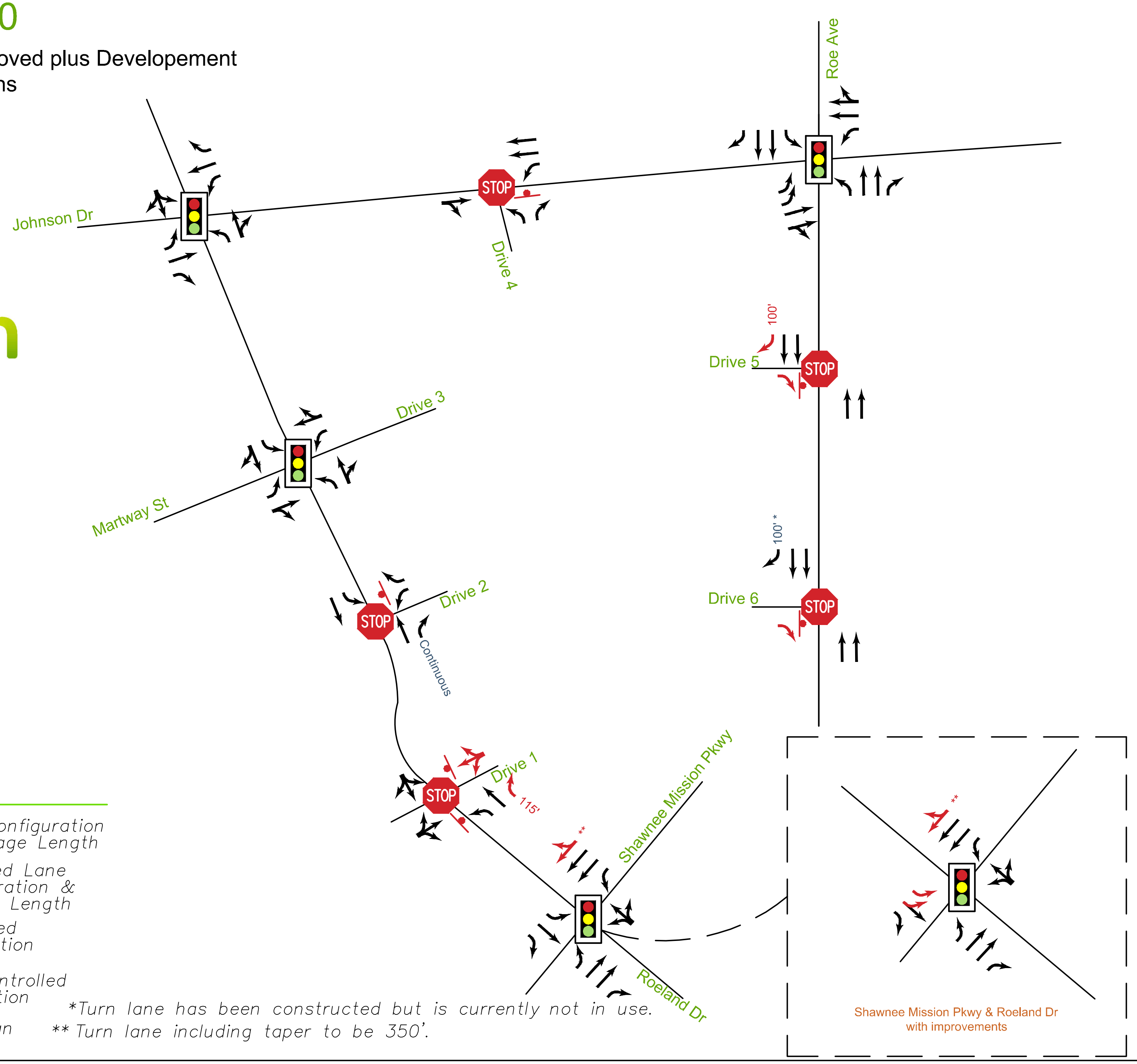
Merge analysis was performed for the Johnson Drive to Shawnee Mission Parkway ramp using the methodologies described in **Section 3.5**. Results of the analysis indicate that the merge section is expected to operate acceptably at LOS B during both peak hour periods.

The existing plus approved plus proposed development conditions capacity analysis summary are illustrated in **Figure 11**. Detailed intersection and merge analysis results may be found in **Appendix D**.

FIGURE 10

Existing plus Approved plus Developement
Lane Configurations
and Traffic Control

Gateway Development
Mission, KS



LEGEND

Lane Configuration & Storage Length

XX' Proposed Lane Configuration & Storage Length

Signalized Intersection

Stop Controlled Intersection

Stop Sign

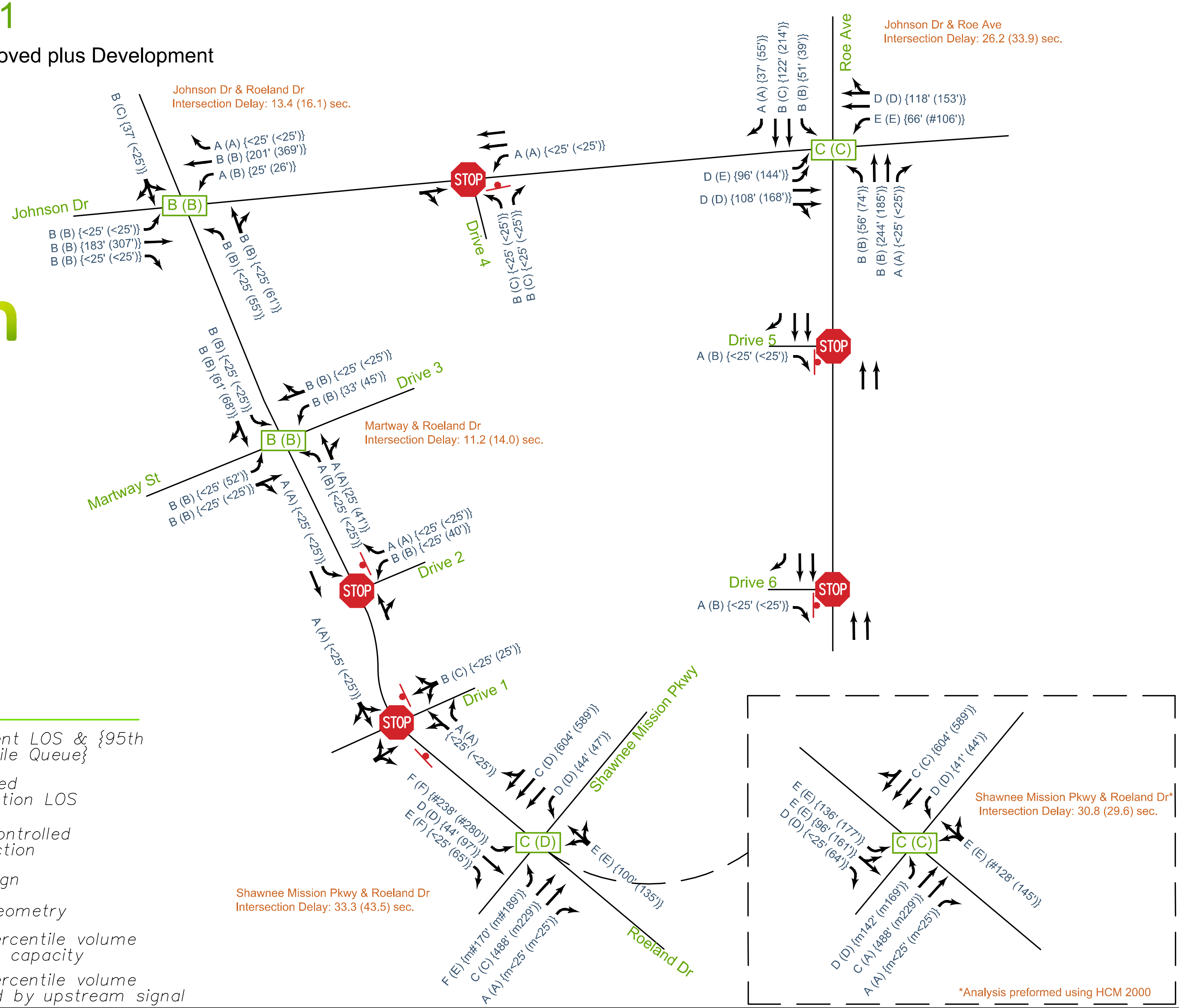
*Turn lane has been constructed but is currently not in use.

** Turn lane including taper to be 350'.

FIGURE 11

Existing plus Approved plus Development
Level of Service

Gateway Development
Mission, KS



LEGEND

AM (PM) {AM (PM)}	Movement LOS & {95th Percentile Queue}
AM (PM)	Signalized Intersection LOS
STOP	Stop Controlled Intersection
	Stop Sign
	Lane Geometry
#	95th percentile volume exceeds capacity
m	95th percentile volume metered by upstream signal

5. FUTURE YEAR 2038 CONDITIONS

The future year 2038 condition considers approved and proposed development volumes plus growth of background traffic volumes. Based on a review of historical traffic count data provided from 2011-2016 by KDOT along Shawnee Mission Parkway, a 3% annual growth rate was used for traffic volumes along public roadways. Growth rate used in the previous 2017 study was 0.5% based on data provided by KDOT at the time (2010-2014). Since this time data has been provided for 2015 and 2016 which resulted in an increase of the annual growth rate. The calculated growth rate was applied to existing volumes for the through movements at the study intersections of Shawnee Mission Parkway with Roeland Drive and Roe Avenue with Johnson Drive to obtain future year background volumes. Volumes were subsequently adjusted through adjacent study intersections. Background traffic growth volumes were added to existing plus approved plus development volumes to obtain future year 2038 traffic volumes.

Figure 12 illustrates the future year 2038 volumes. Additional information for the calculation of background traffic are provided in **Appendix E.**

5.1. Future Year 2038 Warrant Analysis

Turn Lane Warrants: It was determined that no additional turn lanes are warranted considering future year 2038 volumes.

Future year 2038 lane configuration and traffic control for the study network are illustrated in **Figure 13.** Turn lane warrant analysis sheets can be found in **Appendix E.**

5.2. Future Year 2038 Capacity Analysis

Capacity analysis was performed for future conditions using the methodologies described in **Section 3.3**. Split times were updated to account for an increase in background traffic while cycle lengths remained unchanged. Improved operations may be achieved by reviewing signal coordination along the Shawnee Mission Parkway and Roe Avenue corridors. All signalized individual movements are expected to operate with a similar LOS as existing plus approved plus proposed development conditions with the following exceptions:

Johnson Drive and Roe Avenue

- The intersection is expected to operate at a LOS D during the PM peak hour period. The decrease in LOS from previous conditions is expected to be related to an increase in background traffic volumes.
    - The westbound through/right-turn movements are expected to operate at LOS E during the AM and PM peak hour periods. 95th-percentile queue lengths are not expected to extend to Shawnee Mission Parkway.

<u>Shawnee Mission Parkway and Roeland Drive</u>

- Overall operations at the intersection are expected to decrease to LOS F with numerous individual movements expected to operate at LOS F. Poor operations are attributed to the high volume of traffic served by the intersection (lack of capacity) and the signal operating split phased for the north and south movements.
    - If future traffic volumes materialize, it is recommended to consider the following improvements to improve operations:
        - Provide dual eastbound left turn lanes with 350’ of storage.
        - Provide dedicated northbound left-turn lane with 100’ of storage.
        - Provide dedicated westbound right-turn lane with 230’ of storage.
        - Update signal timings.
        - These improvements would be expected to improve overall operations to a LOS E during the AM and PM peak hour periods. Individual movements would be expected to operate at LOS E or better during both peak periods, with 95th-percentile queue lengths contained within available storage.

All movements at the unsignalized intersections are expected to operate at LOS C or better during both peak hour periods, similar to existing plus approved plus proposed development conditions.

Merge analysis was performed for the Johnson Drive to Shawnee Mission Parkway ramp using the methodologies described in **Section 3.5**. Results of the analysis indicate that the merge section is expected to operate acceptably at LOS C and D during the AM and PM peak hours, respectively.

Future operations are based on an increase in background traffic growth based on historical traffic volumes. These volumes may materialize differently due to changes in development or modifications to the roadway network. Operations of study intersections should be monitored to determine if volumes materialize and roadway improvements made based on actual conditions. Poor operations indicated during the future scenario can be attributed to background traffic growth and is not specifically attributed to trips associated with the proposed development.

The future year conditions capacity analysis summary is illustrated in **Figure 14**. Detailed intersection and merge analysis results may be found in **Appendix E**.

FIGURE 12

Future 2038
Peak Hour Volumes

Gateway Development
Mission, KS

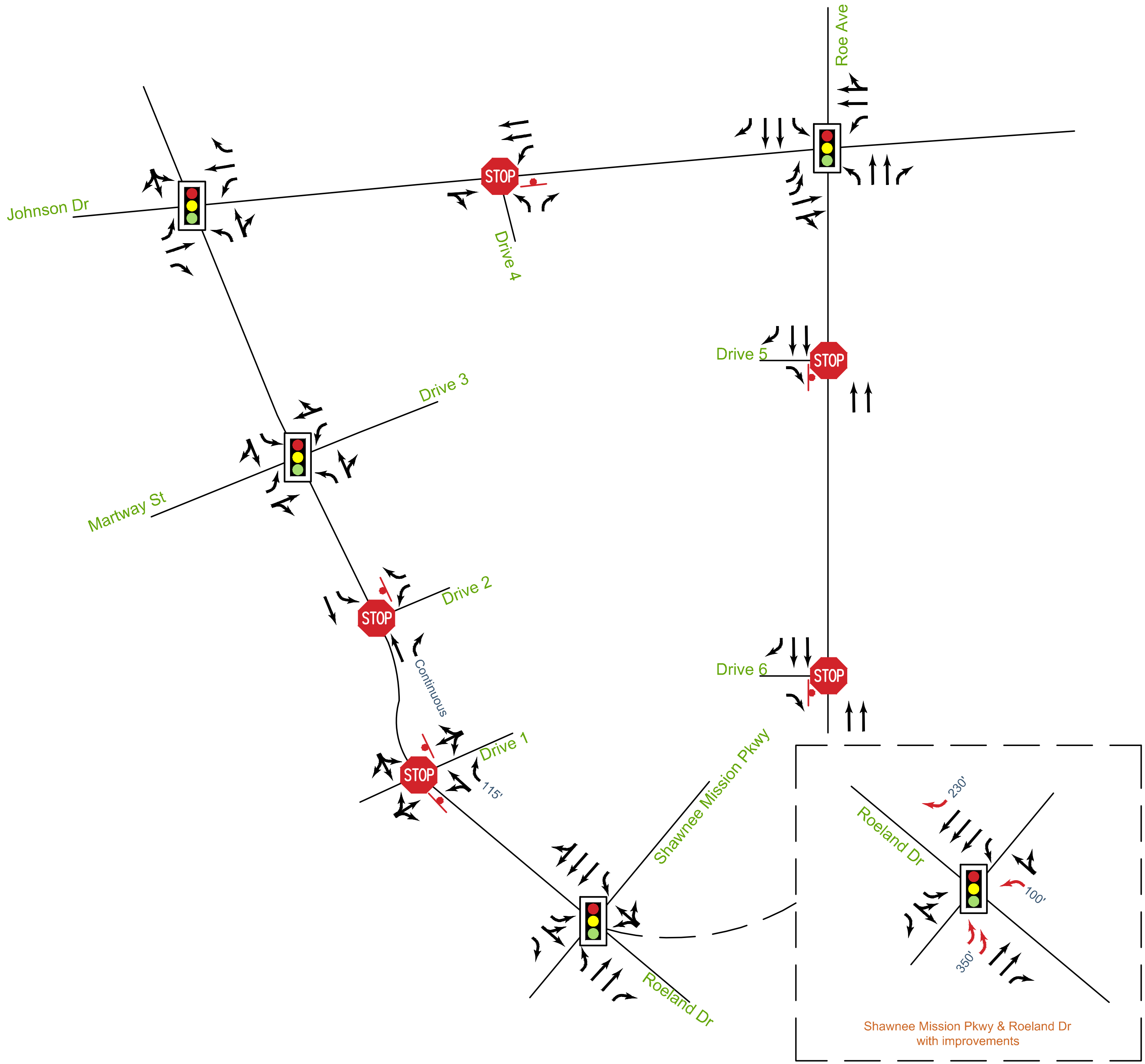
LEGEND

AM (PM) *Peak Hour Volume*

FIGURE 13

Future 2038
Lane Configurations
and Traffic Control

Gateway Development
Mission, KS



LEGEND

Lane Configuration & Storage Length

XX' *Proposed Lane Configuration & Storage Length*

Signalized Intersection

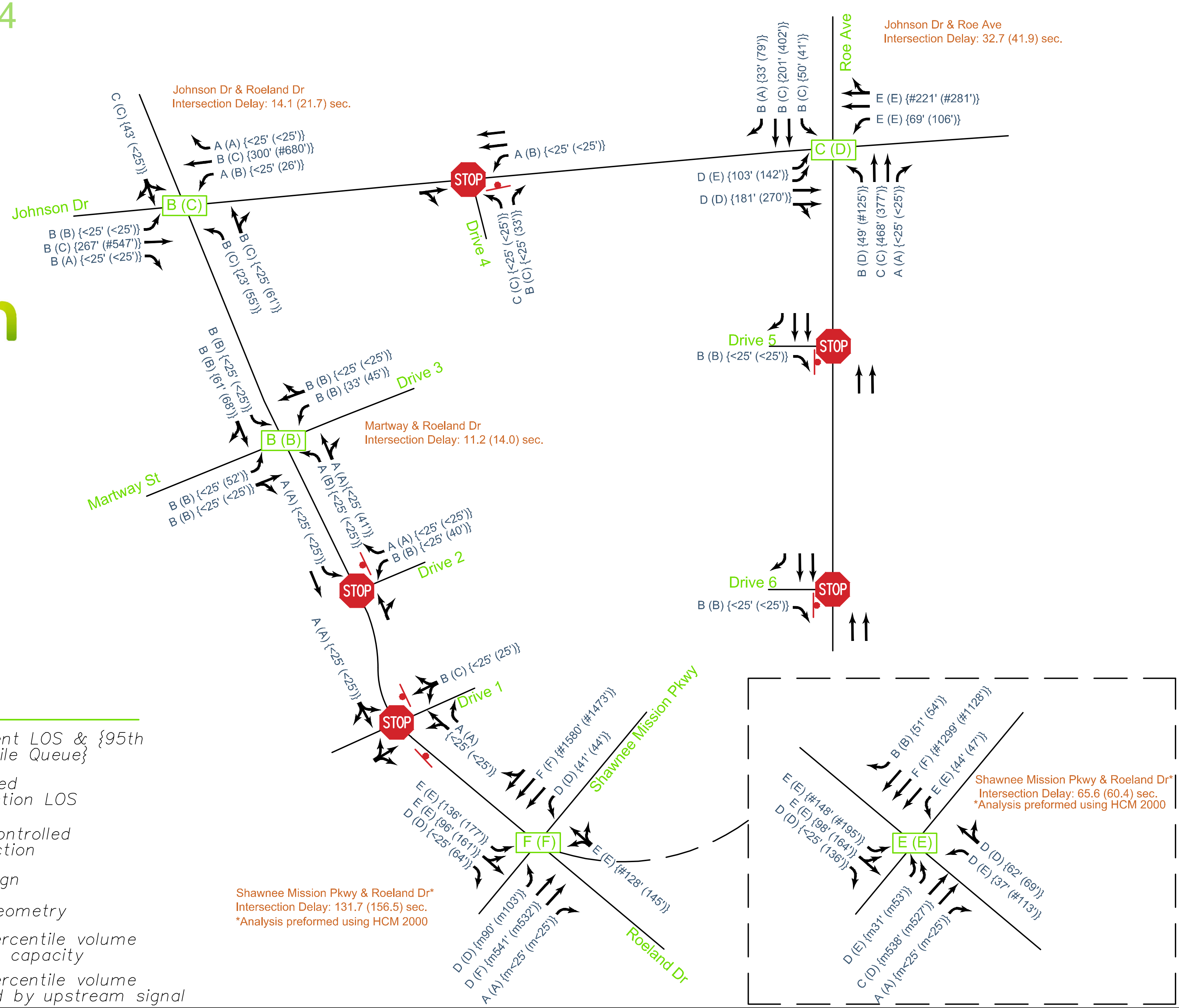
STOP *Stop Controlled Intersection*

Stop Sign

FIGURE 14

Future 2038
Level of Service

Gateway Development
Mission, KS



LEGEND

AM (PM) {AM (PM)}	Movement LOS & {95th Percentile Queue}
AM (PM)	Signalized Intersection LOS
STOP	Stop Controlled Intersection
	Stop Sign
	Lane Geometry
#	95th percentile volume exceeds capacity
m	95th percentile volume metered by upstream signal

6. SUMMARY

This report summarizes analysis conducted considering approved and proposed development located in the northeast quadrant of the intersection of Shawnee Mission Parkway and Roeland Drive in Mission, Kansas.

6.1. Conclusions

The general findings to note for the traffic impact study include the following:

1. Reviewing existing plus approved development conditions, study intersections are expected to operate at acceptable levels of service.
2. Based on the 2017 study the signal at Roeland Drive and Martway Street does not warrant a signal under Warrant 3 criteria. It was recommended in the previous study to keep the signal in place to provide pedestrian accommodations for the Rock Creek Trail. The intersection was analyzed as signalized because the signal will be operational after the construction of the approved development.
3. After development of the site, traffic operations at the study intersections are not expected to be significantly impacted.
4. The site should be designed to accommodate truck traffic at Drives 5 and 6. This includes providing adequate corner radii at Drives 5, 6, and the northbound leg of Shawnee Mission Parkway and Roeland Drive. A southbound 100’ right turn lane should also be provided at Drive 5. The parking lot that is currently shown on the site plan should be designed to allow truck traffic the ability to maneuver within the site.
5. Future year 2038 analysis indicates that the study intersections are expected to operate with longer queue lengths and delays. These volumes may materialize differently due to changes in development or modifications to the roadway network. Operations of study intersections should be monitored to determine if volumes materialize and roadway improvements are made based on actual conditions. Poor operations indicated during the future scenario can be attributed to background traffic growth and is not specifically attributed to trips associated with the proposed development.

6.2. Recommendations

Based on review and analysis of the approved and proposed development, the following improvements are recommended in addition to the approved improvements associated with the residential and retail development:

<u>Existing plus Approved Conditions</u>

- No additional improvements are recommended in addition to the approved improvements.

Existing plus Approved plus Proposed Development Conditions

- Increase the eastbound left-turn lane at Shawnee Mission Parkway and Roeland Drive by 60’ from 330’ to 390’ to meet KDOT required turn lane length.
- Re-time signals at the intersections of Shawnee Mission Parkway with Roeland Drive and Roe Avenue with Johnson Drive to accommodate development trips.
- Re-stripe the north leg of the intersection of Shawnee Mission Parkway and Roeland Drive to provide a dedicated southbound left-turn lane, shared through/left-turn lane, and dedicated southbound right-turn lane.
- Modify the curb radius in the northeast quadrant of the intersection of Shawnee Mission Parkway and Roeland Drive to support large trucks. Plans are currently being completed by the design team, thus exact curb radius and anticipated design vehicle information is not available at this time. Intersection design should meet requirements of the maintaining agency (City or State).
- The existing pavement markings for the outside through lane along Shawnee Mission Parkway at Roeland Drive should be restriped to provide an appropriate taper for the existing outside westbound lane. Turn lane including taper should be 350’ in length to accommodate right-turn vehicles decelerating from 45 mph.
- Extend the median along Roe Avenue to limit right-in/right-out access at Drives 5 and 6.
- Provide appropriate corner radii at Drives 5 and 6 to accommodate truck traffic.
- Provide a 100’ southbound right-turn lane at Drive 5 along Roe Avenue.
- Minimum throat distance of 75’ should be provided at each proposed drive to allow for vehicles to stack internal the site without effecting vehicles maneuvering within the site.
- Pedestrian accommodations should be provided along the north and west legs at the intersection of Shawnee Mission Parkway and Roeland Drive. Accommodations should conform with ADA standards; this includes adequate ramp design with detectable warnings and vibrotactile push buttons.

Future Year 2038 Conditions

- If volumes materialize in the future, it is recommended to consider the following improvements to improve operations at the intersection of Shawnee Mission Parkway and Roeland Drive:
    - Provide dual eastbound left turn lanes with 350’ of storage.
    - Provide dedicated northbound left-turn lane with 100’ of storage.
    - Provide dedicated westbound right-turn lane with 230’ of storage.
    - Update signal timings.

APPENDIX A

Data Collection

Count Data

Olsson Associates : Overland Park
7301 West 133rd St

Overland Park, Kansas, United States 66213
913.381.1170 tmchenry@olssonassociates.com

Count Name: Johnson Dr & Roe Ave
Site Code:
Start Date: 10/04/2018

Turning Movement Data

Start Time	Roe Ave Southbound					Ramps on/off Shawnee Mission Pkwy Westbound					Roe Ave Northbound					Johnson Dr Eastbound					
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
7:00 AM	26	51	11	0	88	1	38	2	0	41	8	81	10	0	99	1	27	19	0	47	275
7:15 AM	32	67	25	0	124	0	24	3	0	27	7	95	11	0	113	7	28	36	0	71	335
7:30 AM	45	96	17	0	158	1	39	7	0	47	17	159	7	0	183	7	38	45	0	90	478
7:45 AM	34	96	24	0	154	1	47	6	0	54	16	174	23	0	213	3	45	44	0	92	513
Hourly Total	137	310	77	0	524	3	148	18	0	169	48	509	51	0	608	18	138	144	0	300	1601
8:00 AM	41	89	20	0	150	7	53	5	0	65	2	192	13	0	207	9	41	47	0	97	519
8:15 AM	37	79	22	0	138	0	47	6	0	53	18	133	16	0	167	4	50	27	0	81	439
8:30 AM	36	71	21	0	128	0	37	7	0	44	9	122	12	0	143	4	40	46	0	90	405
8:45 AM	36	79	17	0	132	4	32	9	0	45	11	111	14	0	136	5	33	47	0	85	398
Hourly Total	150	318	80	0	548	11	169	27	0	207	40	558	55	0	653	22	164	167	0	353	1761
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:30 PM	76	111	10	0	197	5	60	12	0	77	10	87	15	0	112	25	59	51	0	135	521
4:45 PM	64	116	13	0	193	10	75	6	0	91	8	88	21	1	118	18	46	60	0	124	526
Hourly Total	140	227	23	0	390	15	135	18	0	168	18	175	36	1	230	43	105	111	0	259	1047
5:00 PM	81	105	11	0	197	5	74	12	0	91	8	105	27	1	141	23	69	82	0	174	603
5:15 PM	74	156	14	0	244	10	58	14	0	82	13	146	18	0	177	25	72	70	0	167	670
5:30 PM	53	140	20	0	213	7	62	17	2	88	18	137	18	0	173	15	55	45	0	115	589
5:45 PM	78	123	13	0	214	3	62	9	0	74	13	110	18	0	141	17	68	51	1	137	566
Hourly Total	286	524	58	0	868	25	256	52	2	335	52	498	81	1	632	80	264	248	1	593	2428
6:00 PM	52	96	7	0	155	3	40	9	0	52	8	119	21	0	148	16	40	64	0	120	475
6:15 PM	51	90	10	0	151	8	37	6	0	51	9	91	19	0	119	16	48	43	0	107	428
Grand Total	816	1565	255	0	2636	65	785	130	2	982	175	1950	263	2	2390	195	759	777	1	1732	7740
Approach %	31.0	59.4	9.7	0.0	-	6.6	79.9	13.2	0.2	-	7.3	81.6	11.0	0.1	-	11.3	43.8	44.9	0.1	-	-
Total %	10.5	20.2	3.3	0.0	34.1	0.8	10.1	1.7	0.0	12.7	2.3	25.2	3.4	0.0	30.9	2.5	9.8	10.0	0.0	22.4	-
Lights	780	1534	227	0	2541	65	767	130	2	964	173	1929	260	2	2364	194	742	750	1	1687	7556
% Lights	95.6	98.0	89.0	-	96.4	100.0	97.7	100.0	100.0	98.2	98.9	98.9	98.9	100.0	98.9	99.5	97.8	96.5	100.0	97.4	97.6
Mediums	31	27	28	0	86	0	17	0	0	17	2	18	3	0	23	1	17	25	0	43	169
% Mediums	3.8	1.7	11.0	-	3.3	0.0	2.2	0.0	0.0	1.7	1.1	0.9	1.1	0.0	1.0	0.5	2.2	3.2	0.0	2.5	2.2
Articulated Trucks	5	4	0	0	9	0	1	0	0	1	0	3	0	0	3	0	0	2	0	2	15
% Articulated Trucks	0.6	0.3	0.0	-	0.3	0.0	0.1	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.3	0.0	0.1	0.2

Olsson Associates : Overland Park
7301 West 133rd St

Overland Park, Kansas, United States 66213
913.381.1170 tmchenry@olssonassociates.com

Count Name: Johnson Dr & Roe Ave
Site Code:
Start Date: 10/04/2018

Roe Ave [N]

Out	In	Total
2744	2541	5285
43	86	129
5	9	14
2792	**2636**	**5428**

R	T	L	U
780	1534	227	0
31	27	28	0
5	4	0	0
816	**1565**	**255**	**0**

Johnson Dr [W]

Out	In	Total
1808	1687	3495
51	43	94
6	2	8
1865	**1732**	**3597**

U	L	T	R
1	750	742	194
0	25	17	1
0	2	0	0
1	**777**	**759**	**195**

10/04/2018 7:00 AM
Ending At
10/04/2018 6:30 PM

Lights
Mediums
Articulated Trucks

Ramps on/off Shawnee Mis

Out	In	Total
1144	964	2108
47	17	64
0	1	1
1191	**982**	**2173**

R	T	L	U
65	767	130	2
0	17	0	0
0	1	0	0
65	**785**	**130**	**2**

U	L	T	R
2	260	1929	173
0	3	18	2
0	0	3	0
2	**263**	**1950**	**175**

Out	In	Total
1860	2364	4224
28	23	51
4	3	7
1892	**2390**	**4282**

Roe Ave [S]

Turning Movement Data Plot

Olsson Associates : Overland Park
7301 West 133rd St

Overland Park, Kansas, United States 66213
913.381.1170 tmchenry@olssonassociates.com

Count Name: Johnson Dr & Roe Ave
Site Code:
Start Date: 10/04/2018

Turning Movement Peak Hour Data (7:30 AM)

Start Time	Roe Ave Southbound					Ramps on/off Shawnee Mission Pkwy Westbound					Roe Ave Northbound					Johnson Dr Eastbound					
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
7:30 AM	45	96	17	0	158	1	39	7	0	47	17	159	7	0	183	7	38	45	0	90	478
7:45 AM	34	96	24	0	154	1	47	6	0	54	16	174	23	0	213	3	45	44	0	92	513
8:00 AM	41	89	20	0	150	7	53	5	0	65	2	192	13	0	207	9	41	47	0	97	519
8:15 AM	37	79	22	0	138	0	47	6	0	53	18	133	16	0	167	4	50	27	0	81	439
Total	157	360	83	0	600	9	186	24	0	219	53	658	59	0	770	23	174	163	0	360	1949
Approach %	26.2	60.0	13.8	0.0	-	4.1	84.9	11.0	0.0	-	6.9	85.5	7.7	0.0	-	6.4	48.3	45.3	0.0	-	-
Total %	8.1	18.5	4.3	0.0	30.8	0.5	9.5	1.2	0.0	11.2	2.7	33.8	3.0	0.0	39.5	1.2	8.9	8.4	0.0	18.5	-
PHF	0.872	0.938	0.865	0.000	0.949	0.321	0.877	0.857	0.000	0.842	0.736	0.857	0.641	0.000	0.904	0.639	0.870	0.867	0.000	0.928	0.939
Lights	146	337	74	0	557	9	181	24	0	214	52	654	57	0	763	22	172	156	0	350	1884
% Lights	93.0	93.6	89.2	-	92.8	100.0	97.3	100.0	-	97.7	98.1	99.4	96.6	-	99.1	95.7	98.9	95.7	-	97.2	96.7
Mediums	8	19	9	0	36	0	5	0	0	5	1	4	2	0	7	1	2	6	0	9	57
% Mediums	5.1	5.3	10.8	-	6.0	0.0	2.7	0.0	-	2.3	1.9	0.6	3.4	-	0.9	4.3	1.1	3.7	-	2.5	2.9
Articulated Trucks	3	4	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	8
% Articulated Trucks	1.9	1.1	0.0	-	1.2	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.6	-	0.3	0.4

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Count Name: Johnson Dr & Roe Ave
Site Code:
Start Date: 10/04/2018
Page No: 4

Peak Hour Data

10/04/2018 7:30 AM
Ending At
10/04/2018 8:30 AM

Lights
Mediums
Articulated Trucks

Roe Ave [N]

Out	In	Total
819	557	1376
10	36	46
1	7	8
830	**600**	**1430**

R	T	L	U
146	337	74	0
8	19	9	0
3	4	0	0
157	**360**	**83**	**0**

Johnson Dr [W]

Out	In	Total
384	350	734
15	9	24
3	1	4
402	**360**	**762**

U	L	T	R
0	156	172	22
0	6	2	1
0	1	0	0
0	**163**	**174**	**23**

Ramps on/off Shawnee Mis

Out	In	Total
298	214	512
12	5	17
0	0	0
310	**219**	**529**

R	T	L	U
6	181	24	0
0	5	0	0
0	0	0	0
6	**186**	**24**	**0**

Roe Ave [S]

U	L	T	R
0	57	654	52
0	2	4	1
0	0	0	0
0	**59**	**658**	**53**

Out	In	Total
383	763	1146
20	7	27
4	0	4
407	**770**	**1177**

Turning Movement Peak Hour Data Plot (7:30 AM)

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Count Name: Johnson Dr & Roe Ave
Site Code:
Start Date: 10/04/2018
Page No: 5

Turning Movement Peak Hour Data (5:00 PM)

	Roe Ave					Ramps on/off Shawnee Mission Pkwy					Roe Ave					Johnson Dr					
	Southbound					Westbound					Northbound					Eastbound					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
5:00 PM	81	105	11	0	197	5	74	12	0	91	8	105	27	1	141	23	69	82	0	174	603
5:15 PM	74	156	14	0	244	10	58	14	0	82	13	146	18	0	177	25	72	70	0	167	670
5:30 PM	53	140	20	0	213	7	62	17	2	88	18	137	18	0	173	15	55	45	0	115	589
5:45 PM	78	123	13	0	214	3	62	9	0	74	13	110	18	0	141	17	68	51	1	137	566
Total	286	524	58	0	868	25	256	52	2	335	52	498	81	1	632	80	264	248	1	593	2428
Approach %	32.9	60.4	6.7	0.0	-	7.5	76.4	15.5	0.6	-	8.2	78.8	12.8	0.2	-	13.5	44.5	41.8	0.2	-	-
Total %	11.8	21.6	2.4	0.0	35.7	1.0	10.5	2.1	0.1	13.8	2.1	20.5	3.3	0.0	26.0	3.3	10.9	10.2	0.0	24.4	-
PHF	0.883	0.840	0.725	0.000	0.889	0.625	0.865	0.765	0.250	0.920	0.722	0.853	0.750	0.250	0.893	0.800	0.917	0.756	0.250	0.852	0.906
Lights	277	524	53	0	854	25	254	52	2	333	52	493	81	1	627	80	258	242	1	581	2395
% Lights	96.9	100.0	91.4	-	98.4	100.0	99.2	100.0	100.0	99.4	100.0	99.0	100.0	100.0	99.2	100.0	97.7	97.6	100.0	98.0	98.6
Mediums	9	0	5	0	14	0	1	0	0	1	0	3	0	0	3	0	6	6	0	12	30
% Mediums	3.1	0.0	8.6	-	1.6	0.0	0.4	0.0	0.0	0.3	0.0	0.6	0.0	0.0	0.5	0.0	2.3	2.4	0.0	2.0	1.2
Articulated Trucks	0	0	0	0	0	0	1	0	0	1	0	2	0	0	2	0	0	0	0	0	3
% Articulated Trucks	0.0	0.0	0.0	-	0.0	0.0	0.4	0.0	0.0	0.3	0.0	0.4	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.1

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Peak Hour Data

10/04/2018 5:00 PM
Ending At
10/04/2018 6:00 PM

Lights
Mediums
Articulated Trucks

Roe Ave [N]

Out	In	Total
760	854	1614
9	14	23
2	0	2
771	**868**	**1639**

R	T	L	U
277	524	53	0
9	0	5	0
0	0	0	0
286	**524**	**58**	**0**

Johnson Dr [W]

Out	In	Total
613	581	1194
10	12	22
1	0	1
624	**593**	**1217**

R	T	L	U
80	258	242	1
0	6	6	0
0	0	0	0
80	**264**	**248**	**1**

Ramps on/off Shawnee Mis

Out	In	Total
365	333	698
11	1	12
0	1	1
376	**335**	**711**

R	T	L	U
25	254	52	2
0	1	0	0
0	1	0	0
25	**256**	**52**	**2**

Roe Ave [S]

U	L	T	R
1	81	493	52
0	0	3	0
0	0	2	0
1	**81**	**498**	**52**

Out	In	Total
657	627	1284
0	3	3
0	2	2
657	**632**	**1289**

Turning Movement Peak Hour Data Plot (5:00 PM)

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Count Name: Johnson Dr & Roeland Dr
Site Code:
Start Date: 10/04/2018

Turning Movement Data

Start Time	Ash Dr Southbound				Johnson Dr Westbound				Johnson Dr Eastbound				
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	Int. Total
7:00 AM	0	0	0	0	1	75	0	76	50	0	0	50	126
7:15 AM	2	0	0	2	0	61	0	61	61	0	0	61	124
7:30 AM	5	0	0	5	0	88	0	88	79	0	0	79	172
7:45 AM	5	0	0	5	1	99	0	100	84	0	0	84	189
Hourly Total	12	0	0	12	2	323	0	325	274	0	0	274	611
8:00 AM	2	0	0	2	1	103	0	104	82	0	0	82	188
8:15 AM	1	0	0	1	1	94	0	95	86	0	0	86	182
8:30 AM	5	0	0	5	0	85	0	85	80	0	0	80	170
8:45 AM	2	0	0	2	0	74	0	74	82	0	0	82	158
Hourly Total	10	0	0	10	2	356	0	358	330	0	0	330	698
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-
4:30 PM	3	0	0	3	1	136	0	137	113	0	0	113	253
4:45 PM	5	0	0	5	6	157	0	163	122	0	0	122	290
Hourly Total	8	0	0	8	7	293	0	300	235	0	0	235	543
5:00 PM	1	0	0	1	12	165	0	177	161	0	0	161	339
5:15 PM	4	0	0	4	1	157	0	158	152	0	0	152	314
5:30 PM	5	0	0	5	5	119	0	124	120	0	0	120	249
5:45 PM	1	0	0	1	3	152	0	155	130	0	0	130	286
Hourly Total	11	0	0	11	21	593	0	614	563	0	0	563	1188
6:00 PM	1	0	0	1	2	115	0	117	116	0	0	116	234
6:15 PM	6	0	0	6	5	106	0	111	110	0	0	110	227
Grand Total	48	0	0	48	39	1786	0	1825	1628	0	0	1628	3501
Approach %	100.0	0.0	0.0	-	2.1	97.9	0.0	-	100.0	0.0	0.0	-	-
Total %	1.4	0.0	0.0	1.4	1.1	51.0	0.0	52.1	46.5	0.0	0.0	46.5	-
Lights	48	0	0	48	39	1734	0	1773	1589	0	0	1589	3410
% Lights	100.0	-	-	100.0	100.0	97.1	-	97.2	97.6	-	-	97.6	97.4
Mediums	0	0	0	0	0	50	0	50	38	0	0	38	88
% Mediums	0.0	-	-	0.0	0.0	2.8	-	2.7	2.3	-	-	2.3	2.5
Articulated Trucks	0	0	0	0	0	2	0	2	1	0	0	1	3
% Articulated Trucks	0.0	-	-	0.0	0.0	0.1	-	0.1	0.1	-	-	0.1	0.1

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Count Name: Johnson Dr & Roeland Dr
Site Code:
Start Date: 10/04/2018

Ash Dr [N]

	Out	In	Total
Lights	39	48	87
Mediums	0	0	0
Articulated Trucks	0	0	0
Total	**39**	**48**	**87**

	R	L	U
Lights	48	0	0
Mediums	0	0	0
Articulated Trucks	0	0	0
Total	**48**	**0**	**0**

Johnson Dr [W]

	Out	In	Total
Lights	1782	1589	3371
Mediums	50	38	88
Articulated Trucks	2	1	3
Total	**1834**	**1628**	**3462**

	T	L	U
Lights	1589	0	0
Mediums	38	0	0
Articulated Trucks	1	0	0
Total	**1628**	**0**	**0**

Johnson Dr [E]

	Out	In	Total
Lights	1589	1773	3362
Mediums	38	50	88
Articulated Trucks	1	2	3
Total	**1628**	**1825**	**3453**

	R	T	U
Lights	39	1734	0
Mediums	0	50	0
Articulated Trucks	0	2	0
Total	**39**	**1786**	**0**

10/04/2018 7:00 AM
Ending At
10/04/2018 6:30 PM

Lights
Mediums
Articulated Trucks

Turning Movement Data Plot

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Count Name: Johnson Dr & Roeland Dr
Site Code:
Start Date: 10/04/2018

Turning Movement Peak Hour Data (7:30 AM)

Start Time	Ash Dr Southbound				Johnson Dr Westbound				Johnson Dr Eastbound				
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	Int. Total
7:30 AM	5	0	0	5	0	88	0	88	79	0	0	79	172
7:45 AM	5	0	0	5	1	99	0	100	84	0	0	84	189
8:00 AM	2	0	0	2	1	103	0	104	82	0	0	82	188
8:15 AM	1	0	0	1	1	94	0	95	86	0	0	86	182
Total	13	0	0	13	3	384	0	387	331	0	0	331	731
Approach %	100.0	0.0	0.0	-	0.8	99.2	0.0	-	100.0	0.0	0.0	-	-
Total %	1.8	0.0	0.0	1.8	0.4	52.5	0.0	52.9	45.3	0.0	0.0	45.3	-
PHF	0.650	0.000	0.000	0.650	0.750	0.932	0.000	0.930	0.962	0.000	0.000	0.962	0.967
Lights	13	0	0	13	3	370	0	373	324	0	0	324	710
% Lights	100.0	-	-	100.0	100.0	96.4	-	96.4	97.9	-	-	97.9	97.1
Mediums	0	0	0	0	0	13	0	13	7	0	0	7	20
% Mediums	0.0	-	-	0.0	0.0	3.4	-	3.4	2.1	-	-	2.1	2.7
Articulated Trucks	0	0	0	0	0	1	0	1	0	0	0	0	1
% Articulated Trucks	0.0	-	-	0.0	0.0	0.3	-	0.3	0.0	-	-	0.0	0.1

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Count Name: Johnson Dr & Roeland Dr
Site Code:
Start Date: 10/04/2018

Peak Hour Data

10/04/2018 7:30 AM
Ending At
10/04/2018 8:30 AM

Lights
Mediums
Articulated Trucks

Ash Dr [N]

	Out	In	Total
Lights	3	13	16
Mediums	0	0	0
Articulated Trucks	0	0	0
Total	**3**	**13**	**16**

	R	L	U
Lights	13	0	0
Mediums	0	0	0
Articulated Trucks	0	0	0
Total	**13**	**0**	**0**

Johnson Dr [W]

	Out	In	Total
Lights	383	324	707
Mediums	13	7	20
Articulated Trucks	1	0	1
Total	**397**	**331**	**728**

	U	L	T
Lights	0	0	324
Mediums	0	0	7
Articulated Trucks	0	0	0
Total	**0**	**0**	**331**

Johnson Dr [E]

	Out	In	Total
Lights	324	373	697
Mediums	7	13	20
Articulated Trucks	0	1	1
Total	**331**	**387**	**718**

	R	T	U
Lights	3	370	0
Mediums	0	13	0
Articulated Trucks	0	1	0
Total	**3**	**384**	**0**

Turning Movement Peak Hour Data Plot (7:30 AM)

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Count Name: Johnson Dr & Roeland Dr
Site Code:
Start Date: 10/04/2018

Turning Movement Peak Hour Data (4:30 PM)

Start Time	Ash Dr Southbound Right	Left	U-Turn	App. Total	Johnson Dr Westbound Right	Thru	U-Turn	App. Total	Johnson Dr Eastbound Thru	Left	U-Turn	App. Total	Int. Total
4:30 PM	3	0	0	3	1	136	0	137	113	0	0	113	253
4:45 PM	5	0	0	5	6	157	0	163	122	0	0	122	290
5:00 PM	1	0	0	1	12	165	0	177	161	0	0	161	339
5:15 PM	4	0	0	4	1	157	0	158	152	0	0	152	314
Total	13	0	0	13	20	615	0	635	548	0	0	548	1196
Approach %	100.0	0.0	0.0	-	3.1	96.9	0.0	-	100.0	0.0	0.0	-	-
Total %	1.1	0.0	0.0	1.1	1.7	51.4	0.0	53.1	45.8	0.0	0.0	45.8	-
PHF	0.650	0.000	0.000	0.650	0.417	0.932	0.000	0.897	0.851	0.000	0.000	0.851	0.882
Lights	13	0	0	13	20	606	0	626	540	0	0	540	1179
% Lights	100.0	-	-	100.0	100.0	98.5	-	98.6	98.5	-	-	98.5	98.6
Mediums	0	0	0	0	0	9	0	9	8	0	0	8	17
% Mediums	0.0	-	-	0.0	0.0	1.5	-	1.4	1.5	-	-	1.5	1.4
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
% Articulated Trucks	0.0	-	-	0.0	0.0	0.0	-	0.0	0.0	-	-	0.0	0.0

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Count Name: Johnson Dr & Roeland Dr
Site Code:
Start Date: 10/04/2018
Page No: 6

Peak Hour Data

10/04/2018 4:30 PM
Ending At
10/04/2018 5:30 PM

Lights
Mediums
Articulated Trucks

Ash Dr [N]

Out	In	Total
20	13	33
0	0	0
0	0	0
20	**13**	**33**

R	L	U
13	0	0
0	0	0
0	0	0
13	**0**	**0**

Johnson Dr [W]

Out	In	Total
619	540	1159
9	8	17
0	0	0
628	**548**	**1176**

T	L	U
540	0	0
8	0	0
0	0	0
548	**0**	**0**

Johnson Dr [E]

Out	In	Total
540	626	1166
8	9	17
0	0	0
548	**635**	**1183**

R	T	U
20	606	0
0	9	0
0	0	0
20	**615**	**0**

Turning Movement Peak Hour Data Plot (4:30 PM)

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Count Name: Roeland Dr & Martway St
Site Code:
Start Date: 10/04/2018

Turning Movement Data

Start Time	Roeland Dr Southbound				Roeland Dr Northbound				Martway St Eastbound				
	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Int. Total
7:00 AM	0	10	0	10	4	1	0	5	4	0	0	4	19
7:15 AM	4	15	0	19	15	2	0	17	3	5	0	8	44
7:30 AM	2	22	0	24	6	5	0	11	1	5	0	6	41
7:45 AM	3	12	0	15	14	5	0	19	3	3	0	6	40
Hourly Total	9	59	0	68	39	13	0	52	11	13	0	24	144
8:00 AM	3	21	0	24	8	8	0	16	3	5	0	8	48
8:15 AM	3	12	0	15	8	11	0	19	5	5	0	10	44
8:30 AM	0	7	0	7	11	10	0	21	4	7	0	11	39
8:45 AM	5	15	0	20	12	8	0	20	5	7	0	12	52
Hourly Total	11	55	0	66	39	37	0	76	17	24	0	41	183
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-
4:30 PM	7	16	0	23	11	5	0	16	9	15	0	24	63
4:45 PM	7	19	0	26	20	11	0	31	20	8	0	28	85
Hourly Total	14	35	0	49	31	16	0	47	29	23	0	52	148
5:00 PM	5	12	0	17	22	12	0	34	18	23	0	41	92
5:15 PM	13	18	0	31	20	12	0	32	19	19	0	38	101
5:30 PM	9	15	0	24	13	6	0	19	12	13	0	25	68
5:45 PM	15	15	0	30	17	7	0	24	14	18	0	32	86
Hourly Total	42	60	0	102	72	37	0	109	63	73	0	136	347
6:00 PM	11	21	0	32	16	6	0	22	9	9	0	18	72
6:15 PM	2	17	0	19	14	8	0	22	9	6	0	15	56
Grand Total	89	247	0	336	211	117	0	328	138	148	0	286	950
Approach %	26.5	73.5	0.0	-	64.3	35.7	0.0	-	48.3	51.7	0.0	-	-
Total %	9.4	26.0	0.0	35.4	22.2	12.3	0.0	34.5	14.5	15.6	0.0	30.1	-
Lights	88	243	0	331	209	115	0	324	135	143	0	278	933
% Lights	98.9	98.4	-	98.5	99.1	98.3	-	98.8	97.8	96.6	-	97.2	98.2
Mediums	1	3	0	4	2	2	0	4	3	4	0	7	15
% Mediums	1.1	1.2	-	1.2	0.9	1.7	-	1.2	2.2	2.7	-	2.4	1.6
Articulated Trucks	0	1	0	1	0	0	0	0	0	1	0	1	2
% Articulated Trucks	0.0	0.4	-	0.3	0.0	0.0	-	0.0	0.0	0.7	-	0.3	0.2

Olsson Associates : Overland Park
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Count Name: Roeland Dr & Martway St
Site Code:
Start Date: 10/04/2018
Page No: 2

Roeland Dr [N]

Out	In	Total
352	331	683
6	4	10
1	1	2
359	**336**	**695**

R	T	U
88	243	0
1	3	0
0	1	0
89	**247**	**0**

Martway St [W]

Out	In	Total
203	278	481
3	7	10
0	1	1
206	**286**	**492**

R	L	U
135	143	0
3	4	0
0	1	0
138	**148**	**0**

10/04/2018 7:00 AM
Ending At
10/04/2018 6:30 PM

Lights
Mediums
Articulated Trucks

U	L	T
0	115	209
0	2	2
0	0	0
0	**117**	**211**

Out	In	Total
378	324	702
6	4	10
1	0	1
385	**328**	**713**

Roeland Dr [S]

Turning Movement Data Plot

Olsson Associates : Overland Park
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Turning Movement Peak Hour Data (8:00 AM)

Start Time	Roeland Dr Southbound				Roeland Dr Northbound				Martway St Eastbound				
	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Int. Total
8:00 AM	3	21	0	24	8	8	0	16	3	5	0	8	48
8:15 AM	3	12	0	15	8	11	0	19	5	5	0	10	44
8:30 AM	0	7	0	7	11	10	0	21	4	7	0	11	39
8:45 AM	5	15	0	20	12	8	0	20	5	7	0	12	52
Total	11	55	0	66	39	37	0	76	17	24	0	41	183
Approach %	16.7	83.3	0.0	-	51.3	48.7	0.0	-	41.5	58.5	0.0	-	-
Total %	6.0	30.1	0.0	36.1	21.3	20.2	0.0	41.5	9.3	13.1	0.0	22.4	-
PHF	0.550	0.655	0.000	0.688	0.813	0.841	0.000	0.905	0.850	0.857	0.000	0.854	0.880
Lights	11	53	0	64	38	37	0	75	16	22	0	38	177
% Lights	100.0	96.4	-	97.0	97.4	100.0	-	98.7	94.1	91.7	-	92.7	96.7
Mediums	0	2	0	2	1	0	0	1	1	1	0	2	5
% Mediums	0.0	3.6	-	3.0	2.6	0.0	-	1.3	5.9	4.2	-	4.9	2.7
Articulated Trucks	0	0	0	0	0	0	0	0	0	1	0	1	1
% Articulated Trucks	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	4.2	-	2.4	0.5

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Count Name: Roeland Dr & Martway St
Site Code:
Start Date: 10/04/2018
Page No: 4

Peak Hour Data

10/04/2018 8:00 AM
Ending At
10/04/2018 9:00 AM

Lights
Mediums
Articulated Trucks

Roeland Dr [N]

Out	In	Total
60	64	124
2	2	4
1	0	1
63	**66**	**129**

R	T	U
11	53	0
0	2	0
0	0	0
11	**55**	**0**

Martway St [W]

Out	In	Total
48	38	86
0	2	2
0	1	1
48	**41**	**89**

R	L	U
16	22	0
1	1	0
0	1	0
17	**24**	**0**

U	L	T
0	37	38
0	0	1
0	0	0
0	**37**	**39**

Out	In	Total
69	75	144
3	1	4
0	0	0
72	**76**	**148**

Roeland Dr [S]

Turning Movement Peak Hour Data Plot (8:00 AM)

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Count Name: Roeland Dr & Martway St
Site Code:
Start Date: 10/04/2018

Turning Movement Peak Hour Data (5:00 PM)

Start Time	Roeland Dr Southbound				Roeland Dr Northbound				Martway St Eastbound				
	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Int. Total
5:00 PM	5	12	0	17	22	12	0	34	18	23	0	41	92
5:15 PM	13	18	0	31	20	12	0	32	19	19	0	38	101
5:30 PM	9	15	0	24	13	6	0	19	12	13	0	25	68
5:45 PM	15	15	0	30	17	7	0	24	14	18	0	32	86
Total	42	60	0	102	72	37	0	109	63	73	0	136	347
Approach %	41.2	58.8	0.0	-	66.1	33.9	0.0	-	46.3	53.7	0.0	-	-
Total %	12.1	17.3	0.0	29.4	20.7	10.7	0.0	31.4	18.2	21.0	0.0	39.2	-
PHF	0.700	0.833	0.000	0.823	0.818	0.771	0.000	0.801	0.829	0.793	0.000	0.829	0.859
Lights	41	60	0	101	72	35	0	107	63	72	0	135	343
% Lights	97.6	100.0	-	99.0	100.0	94.6	-	98.2	100.0	98.6	-	99.3	98.8
Mediums	1	0	0	1	0	2	0	2	0	1	0	1	4
% Mediums	2.4	0.0	-	1.0	0.0	5.4	-	1.8	0.0	1.4	-	0.7	1.2
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
% Articulated Trucks	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0

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Count Name: Roeland Dr & Martway St
Site Code:
Start Date: 10/04/2018
Page No: 6

Peak Hour Data

10/04/2018 5:00 PM
Ending At
10/04/2018 6:00 PM

Lights
Mediums
Articulated Trucks

Roeland Dr [N]

Out	In	Total
144	101	245
1	1	2
0	0	0
145	**102**	**247**

R	T	U
41	60	0
1	0	0
0	0	0
42	**60**	**0**

Martway St [W]

Out	In	Total
76	135	211
3	1	4
0	0	0
79	**136**	**215**

U	L	R
0	72	63
0	1	0
0	0	0
0	**73**	**63**

Roeland Dr [S]

U	L	T
0	35	72
0	2	0
0	0	0
0	**37**	**72**

Out	In	Total
123	107	230
0	2	2
0	0	0
123	**109**	**232**

Turning Movement Peak Hour Data Plot (5:00 PM)

Olsson Associates : Overland Park
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Count Name: Roeland Dr & Shawnee Mission Pkwy
Site Code:
Start Date: 10/04/2018

Turning Movement Data

Start Time	Shawnee Mission Pkwy Southbound					Roeland Dr Westbound					Shawnee Mission Pkwy Northbound					Roeland Dr Eastbound					
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
7:00 AM	2	122	0	0	124	1	1	15	0	17	12	306	3	0	321	9	1	2	0	12	474
7:15 AM	6	185	0	0	191	0	4	24	0	28	14	409	6	0	429	11	3	5	0	19	667
7:30 AM	4	288	1	0	293	2	3	25	0	30	28	448	2	1	479	20	4	2	0	26	828
7:45 AM	7	236	1	0	244	3	5	19	0	27	38	452	8	0	498	14	5	1	0	20	789
Hourly Total	19	831	2	0	852	6	13	83	0	102	92	1615	19	1	1727	54	13	10	0	77	2758
8:00 AM	5	256	1	0	262	2	7	20	0	29	29	396	6	2	433	20	2	6	0	28	752
8:15 AM	5	188	2	0	195	2	10	15	0	27	34	426	4	0	464	13	0	6	0	19	705
8:30 AM	8	162	1	1	172	2	5	14	0	21	26	329	9	0	364	4	4	4	0	12	569
8:45 AM	6	145	1	1	153	1	6	15	0	22	21	306	8	0	335	12	8	3	0	23	533
Hourly Total	24	751	5	2	782	7	28	64	0	99	110	1457	27	2	1596	49	14	19	0	82	2559
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:30 PM	7	419	11	1	438	1	5	12	0	18	31	226	7	0	264	18	7	4	0	29	749
4:45 PM	9	390	6	0	405	3	6	22	0	31	16	289	9	0	314	9	21	10	0	40	790
Hourly Total	16	809	17	1	843	4	11	34	0	49	47	515	16	0	578	27	28	14	0	69	1539
5:00 PM	12	413	7	0	432	0	13	12	0	25	26	299	11	0	336	8	15	4	0	27	820
5:15 PM	11	380	3	0	394	2	12	12	0	26	27	312	13	0	352	10	15	9	0	34	806
5:30 PM	6	388	8	0	402	2	6	22	0	30	34	274	5	1	314	8	15	6	0	29	775
5:45 PM	4	330	2	1	337	6	10	15	0	31	21	305	8	1	335	8	15	7	0	30	733
Hourly Total	33	1511	20	1	1565	10	41	61	0	112	108	1190	37	2	1337	34	60	26	0	120	3134
6:00 PM	5	244	6	0	255	1	9	15	0	25	25	241	10	0	276	19	11	7	0	37	593
6:15 PM	5	242	5	0	252	1	7	11	0	19	21	224	9	0	254	12	13	6	0	31	556
Grand Total	102	4388	55	4	4549	29	109	268	0	406	403	5242	118	5	5768	195	139	82	0	416	11139
Approach %	2.2	96.5	1.2	0.1	-	7.1	26.8	66.0	0.0	-	7.0	90.9	2.0	0.1	-	46.9	33.4	19.7	0.0	-	-
Total %	0.9	39.4	0.5	0.0	40.8	0.3	1.0	2.4	0.0	3.6	3.6	47.1	1.1	0.0	51.8	1.8	1.2	0.7	0.0	3.7	-
Lights	101	4347	55	4	4507	29	108	260	0	397	388	5200	107	5	5700	184	135	82	0	401	11005
% Lights	99.0	99.1	100.0	100.0	99.1	100.0	99.1	97.0	-	97.8	96.3	99.2	90.7	100.0	98.8	94.4	97.1	100.0	-	96.4	98.8
Mediums	1	34	0	0	35	0	1	8	0	9	13	36	8	0	57	7	4	0	0	11	112
% Mediums	1.0	0.8	0.0	0.0	0.8	0.0	0.9	3.0	-	2.2	3.2	0.7	6.8	0.0	1.0	3.6	2.9	0.0	-	2.6	1.0
Articulated Trucks	0	7	0	0	7	0	0	0	0	0	2	6	3	0	11	4	0	0	0	4	22
% Articulated Trucks	0.0	0.2	0.0	0.0	0.2	0.0	0.0	0.0	-	0.0	0.5	0.1	2.5	0.0	0.2	2.1	0.0	0.0	-	1.0	0.2

Olsson Associates : Overland Park
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Count Name: Roeland Dr & Shawnee Mission Pkwy
Site Code:
Start Date: 10/04/2018

10/04/2018 7:00 AM
Ending At
10/04/2018 6:30 PM

Lights
Mediums
Articulated Trucks

Shawnee Mission Pkwy (North)

Out	In	Total
5315	4507	9822
36	35	71
6	7	13
5357	**4549**	**9906**

R	T	L	U
101	4347	55	4
1	34	0	0
0	7	0	0
102	**4388**	**55**	**4**

Roeland Dr [W]

	Out	In	Total
	316	401	717
	10	11	21
	3	4	7
	329	**416**	**745**

R	T	L	U
184	135	82	0
7	4	0	0
4	0	0	0
195	**139**	**82**	**0**

Roeland Dr [E]

Out	In	Total
578	397	975
17	9	26
2	0	2
597	**406**	**1003**

R	T	L	U
29	108	260	0
0	1	8	0
0	0	0	0
29	**109**	**268**	**0**

Shawnee Mission Pkwy (South)

U	L	T	R
5	107	5200	388
0	8	36	13
0	3	6	2
5	**118**	**5242**	**403**

Out	In	Total
4796	5700	10496
49	57	106
11	11	22
4856	**5768**	**10624**

Turning Movement Data Plot

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Turning Movement Peak Hour Data (7:30 AM)

Start Time	Shawnee Mission Pkwy Southbound					Roeland Dr Westbound					Shawnee Mission Pkwy Northbound					Roeland Dr Eastbound					
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
7:30 AM	4	288	1	0	293	2	3	25	0	30	28	448	2	1	479	20	4	2	0	26	828
7:45 AM	7	236	1	0	244	3	5	19	0	27	38	452	8	0	498	14	5	1	0	20	789
8:00 AM	5	256	1	0	262	2	7	20	0	29	29	396	6	2	433	20	2	6	0	28	752
8:15 AM	5	188	2	0	195	2	10	15	0	27	34	426	4	0	464	13	0	6	0	19	705
Total	21	968	5	0	994	9	25	79	0	113	129	1722	20	3	1874	67	11	15	0	93	3074
Approach %	2.1	97.4	0.5	0.0	-	8.0	22.1	69.9	0.0	-	6.9	91.9	1.1	0.2	-	72.0	11.8	16.1	0.0	-	-
Total %	0.7	31.5	0.2	0.0	32.3	0.3	0.8	2.6	0.0	3.7	4.2	56.0	0.7	0.1	61.0	2.2	0.4	0.5	0.0	3.0	-
PHF	0.750	0.840	0.625	0.000	0.848	0.750	0.625	0.790	0.000	0.942	0.849	0.952	0.625	0.375	0.941	0.838	0.550	0.625	0.000	0.830	0.928
Lights	21	956	5	0	982	9	24	77	0	110	119	1703	15	3	1840	60	9	15	0	84	3016
% Lights	100.0	98.8	100.0	-	98.8	100.0	96.0	97.5	-	97.3	92.2	98.9	75.0	100.0	98.2	89.6	81.8	100.0	-	90.3	98.1
Mediums	0	10	0	0	10	0	1	2	0	3	9	17	3	0	29	5	2	0	0	7	49
% Mediums	0.0	1.0	0.0	-	1.0	0.0	4.0	2.5	-	2.7	7.0	1.0	15.0	0.0	1.5	7.5	18.2	0.0	-	7.5	1.6
Articulated Trucks	0	2	0	0	2	0	0	0	0	0	1	2	2	0	5	2	0	0	0	2	9
% Articulated Trucks	0.0	0.2	0.0	-	0.2	0.0	0.0	0.0	-	0.0	0.8	0.1	10.0	0.0	0.3	3.0	0.0	0.0	-	2.2	0.3

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Count Name: Roeland Dr & Shawnee Mission Pkwy
Site Code:
Start Date: 10/04/2018

Peak Hour Data

10/04/2018 7:30 AM
Ending At
10/04/2018 8:30 AM

Lights
Mediums
Articulated Trucks

Shawnee Mission Pkwy (North)

Out	In	Total
1727	982	2709
17	10	27
2	2	4
1746	**994**	**2740**

R	T	L	U
21	956	5	0
0	10	0	0
0	2	0	0
21	**968**	**5**	**0**

Roeland Dr [W]

Out	In	Total
60	84	144
4	7	11
2	2	4
66	**93**	**159**

U	L	T	R
0	15	9	60
0	0	2	5
0	0	0	2
0	**15**	**11**	**67**

Roeland Dr [E]

Out	In	Total
133	110	243
11	3	14
1	0	1
145	**113**	**258**

R	T	L	U
6	24	77	0
0	1	2	0
0	0	0	0
6	**25**	**79**	**0**

Shawnee Mission Pkwy (South)

U	L	T	R
3	15	1703	119
0	3	17	9
0	2	2	1
3	**20**	**1722**	**129**

Out	In	Total
1096	1840	2936
17	29	46
4	5	9
1117	**1874**	**2991**

Turning Movement Peak Hour Data Plot (7:30 AM)

Olsson Associates : Overland Park
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913.381.1170 tmchenry@olssonassociates.com

Count Name: Roeland Dr & Shawnee Mission Pkwy
Site Code:
Start Date: 10/04/2018

Turning Movement Peak Hour Data (4:45 PM)

Start Time	Shawnee Mission Pkwy Southbound					Roeland Dr Westbound					Shawnee Mission Pkwy Northbound					Roeland Dr Eastbound					
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
4:45 PM	9	390	6	0	405	3	6	22	0	31	16	289	9	0	314	9	21	10	0	40	790
5:00 PM	12	413	7	0	432	0	13	12	0	25	26	299	11	0	336	8	15	4	0	27	820
5:15 PM	11	380	3	0	394	2	12	12	0	26	27	312	13	0	352	10	15	9	0	34	806
5:30 PM	6	388	8	0	402	2	6	22	0	30	34	274	5	1	314	8	15	6	0	29	775
Total	38	1571	24	0	1633	7	37	68	0	112	103	1174	38	1	1316	35	66	29	0	130	3191
Approach %	2.3	96.2	1.5	0.0	-	6.3	33.0	60.7	0.0	-	7.8	89.2	2.9	0.1	-	26.9	50.8	22.3	0.0	-	-
Total %	1.2	49.2	0.8	0.0	51.2	0.2	1.2	2.1	0.0	3.5	3.2	36.8	1.2	0.0	41.2	1.1	2.1	0.9	0.0	4.1	-
PHF	0.792	0.951	0.750	0.000	0.945	0.583	0.712	0.773	0.000	0.903	0.757	0.941	0.731	0.250	0.935	0.875	0.786	0.725	0.000	0.813	0.973
Lights	37	1559	24	0	1620	7	37	66	0	110	103	1170	38	1	1312	35	65	29	0	129	3171
% Lights	97.4	99.2	100.0	-	99.2	100.0	100.0	97.1	-	98.2	100.0	99.7	100.0	100.0	99.7	100.0	98.5	100.0	-	99.2	99.4
Mediums	1	9	0	0	10	0	0	2	0	2	0	4	0	0	4	0	1	0	0	1	17
% Mediums	2.6	0.6	0.0	-	0.6	0.0	0.0	2.9	-	1.8	0.0	0.3	0.0	0.0	0.3	0.0	1.5	0.0	-	0.8	0.5
Articulated Trucks	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
% Articulated Trucks	0.0	0.2	0.0	-	0.2	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.1

Olsson Associates : Overland Park
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Overland Park, Kansas, United States 66213
913.381.1170 tmchenry@olssonassociates.com

Peak Hour Data

10/04/2018 4:45 PM
Ending At
10/04/2018 5:45 PM

Lights
Mediums
Articulated Trucks

Shawnee Mission Pkwy (North)

Out	In	Total
1206	1620	2826
4	10	14
0	3	3
1210	**1633**	**2843**

R	T	L	U
37	1559	24	0
1	9	0	0
0	3	0	0
38	**1571**	**24**	**0**

Roeland Dr [W]

Out	In	Total
112	129	241
1	1	2
0	0	0
113	**130**	**243**

U	L	T	R
0	29	65	35
0	0	1	0
0	0	0	0
0	**29**	**66**	**35**

Roeland Dr [E]

Out	In	Total
192	110	302
1	2	3
0	0	0
193	**112**	**305**

R	T	L	U
7	37	66	0
0	0	2	0
0	0	0	0
7	**37**	**68**	**0**

Shawnee Mission Pkwy (South)

U	L	T	R
1	38	1170	103
0	0	4	0
0	0	0	0
1	**38**	**1174**	**103**

Out	In	Total
1661	1312	2973
11	4	15
3	0	3
1675	**1316**	**2991**

Turning Movement Peak Hour Data Plot (4:45 PM)

Olsson Associates : Overland Park
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Olsson Associates : Overland Park
7301 West 133rd St

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Count Name: Johnson Dr & Roe Ave
Site Code:
Start Date: 10/04/2018

Turning Movement Data

	Roe Ave					Ramps on/off Shawnee Mission Pkwy					Roe Ave					Johnson Dr					
	Southbound					Westbound					Northbound					Eastbound					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
7:00 AM	26	51	11	0	88	1	38	2	0	41	8	81	10	0	99	1	27	19	0	47	275
7:15 AM	32	67	25	0	124	0	24	3	0	27	7	95	11	0	113	7	28	36	0	71	335
7:30 AM	45	96	17	0	158	1	39	7	0	47	17	159	7	0	183	7	38	45	0	90	478
7:45 AM	34	96	24	0	154	1	47	6	0	54	16	174	23	0	213	3	45	44	0	92	513
Hourly Total	137	310	77	0	524	3	148	18	0	169	48	509	51	0	608	18	138	144	0	300	1601
8:00 AM	41	89	20	0	150	7	53	5	0	65	2	192	13	0	207	9	41	47	0	97	519
8:15 AM	37	79	22	0	138	0	47	6	0	53	18	133	16	0	167	4	50	27	0	81	439
8:30 AM	36	71	21	0	128	0	37	7	0	44	9	122	12	0	143	4	40	46	0	90	405
8:45 AM	36	79	17	0	132	4	32	9	0	45	11	111	14	0	136	5	33	47	0	85	398
Hourly Total	150	318	80	0	548	11	169	27	0	207	40	558	55	0	653	22	164	167	0	353	1761
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:30 PM	76	111	10	0	197	5	60	12	0	77	10	87	15	0	112	25	59	51	0	135	521
4:45 PM	64	116	13	0	193	10	75	6	0	91	8	88	21	1	118	18	46	60	0	124	526
Hourly Total	140	227	23	0	390	15	135	18	0	168	18	175	36	1	230	43	105	111	0	259	1047
5:00 PM	81	105	11	0	197	5	74	12	0	91	8	105	27	1	141	23	69	82	0	174	603
5:15 PM	74	156	14	0	244	10	58	14	0	82	13	146	18	0	177	25	72	70	0	167	670
5:30 PM	53	140	20	0	213	7	62	17	2	88	18	137	18	0	173	15	55	45	0	115	589
5:45 PM	78	123	13	0	214	3	62	9	0	74	13	110	18	0	141	17	68	51	1	137	566
Hourly Total	286	524	58	0	868	25	256	52	2	335	52	498	81	1	632	80	264	248	1	593	2428
6:00 PM	52	96	7	0	155	3	40	9	0	52	8	119	21	0	148	16	40	64	0	120	475
6:15 PM	51	90	10	0	151	8	37	6	0	51	9	91	19	0	119	16	48	43	0	107	428
Grand Total	816	1565	255	0	2636	65	785	130	2	982	175	1950	263	2	2390	195	759	777	1	1732	7740
Approach %	31.0	59.4	9.7	0.0	-	6.6	79.9	13.2	0.2	-	7.3	81.6	11.0	0.1	-	11.3	43.8	44.9	0.1	-	-
Total %	10.5	20.2	3.3	0.0	34.1	0.8	10.1	1.7	0.0	12.7	2.3	25.2	3.4	0.0	30.9	2.5	9.8	10.0	0.0	22.4	-
Lights	780	1534	227	0	2541	65	767	130	2	964	173	1929	260	2	2364	194	742	750	1	1687	7556
% Lights	95.6	98.0	89.0	-	96.4	100.0	97.7	100.0	100.0	98.2	98.9	98.9	98.9	100.0	98.9	99.5	97.8	96.5	100.0	97.4	97.6
Mediums	31	27	28	0	86	0	17	0	0	17	2	18	3	0	23	1	17	25	0	43	169
% Mediums	3.8	1.7	11.0	-	3.3	0.0	2.2	0.0	0.0	1.7	1.1	0.9	1.1	0.0	1.0	0.5	2.2	3.2	0.0	2.5	2.2
Articulated Trucks	5	4	0	0	9	0	1	0	0	1	0	3	0	0	3	0	0	2	0	2	15
% Articulated Trucks	0.6	0.3	0.0	-	0.3	0.0	0.1	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.3	0.0	0.1	0.2

Olsson Associates : Overland Park
7301 West 133rd St

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913.381.1170 tmchenry@olssonassociates.com

Count Name: Johnson Dr & Roe Ave
Site Code:
Start Date: 10/04/2018

Roe Ave [N]

Out	In	Total
2744	2541	5285
43	86	129
5	9	14
2792	**2636**	**5428**

R	T	L	U
780	1534	227	0
31	27	28	0
5	4	0	0
816	**1565**	**255**	**0**

Johnson Dr [W]

Out	In	Total
1808	1687	3495
51	43	94
6	2	8
1865	**1732**	**3597**

U	L	T	R
1	750	742	194
0	25	17	1
0	2	0	0
1	**777**	**759**	**195**

10/04/2018 7:00 AM
Ending At
10/04/2018 6:30 PM

Lights
Mediums
Articulated Trucks

Ramps on/off Shawnee Mis

Out	In	Total
1144	964	2108
47	17	64
0	1	1
1191	**982**	**2173**

R	T	L	U
65	767	130	2
0	17	0	0
0	1	0	0
65	**785**	**130**	**2**

U	L	T	R
2	260	1929	173
0	3	18	2
0	0	3	0
2	**263**	**1950**	**175**

Out	In	Total
1860	2364	4224
28	23	51
4	3	7
1892	**2390**	**4282**

Roe Ave [S]

Turning Movement Data Plot

Olsson Associates : Overland Park
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Overland Park, Kansas, United States 66213
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Turning Movement Peak Hour Data (7:30 AM)

	Roe Ave					Ramps on/off Shawnee Mission Pkwy					Roe Ave					Johnson Dr					
	Southbound					Westbound					Northbound					Eastbound					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
7:30 AM	45	96	17	0	158	1	39	7	0	47	17	159	7	0	183	7	38	45	0	90	478
7:45 AM	34	96	24	0	154	1	47	6	0	54	16	174	23	0	213	3	45	44	0	92	513
8:00 AM	41	89	20	0	150	7	53	5	0	65	2	192	13	0	207	9	41	47	0	97	519
8:15 AM	37	79	22	0	138	0	47	6	0	53	18	133	16	0	167	4	50	27	0	81	439
Total	157	360	83	0	600	9	186	24	0	219	53	658	59	0	770	23	174	163	0	360	1949
Approach %	26.2	60.0	13.8	0.0	-	4.1	84.9	11.0	0.0	-	6.9	85.5	7.7	0.0	-	6.4	48.3	45.3	0.0	-	-
Total %	8.1	18.5	4.3	0.0	30.8	0.5	9.5	1.2	0.0	11.2	2.7	33.8	3.0	0.0	39.5	1.2	8.9	8.4	0.0	18.5	-
PHF	0.872	0.938	0.865	0.000	0.949	0.321	0.877	0.857	0.000	0.842	0.736	0.857	0.641	0.000	0.904	0.639	0.870	0.867	0.000	0.928	0.939
Lights	146	337	74	0	557	9	181	24	0	214	52	654	57	0	763	22	172	156	0	350	1884
% Lights	93.0	93.6	89.2	-	92.8	100.0	97.3	100.0	-	97.7	98.1	99.4	96.6	-	99.1	95.7	98.9	95.7	-	97.2	96.7
Mediums	8	19	9	0	36	0	5	0	0	5	1	4	2	0	7	1	2	6	0	9	57
% Mediums	5.1	5.3	10.8	-	6.0	0.0	2.7	0.0	-	2.3	1.9	0.6	3.4	-	0.9	4.3	1.1	3.7	-	2.5	2.9
Articulated Trucks	3	4	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	8
% Articulated Trucks	1.9	1.1	0.0	-	1.2	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.6	-	0.3	0.4

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Count Name: Johnson Dr & Roe Ave
Site Code:
Start Date: 10/04/2018

Peak Hour Data

10/04/2018 7:30 AM
Ending At
10/04/2018 8:30 AM

Lights
Mediums
Articulated Trucks

Roe Ave [N]

Out	In	Total
819	557	1376
10	36	46
1	7	8
830	**600**	**1430**

R	T	L	U
146	337	74	0
8	19	9	0
3	4	0	0
157	**360**	**83**	**0**

Johnson Dr [W]

Out	In	Total
384	350	734
15	9	24
3	1	4
402	**360**	**762**

U	L	T	R
0	156	172	22
0	6	2	1
0	1	0	0
0	**163**	**174**	**23**

Ramps on/off Shawnee Mis

Out	In	Total
298	214	512
12	5	17
0	0	0
310	**219**	**529**

R	T	L	U
6	181	24	0
0	5	0	0
0	0	0	0
6	**186**	**24**	**0**

U	L	T	R
0	57	654	52
0	2	4	1
0	0	0	0
0	**59**	**658**	**53**

Out	In	Total
383	763	1146
20	7	27
4	0	4
407	**770**	**1177**

Roe Ave [S]

Turning Movement Peak Hour Data Plot (7:30 AM)

Olsson Associates : Overland Park
7301 West 133rd St

Overland Park, Kansas, United States 66213
913.381.1170 tmchenry@olssonassociates.com

Count Name: Johnson Dr & Roe Ave
Site Code:
Start Date: 10/04/2018

Turning Movement Peak Hour Data (5:00 PM)

Start Time	Roe Ave Southbound					Ramps on/off Shawnee Mission Pkwy Westbound					Roe Ave Northbound					Johnson Dr Eastbound					
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
5:00 PM	81	105	11	0	197	5	74	12	0	91	8	105	27	1	141	23	69	82	0	174	603
5:15 PM	74	156	14	0	244	10	58	14	0	82	13	146	18	0	177	25	72	70	0	167	670
5:30 PM	53	140	20	0	213	7	62	17	2	88	18	137	18	0	173	15	55	45	0	115	589
5:45 PM	78	123	13	0	214	3	62	9	0	74	13	110	18	0	141	17	68	51	1	137	566
Total	286	524	58	0	868	25	256	52	2	335	52	498	81	1	632	80	264	248	1	593	2428
Approach %	32.9	60.4	6.7	0.0	-	7.5	76.4	15.5	0.6	-	8.2	78.8	12.8	0.2	-	13.5	44.5	41.8	0.2	-	-
Total %	11.8	21.6	2.4	0.0	35.7	1.0	10.5	2.1	0.1	13.8	2.1	20.5	3.3	0.0	26.0	3.3	10.9	10.2	0.0	24.4	-
PHF	0.883	0.840	0.725	0.000	0.889	0.625	0.865	0.765	0.250	0.920	0.722	0.853	0.750	0.250	0.893	0.800	0.917	0.756	0.250	0.852	0.906
Lights	277	524	53	0	854	25	254	52	2	333	52	493	81	1	627	80	258	242	1	581	2395
% Lights	96.9	100.0	91.4	-	98.4	100.0	99.2	100.0	100.0	99.4	100.0	99.0	100.0	100.0	99.2	100.0	97.7	97.6	100.0	98.0	98.6
Mediums	9	0	5	0	14	0	1	0	0	1	0	3	0	0	3	0	6	6	0	12	30
% Mediums	3.1	0.0	8.6	-	1.6	0.0	0.4	0.0	0.0	0.3	0.0	0.6	0.0	0.0	0.5	0.0	2.3	2.4	0.0	2.0	1.2
Articulated Trucks	0	0	0	0	0	0	1	0	0	1	0	2	0	0	2	0	0	0	0	0	3
% Articulated Trucks	0.0	0.0	0.0	-	0.0	0.0	0.4	0.0	0.0	0.3	0.0	0.4	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.1

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Count Name: Johnson Dr & Roe Ave
Site Code:
Start Date: 10/04/2018
Page No: 6

Peak Hour Data

10/04/2018 5:00 PM
Ending At
10/04/2018 6:00 PM

Lights
Mediums
Articulated Trucks

Roe Ave [N]

Out	In	Total
760	854	1614
9	14	23
2	0	2
771	**868**	**1639**

R	T	L	U
277	524	53	0
9	0	5	0
0	0	0	0
286	**524**	**58**	**0**

Johnson Dr [W]

	Out	In	Total
	613	581	1194
	10	12	22
	1	0	1
	624	**593**	**1217**

U	L	T	R
1	242	258	80
0	6	6	0
0	0	0	0
1	**248**	**264**	**80**

Ramps on/off Shawnee Mis

Out	In	Total
365	333	698
11	1	12
0	1	1
376	**335**	**711**

R	T	L	U
25	254	52	2
0	1	0	0
0	1	0	0
25	**256**	**52**	**2**

U	L	T	R
1	81	493	52
0	0	3	0
0	0	2	0
1	**81**	**498**	**52**

Roe Ave [S]

Out	In	Total
657	627	1284
0	3	3
0	2	2
657	**632**	**1289**

Turning Movement Peak Hour Data Plot (5:00 PM)

Olsson Associates : Overland Park
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Signal Timings

Configuration Submenu

MM-1-1-1 Phase Ring Assignment (PRI = Priority)

Sequence 1

	CONFIGURE UTILITY	F	HW ALTERNATE SEQUENCE ENABLE	

PRI	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
BC																
R1	1	2	3	4	9	10	13	14								
R2	5	6	7	8	11	12	15	6								
R3																
R4																

Sequence 2

PRI	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
BC																
R1																
R2																
R3																
R4																

Sequence 3

PRI	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
BC																
R1																
R2																
R3																
R4																

Sequence 4

PRI	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
BC																
R1																
R2																
R3																
R4																

Controller Submenu

MM-2-1 Controller Timing Data, sheet 1 of 2

TIMING PLAN ____	Johnson DR & Roe															
PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
MINIMUM GREEN	5	5	5	5	5	5	5	5								
BICYCLE MINIMUM GREEN																
CONDITIONAL SERVICE MIN. GREEN																
DELAYED GREEN																
WALK		9						8								
WALK 2																
WALK MAX																
PEDESTRIAN CLEARANCE		31						30								
PEDESTRIAN CLEARANCE 2																
PEDESTRIAN CLEARANCE MAX																
PEDESTRIAN CARRY OVER																
VEHICLE EXTENSION	3	3	3	3	3	3	3	3								
VEHICLE EXTENSION 2																
MAX1	15	18	33	33	22	22	33	33								
MAX2																
MAX3																
DYNAMIC MAX																
DYNAMIC MAX STEP																
YELLOW CHANGE	4	4	4	4	4	4	4	4								
RED CLEARANCE	2	2	2	2	2	2	2	2								
RED MAX																
RED REVERT																
ACTUATIONS BEFORE GAP REDUCTION																
SECONDS PER ACTIONS ADDED TO INITIAL																
MAXIMUM ADDED INITIAL GREEN																
TIME BEFORE GAP REDUCTION																
CARS WAITING BEFORE GAP REDUCTION																
STEP TO REDUCE																
TIME TO REDUCE TO MINIMUM																
MINIMUM GAP																

MM-2-4 Guaranteed Minimum Times

OL/PHASE	A01	B02	C03	D04	E05	F06	G07	H08
MIN GRN	5	5	5	5	5	5	5	5
WALK								
PED CLR								
YELLOW	3	3	3	3	3	3	3	3
RED CLR	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
OVL GRN	5	5	5	5	5	5	5	5
OL/PHASE	**I09**	**J10**	**K11**	**L12**	**M13**	**N14**	**O15**	**P16**
MIN GRN								
WALK								
PED CLR								
YELLOW								
RED CLR								
OVL GRN								

MM-2-5 Start/Flash Data

START UP																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE		Y				Y										
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
OVERLAP	X	X	X	X												

FLASH>MON.	NO	FLASH TIME	Ø	ALL RED TIME	8
PWR START SEQ.					

AUTOMATIC FLASH																
PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
ENTRY		X				X										
EXIT		X				X										
OVERLAP	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
EXIT	X	X	X	X												

FLASH>MON.	NO	EXIT FLASH	W	MIN FLASH	8
MINIMUM RECALL	NO			CYCLE THROUGH PHASES	NO

MM-2-8 Phase Recall Options

TIMING PLAN NUMBER [1]

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
LOCK DET INPUT																
VEH RECALL				X				X								
PED RECALL																
MAX TIME RECALL																
SOFT RECALL																
NO REST IN PHASE																
ADDED INIT CALC																

TIMING PLAN NUMBER [2]

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
LOCK DET INPUT																
VEH RECALL																
PED RECALL																
MAX TIME RECALL																
SOFT RECALL																
NO REST IN PHASE																
ADDED INIT CALC																

TIMING PLAN NUMBER [3]

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
LOCK DET INPUT																
VEH RECALL																
PED RECALL																
MAX TIME RECALL																
SOFT RECALL																
NO REST IN PHASE																
ADDED INIT CALC																

TIMING PLAN NUMBER [4]

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
LOCK DET INPUT																
VEH RECALL																
PED RECALL																
MAX TIME RECALL																
SOFT RECALL																
NO REST IN PHASE																
ADDED INIT CALC																

Coordinator Submenu

MM-3-1 Coordinator Options

COORD OPTIONS			
MANUAL PATTERN	AUTO	ECPI COORD	YES
SYSTEM SOURCE	TBC	SYSTEM FORMAT	STD
SPLITS IN	%	OFFSET IN	Sec's
TRANSITION	Smooth	MAX SELECT	Max INH
DWELL/ADD TIME	Ø	ENABLE MAN SYNC	NO
DLY COORD WK-LZ	NO	FORCE OFF	FLOAT
OFFSET REF	LEAD	CAL USE PED TM	YES
PED RECALL	NO	PED RESERVE	NO
LOCAL ZERO OVRD	NO	FO ADD INI GRN	NO
RE-SYNC COUNT	Ø	MULTISYNC	NO

MM-3-2 Coordinator Pattern, sheet 1 of 2

COORDINATOR PATTERN	1
USE SPLIT PATTERN	1
TS2 PATTERN / OFFSET	Ø-1
CYCLE	100s
OFFSET VAL	Ø5
ACTUATED COORD	Yes
ACT WALK REST	NO
PHASE RESERVICE	NO
MAX SELECT	NONE

STD (COS)	111
DWELL/ADD TIME	Ø
TIMING PLAN	1
SEQUENCE	Ø
ACTION PLAN	1
FORCE OFF	NONE

SPLIT PREFERENCE PHASES

PHASE	1	2	3	4	5	6	7	8
SPLIT PATTERN	15	35	15	35	15	35	15	35
PREF 1								
PREF 2								
SPLT EXT								
VEH PERM				DISP				
RING DISP					(RINGS 2-4)			

SPLIT PREFERENCE PHASES

PHASE	9	10	11	12	13	14	15	16
SPLIT PATTERN								
PREF 1								
PREF 2								

SPLIT DEMAND PATTERN (1 or 2)	
X ARTERY PATTERN	

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COORD				X				X								
VE RCALL																
PD RCALL																
MX RCALL																
OMIT																
SF OUT									(1-8)							

MM-3-2 Coordinator Pattern, sheet 1 of 2

COORDINATOR PATTERN	2
USE SPLIT PATTERN	2
TS2 PATTERN / OFFSET	0-2
CYCLE	100's
OFFSET VAL	%
ACTUATED COORD	yes
ACT WALK REST	NO
PHASE RESERVICE	NO
MAX SELECT	NONE

STD (COS)	121
DWELL/ADD TIME	∅
TIMING PLAN	1
SEQUENCE	∅
ACTION PLAN	2
FORCE OFF	Float

SPLIT PREFERENCE PHASES

PHASE		1	2	3	4	5	6	7	8
SPLIT PATTERN	2	18	19	18	45	13	24	17	46
PREF 1									
PREF 2									
SPLT EXT									
VEH PERM					DISP				
RING DISP					(RINGS 2-4)				

SPLIT PREFERENCE PHASES

PHASE		9	10	11	12	13	14	15	16
SPLIT PATTERN									
PREF 1									
PREF 2									

SPLIT DEMAND PATTERN (1 or 2)	
X ARTERY PATTERN	

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COORD				X				X								
VE RCALL																
PD RCALL																
MX RCALL																
OMIT																
SF OUT									(1-8)							

MM-3-2 Coordinator Pattern, sheet 1 of 2

COORDINATOR PATTERN	3
USE SPLIT PATTERN	3
TS2 PATTERN / OFFSET	∅ - 3
CYCLE	100's
OFFSET VAL	90
ACTUATED COORD	yes
ACT WALK REST	NO
PHASE RESERVICE	NO
MAX SELECT	None

STD (COS)	131
DWELL/ADD TIME	∅
TIMING PLAN	1
SEQUENCE	∅
ACTION PLAN	3
FORCE OFF	Float

SPLIT PREFERENCE PHASES

PHASE	1	2	3	4	5	6	7	8
SPLIT PATTERN 3	19	24	15	42	14	29	18	39
PREF 1								
PREF 2								
SPLT EXT								
VEH PERM				DISP				
RING DISP					(RINGS 2-4)			

SPLIT PREFERENCE PHASES

PHASE	9	10	11	12	13	14	15	16
SPLIT PATTERN								
PREF 1								
PREF 2								

SPLIT DEMAND PATTERN (1 or 2)	
X ARTERY PATTERN	

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COORD				X				X								
VE RCALL																
PD RCALL																
MX RCALL																
OMIT																
SF OUT									(1-8)							

MM-3-3 Split Pattern, sheet 1 of 4

SPLIT PATTERN NUMBER	1

PHASE	1	2	3	4	5	6	7	8
SPLIT	15	35	15	35	15	35	15	35

PHASE	9	10	11	12	13	14	15	16
SPLIT								

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COORD				X				X								
VEH RECALL																
PED RECALL																
MAX RECALL																
OMIT																

SPLIT PATTERN NUMBER	2

PHASE	1	2	3	4	5	6	7	8
SPLIT	18	19	18	45	13	24	17	46

PHASE	9	10	11	12	13	14	15	16
SPLIT								

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COORD				X				X								
VEH RECALL																
PED RECALL																
MAX RECALL																
OMIT																

MM-3-3 Split Pattern, sheet 2 of 4

SPLIT PATTERN NUMBER	3							
PHASE	1	2	3	4	5	6	7	8
SPLIT	19	24	15	42	14	29	18	39
PHASE	9	10	11	12	13	14	15	16
SPLIT								

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COORD				X				X								
VEH RECALL																
PED RECALL																
MAX RECALL																
OMIT																

SPLIT PATTERN NUMBER								
PHASE	1	2	3	4	5	6	7	8
SPLIT								
PHASE	9	10	11	12	13	14	15	16
SPLIT								

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COORD																
VEH RECALL																
PED RECALL																
MAX RECALL																
OMIT																

Preemptor Submenu

MM-4-1 Preemptor, sheet 1 of 2

PREEMPTOR NUMBER	3

VEH/PED	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
OVERLAP	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
TRACKCLR V																
TRACKCLR O																
ENA TRL																
DWEL VEH				X			X									
DWEL PED																
DWEL OLP																
CYC VEH																
CYC PED																
CYC OLP																
EXIT PH				X				X								
EXIT CAL																
SP FUNC																

ENABLE	Yes	PREEMPTION OVERRIDE	—	INTERLOCK ENABLE	NO
NON-LOCK INPUT	—	DELAY TIME (SECONDS)	Ø	INHIBIT TIME (SECONDS)	Ø
AUTOMATIC FLASH HAS PRIORITY	X	DURATION TIME (SECONDS)	Ø	RED CLEAR GOES GREEN	NO
TERMINATE OVERLAPS ASAP	NO	PED CLEAR THRU YELLOW	NO	TERM PH	NO
PED DARK	NO	TRACK CLEARANCE RESERVICE	NO	DWELL FL	off
LINKED PREEMPTOR	Ø	FLASH EXIT COLOR	GRN	PREEMPTION TO COORDINATION	off
EXIT TIMING PLAN	Ø	RESERVICE TIME	Ø		

FREE DURING PREEMPTION	RING 1	NO	RING 2	NO	RING 3	NO	RING 4	NO

TIMING	WALK	PED CLEAR	MIN GREEN	YELLOW	RED
ENTRANCE MIN TIMES	Ø	255	5	4	1
	MIN GREEN	EXT GREEN	MAX GREEN	YELLOW	RED
TRACK CLEAR	Ø	Ø	Ø	4	1
	MIN DWELL	PMT EXT	MAX TIME	YELLOW	RED
DWELL/CYCLE - EXIT	20	Ø	180	4	1

PREEMPTOR ACTIVE OUT	ON	PREEMPTOR ACTIVE OUT IN DWELL	NO
OTHER PRIORITY PREEMPTOR OUT	off	NON-PRIORITY PREEMPTOR OUT	off
INHIBIT EXTENSION TIME	Ø		

Preemptor Submenu

MM-4-1 Preemptor, sheet 1 of 2

PREEMPTOR NUMBER	4

VEH/PED	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
OVERLAP	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
TRACKCLR V																
TRACKCLR O																
ENA TRL																
DWEL VEH			X					X								
DWEL PED																
DWEL OLP																
CYC VEH																
CYC PED																
CYC OLP																
EXIT PH				X				X								
EXIT CAL																
SP FUNC																

ENABLE	Yes	PREEMPTION OVERRIDE	-	INTERLOCK ENABLE	NO
NON-LOCK INPUT	-	DELAY TIME (SECONDS)	ϕ	INHIBIT TIME (SECONDS)	ϕ
AUTOMATIC FLASH HAS PRIORITY	X	DURATION TIME (SECONDS)	ϕ	RED CLEAR GOES GREEN	No
TERMINATE OVERLAPS ASAP	No	PED CLEAR THRU YELLOW	No	TERM PH	NO
PED DARK	NO	TRACK CLEARANCE RESERVICE	NO	DWELL FL	OFF
LINKED PREEMPTOR	ϕ	FLASH EXIT COLOR	GRN	PREEMPTION TO COORDINATION	OFF
EXIT TIMING PLAN	ϕ	RESERVICE TIME ϕ	~~255~~		

FREE DURING PREEMPTION	RING 1	NO	RING 2	NO	RING 3	NO	RING 4	NO

TIMING	WALK	PED CLEAR	MIN GREEN	YELLOW	RED
ENTRANCE MIN TIMES	ϕ	255	5	4	1
	MIN GREEN	EXT GREEN	MAX GREEN	YELLOW	RED
TRACK CLEAR	ϕ	ϕ	ϕ	4	1
	MIN DWELL	PMT EXT	MAX TIME	YELLOW	RED
DWELL/CYCLE - EXIT	20	ϕ	100	4	1

PREEMPTOR ACTIVE OUT	ON	PREEMPTOR ACTIVE OUT IN DWELL	No
OTHER PRIORITY PREEMPTOR OUT	OFF	NON-PRIORITY PREEMPTOR OUT	OFF
INHIBIT EXTENSION TIME	ϕ		

MM-4-1 Preemptor, sheet 2 of 2

PREEMPTOR NUMBER	5

VEH/PED	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
OVERLAP	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
TRACKCLR V																
TRACKCLR O																
ENA TRL																
DWEL VEH		X			X											
DWEL PED																
DWEL OLP																
CYC VEH																
CYC PED																
CYC OLP																
EXIT PH		X				X										
EXIT CAL																
SP FUNC																

ENABLE	YES	PREEMPTION OVERRIDE	—	INTERLOCK ENABLE	NO
NON-LOCK INPUT	—	DELAY TIME (SECONDS)	Ø	INHIBIT TIME (SECONDS)	Ø
AUTOMATIC FLASH HAS PRIORITY	X	DURATION TIME (SECONDS)	Ø	RED CLEAR GOES GREEN	NO
TERMINATE OVERLAPS ASAP	NO	PED CLEAR THRU YELLOW	NO	TERM PH	NO
PED DARK	NO	TRACK CLEARANCE RESERVICE	NO	DWELL FL	OFF
LINKED PREEMPTOR	Ø	FLASH EXIT COLOR	GRN	PREEMPTION TO COORDINATION	OFF
EXIT TIMING PLAN	Ø	RESERVICE TIME	Ø ~~255~~		

FREE DURING PREEMPTION	RING 1	NO	RING 2	NO	RING 3	NO	RING 4	NO

TIMING	WALK	PED CLEAR	MIN GREEN	YELLOW	RED
ENTRANCE MIN TIMES	Ø	255	5	4	1
	MIN GREEN	EXT GREEN	MAX GREEN	YELLOW	RED
TRACK CLEAR	Ø	Ø	Ø	4	1
	MIN DWELL	PMT EXT	MAX TIME	YELLOW	RED
DWELL/CYCLE - EXIT	20	Ø	1ØØ	4	1

PREEMPTOR ACTIVE OUT	ON	PREEMPTOR ACTIVE OUT IN DWELL	NO
OTHER PRIORITY PREEMPTOR OUT	OFF	NON-PRIORITY PREEMPTOR OUT	OFF
INHIBIT EXTENSION TIME	Ø		

Preemptor Submenu

MM-4-1 Preemptor, sheet 1 of 2

PREEMPTOR NUMBER	6

VEH/PED	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
OVERLAP	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
TRACKCLR V																
TRACKCLR O																
ENA TRL																
DWEL VEH	X					X										
DWEL PED																
DWEL OLP																
CYC VEH																
CYC PED																
CYC OLP																
EXIT PH		X				X										
EXIT CAL																
SP FUNC																

ENABLE	Yes	PREEMPTION OVERRIDE	—	INTERLOCK ENABLE	No
NON-LOCK INPUT	—	DELAY TIME (SECONDS)	Ø	INHIBIT TIME (SECONDS)	Ø
AUTOMATIC FLASH HAS PRIORITY	X	DURATION TIME (SECONDS)	Ø	RED CLEAR GOES GREEN	NO
TERMINATE OVERLAPS ASAP	NO	PED CLEAR THRU YELLOW	NO	TERM PH	NO
PED DARK	NO	TRACK CLEARANCE RESERVICE	NO	DWELL FL	OFF
LINKED PREEMPTOR	Ø	FLASH EXIT COLOR	GRN	PREEMPTION TO COORDINATION	OFF
EXIT TIMING PLAN	Ø	RESERVICE TIME	Ø ~~255~~		

FREE DURING PREEMPTION	RING 1	No	RING 2	NO	RING 3	No	RING 4	NO

TIMING	WALK	PED CLEAR	MIN GREEN	YELLOW	RED
ENTRANCE MIN TIMES	Ø	255	5	4	1
	MIN GREEN	EXT GREEN	MAX GREEN	YELLOW	RED
TRACK CLEAR	Ø	Ø	Ø	4	1
	MIN DWELL	PMT EXT	MAX TIME	YELLOW	RED
DWELL/CYCLE - EXIT	20	Ø	1ØØ	4	1

PREEMPTOR ACTIVE OUT	ON	PREEMPTOR ACTIVE OUT IN DWELL	NO
OTHER PRIORITY PREEMPTOR OUT	OFF	NON-PRIORITY PREEMPTOR OUT	OFF
INHIBIT EXTENSION TIME	Ø		

MM-4-2 Low Priority Preemptor Selection

ENABLE PREEMPT FILTERING & TSP/SCP		
FILTERED INPUT	SOLID	PULSING
1	By Pass	BP
2	By Pass	BP
3	Pre 3	TSP 1
4	Pre 4	TSP 2
5	Pre 5	Pre 9
6	Pre 6	Pre 10
7	BP	BP
8	BP	BP
9	BP	BP
10	BP	BP

MM-4-3 TSP/SCP Plan (Optional)

TSP/SCP PLAN	1	2	3	4	5	6
TSP/SCP ENABLED	yes	Yes				
SIGNAL TYPE (S or P)	P	P				
DETECTOR LOCK	X	X				
DELAY TIME	Ø	Ø				
MAX PRESENCE	100	100				
PREEMPT ENABLES RESERVICE						
NO DELAY IN TSP PHASES						
ACTION SPECIAL FUNCTION INHIBIT	Ø	Ø				
RESERVICE CYCLES	31	31				
BUS HEADING (NB, SB, EB, WB)						
MODE (TSP or SCP)	TSP	FREE DEFAULT PTN		120		
HEADWAY ALLOWANCE	Ø					

— TSP/SCP PHASE —

VEH/PED	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
TSP/SCP1			[illegible]		[illegible]	T										
TSP/SCP2		T	[illegible]		[illegible]											
TSP/SCP3																
TSP/SCP4																
TSP/SCP5																
TSP/SCP6																

MM-4-4 TSP/SCP Split Pattern (Optional)

TSP/SCP SPLIT PATTERN	1							
PHASE	1	2	3	4	5	6	7	8
MAX REDUCTION	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
MIN GREEN	15	35	(computed automatically) 15	35	15	35	15	35
MAX EXTENSION								

PHASE	9	10	11	12	13	14	15	16
MAX REDUCTION								
MIN GREEN	(computed automatically)							
MAX EXTENSION								

2

Ø Ø Ø 7 2 Ø Ø 7
18 19 18 38 11 24 17 39

3

Ø Ø Ø 7 Ø Ø Ø 7
19 24 15 35 14 29 18 32

Time Base Submenu

MM-5-1 Clock/Calendar Data

Are the Date and Time set OK? (Yes, No)		STANDARD TIME FROM GMT	[illegible]
MANUAL ACTION PLAN		SYNC REFERENCE	Ref-Time
SYNC REFERENCE TIME	0:0	DAYLIGHT SAVINGS	[illegible]
TIME RESET INPUT TIME SET	03:30:00		

MM-5-2 Action Plan, sheet 1 of 4

ACTION PLAN	1		
PATTERN	Free	SYSTEM OVERRIDE	NO
TIMING PLAN	1	SEQUENCE	0
VEHICLE DETECTOR PLAN	0	DETECTOR LOG	None
FLASH	—	RED REST	0
VEHICLE DET DIAGNOSTIC PLAN	0	PED DET DIAGNOSTIC PLAN	NO
DIMMING ENABLE	NO		

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PED RECALL																
WALK 2																
VEH EXT 2																
VEH RECALL																
MAX RECALL																
MAX 2																
MAX 3																
CS INHIBIT																
PHASE OMIT																
SPEC FUNCTION									(1-8)							
AUX FUNCTION				(1-3)												

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LP 1-15															
LP 16-30															
LP 31-45															
LP 46-60															
LP 61-75															
LP 76-90															
LP 91-100															

MM-5-2 Action Plan, sheet 2 of 4

ACTION PLAN	2		
PATTERN	2	SYSTEM OVERRIDE	NO
TIMING PLAN	1	SEQUENCE	Ø
VEHICLE DETECTOR PLAN	Ø	DETECTOR LOG	None
FLASH	—	RED REST	NO
VEHICLE DET DIAGNOSTIC PLAN	Ø	PED DET DIAGNOSTIC PLAN	Ø
DIMMING ENABLE	NO		

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PED RECALL																
WALK 2																
VEH EXT 2																
VEH RECALL																
MAX RECALL																
MAX 2																
MAX 3																
CS INHIBIT																
PHASE OMIT																
SPEC FUNCTION									(1-8)							
AUX FUNCTION				(1-3)												

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LP 1-15															
LP 16-30															
LP 31-45															
LP 46-60															
LP 61-75															
LP 76-90															
LP 91-100															

MM-5-2 Action Plan, sheet 3 of 4

ACTION PLAN	3		
PATTERN	3	SYSTEM OVERRIDE	NO
TIMING PLAN	1	SEQUENCE	Ø
VEHICLE DETECTOR PLAN	Ø	DETECTOR LOG	None
FLASH	—	RED REST	NO
VEHICLE DET DIAGNOSTIC PLAN	Ø	PED DET DIAGNOSTIC PLAN	Ø
DIMMING ENABLE	NO		

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PED RECALL																
WALK 2																
VEH EXT 2																
VEH RECALL																
MAX RECALL																
MAX 2																
MAX 3																
CS INHIBIT																
PHASE OMIT																
SPEC FUNCTION									(1-8)							
AUX FUNCTION				(1-3)												

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LP 1-15															
LP 16-30															
LP 31-45															
LP 46-60															
LP 61-75															
LP 76-90															
LP 91-100															

MM-5-3 Day Plan, sheet 1 of 2

DAY PLAN #	1

EVENT #	ACTION PLAN #	START TIME	EVENT #	ACTION PLAN #	START TIME
1	1	00 : 01	26		:
2	2	06 : 00	27		:
3	1	08 : 00	28		:
4	3	16 : 00	29		:
5	1	18 : 00	30		:
6		:	31		:
7		:	32		:
8		:	33		:
9		:	34		:
10		:	35		:
11		:	36		:
12		:	37		:
13		:	38		:
14		:	39		:
15		:	40		:
16		:	41		:
17		:	42		:
18		:	43		:
19		:	44		:
20		:	45		:
21		:	46		:
22		:	47		:
23		:	48		:
24		:	49		:
25		:	50		:

MM-5-3 Day Plan, sheet 2 of 2

DAY PLAN #	2

EVENT #	ACTION PLAN #	START TIME	EVENT #	ACTION PLAN #	START TIME
1	1	00:01	26		:
2		:	27		:
3		:	28		:
4		:	29		:
5		:	30		:
6		:	31		:
7		:	32		:
8		:	33		:
9		:	34		:
10		:	35		:
11		:	36		:
12		:	37		:
13		:	38		:
14		:	39		:
15		:	40		:
16		:	41		:
17		:	42		:
18		:	43		:
19		:	44		:
20		:	45		:
21		:	46		:
22		:	47		:
23		:	48		:
24		:	49		:
25		:	50		:

MM-5-4 Schedule, sheet 1 of 3

SCHEDULE NUMBER	1
DAY PLAN NUMBER	1

	J	F	M	A	M	J	J	A	S	O	N	D
MONTH	X	X	X	X	X	X	X	X	X	X	X	X

	SUN	MON	TUE	WED	THU	FRI	SAT
DAY OF WEEK (DOW)		X	X	X	X	X	

DAY OF MONTH (DOM)											
	1	2	3	4	5	6	7	8	9	10	11
	X	X	X	X	X	X	X	X	X	X	X
	12	13	14	15	16	17	18	19	20	21	22
	X	X	X	X	X	X	X	X	X	X	X
	23	24	25	26	27	28	29	30	31		
	X	X	X	X	X	X	X	X	X		

SCHEDULE NUMBER	2
DAY PLAN NUMBER	2

	J	F	M	A	M	J	J	A	S	O	N	D
MONTH	X	X	X	X	X	X	X	X	X	X	X	X

	SUN	MON	TUE	WED	THU	FRI	SAT
DAY OF WEEK (DOW)	X						X

DAY OF MONTH (DOM)											
	1	2	3	4	5	6	7	8	9	10	11
	X	X	X	X	X	X	X	X	X	X	X
	12	13	14	15	16	17	18	19	20	21	22
	X	X	X	X	X	X	X	X	X	X	X
	23	24	25	26	27	28	29	30	31		
	X	X	X	X	X	X	X	X	X		

APPENDIX B

Existing Plus Approved Development

Crash Data

Total Crashes per KDOT Summary

Year	Roeland Drive
2013	0
2014	10
2015	4
2016	3
2017	0
Total*	**17**

*2018 & 2019 Excluded from crash rate due to incomplete/unofficial data (per KDOT)

Sorted Crash Data After Review ("Random" Crashes Removed)

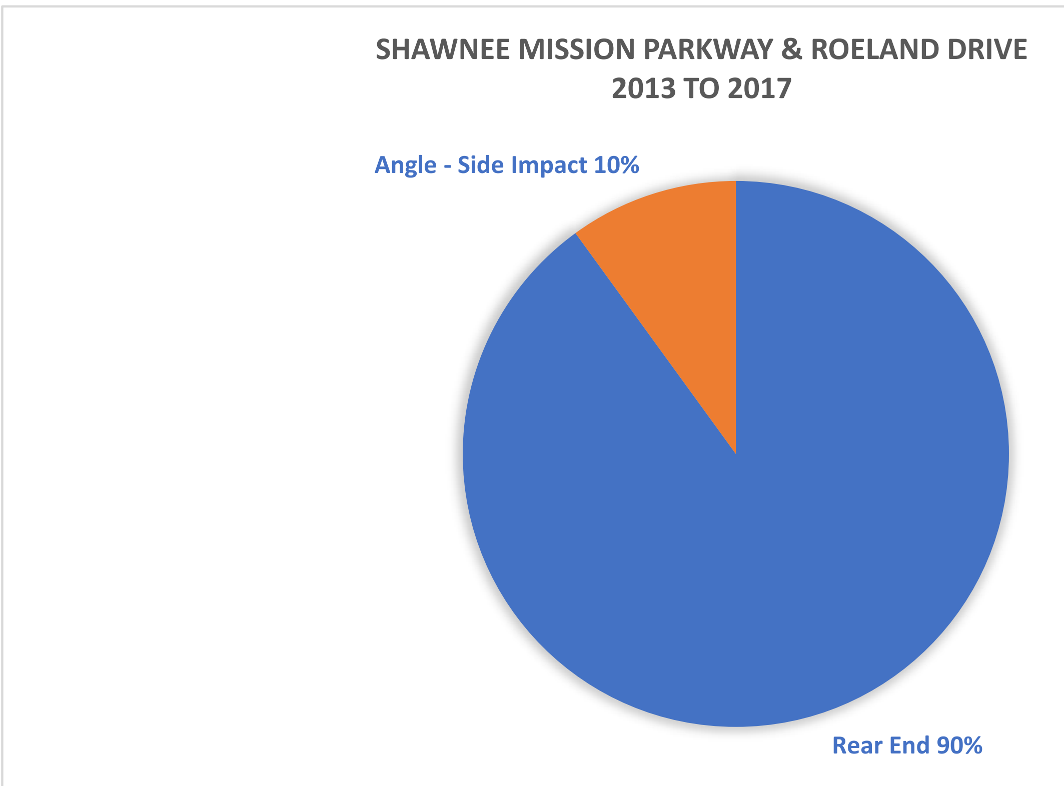
Year	Roeland Drive
2013	0
2014	5
2015	2
2016	3
2017	0
Total*	**10**

*2018 & 2019 Excluded from crash rate due to incomplete/unofficial data (per KDOT)

Examples of "random" crashes include those deemed to be caused by:
alcohol impairment, animals, construction, inclement weather, a previous crash
emergency vehicle, vehicle malfunction, or medical complications.

CWOV
Rear End
Rear End
Rear End
Angle - Side Impact
Rear End
Rear End
Rear End
Rear End
Rear End
Rear End

Rear End	Angle - Side Impact
9	1



	Intersection		Total Entering Vehicles (TEV/day)	Ten Million Entering Vehicles (TMEV/5 years)	2013-2017 Total	Intersection Crash Rate (crashes/TMEV)
	Street	Street				
Intersection						
1	US-73	Roeland Drive	38,360	7.0	10	1.43

Note: Crash rate only includes crashes occuring from 2013-2017. Crashes that were considered "random" were not included in the crash rate calculation

Signal Warrants

Configuration Submenu

MM-1-1-1 Phase Ring Assignment (PRI = Priority)

Sequence 1

	CONFIGURE UTILITY		F						HW ALTERNATE SEQUENCE ENABLE							
PRI	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
BC																
R1	1	2	3	4	9	10	13	14								
R2	5	6	7	8	11	12	15	6								
R3																
R4																

Sequence 2

PRI	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
BC																
R1																
R2																
R3																
R4																

Sequence 3

PRI	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
BC																
R1																
R2																
R3																
R4																

Sequence 4

PRI	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
BC																
R1																
R2																
R3																
R4																

Controller Submenu

MM-2-1 Controller Timing Data, sheet 1 of 2

TIMING PLAN _____	Johnson DR & Roe															
PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
MINIMUM GREEN	5	5	5	5	5	5	5	5								
BICYCLE MINIMUM GREEN																
CONDITIONAL SERVICE MIN. GREEN																
DELAYED GREEN																
WALK		9						8								
WALK 2																
WALK MAX																
PEDESTRIAN CLEARANCE		31						30								
PEDESTRIAN CLEARANCE 2																
PEDESTRIAN CLEARANCE MAX																
PEDESTRIAN CARRY OVER																
VEHICLE EXTENSION	3	3	3	3	3	3	3	3								
VEHICLE EXTENSION 2																
MAX1	15	18	33	33	22	22	33	33								
MAX2																
MAX3																
DYNAMIC MAX																
DYNAMIC MAX STEP																
YELLOW CHANGE	4	4	4	4	4	4	4	4								
RED CLEARANCE	2	2	2	2	2	2	2	2								
RED MAX																
RED REVERT																
ACTUATIONS BEFORE GAP REDUCTION																
SECONDS PER ACTIONS ADDED TO INITIAL																
MAXIMUM ADDED INITIAL GREEN																
TIME BEFORE GAP REDUCTION																
CARS WAITING BEFORE GAP REDUCTION																
STEP TO REDUCE																
TIME TO REDUCE TO MINIMUM																
MINIMUM GAP																

MM-2-4 Guaranteed Minimum Times

OL/PHASE	A01	B02	C03	D04	E05	F06	G07	H08
MIN GRN	5	5	5	5	5	5	5	5
WALK								
PED CLR								
YELLOW	3	3	3	3	3	3	3	3
RED CLR	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
OVL GRN	5	5	5	5	5	5	5	5
OL/PHASE	**I09**	**J10**	**K11**	**L12**	**M13**	**N14**	**O15**	**P16**
MIN GRN								
WALK								
PED CLR								
YELLOW								
RED CLR								
OVL GRN								

MM-2-5 Start/Flash Data

START UP

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE		Y				Y										
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**
OVERLAP	X	X	X	X												

FLASH>MON.	NO	FLASH TIME	Ø	ALL RED TIME	8
PWR START SEQ.					

AUTOMATIC FLASH

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
ENTRY		X				X										
EXIT		X				X										
OVERLAP	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**
EXIT	X	X	X	X												

FLASH>MON.	NO	EXIT FLASH	W	MIN FLASH	8
MINIMUM RECALL	NO			CYCLE THROUGH PHASES	NO

MM-2-8 Phase Recall Options

TIMING PLAN NUMBER [1]

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
LOCK DET INPUT																
VEH RECALL				X				X								
PED RECALL																
MAX TIME RECALL																
SOFT RECALL																
NO REST IN PHASE																
ADDED INIT CALC																

TIMING PLAN NUMBER [2]

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
LOCK DET INPUT																
VEH RECALL																
PED RECALL																
MAX TIME RECALL																
SOFT RECALL																
NO REST IN PHASE																
ADDED INIT CALC																

TIMING PLAN NUMBER [3]

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
LOCK DET INPUT																
VEH RECALL																
PED RECALL																
MAX TIME RECALL																
SOFT RECALL																
NO REST IN PHASE																
ADDED INIT CALC																

TIMING PLAN NUMBER [4]

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
LOCK DET INPUT																
VEH RECALL																
PED RECALL																
MAX TIME RECALL																
SOFT RECALL																
NO REST IN PHASE																
ADDED INIT CALC																

Coordinator Submenu

MM-3-1 Coordinator Options

COORD OPTIONS			
MANUAL PATTERN	AUTO	ECPI COORD	YES
SYSTEM SOURCE	TBC	SYSTEM FORMAT	STD
SPLITS IN	%	OFFSET IN	Sec's
TRANSITION	Smooth	MAX SELECT	Max INH
DWELL/ADD TIME	Ø	ENABLE MAN SYNC	NO
DLY COORD WK-LZ	NO	FORCE OFF	FLOAT
OFFSET REF	LEAD	CAL USE PED TM	YES
PED RECALL	NO	PED RESERVE	NO
LOCAL ZERO OVRD	NO	FO ADD INI GRN	NO
RE-SYNC COUNT	Ø	MULTISYNC	NO

MM-3-2 Coordinator Pattern, sheet 1 of 2

COORDINATOR PATTERN	1
USE SPLIT PATTERN	1
TS2 PATTERN / OFFSET	Ø-1
CYCLE	100 s
OFFSET VAL	Ø 5
ACTUATED COORD	Yes
ACT WALK REST	NO
PHASE RESERVICE	NO
MAX SELECT	NONE

STD (COS)	111
DWELL/ADD TIME	Ø
TIMING PLAN	1
SEQUENCE	Ø
ACTION PLAN	1
FORCE OFF	NONE

SPLIT PREFERENCE PHASES

PHASE	1	2	3	4	5	6	7	8
SPLIT PATTERN	15	35	15	35	15	35	15	35
PREF 1								
PREF 2								
SPLT EXT								
VEH PERM				DISP				
RING DISP				(RINGS 2-4)				

SPLIT PREFERENCE PHASES

PHASE	9	10	11	12	13	14	15	16
SPLIT PATTERN								
PREF 1								
PREF 2								

SPLIT DEMAND PATTERN (1 or 2)	
X ARTERY PATTERN	

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COORD				X				X								
VE RCALL																
PD RCALL																
MX RCALL																
OMIT																
SF OUT									(1-8)							

MM-3-2 Coordinator Pattern, sheet 1 of 2

COORDINATOR PATTERN	2
USE SPLIT PATTERN	2
TS2 PATTERN / OFFSET	0-2
CYCLE	100's
OFFSET VAL	%
ACTUATED COORD	yes
ACT WALK REST	NO
PHASE RESERVICE	NO
MAX SELECT	NONE

STD (COS)	121
DWELL/ADD TIME	Ø
TIMING PLAN	1
SEQUENCE	Ø
ACTION PLAN	2
FORCE OFF	Float

SPLIT PREFERENCE PHASES

PHASE		1	2	3	4	5	6	7	8
SPLIT PATTERN	2	18	19	18	45	13	24	17	46
PREF 1									
PREF 2									
SPLT EXT									
VEH PERM					DISP				
RING DISP						(RINGS 2-4)			

SPLIT PREFERENCE PHASES

PHASE		9	10	11	12	13	14	15	16
SPLIT PATTERN									
PREF 1									
PREF 2									

SPLIT DEMAND PATTERN (1 or 2)	
X ARTERY PATTERN	

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COORD				X				X								
VE RCALL																
PD RCALL																
MX RCALL																
OMIT																
SF OUT									(1-8)							

MM-3-2 Coordinator Pattern, sheet 1 of 2

COORDINATOR PATTERN	3
USE SPLIT PATTERN	3
TS2 PATTERN / OFFSET	ø - 3
CYCLE	100's
OFFSET VAL	90
ACTUATED COORD	yes
ACT WALK REST	NO
PHASE RESERVICE	NO
MAX SELECT	None

STD (COS)	131
DWELL/ADD TIME	ø
TIMING PLAN	1
SEQUENCE	ø
ACTION PLAN	3
FORCE OFF	Float

SPLIT PREFERENCE PHASES

PHASE		1	2	3	4	5	6	7	8
SPLIT PATTERN	3	19	24	15	42	14	29	18	39
PREF 1									
PREF 2									
SPLT EXT									
VEH PERM					DISP				
RING DISP						(RINGS 2-4)			

SPLIT PREFERENCE PHASES

PHASE		9	10	11	12	13	14	15	16
SPLIT PATTERN									
PREF 1									
PREF 2									

SPLIT DEMAND PATTERN (1 or 2)	
X ARTERY PATTERN	

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COORD				X				X								
VE RCALL																
PD RCALL																
MX RCALL																
OMIT																
SF OUT									(1-8)							

MM-3-3 Split Pattern, sheet 1 of 4

SPLIT PATTERN NUMBER	1

PHASE	1	2	3	4	5	6	7	8
SPLIT	15	35	15	35	15	35	15	35

PHASE	9	10	11	12	13	14	15	16
SPLIT								

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COORD				X				X								
VEH RECALL																
PED RECALL																
MAX RECALL																
OMIT																

SPLIT PATTERN NUMBER	2

PHASE	1	2	3	4	5	6	7	8
SPLIT	18	19	18	45	13	24	17	46

PHASE	9	10	11	12	13	14	15	16
SPLIT								

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COORD				X				X								
VEH RECALL																
PED RECALL																
MAX RECALL																
OMIT																

MM-3-3 Split Pattern, sheet 2 of 4

SPLIT PATTERN NUMBER	3							
PHASE	1	2	3	4	5	6	7	8
SPLIT	19	24	15	42	14	29	18	39
PHASE	9	10	11	12	13	14	15	16
SPLIT								

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COORD				X				X								
VEH RECALL																
PED RECALL																
MAX RECALL																
OMIT																

SPLIT PATTERN NUMBER								
PHASE	1	2	3	4	5	6	7	8
SPLIT								
PHASE	9	10	11	12	13	14	15	16
SPLIT								

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COORD																
VEH RECALL																
PED RECALL																
MAX RECALL																
OMIT																

Preemptor Submenu

MM-4-1 Preemptor, sheet 1 of 2

PREEMPTOR NUMBER	3

VEH/PED	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
OVERLAP	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
TRACKCLR V																
TRACKCLR O																
ENA TRL																
DWEL VEH				X			X									
DWEL PED																
DWEL OLP																
CYC VEH																
CYC PED																
CYC OLP																
EXIT PH				X				X								
EXIT CAL																
SP FUNC																

ENABLE	Yes	PREEMPTION OVERRIDE	—	INTERLOCK ENABLE	NO
NON-LOCK INPUT	—	DELAY TIME (SECONDS)	Ø	INHIBIT TIME (SECONDS)	Ø
AUTOMATIC FLASH HAS PRIORITY	X	DURATION TIME (SECONDS)	Ø	RED CLEAR GOES GREEN	NO
TERMINATE OVERLAPS ASAP	NO	PED CLEAR THRU YELLOW	NO	TERM PH	NO
PED DARK	NO	TRACK CLEARANCE RESERVICE	NO	DWELL FL	off
LINKED PREEMPTOR	Ø	FLASH EXIT COLOR	GEN	PREEMPTION TO COORDINATION	off
EXIT TIMING PLAN	Ø	RESERVICE TIME	Ø		

FREE DURING PREEMPTION	RING 1	NO	RING 2	NO	RING 3	NO	RING 4	NO

TIMING	WALK	PED CLEAR	MIN GREEN	YELLOW	RED
ENTRANCE MIN TIMES	Ø	255	5	4	1
	MIN GREEN	EXT GREEN	MAX GREEN	YELLOW	RED
TRACK CLEAR	Ø	Ø	Ø	4	1
	MIN DWELL	PMT EXT	MAX TIME	YELLOW	RED
DWELL/CYCLE - EXIT	20	Ø	1ØØ	4	1

PREEMPTOR ACTIVE OUT	ON	PREEMPTOR ACTIVE OUT IN DWELL	NO
OTHER PRIORITY PREEMPTOR OUT	off	NON-PRIORITY PREEMPTOR OUT	off
INHIBIT EXTENSION TIME	Ø		

Preemptor Submenu

MM-4-1 Preemptor, sheet 1 of 2

PREEMPTOR NUMBER	4

VEH/PED	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
OVERLAP	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
TRACKCLR V																
TRACKCLR O																
ENA TRL																
DWEL VEH			X					X								
DWEL PED																
DWEL OLP																
CYC VEH																
CYC PED																
CYC OLP																
EXIT PH				X				X								
EXIT CAL																
SP FUNC																

ENABLE	Yes	PREEMPTION OVERRIDE	-	INTERLOCK ENABLE	NO
NON-LOCK INPUT	-	DELAY TIME (SECONDS)	Ø	INHIBIT TIME (SECONDS)	Ø
AUTOMATIC FLASH HAS PRIORITY	X	DURATION TIME (SECONDS)	Ø	RED CLEAR GOES GREEN	No
TERMINATE OVERLAPS ASAP	No	PED CLEAR THRU YELLOW	No	TERM PH	NO
PED DARK	NO	TRACK CLEARANCE RESERVICE	NO	DWELL FL	OFF
LINKED PREEMPTOR	Ø	FLASH EXIT COLOR	GRN	PREEMPTION TO COORDINATION	OFF
EXIT TIMING PLAN	Ø	RESERVICE TIME	Ø		

FREE DURING PREEMPTION	RING 1	NO	RING 2	NO	RING 3	NO	RING 4	NO

TIMING	WALK	PED CLEAR	MIN GREEN	YELLOW	RED
ENTRANCE MIN TIMES	Ø	255	5	4	1
	MIN GREEN	EXT GREEN	MAX GREEN	YELLOW	RED
TRACK CLEAR	Ø	Ø	Ø	4	1
	MIN DWELL	PMT EXT	MAX TIME	YELLOW	RED
DWELL/CYCLE - EXIT	20	Ø	100	4	1

PREEMPTOR ACTIVE OUT	ON	PREEMPTOR ACTIVE OUT IN DWELL	No
OTHER PRIORITY PREEMPTOR OUT	OFF	NON-PRIORITY PREEMPTOR OUT	OFF
INHIBIT EXTENSION TIME	Ø		

MM-4-1 Preemptor, sheet 2 of 2

PREEMPTOR NUMBER	5

VEH/PED	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
OVERLAP	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
TRACKCLR V																
TRACKCLR O																
ENA TRL																
DWEL VEH		X			X											
DWEL PED																
DWEL OLP																
CYC VEH																
CYC PED																
CYC OLP																
EXIT PH		X				X										
EXIT CAL																
SP FUNC																

ENABLE	Yes	PREEMPTION OVERRIDE	—	INTERLOCK ENABLE	NO
NON-LOCK INPUT	—	DELAY TIME (SECONDS)	Ø	INHIBIT TIME (SECONDS)	Ø
AUTOMATIC FLASH HAS PRIORITY	X	DURATION TIME (SECONDS)	Ø	RED CLEAR GOES GREEN	No
TERMINATE OVERLAPS ASAP	NO	PED CLEAR THRU YELLOW	NO	TERM PH	NO
PED DARK	NO	TRACK CLEARANCE RESERVICE	NO	DWELL FL	OFF
LINKED PREEMPTOR	Ø	FLASH EXIT COLOR	GRN	PREEMPTION TO COORDINATION	OFF
EXIT TIMING PLAN	Ø	RESERVICE TIME	Ø ~~255~~		

FREE DURING PREEMPTION	RING 1	NO	RING 2	NO	RING 3	NO	RING 4	NO

TIMING	WALK	PED CLEAR	MIN GREEN	YELLOW	RED
ENTRANCE MIN TIMES	Ø	255	5	4	1
	MIN GREEN	EXT GREEN	MAX GREEN	YELLOW	RED
TRACK CLEAR	Ø	Ø	Ø	4	1
	MIN DWELL	PMT EXT	MAX TIME	YELLOW	RED
DWELL/CYCLE - EXIT	20	Ø	100	4	1

PREEMPTOR ACTIVE OUT	ON	PREEMPTOR ACTIVE OUT IN DWELL	NO
OTHER PRIORITY PREEMPTOR OUT	OFF	NON-PRIORITY PREEMPTOR OUT	OFF
INHIBIT EXTENSION TIME	Ø		

Preemptor Submenu

MM-4-1 Preemptor, sheet 1 of 2

PREEMPTOR NUMBER	6

VEH/PED	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
OVERLAP	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
TRACKCLR V																
TRACKCLR O																
ENA TRL																
DWEL VEH	X					X										
DWEL PED																
DWEL OLP																
CYC VEH																
CYC PED																
CYC OLP																
EXIT PH		X				X										
EXIT CAL																
SP FUNC																

ENABLE	Yes	PREEMPTION OVERRIDE	—	INTERLOCK ENABLE	NO
NON-LOCK INPUT	—	DELAY TIME (SECONDS)	Ø	INHIBIT TIME (SECONDS)	Ø
AUTOMATIC FLASH HAS PRIORITY	X	DURATION TIME (SECONDS)	Ø	RED CLEAR GOES GREEN	NO
TERMINATE OVERLAPS ASAP	NO	PED CLEAR THRU YELLOW	NO	TERM PH	NO
PED DARK	NO	TRACK CLEARANCE RESERVICE	NO	DWELL FL	OFF
LINKED PREEMPTOR	Ø	FLASH EXIT COLOR	GRN	PREEMPTION TO COORDINATION	OFF
EXIT TIMING PLAN	Ø	RESERVICE TIME	Ø ~~255~~		

FREE DURING PREEMPTION	RING 1	No	RING 2	NO	RING 3	No	RING 4	NO

TIMING	WALK	PED CLEAR	MIN GREEN	YELLOW	RED
ENTRANCE MIN TIMES	Ø	255	5	4	1
	MIN GREEN	EXT GREEN	MAX GREEN	YELLOW	RED
TRACK CLEAR	Ø	Ø	Ø	4	1
	MIN DWELL	PMT EXT	MAX TIME	YELLOW	RED
DWELL/CYCLE - EXIT	20	Ø	1ØØ	4	1

PREEMPTOR ACTIVE OUT	ON	PREEMPTOR ACTIVE OUT IN DWELL	NO
OTHER PRIORITY PREEMPTOR OUT	OFF	NON-PRIORITY PREEMPTOR OUT	OFF
INHIBIT EXTENSION TIME	Ø		

MM-4-2 Low Priority Preemptor Selection

ENABLE PREEMPT FILTERING & TSP/SCP		
FILTERED INPUT	SOLID	PULSING
1	By Pass	BP
2	By Pass	BP
3	Pre 3	TSP 1
4	Pre 4	TSP 2
5	Pre 5	Pre 9
6	Pre 6	Pre 10
7	BP	BP
8	BP	BP
9	BP	BP
10	BP	BP

MM-4-3 TSP/SCP Plan (Optional)

TSP/SCP PLAN	1	2	3	4	5	6
TSP/SCP ENABLED	yes	Yes				
SIGNAL TYPE (S or P)	P	P				
DETECTOR LOCK	X	X				
DELAY TIME	Ø	Ø				
MAX PRESENCE	100	100				
PREEMPT ENABLES RESERVICE						
NO DELAY IN TSP PHASES						
ACTION SPECIAL FUNCTION INHIBIT	Ø	Ø				
RESERVICE CYCLES	31	31				
BUS HEADING (NB, SB, EB, WB)						
MODE (TSP or SCP)	TSP	FREE DEFAULT PTN	120			
HEADWAY ALLOWANCE	Ø					

— TSP/SCP PHASE —

VEH/PED	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
TSP/SCP1			[illegible]		[illegible]	T										
TSP/SCP2		T	[illegible]		[illegible]											
TSP/SCP3																
TSP/SCP4																
TSP/SCP5																
TSP/SCP6																

MM-4-4 TSP/SCP Split Pattern (Optional)

TSP/SCP SPLIT PATTERN	1

PHASE	1	2	3	4	5	6	7	8
MAX REDUCTION	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
MIN GREEN	15	35	(computed automatically)				15	35
MAX EXTENSION								

PHASE	9	10	11	12	13	14	15	16
MAX REDUCTION								
MIN GREEN	(computed automatically)							
MAX EXTENSION								

2

Ø Ø Ø 7 2 Ø Ø 7

18 19 18 38 11 24 17 39

3

Ø Ø Ø 7 Ø Ø Ø 7

19 24 15 35 14 29 18 32

Time Base Submenu

MM-5-1 Clock/Calendar Data

Are the Date and Time set OK? (Yes, No)		STANDARD TIME FROM GMT	7:00
MANUAL ACTION PLAN		SYNC REFERENCE	Ref-Time
SYNC REFERENCE TIME	0:0	DAYLIGHT SAVINGS	[illegible]
TIME RESET INPUT TIME SET	03:30:00		

MM-5-2 Action Plan, sheet 1 of 4

ACTION PLAN	1		
PATTERN	FRee	SYSTEM OVERRIDE	NO
TIMING PLAN	1	SEQUENCE	0
VEHICLE DETECTOR PLAN	0	DETECTOR LOG	None
FLASH	—	RED REST	0
VEHICLE DET DIAGNOSTIC PLAN	0	PED DET DIAGNOSTIC PLAN	NO
DIMMING ENABLE	NO		

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PED RECALL																
WALK 2																
VEH EXT 2																
VEH RECALL																
MAX RECALL																
MAX 2																
MAX 3																
CS INHIBIT																
PHASE OMIT																
SPEC FUNCTION									(1-8)							
AUX FUNCTION				(1-3)												

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LP 1-15															
LP 16-30															
LP 31-45															
LP 46-60															
LP 61-75															
LP 76-90															
LP 91-100															

MM-5-2 Action Plan, sheet 2 of 4

ACTION PLAN	2		
PATTERN	2	SYSTEM OVERRIDE	NO
TIMING PLAN	1	SEQUENCE	Ø
VEHICLE DETECTOR PLAN	Ø	DETECTOR LOG	None
FLASH	—	RED REST	NO
VEHICLE DET DIAGNOSTIC PLAN	Ø	PED DET DIAGNOSTIC PLAN	Ø
DIMMING ENABLE	NO		

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PED RECALL																
WALK 2																
VEH EXT 2																
VEH RECALL																
MAX RECALL																
MAX 2																
MAX 3																
CS INHIBIT																
PHASE OMIT																
SPEC FUNCTION									(1-8)							
AUX FUNCTION				(1-3)												

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LP 1-15															
LP 16-30															
LP 31-45															
LP 46-60															
LP 61-75															
LP 76-90															
LP 91-100															

MM-5-2 Action Plan, sheet 3 of 4

ACTION PLAN	3		
PATTERN	3	SYSTEM OVERRIDE	No
TIMING PLAN	1	SEQUENCE	2
VEHICLE DETECTOR PLAN	2	DETECTOR LOG	None
FLASH	—	RED REST	No
VEHICLE DET DIAGNOSTIC PLAN	Ø	PED DET DIAGNOSTIC PLAN	Ø
DIMMING ENABLE	NO		

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PED RECALL																
WALK 2																
VEH EXT 2																
VEH RECALL																
MAX RECALL																
MAX 2																
MAX 3																
CS INHIBIT																
PHASE OMIT																
SPEC FUNCTION									(1-8)							
AUX FUNCTION				(1-3)												

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LP 1-15															
LP 16-30															
LP 31-45															
LP 46-60															
LP 61-75															
LP 76-90															
LP 91-100															

MM-5-3 Day Plan, sheet 1 of 2

DAY PLAN #	1

EVENT #	ACTION PLAN #	START TIME	EVENT #	ACTION PLAN #	START TIME
1	1	00 : 01	26		:
2	2	06 : 00	27		:
3	1	08 : 00	28		:
4	3	16 : 00	29		:
5	1	18 : 00	30		:
6		:	31		:
7		:	32		:
8		:	33		:
9		:	34		:
10		:	35		:
11		:	36		:
12		:	37		:
13		:	38		:
14		:	39		:
15		:	40		:
16		:	41		:
17		:	42		:
18		:	43		:
19		:	44		:
20		:	45		:
21		:	46		:
22		:	47		:
23		:	48		:
24		:	49		:
25		:	50		:

MM-5-3 Day Plan, sheet 2 of 2

DAY PLAN #	2

EVENT #	ACTION PLAN #	START TIME	EVENT #	ACTION PLAN #	START TIME
1	1	00:01	26		:
2		:	27		:
3		:	28		:
4		:	29		:
5		:	30		:
6		:	31		:
7		:	32		:
8		:	33		:
9		:	34		:
10		:	35		:
11		:	36		:
12		:	37		:
13		:	38		:
14		:	39		:
15		:	40		:
16		:	41		:
17		:	42		:
18		:	43		:
19		:	44		:
20		:	45		:
21		:	46		:
22		:	47		:
23		:	48		:
24		:	49		:
25		:	50		:

MM-5-4 Schedule, sheet 1 of 3

SCHEDULE NUMBER	1
DAY PLAN NUMBER	1

MONTH	J	F	M	A	M	J	J	A	S	O	N	D
	X	X	X	X	X	X	X	X	X	X	X	X

DAY OF WEEK (DOW)	SUN	MON	TUE	WED	THU	FRI	SAT
		X	X	X	X	X	

DAY OF MONTH (DOM)											
	1	2	3	4	5	6	7	8	9	10	11
	X	X	X	X	X	X	X	X	X	X	X
	12	13	14	15	16	17	18	19	20	21	22
	X	X	X	X	X	X	X	X	X	X	X
	23	24	25	26	27	28	29	30	31		
	X	X	X	X	X	X	X	X	X		

SCHEDULE NUMBER	2
DAY PLAN NUMBER	2

MONTH	J	F	M	A	M	J	J	A	S	O	N	D
	X	X	X	X	X	X	X	X	X	X	X	X

DAY OF WEEK (DOW)	SUN	MON	TUE	WED	THU	FRI	SAT
	X						X

DAY OF MONTH (DOM)											
	1	2	3	4	5	6	7	8	9	10	11
	X	X	X	X	X	X	X	X	X	X	X
	12	13	14	15	16	17	18	19	20	21	22
	X	X	X	X	X	X	X	X	X	X	X
	23	24	25	26	27	28	29	30	31		
	X	X	X	X	X	X	X	X	X		

Trip Generation

Land Use: 220
Multifamily Housing (Low-Rise)

Description

Low-rise multifamily housing includes apartments, townhouses, and condominiums located within the same building with at least three other dwelling units and that have one or two levels (floors). Multifamily housing (mid-rise) (Land Use 221), multifamily housing (high-rise) (Land Use 222), and off-campus student apartment (Land Use 225) are related land uses.

Additional Data

In prior editions of *Trip Generation Manual*, the low-rise multifamily housing sites were further divided into rental and condominium categories. An investigation of vehicle trip data found no clear differences in trip making patterns between the rental and condominium sites within the ITE database. As more data are compiled for future editions, this land use classification can be reinvestigated.

For the three sites for which both the number of residents and the number of occupied dwelling units were available, there were an average of 2.72 residents per occupied dwelling unit.

For the two sites for which the numbers of both total dwelling units and occupied dwelling units were available, an average of 96.2 percent of the total dwelling units were occupied.

This land use included data from a wide variety of units with different sizes, price ranges, locations, and ages. Consequently, there was a wide variation in trips generated within this category. Other factors, such as geographic location and type of adjacent and nearby development, may also have had an effect on the site trip generation.

Time-of-day distribution data for this land use are presented in Appendix A. For the 10 general urban/suburban sites with data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 7:15 and 8:15 a.m. and 4:45 and 5:45 p.m., respectively. For the one site with Saturday data, the overall highest vehicle volume was counted between 9:45 and 10:45 a.m. For the one site with Sunday data, the overall highest vehicle volume was counted between 11:45 a.m. and 12:45 p.m.

For the one dense multi-use urban site with 24-hour count data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 7:00 and 8:00 a.m. and 6:15 and 7:15 p.m., respectively.

For the three sites for which data were provided for both occupied dwelling units and residents, there was an average of 2.72 residents per occupied dwelling unit.

The average numbers of person trips per vehicle trip at the five general urban/suburban sites at which both person trip and vehicle trip data were collected were as follows:

- 1.13 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 1.21 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in British Columbia (CAN), California, District of Columbia, Florida, Georgia, Illinois, Indiana, Maine, Maryland, Minnesota, New Jersey, New York, Ontario, Oregon, Pennsylvania, South Dakota, Tennessee, Texas, Utah, Virginia, and Washington.

It is expected that the number of bedrooms and number of residents are likely correlated to the number of trips generated by a residential site. Many of the studies included in this land use did not indicate the total number of bedrooms. To assist in the future analysis of this land use, it is important that this information be collected and included in trip generation data submissions.

Source Numbers

168, 187, 188, 204, 211, 300, 305, 306, 319, 320, 321, 357, 390, 412, 418, 525, 530, 571, 579, 583, 864, 868, 869, 870, 896, 903, 918, 946, 947, 948, 951

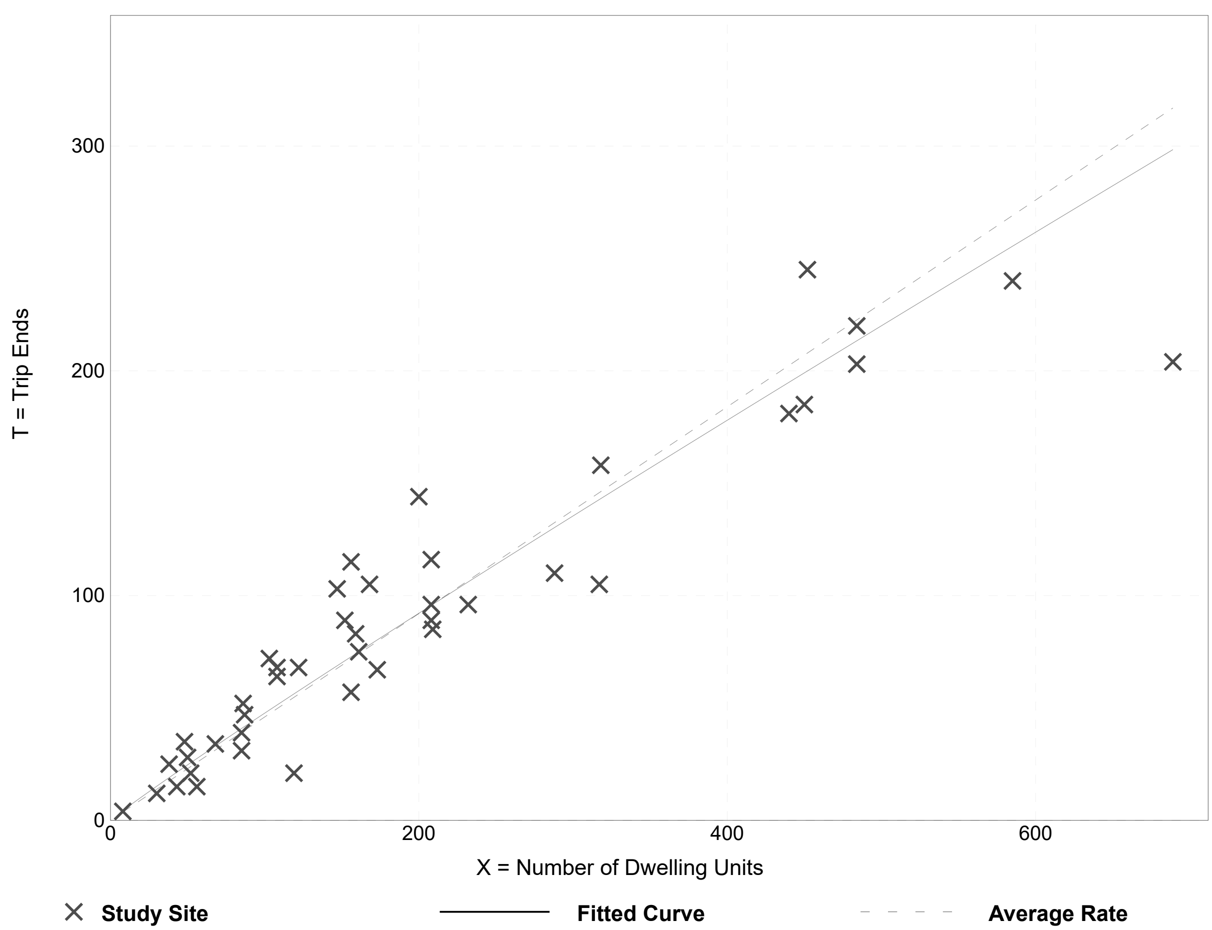
Multifamily Housing (Low-Rise)
(220)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	42
Avg. Num. of Dwelling Units:	199
Directional Distribution:	23% entering, 77% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.46	0.18 - 0.74	0.12

Data Plot and Equation



Fitted Curve Equation: $Ln(T) = 0.95 Ln(X) - 0.51$ **$R^2= 0.90$**

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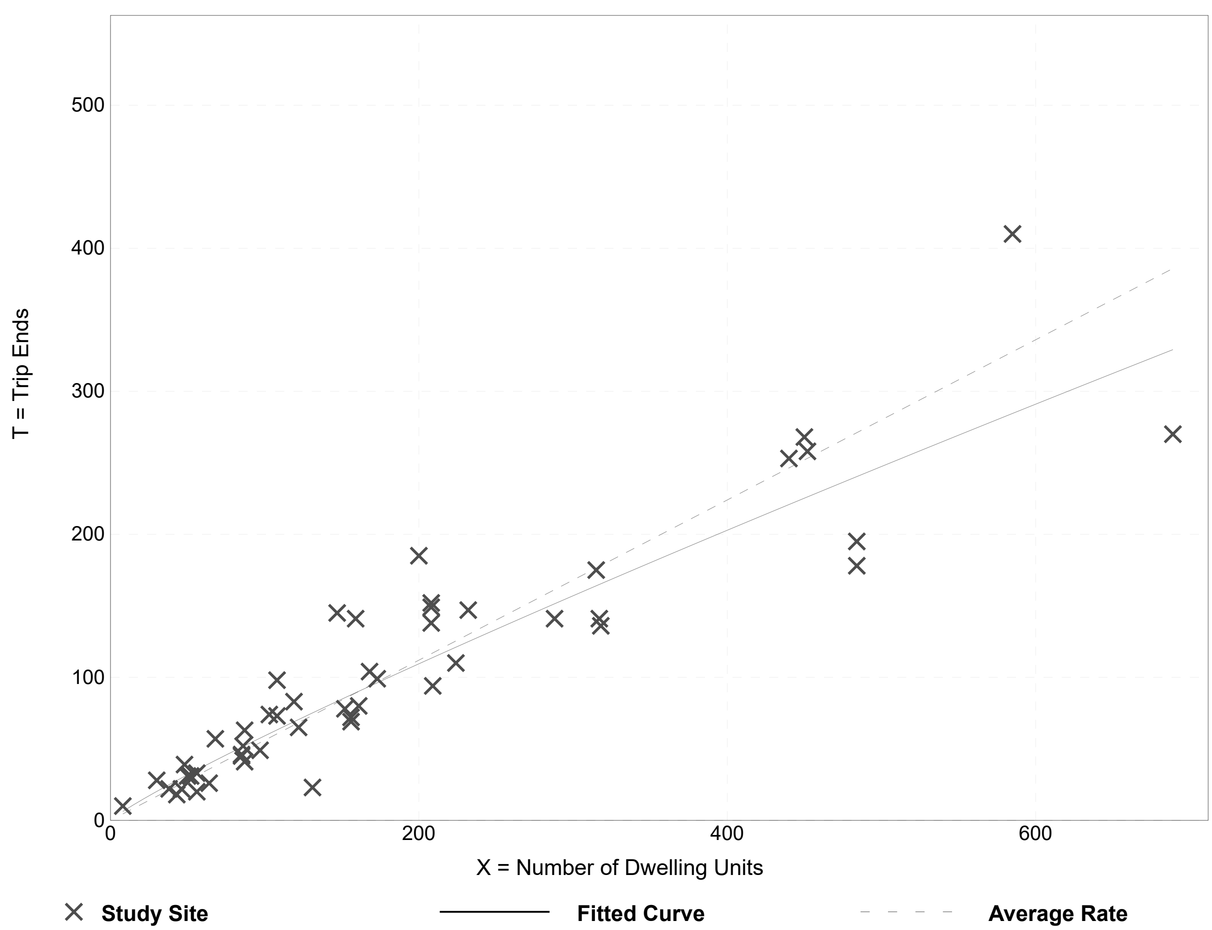
Multifamily Housing (Low-Rise)
(220)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	50
Avg. Num. of Dwelling Units:	187
Directional Distribution:	63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.56	0.18 - 1.25	0.16

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.89 Ln(X) - 0.02 **R^2= 0.86**

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Land Use: 820
Shopping Center

Description

A shopping center is an integrated group of commercial establishments that is planned, developed, owned, and managed as a unit. A shopping center's composition is related to its market area in terms of size, location, and type of store. A shopping center also provides on-site parking facilities sufficient to serve its own parking demands. Factory outlet center (Land Use 823) is a related use.

Additional Data

Shopping centers, including neighborhood centers, community centers, regional centers, and super regional centers, were surveyed for this land use. Some of these centers contained non-merchandising facilities, such as office buildings, movie theaters, restaurants, post offices, banks, health clubs, and recreational facilities (for example, ice skating rinks or indoor miniature golf courses).

Many shopping centers, in addition to the integrated unit of shops in one building or enclosed around a mall, include outparcels (peripheral buildings or pads located on the perimeter of the center adjacent to the streets and major access points). These buildings are typically drive-in banks, retail stores, restaurants, or small offices. Although the data herein do not indicate which of the centers studied included peripheral buildings, it can be assumed that some of the data show their effect.

The vehicle trips generated at a shopping center are based upon the total GLA of the center. In cases of smaller centers without an enclosed mall or peripheral buildings, the GLA could be the same as the gross floor area of the building.

Time-of-day distribution data for this land use are presented in Appendix A. For the 10 general urban/suburban sites with data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 11:45 a.m. and 12:45 p.m. and 12:15 and 1:15 p.m., respectively.

The average numbers of person trips per vehicle trip at the 27 general urban/suburban sites at which both person trip and vehicle trip data were collected were as follows:

- 1.31 during Weekday, AM Peak Hour of Generator
- 1.43 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.
- 1.46 during Weekday, PM Peak Hour of Generator

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in Alberta (CAN), British Columbia (CAN), California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, Nevada, New Jersey, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, South Dakota, Tennessee, Texas, Vermont, Virginia, Washington, West Virginia, and Wisconsin.

Source Numbers

105, 110, 154, 156, 159, 186, 190, 198, 199, 202, 204, 211, 213, 239, 251, 259, 260, 269, 294, 295, 299, 300, 301, 304, 305, 307, 308, 309, 310, 311, 314, 315, 316, 317, 319, 358, 365, 376, 385, 390, 400, 404, 414, 420, 423, 428, 437, 440, 442, 444, 446, 507, 562, 580, 598, 629, 658, 702, 715, 728, 868, 870, 871, 880, 899, 908, 912, 915, 926, 936, 944, 946, 960, 961, 962, 973, 974, 978

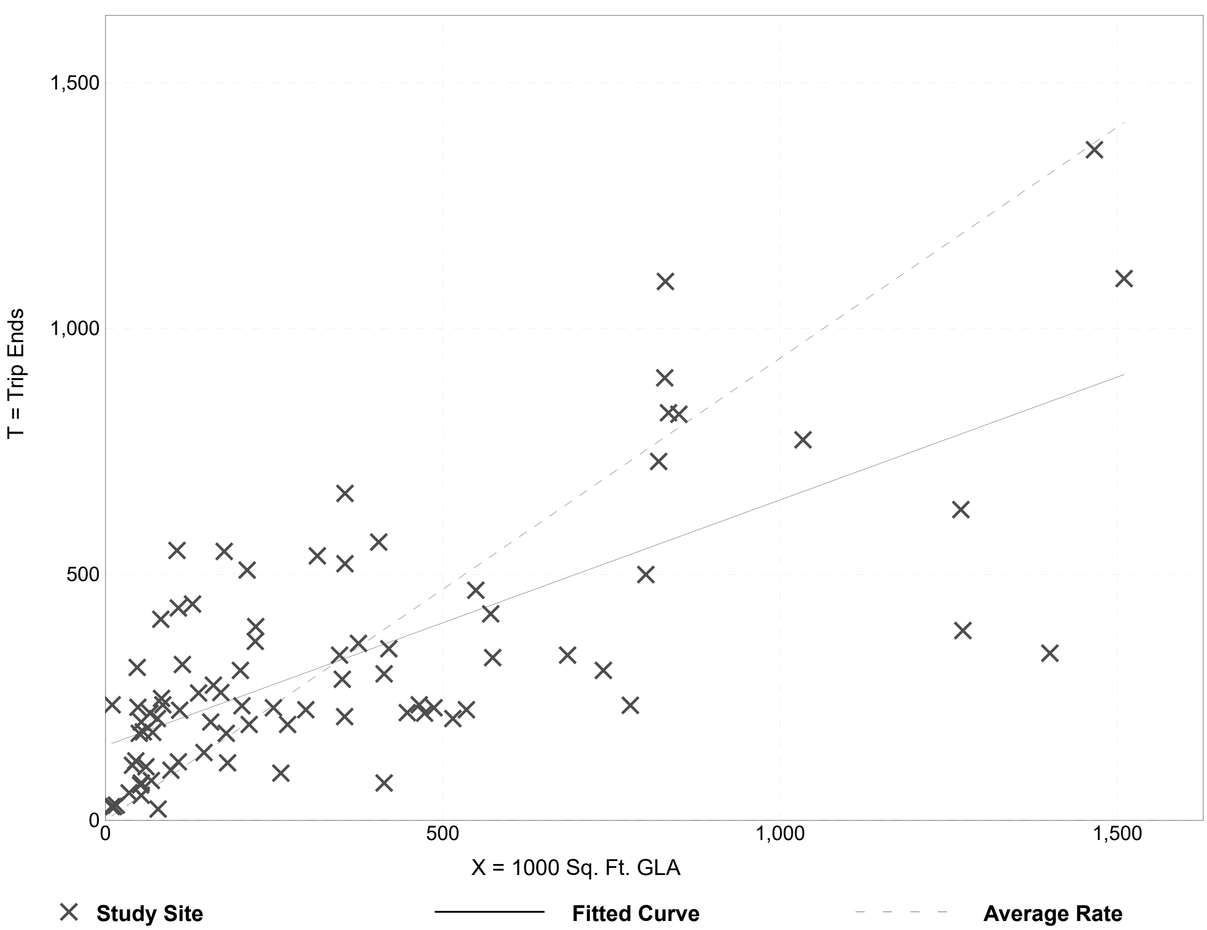
Shopping Center
(820)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GLA**
On a:	**Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	84
Avg. 1000 Sq. Ft. GLA:	351
Directional Distribution:	62% entering, 38% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
0.94	0.18 - 23.74	0.87

Data Plot and Equation



Fitted Curve Equation: $T = 0.50(X) + 151.78$ **$R^2 = 0.50$**

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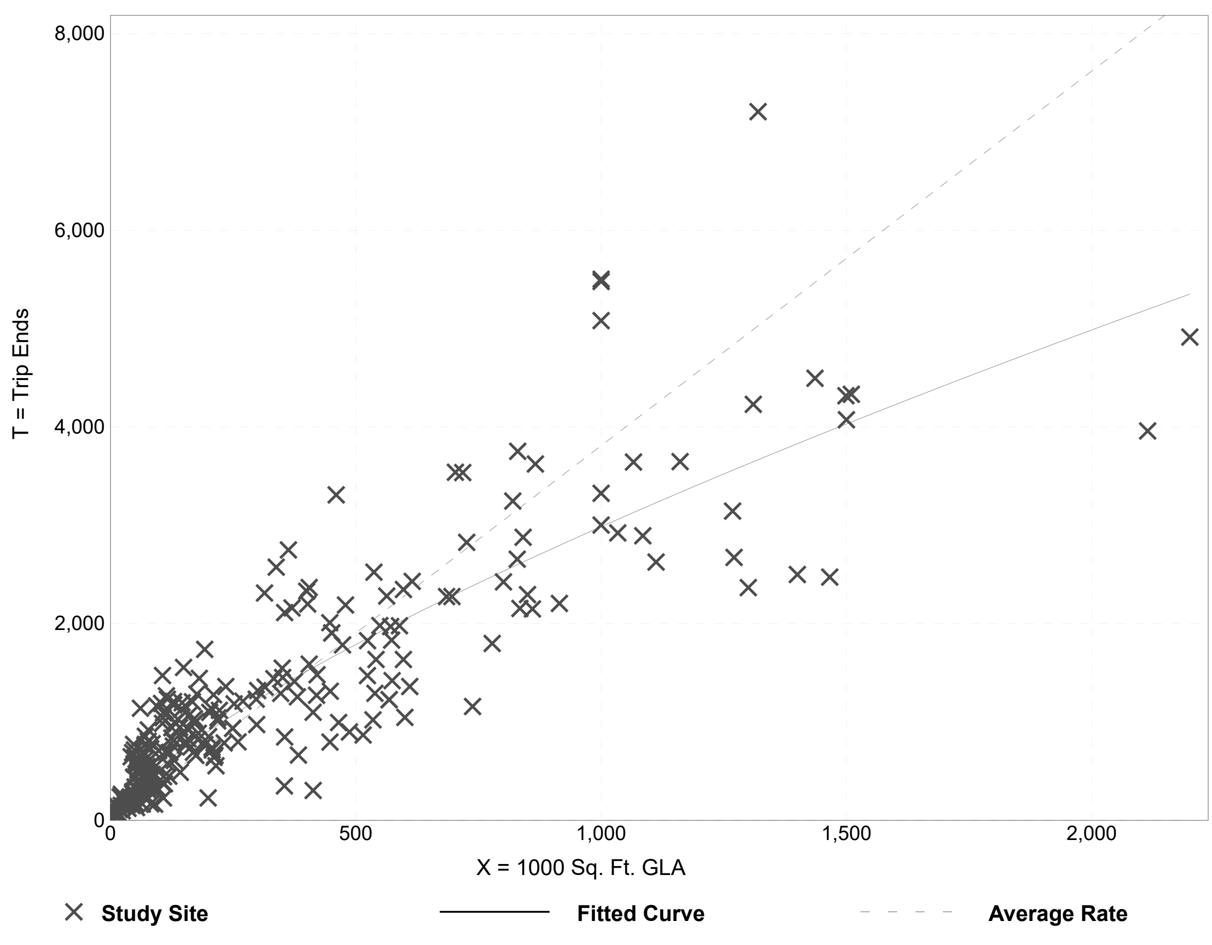
Shopping Center
(820)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GLA**
On a:	**Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	261
Avg. 1000 Sq. Ft. GLA:	327
Directional Distribution:	48% entering, 52% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
3.81	0.74 - 18.69	2.04

Data Plot and Equation



Fitted Curve Equation: $\ln(T) = 0.74 \ln(X) + 2.89$ **$R^2 = 0.82$**

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Daily Trip Generation

ITE Code/Page	Land Use	Size		Trip Gen. Avg. Rate/Eq.	Daily Trips	Trip Distribution Enter	Exit	Daily Trips Enter	Exit
		Approved							
220	Apartment	168	DU	Equation	1230	50%	50%	615	615
820	Shopping Center	54,594	SF	Equation	3984	50%	50%	1,992	1,992
Total					**5,214**			**2,607**	**2,607**

AM Peak Hour Trip Generation (Adjacent Street)

ITE Code/Page	Land Use	Size		Trip Gen. Avg. Rate/Eq.	AM Peak Hour Trips	Trip Distribution Enter	Exit	AM Peak Hour Trips Enter	Exit
		Approved							
220	Apartment	168	DU	Equation	79	23%	77%	19	60
820	Shopping Center	54594	SF	Equation	180	62%	38%	112	68
	Total				**259**			**131**	**128**
	Total (w/ Internal Capture Reduction)				**257**			**130**	**127**
	Pass-by Reduction				**-**			**-**	**-**

PM Peak Hour Trip Generation (Adjacent Street)

ITE Code/Page	Land Use	Size		Trip Gen. Avg. Rate/Eq.	PM Peak Hour Trips	Trip Distribution Enter	Exit	PM Peak Hour Trips Enter	Exit
		Approved							
220	Apartment	168	DU	Equation	94	63%	37%	60	34
820	Shopping Center	54594	SF	Equation	348	48%	52%	168	180
	Total				**442**			**228**	**214**
	Total (w/ Internal Capture Reduction)				**358**			**186**	**172**
	Pass-by Reduction				**122**			**57**	**61**
	Total (w/ Pass-by)				**236**			**129**	**111**

NCHRP 8-51 Internal Trip Capture Estimation Tool			
Project Name:	Mission Gateway	**Organization:**	Olsson
Project Location:	Mission, KS	**Performed By:**	TCM
Scenario Description:	Existing + Approved	**Date:**	11/16/2018
Analysis Year:	2018	**Checked By:**	
Analysis Period:	**AM Street Peak Hour**	**Date:**	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail				180	112	68
Restaurant				0		
Cinema/Entertainment				0		
Residential				79	19	60
Hotel				0		
All Other Land Uses[2]				0		
Total				259	131	128

Table 2-A: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses[2]						

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	1	0	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary

	Total	Entering	Exiting
All Person-Trips	259	131	128
Internal Capture Percentage	1%	1%	1%
External Vehicle-Trips[3]	257	130	127
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	1%	0%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	0%	2%
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.
[2]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
[3]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A
[4]Person-Trips
*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

NCHRP 8-51 Internal Trip Capture Estimation Tool			
Project Name:	Mission Gateway	**Organization:**	Olsson
Project Location:	Mission, KS	**Performed By:**	TCM
Scenario Description:	Approved Development	**Date:**	11/16/2018
Analysis Year:	2018	**Checked By:**	
Analysis Period:	**PM Street Peak Hour**	**Date:**	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail	820	54,594	SQF	348	168	180
Restaurant				0		
Cinema/Entertainment				0		
Residential	220	168	DU	94	60	34
Hotel				0		
All Other Land Uses[2]				0		
Total				442	228	214

Table 2-P: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses[2]						

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	28	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	14	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary

	Total	Entering	Exiting
All Person-Trips	442	228	214
Internal Capture Percentage	19%	18%	20%
External Vehicle-Trips[3]	358	186	172
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use

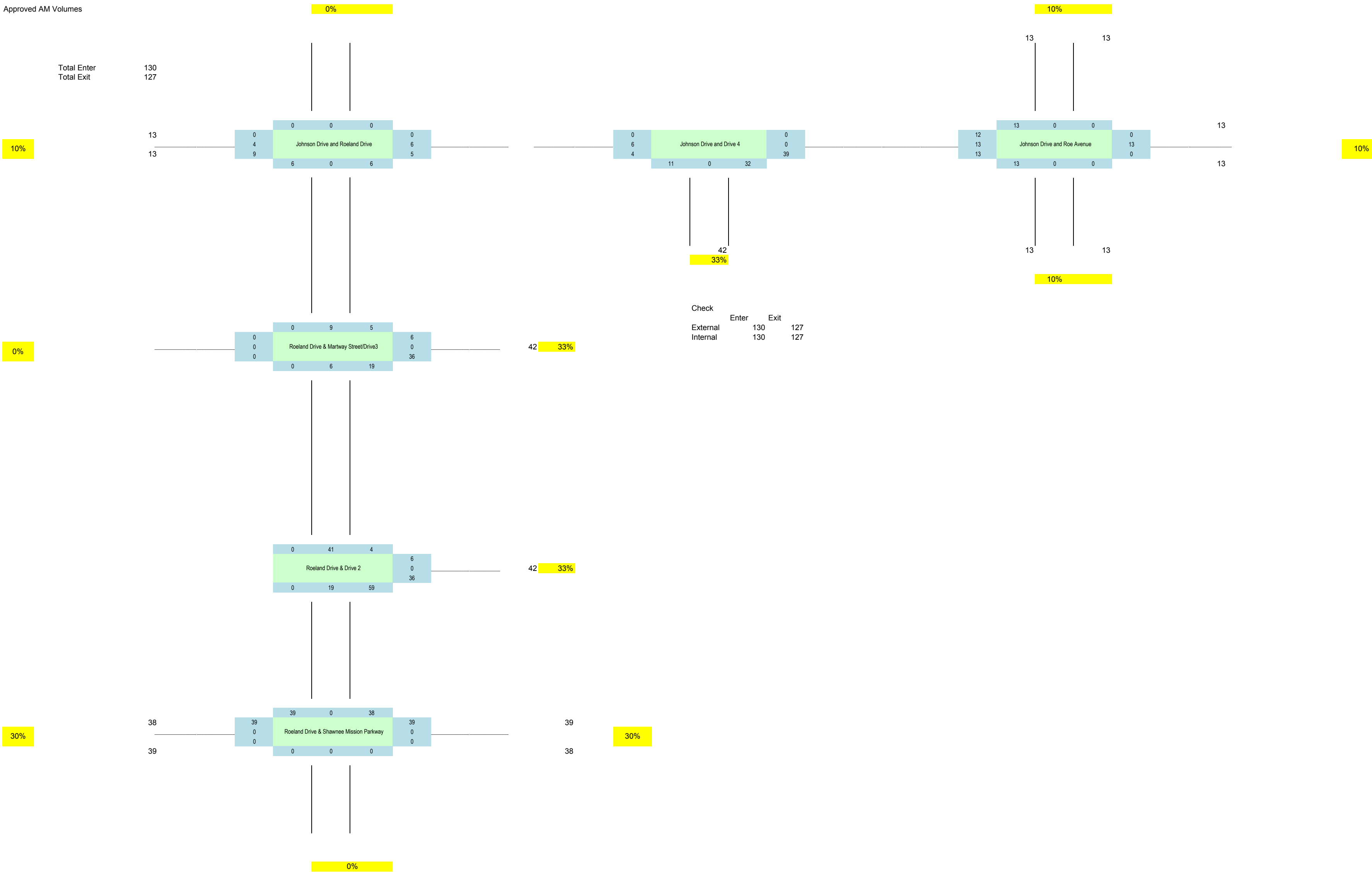
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	8%	16%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	47%	41%
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.
[2]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
[3]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P
[4]Person-Trips
*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Approved AM Volumes

Total Enter 130
Total Exit 127

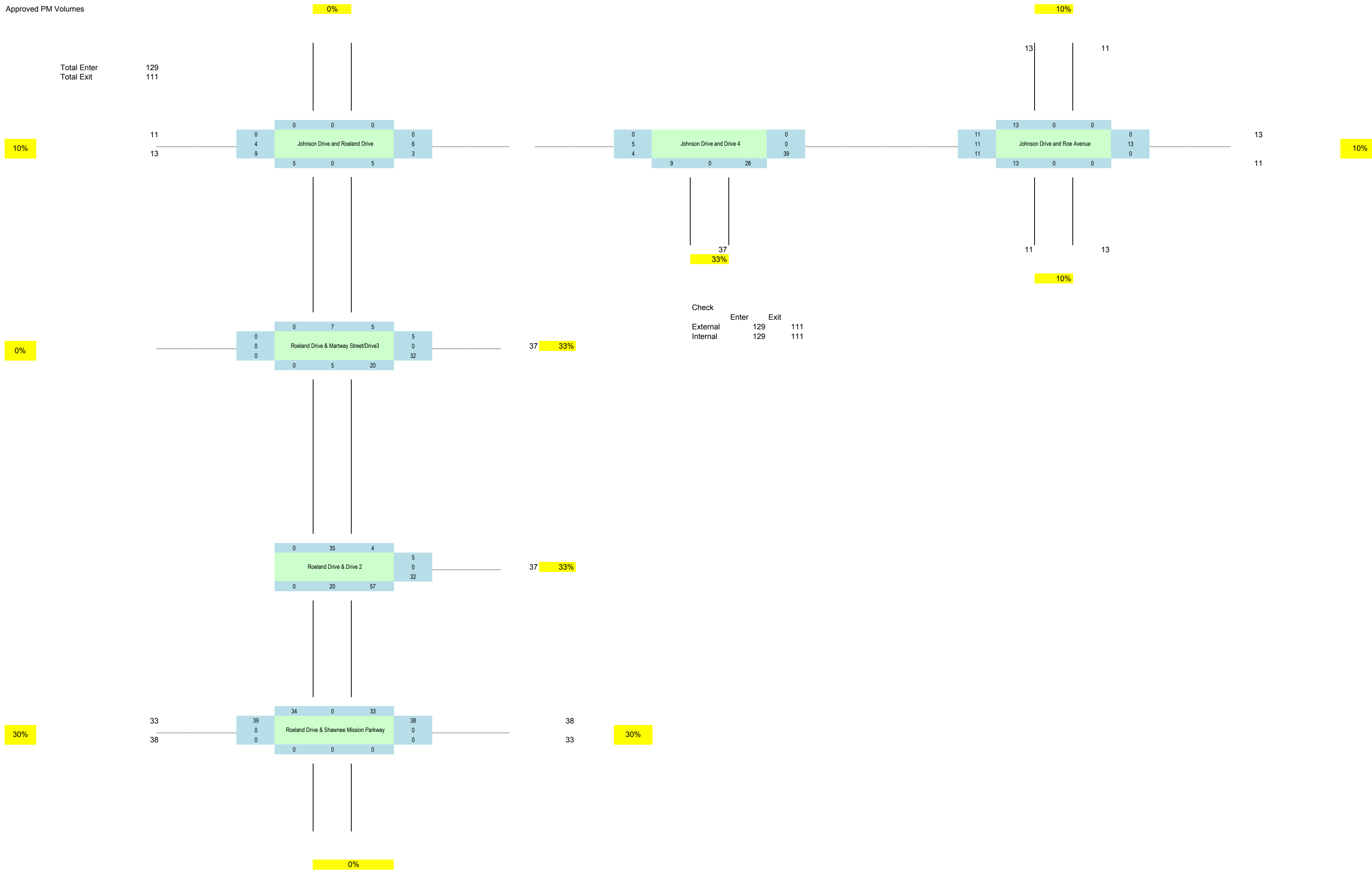


Check

	Enter	Exit
External	130	127
Internal	130	127

Approved PM Volumes

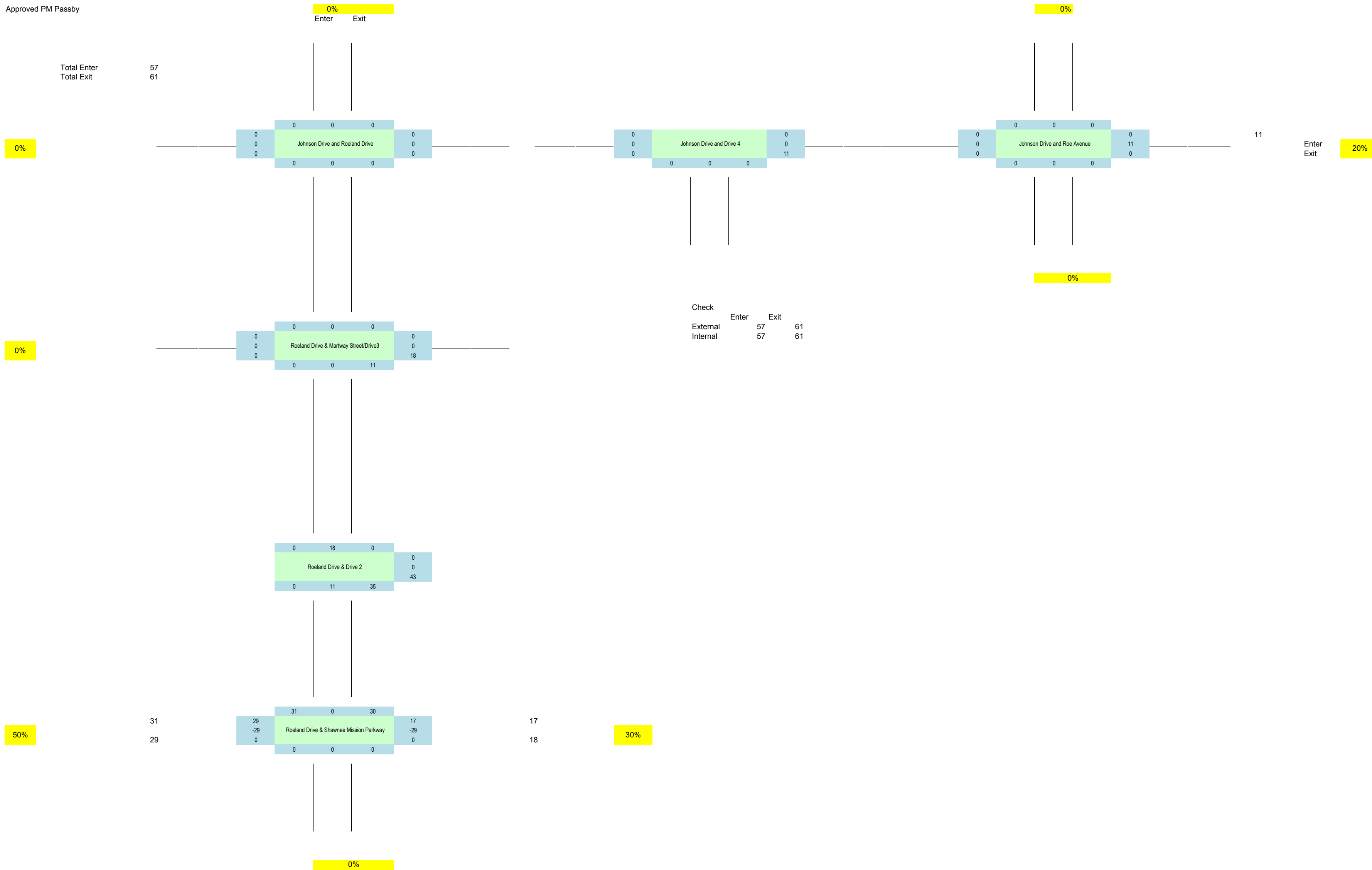
Total Enter 129
Total Exit 111



Check	Enter	Exit
External	129	111
Internal	129	111

Approved PM Passby

Total Enter 57
Total Exit 61

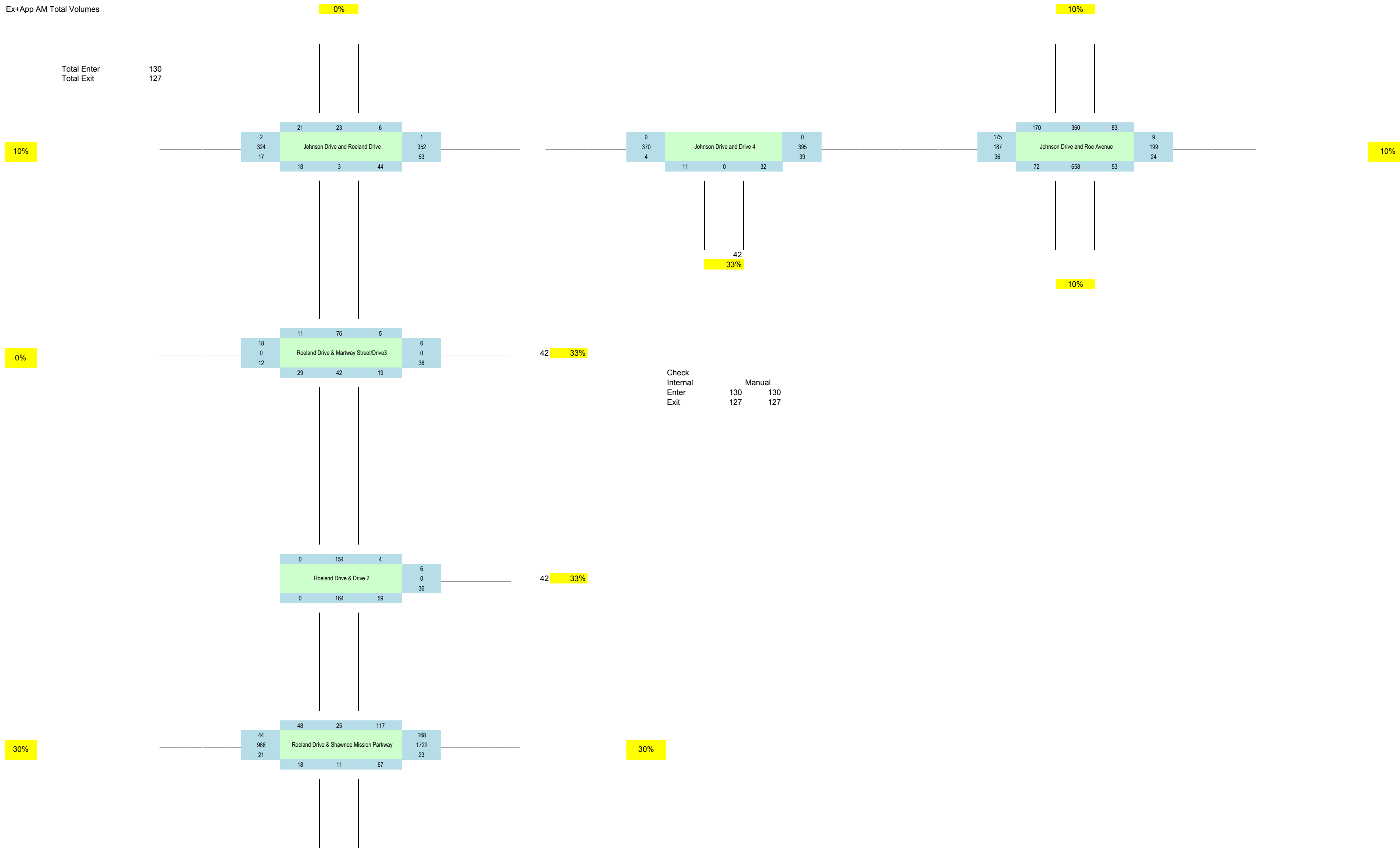


Check

	Enter	Exit
External	57	61
Internal	57	61

Ex+App AM Total Volumes

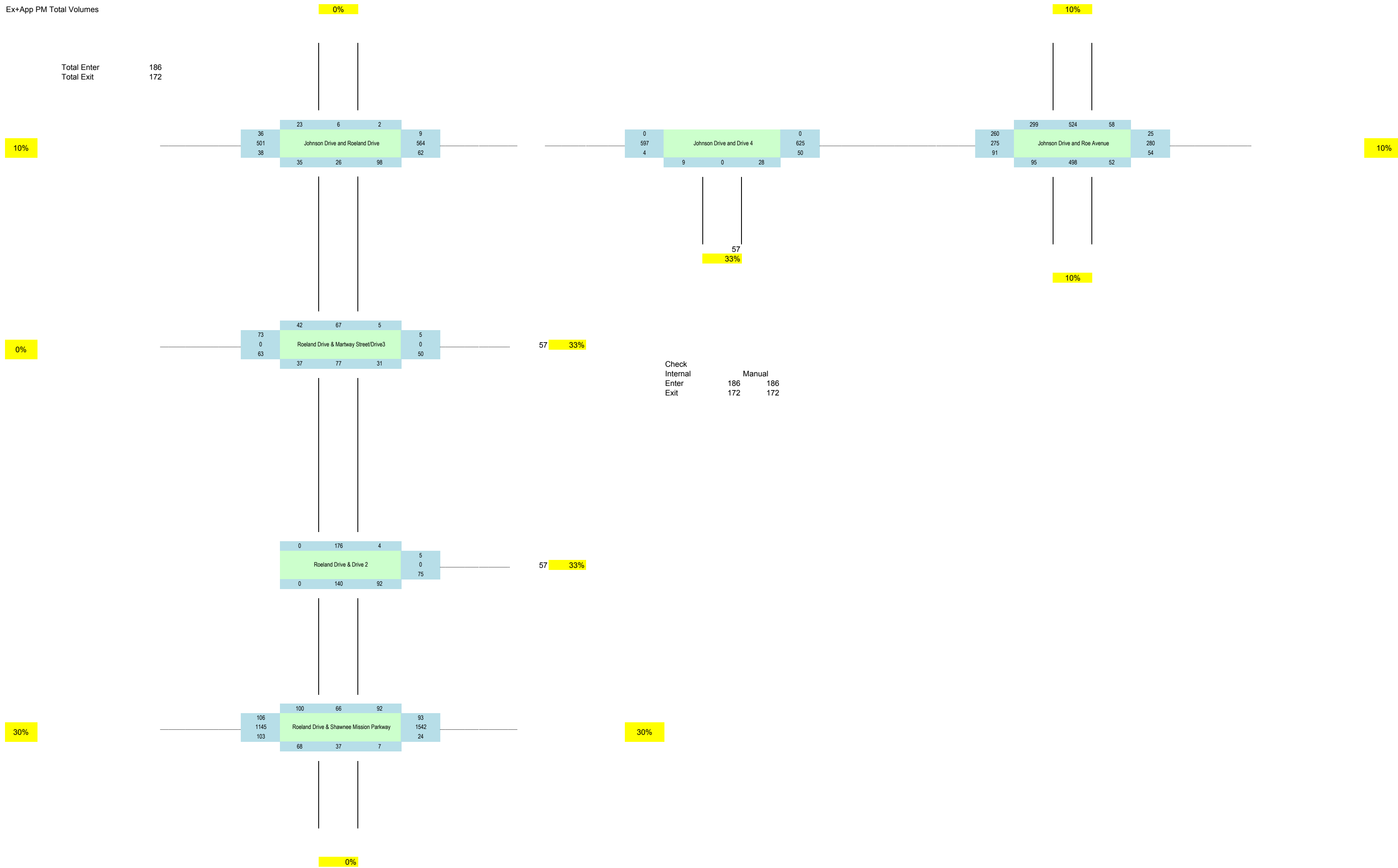
Total Enter 130
Total Exit 127



Check		
Internal		Manual
Enter	130	130
Exit	127	127

Ex+App PM Total Volumes

Total Enter 186
Total Exit 172



Check

Internal		Manual
Enter	186	186
Exit	172	172

Capacity Analysis

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	201	271	28	254	113	765	72	97	383	195
v/c Ratio	0.53	0.37	0.22	0.59	0.20	0.45	0.09	0.25	0.24	0.24
Control Delay	46.7	32.7	47.4	45.5	11.2	20.4	0.2	11.7	19.1	3.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.7	32.7	47.4	45.5	11.2	20.4	0.2	11.7	19.1	3.9
Queue Length 50th (ft)	63	74	17	77	30	173	0	25	77	0
Queue Length 95th (ft)	92	106	42	113	43	246	0	51	127	41
Internal Link Dist (ft)		512		629		477			492	
Turn Bay Length (ft)	245		130		150		25	150		250
Base Capacity (vph)	429	744	134	476	604	1700	845	469	1598	821
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.47	0.36	0.21	0.53	0.19	0.45	0.09	0.21	0.24	0.24

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	175	187	36	24	199	9	72	658	53	83	360	170
Future Volume (veh/h)	175	187	36	24	199	9	72	658	53	83	360	170
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	201	215	56	28	226	28	112	765	0	97	383	0
Peak Hour Factor	0.87	0.87	0.64	0.86	0.88	0.32	0.64	0.86	0.74	0.86	0.94	0.87
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	273	412	105	48	302	37	640	1906		459	1913	
Arrive On Green	0.08	0.15	0.15	0.03	0.09	0.09	0.05	0.54	0.00	0.06	0.54	0.00
Sat Flow, veh/h	3456	2805	714	1781	3187	390	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	201	134	137	28	125	129	112	765	0	97	383	0
Grp Sat Flow(s),veh/h/ln	1728	1777	1742	1781	1777	1800	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	5.7	7.0	7.3	1.6	6.8	7.0	2.8	12.7	0.0	2.3	5.6	0.0
Cycle Q Clear(g_c), s	5.7	7.0	7.3	1.6	6.8	7.0	2.8	12.7	0.0	2.3	5.6	0.0
Prop In Lane	1.00		0.41	1.00		0.22	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	273	261	256	48	168	171	640	1906		459	1913	
V/C Ratio(X)	0.74	0.52	0.53	0.58	0.74	0.76	0.18	0.40		0.21	0.20	
Avail Cap(c_a), veh/h	415	320	314	125	231	234	751	1906		584	1913	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	45.0	39.4	39.5	48.1	44.1	44.1	9.4	13.7	0.0	9.7	11.9	0.0
Incr Delay (d2), s/veh	3.8	1.6	1.7	10.6	8.0	9.0	0.1	0.6	0.0	0.2	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.6	3.1	3.2	0.8	3.4	3.5	1.0	4.9	0.0	0.9	2.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	48.9	41.0	41.2	58.7	52.1	53.2	9.5	14.3	0.0	10.0	12.2	0.0
LnGrp LOS	D	D	D	E	D	D	A	B		A	B	
Approach Vol, veh/h		472			282			877	A		480	A
Approach Delay, s/veh		44.4			53.2			13.7			11.7	
Approach LOS		D			D			B			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.9	15.5	11.0	59.6	8.7	20.7	10.8	59.8
Change Period (Y+Rc), s	6.0	6.0	* 5.4	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	12.0	13.0	* 13	39.0	7.0	18.0	11.0	40.0
Max Q Clear Time (g_c+I1), s	7.7	9.0	4.3	14.7	3.6	9.3	4.8	7.6
Green Ext Time (p_c), s	0.2	0.5	0.1	5.5	0.0	1.0	0.1	2.6

Intersection Summary	
HCM 6th Ctrl Delay	25.4
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	8	338	25	62	383	4	36	50	72
v/c Ratio	0.01	0.30	0.02	0.09	0.30	0.00	0.10	0.12	0.24
Control Delay	7.0	14.0	0.1	6.7	9.8	0.0	15.8	6.9	18.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.0	14.0	0.1	6.7	9.8	0.0	15.8	6.9	18.2
Queue Length 50th (ft)	1	66	0	5	37	0	8	1	10
Queue Length 95th (ft)	2	178	0	25	199	0	16	16	38
Internal Link Dist (ft)		180			509			267	783
Turn Bay Length (ft)	100		100	130			100		
Base Capacity (vph)	738	1673	1436	724	1673	1436	405	880	397
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.20	0.02	0.09	0.23	0.00	0.09	0.06	0.18

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	324	17	53	352	1	18	3	44	6	23	21
Future Volume (veh/h)	2	324	17	53	352	1	18	3	44	6	23	21
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	8	338	25	62	383	4	36	4	46	12	32	28
Peak Hour Factor	0.25	0.96	0.67	0.86	0.92	0.25	0.50	0.75	0.95	0.50	0.72	0.75
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	359	502	426	421	618	523	521	37	420	125	94	73
Arrive On Green	0.01	0.27	0.27	0.07	0.33	0.33	0.05	0.28	0.28	0.11	0.11	0.11
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	1781	128	1476	183	846	655
Grp Volume(v), veh/h	8	338	25	62	383	4	36	0	50	72	0	0
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	1781	0	1605	1683	0	0
Q Serve(g_s), s	0.1	6.5	0.5	1.0	6.9	0.1	0.7	0.0	0.9	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.1	6.5	0.5	1.0	6.9	0.1	0.7	0.0	0.9	1.5	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.92	0.17		0.39
Lane Grp Cap(c), veh/h	359	502	426	421	618	523	521	0	457	291	0	0
V/C Ratio(X)	0.02	0.67	0.06	0.15	0.62	0.01	0.07	0.00	0.11	0.25	0.00	0.00
Avail Cap(c_a), veh/h	646	2183	1850	598	2183	1850	743	0	837	477	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	10.7	13.2	10.9	9.6	11.4	9.1	12.8	0.0	10.6	16.6	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.6	0.1	0.2	1.0	0.0	0.1	0.0	0.1	0.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	2.4	0.1	0.3	2.4	0.0	0.2	0.0	0.3	0.6	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.7	14.7	11.0	9.7	12.4	9.1	12.9	0.0	10.7	17.0	0.0	0.0
LnGrp LOS	B	B	B	A	B	A	B	A	B	B	A	A
Approach Vol, veh/h		371			449			86			72	
Approach Delay, s/veh		14.4			12.0			11.6			17.0	
Approach LOS		B			B			B			B	
Timer - Assigned Phs	1	2		4	5	6	7	8				
Phs Duration (G+Y+Rc), s	5.5	18.3		16.5	8.0	15.8	7.0	9.5				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0	5.0	5.0				
Max Green Setting (Gmax), s	7.0	47.0		21.0	7.0	47.0	7.0	9.0				
Max Q Clear Time (g_c+I1), s	2.1	8.9		2.9	3.0	8.5	2.7	3.5				
Green Ext Time (p_c), s	0.0	2.6		0.2	0.0	2.3	0.0	0.1				
Intersection Summary												
HCM 6th Ctrl Delay			13.2									
HCM 6th LOS			B									

Lane Group	EBL	EBT	EBR	WBL	WBT	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	70	1174	28	37	2011	120	148	40	64
v/c Ratio	0.55	0.55	0.02	0.28	0.74	0.56	0.72	0.19	0.20
Control Delay	51.7	35.2	0.0	58.0	21.7	35.6	71.0	49.8	1.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.7	35.2	0.0	58.0	21.7	35.6	71.0	49.8	1.4
Queue Length 50th (ft)	52	442	0	27	461	40	110	28	0
Queue Length 95th (ft)	63	434	m0	44	553	100	#176	44	0
Internal Link Dist (ft)		682			2401	499		439	
Turn Bay Length (ft)	345		310	170			100		125
Base Capacity (vph)	140	2129	1583	140	2701	274	208	219	322
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.50	0.55	0.02	0.26	0.74	0.44	0.71	0.18	0.20

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	44	986	21	23	1722	168	18	11	67	117	25	48
Future Volume (veh/h)	44	986	21	23	1722	168	18	11	67	117	25	48
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	70	1174	0	37	1813	198	29	12	79	148	40	64
Peak Hour Factor	0.63	0.84	0.75	0.63	0.95	0.85	0.63	0.95	0.85	0.79	0.63	0.75
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	107	1910		200	2657	289	35	15	95	171	179	152
Arrive On Green	0.06	0.54	0.00	0.11	0.60	0.60	0.09	0.09	0.09	0.10	0.10	0.10
Sat Flow, veh/h	1781	3554	1585	1781	4443	483	400	165	1089	1781	1870	1585
Grp Volume(v), veh/h	70	1174	0	37	1280	731	120	0	0	148	40	64
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1571	1783	1654	0	0	1781	1870	1585
Q Serve(g_s), s	4.6	27.4	0.0	2.3	33.2	33.5	8.6	0.0	0.0	9.8	2.4	4.6
Cycle Q Clear(g_c), s	4.6	27.4	0.0	2.3	33.2	33.5	8.6	0.0	0.0	9.8	2.4	4.6
Prop In Lane	1.00		1.00	1.00		0.27	0.24		0.66	1.00		1.00
Lane Grp Cap(c), veh/h	107	1910		200	1879	1066	145	0	0	171	179	152
V/C Ratio(X)	0.65	0.61		0.18	0.68	0.69	0.83	0.00	0.00	0.87	0.22	0.42
Avail Cap(c_a), veh/h	141	1910		200	1879	1066	214	0	0	171	179	152
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	55.2	19.2	0.0	48.3	16.4	16.4	53.8	0.0	0.0	53.5	50.1	51.1
Incr Delay (d2), s/veh	2.5	1.5	0.0	0.2	2.0	3.6	10.2	0.0	0.0	33.3	0.2	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.1	10.8	0.0	1.0	11.1	13.3	4.0	0.0	0.0	6.0	1.1	1.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	57.6	20.7	0.0	48.4	18.4	20.0	64.0	0.0	0.0	86.8	50.4	51.8
LnGrp LOS	E	C		D	B	C	E	A	A	F	D	D
Approach Vol, veh/h		1244	A		2048			120			252	
Approach Delay, s/veh		22.7			19.5			64.0			72.1	
Approach LOS		C			B			E			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	11.7	77.3		15.0	19.0	70.0		16.0
Change Period (Y+Rc), s	4.5	5.5		4.5	5.5	* 5.5		4.5
Max Green Setting (Gmax), s	9.5	64.5		15.5	9.5	* 65		11.5
Max Q Clear Time (g_c+I1), s	6.6	35.5		10.6	4.3	29.4		11.8
Green Ext Time (p_c), s	0.0	11.1		0.2	0.0	5.8		0.0

Intersection Summary	
HCM 6th Ctrl Delay	25.7
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↑	↱	↰	↑
Traffic Vol, veh/h	36	6	164	59	4	154
Future Vol, veh/h	36	6	164	59	4	154
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	130	75	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	39	7	178	64	4	167

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	353	178	0	0	242	0
Stage 1	178	-	-	-	-	-
Stage 2	175	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	645	865	-	-	1324	-
Stage 1	853	-	-	-	-	-
Stage 2	855	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	643	865	-	-	1324	-
Mov Cap-2 Maneuver	683	-	-	-	-	-
Stage 1	853	-	-	-	-	-
Stage 2	852	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.4	0	0.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	683	865	1324	-
HCM Lane V/C Ratio	-	-	0.057	0.008	0.003	-
HCM Control Delay (s)	-	-	10.6	9.2	7.7	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0	0	-

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	20	20	39	7	44	87	5	112
v/c Ratio	0.06	0.02	0.09	0.01	0.05	0.06	0.01	0.09
Control Delay	19.3	0.0	17.4	0.0	7.4	6.0	16.2	13.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.3	0.0	17.4	0.0	7.4	6.0	16.2	13.3
Queue Length 50th (ft)	2	0	3	0	0	0	0	0
Queue Length 95th (ft)	22	0	33	0	16	21	9	55
Internal Link Dist (ft)		773		54		238		267
Turn Bay Length (ft)	105				115		100	
Base Capacity (vph)	1420	1429	491	1115	1012	1783	1107	1554
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.01	0.08	0.01	0.04	0.05	0.00	0.07

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	0	12	36	0	6	29	42	19	5	76	11
Future Volume (veh/h)	18	0	12	36	0	6	29	42	19	5	76	11
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	20	0	20	39	0	7	44	66	21	5	100	12
Peak Hour Factor	0.90	0.92	0.60	0.92	0.92	0.92	0.66	0.64	0.92	0.92	0.76	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	100	0	89	112	0	100	503	547	174	468	306	37
Arrive On Green	0.06	0.00	0.06	0.06	0.00	0.06	0.06	0.40	0.40	0.19	0.19	0.19
Sat Flow, veh/h	1781	0	1585	1781	0	1585	1781	1360	433	1310	1638	197
Grp Volume(v), veh/h	20	0	20	39	0	7	44	0	87	5	0	112
Grp Sat Flow(s),veh/h/ln	1781	0	1585	1781	0	1585	1781	0	1792	1310	0	1835
Q Serve(g_s), s	0.3	0.0	0.4	0.7	0.0	0.1	0.6	0.0	1.0	0.1	0.0	1.7
Cycle Q Clear(g_c), s	0.3	0.0	0.4	0.7	0.0	0.1	0.6	0.0	1.0	0.1	0.0	1.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.24	1.00		0.11
Lane Grp Cap(c), veh/h	100	0	89	112	0	100	503	0	721	468	0	342
V/C Ratio(X)	0.20	0.00	0.23	0.35	0.00	0.07	0.09	0.00	0.12	0.01	0.00	0.33
Avail Cap(c_a), veh/h	1495	0	1330	476	0	424	1225	0	2952	1568	0	1882
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	14.5	0.0	14.5	14.4	0.0	14.2	8.1	0.0	6.0	10.7	0.0	11.3
Incr Delay (d2), s/veh	1.0	0.0	1.3	1.8	0.0	0.3	0.1	0.0	0.1	0.0	0.0	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.1	0.2	0.0	0.0	0.2	0.0	0.2	0.0	0.0	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.5	0.0	15.8	16.3	0.0	14.5	8.2	0.0	6.1	10.7	0.0	11.9
LnGrp LOS	B	A	B	B	A	B	A	A	A	B	A	B
Approach Vol, veh/h		40			46			131			117	
Approach Delay, s/veh		15.6			16.0			6.8			11.8	
Approach LOS		B			B			A			B	
Timer - Assigned Phs		2		4		6	7	8				
Phs Duration (G+Y+Rc), s		7.4		18.0		6.8	7.0	11.0				
Change Period (Y+Rc), s		* 5.4		5.0		5.0	5.0	5.0				
Max Green Setting (Gmax), s		* 8.6		53.0		27.0	15.0	33.0				
Max Q Clear Time (g_c+I1), s		2.7		3.0		2.4	2.6	3.7				
Green Ext Time (p_c), s		0.0		0.5		0.1	0.0	0.6				

Intersection Summary			
HCM 6th Ctrl Delay			10.9
HCM 6th LOS			B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection						
Int Delay, s/veh	0.9					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	370	4	39	395	11	32
Future Vol, veh/h	370	4	39	395	11	32
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	150	-	100	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	86	86	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	385	4	45	459	12	35

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	389	0	707	387
Stage 1	-	-	-	-	387	-
Stage 2	-	-	-	-	320	-
Critical Hdwy	-	-	4.13	-	6.63	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.83	-
Follow-up Hdwy	-	-	2.219	-	3.519	3.319
Pot Cap-1 Maneuver	-	-	1168	-	385	660
Stage 1	-	-	-	-	685	-
Stage 2	-	-	-	-	710	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1168	-	370	660
Mov Cap-2 Maneuver	-	-	-	-	481	-
Stage 1	-	-	-	-	685	-
Stage 2	-	-	-	-	682	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.7	11.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	481	660	-	-	1168	-
HCM Lane V/C Ratio	0.025	0.053	-	-	0.039	-
HCM Control Delay (s)	12.7	10.8	-	-	8.2	-
HCM Lane LOS	B	B	-	-	A	-
HCM 95th %tile Q(veh)	0.1	0.2	-	-	0.1	-

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	342	413	71	366	127	586	72	79	624	340
v/c Ratio	0.71	0.50	0.48	0.68	0.33	0.41	0.10	0.51	0.47	0.42
Control Delay	49.7	31.7	54.7	45.6	15.5	24.3	0.3	55.1	26.3	4.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.7	31.7	54.7	45.6	15.5	24.3	0.3	55.1	26.3	4.6
Queue Length 50th (ft)	106	107	44	113	41	150	0	48	160	0
Queue Length 95th (ft)	130	154	75	150	59	185	0	77	205	55
Internal Link Dist (ft)		513		629		477			492	
Turn Bay Length (ft)	245		130		150		25	150		250
Base Capacity (vph)	495	860	156	635	430	1469	752	168	1341	811
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.69	0.48	0.46	0.58	0.30	0.40	0.10	0.47	0.47	0.42

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	260	275	91	54	280	25	95	498	52	58	524	299
Future Volume (veh/h)	260	275	91	54	280	25	95	498	52	58	524	299
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	342	299	114	71	326	40	127	586	0	79	624	0
Peak Hour Factor	0.76	0.92	0.80	0.76	0.86	0.63	0.75	0.85	0.72	0.73	0.84	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	410	501	187	91	416	51	444	1589		114	1611	
Arrive On Green	0.12	0.20	0.20	0.05	0.13	0.13	0.06	0.45	0.00	0.06	0.45	0.00
Sat Flow, veh/h	3456	2532	945	1781	3189	388	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	342	208	205	71	180	186	127	586	0	79	624	0
Grp Sat Flow(s),veh/h/ln	1728	1777	1700	1781	1777	1800	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	9.7	10.6	11.0	3.9	9.8	10.0	3.8	10.9	0.0	4.3	11.6	0.0
Cycle Q Clear(g_c), s	9.7	10.6	11.0	3.9	9.8	10.0	3.8	10.9	0.0	4.3	11.6	0.0
Prop In Lane	1.00		0.56	1.00		0.22	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	410	351	336	91	232	235	444	1589		114	1611	
V/C Ratio(X)	0.83	0.59	0.61	0.78	0.78	0.79	0.29	0.37		0.70	0.39	
Avail Cap(c_a), veh/h	449	409	391	143	320	324	555	1589		160	1611	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	43.1	36.4	36.6	46.9	42.1	42.1	13.9	18.3	0.0	45.9	18.1	0.0
Incr Delay (d2), s/veh	11.9	1.7	2.1	13.1	8.0	8.7	0.3	0.7	0.0	7.4	0.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.8	4.7	4.7	2.1	4.8	5.0	1.5	4.4	0.0	2.1	4.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	55.0	38.1	38.7	60.0	50.1	50.9	14.3	19.0	0.0	53.3	18.8	0.0
LnGrp LOS	E	D	D	E	D	D	B	B		D	B	
Approach Vol, veh/h		755			437			713	A		703	A
Approach Delay, s/veh		45.9			52.0			18.1			22.7	
Approach LOS		D			D			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	17.9	19.0	12.4	50.7	11.1	25.8	11.8	51.3
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	13.0	18.0	9.0	36.0	8.0	23.0	12.0	33.0
Max Q Clear Time (g_c+I1), s	11.7	12.0	6.3	12.9	5.9	13.0	5.8	13.6
Green Ext Time (p_c), s	0.2	1.1	0.0	3.9	0.0	1.7	0.1	4.0

Intersection Summary	
HCM 6th Ctrl Delay	33.1
HCM 6th LOS	C

Notes

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	48	583	42	79	648	24	42	151	52
v/c Ratio	0.11	0.53	0.04	0.16	0.59	0.02	0.13	0.33	0.21
Control Delay	6.3	15.4	0.1	6.5	16.4	0.0	24.5	10.4	20.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.3	15.4	0.1	6.5	16.4	0.0	24.5	10.4	20.2
Queue Length 50th (ft)	8	201	0	13	230	0	13	9	6
Queue Length 95th (ft)	16	300	0	25	356	0	41	61	15
Internal Link Dist (ft)		180			507			267	783
Turn Bay Length (ft)	100		100	130			100		
Base Capacity (vph)	472	1421	1242	516	1421	1242	352	761	321
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.41	0.03	0.15	0.46	0.02	0.12	0.20	0.16

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	36	501	38	62	564	9	35	26	98	2	6	23
Future Volume (veh/h)	36	501	38	62	564	9	35	26	98	2	6	23
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	48	583	42	79	648	24	42	28	122	4	12	36
Peak Hour Factor	0.75	0.86	0.91	0.78	0.87	0.38	0.83	0.93	0.80	0.50	0.50	0.64
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	327	765	649	378	802	680	438	75	325	76	46	117
Arrive On Green	0.06	0.41	0.41	0.08	0.43	0.43	0.05	0.24	0.24	0.10	0.10	0.10
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	1781	305	1327	60	443	1132
Grp Volume(v), veh/h	48	583	42	79	648	24	42	0	150	52	0	0
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	1781	0	1632	1636	0	0
Q Serve(g_s), s	0.8	14.9	0.9	1.3	16.8	0.5	1.1	0.0	4.2	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.8	14.9	0.9	1.3	16.8	0.5	1.1	0.0	4.2	1.6	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.81	0.08		0.69
Lane Grp Cap(c), veh/h	327	765	649	378	802	680	438	0	399	239	0	0
V/C Ratio(X)	0.15	0.76	0.06	0.21	0.81	0.04	0.10	0.00	0.38	0.22	0.00	0.00
Avail Cap(c_a), veh/h	450	1582	1341	467	1582	1341	571	0	617	333	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	10.5	14.1	10.0	9.9	13.9	9.2	18.6	0.0	17.5	23.1	0.0	0.0
Incr Delay (d2), s/veh	0.2	1.6	0.0	0.3	2.0	0.0	0.1	0.0	0.6	0.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	5.6	0.3	0.4	6.3	0.1	0.4	0.0	1.5	0.6	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.7	15.7	10.0	10.2	15.9	9.2	18.7	0.0	18.0	23.5	0.0	0.0
LnGrp LOS	B	B	B	B	B	A	B	A	B	C	A	A
Approach Vol, veh/h		673			751			192			52	
Approach Delay, s/veh		15.0			15.1			18.2			23.5	
Approach LOS		B			B			B			C	
Timer - Assigned Phs	1	2		4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.1	28.8		18.6	9.2	27.7	7.9	10.7				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0	5.0	5.0				
Max Green Setting (Gmax), s	7.0	47.0		21.0	7.0	47.0	7.0	9.0				
Max Q Clear Time (g_c+I1), s	2.8	18.8		6.2	3.3	16.9	3.1	3.6				
Green Ext Time (p_c), s	0.0	5.0		0.7	0.0	4.4	0.0	0.1				
Intersection Summary												
HCM 6th Ctrl Delay			15.6									
HCM 6th LOS			B									

Lane Group	EBL	EBT	EBR	WBL	WBT	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	145	1218	136	32	1741	152	126	84	114
v/c Ratio	0.84	0.59	0.09	0.24	0.72	0.70	0.67	0.42	0.42
Control Delay	69.3	5.8	0.0	56.9	25.7	65.9	68.6	56.2	13.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	69.3	5.8	0.0	56.9	25.7	65.9	68.6	56.2	13.6
Queue Length 50th (ft)	121	30	0	24	401	113	95	62	0
Queue Length 95th (ft)	m123	m399	m0	47	535	135	125	97	51
Internal Link Dist (ft)		682			2401	499		439	
Turn Bay Length (ft)	345		310	170			100		125
Base Capacity (vph)	184	2058	1583	140	2404	293	228	240	303
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.79	0.59	0.09	0.23	0.72	0.52	0.55	0.35	0.38

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	106	1145	103	24	1542	93	68	37	7	92	66	100
Future Volume (veh/h)	106	1145	103	24	1542	93	68	37	7	92	66	100
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	145	1218	0	32	1623	118	88	52	12	126	84	114
Peak Hour Factor	0.73	0.94	0.76	0.75	0.95	0.79	0.77	0.71	0.58	0.73	0.79	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	364	1673		319	2058	150	105	62	14	160	168	143
Arrive On Green	0.20	0.47	0.00	0.18	0.45	0.45	0.10	0.10	0.10	0.09	0.09	0.09
Sat Flow, veh/h	1781	3554	1585	1781	4617	335	1038	613	142	1781	1870	1585
Grp Volume(v), veh/h	145	1218	0	32	1104	637	152	0	0	126	84	114
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1571	1810	1793	0	0	1781	1870	1585
Q Serve(g_s), s	8.5	33.1	0.0	1.8	36.0	36.1	10.0	0.0	0.0	8.3	5.1	8.5
Cycle Q Clear(g_c), s	8.5	33.1	0.0	1.8	36.0	36.1	10.0	0.0	0.0	8.3	5.1	8.5
Prop In Lane	1.00		1.00	1.00		0.19	0.58		0.08	1.00		1.00
Lane Grp Cap(c), veh/h	364	1673		319	1401	807	182	0	0	160	168	143
V/C Ratio(X)	0.40	0.73		0.10	0.79	0.79	0.83	0.00	0.00	0.79	0.50	0.80
Avail Cap(c_a), veh/h	364	1673		319	1401	807	291	0	0	230	242	205
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	41.4	25.6	0.0	41.1	28.4	28.4	52.9	0.0	0.0	53.5	52.0	53.5
Incr Delay (d2), s/veh	0.3	2.8	0.0	0.1	4.6	7.7	5.6	0.0	0.0	6.5	0.9	8.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.7	13.7	0.0	0.8	13.6	16.4	4.8	0.0	0.0	4.0	2.5	3.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	41.6	28.4	0.0	41.2	33.0	36.1	58.5	0.0	0.0	60.0	52.9	62.1
LnGrp LOS	D	C		D	C	D	E	A	A	E	D	E
Approach Vol, veh/h		1363	A		1773			152			324	
Approach Delay, s/veh		29.8			34.3			58.5			58.9	
Approach LOS		C			C			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	29.0	59.0		16.7	26.0	62.0		15.3				
Change Period (Y+Rc), s	4.5	5.5		4.5	4.5	5.5		4.5				
Max Green Setting (Gmax), s	12.5	53.5		19.5	9.5	56.5		15.5				
Max Q Clear Time (g_c+I1), s	10.5	38.1		12.0	3.8	35.1		10.5				
Green Ext Time (p_c), s	0.0	6.9		0.3	0.0	5.6		0.3				
Intersection Summary												
HCM 6th Ctrl Delay			35.8									
HCM 6th LOS			D									

Notes

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection						
Int Delay, s/veh	1.8					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	75	5	140	92	4	176
Future Vol, veh/h	75	5	140	92	4	176
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	130	75	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	82	5	152	100	4	191

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	351	152	0	0	252	0
Stage 1	152	-	-	-	-	-
Stage 2	199	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	646	894	-	-	1313	-
Stage 1	876	-	-	-	-	-
Stage 2	835	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	644	894	-	-	1313	-
Mov Cap-2 Maneuver	683	-	-	-	-	-
Stage 1	876	-	-	-	-	-
Stage 2	832	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.9	0	0.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	683	894	1313	-
HCM Lane V/C Ratio	-	-	0.119	0.006	0.003	-
HCM Control Delay (s)	-	-	11	9.1	7.8	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	0.4	0	0	-

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	81	105	54	5	56	154	5	134
v/c Ratio	0.23	0.11	0.15	0.01	0.08	0.13	0.01	0.15
Control Delay	21.0	0.3	19.7	0.0	10.6	9.0	19.4	15.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.0	0.3	19.7	0.0	10.6	9.0	19.4	15.0
Queue Length 50th (ft)	23	0	14	0	10	24	1	26
Queue Length 95th (ft)	56	0	41	0	21	38	9	55
Internal Link Dist (ft)		773		54		238		267
Turn Bay Length (ft)	105				115		100	
Base Capacity (vph)	452	974	472	922	685	1152	614	905
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.11	0.11	0.01	0.08	0.13	0.01	0.15

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	73	0	63	50	0	5	37	77	31	5	67	42
Future Volume (veh/h)	73	0	63	50	0	5	37	77	31	5	67	42
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	81	0	105	54	0	5	56	120	34	5	88	46
Peak Hour Factor	0.90	0.92	0.60	0.92	0.92	0.92	0.66	0.64	0.92	0.92	0.76	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	247	0	220	131	0	117	440	518	147	396	188	98
Arrive On Green	0.14	0.00	0.14	0.07	0.00	0.07	0.07	0.37	0.37	0.16	0.16	0.16
Sat Flow, veh/h	1781	0	1585	1781	0	1585	1781	1402	397	1233	1157	605
Grp Volume(v), veh/h	81	0	105	54	0	5	56	0	154	5	0	134
Grp Sat Flow(s),veh/h/ln	1781	0	1585	1781	0	1585	1781	0	1799	1233	0	1762
Q Serve(g_s), s	1.5	0.0	2.3	1.1	0.0	0.1	0.9	0.0	2.2	0.1	0.0	2.5
Cycle Q Clear(g_c), s	1.5	0.0	2.3	1.1	0.0	0.1	0.9	0.0	2.2	0.1	0.0	2.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.22	1.00		0.34
Lane Grp Cap(c), veh/h	247	0	220	131	0	117	440	0	665	396	0	287
V/C Ratio(X)	0.33	0.00	0.48	0.41	0.00	0.04	0.13	0.00	0.23	0.01	0.00	0.47
Avail Cap(c_a), veh/h	435	0	387	464	0	413	652	0	1025	497	0	430
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	14.3	0.0	14.6	16.3	0.0	15.9	9.9	0.0	8.0	13.0	0.0	14.0
Incr Delay (d2), s/veh	0.8	0.0	1.6	2.0	0.0	0.1	0.1	0.0	0.2	0.0	0.0	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	0.7	0.4	0.0	0.0	0.3	0.0	0.6	0.0	0.0	0.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.1	0.0	16.2	18.3	0.0	16.0	10.1	0.0	8.2	13.0	0.0	15.2
LnGrp LOS	B	A	B	B	A	B	B	A	A	B	A	B
Approach Vol, veh/h		186			59			210			139	
Approach Delay, s/veh		15.7			18.1			8.7			15.1	
Approach LOS		B			B			A			B	

Timer - Assigned Phs		2		4		6	7	8				
Phs Duration (G+Y+Rc), s		8.1		18.6		10.1	7.6	11.0				
Change Period (Y+Rc), s		* 5.4		5.0		5.0	5.0	5.0				
Max Green Setting (Gmax), s		* 9.6		21.0		9.0	7.0	9.0				
Max Q Clear Time (g_c+I1), s		3.1		4.2		4.3	2.9	4.5				
Green Ext Time (p_c), s		0.0		0.7		0.3	0.0	0.2				

Intersection Summary		
HCM 6th Ctrl Delay		13.3
HCM 6th LOS		B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection						
Int Delay, s/veh	0.7					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	597	4	50	625	9	28
Future Vol, veh/h	597	4	50	625	9	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	150	-	100	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	649	4	54	679	10	30

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	653	0	1099	651
Stage 1	-	-	-	-	651	-
Stage 2	-	-	-	-	448	-
Critical Hdwy	-	-	4.13	-	6.63	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.83	-
Follow-up Hdwy	-	-	2.219	-	3.519	3.319
Pot Cap-1 Maneuver	-	-	932	-	221	468
Stage 1	-	-	-	-	518	-
Stage 2	-	-	-	-	612	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	932	-	208	468
Mov Cap-2 Maneuver	-	-	-	-	344	-
Stage 1	-	-	-	-	518	-
Stage 2	-	-	-	-	577	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.7	13.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	344	468	-	-	932	-
HCM Lane V/C Ratio	0.028	0.065	-	-	0.058	-
HCM Control Delay (s)	15.8	13.2	-	-	9.1	-
HCM Lane LOS	C	B	-	-	A	-
HCM 95th %tile Q(veh)	0.1	0.2	-	-	0.2	-

Merge Analysis

HCS7 Freeway Merge Report

Project Information

Analyst	TCM	Date	5/20/2019
Agency	Olsson	Analysis Year	2019
Jurisdiction	Mission, KS	Time Period Analyzed	PM
Project Description	EB Johnson Drive On-Ramp to NB Shawnee Mission Parkway		

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	45.0	25.0
Segment Length (L) / Acceleration Length (L_A),ft	1500	150
Terrain Type	Rolling	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i)	1228	399
Peak Hour Factor (PHF)	0.94	0.86
Total Trucks, %	0.02	0.02
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	1.000	1.000
Flow Rate (v_i),pc/h	1306	464
Capacity (c), pc/h	4500	1900
Volume-to-Capacity Ratio (v/c)	0.39	0.24

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Number of Outer Lanes on Freeway (N_O)	0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.336
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/mi/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influenece Area Speed (S_R), mi/h	44.0
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1306	Ramp Junction Speed (S), mi/h	44.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1770	Average Density (D), pc/mi/ln	20.1
Level of Service (LOS)	B	Density in Ramp Influence Area (D_R), pc/mi/ln	18.2

HCS7 Freeway Merge Report

Project Information

Analyst	TCM	Date	5/20/2019
Agency	Olsson	Analysis Year	2019
Jurisdiction	Mission, KS	Time Period Analyzed	AM
Project Description	EB Johnson Drive On-Ramp to NB Shawnee Mission Parkway		

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	45.0	25.0
Segment Length (L) / Acceleration Length (L_A),ft	1500	150
Terrain Type	Rolling	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i)	1168	321
Peak Hour Factor (PHF)	0.84	0.85
Total Trucks, %	0.02	0.02
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	1.000	1.000
Flow Rate (v_i),pc/h	1390	378
Capacity (c), pc/h	4500	1900
Volume-to-Capacity Ratio (v/c)	0.39	0.20

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Number of Outer Lanes on Freeway (N_O)	0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.336
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/mi/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influenece Area Speed (S_R), mi/h	44.0
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1390	Ramp Junction Speed (S), mi/h	44.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1768	Average Density (D), pc/mi/ln	20.1
Level of Service (LOS)	B	Density in Ramp Influence Area (D_R), pc/mi/ln	18.2

APPENDIX C

Existing Plus Approved Development Plus Proposed Development

Drive Spacing – Influence Area Calculations

Drive 1 = $\boxed{360}$ center to stop bar from SMP & Roeland Dr.

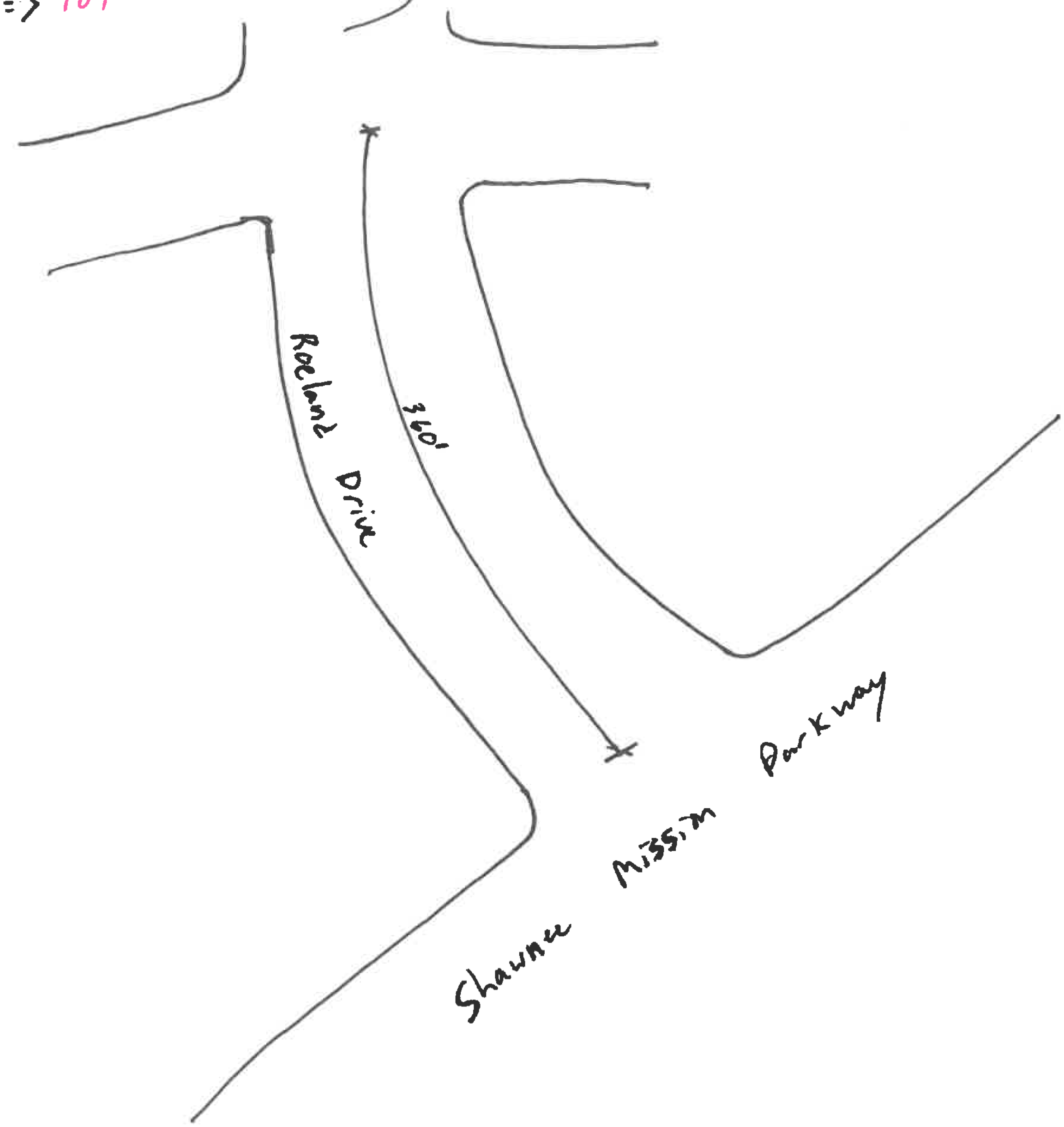
Ex + App + Dev.

D_1 => ~~[illegible]~~ Developer = 55'

D_2 => 115'

D_3 => 189'

= 55' + 115' + 189' = $\boxed{359'}$



olsson

Ex + ~~Exc~~ App + Dev

PROJECT: 017-2145 (Mission Gateway)

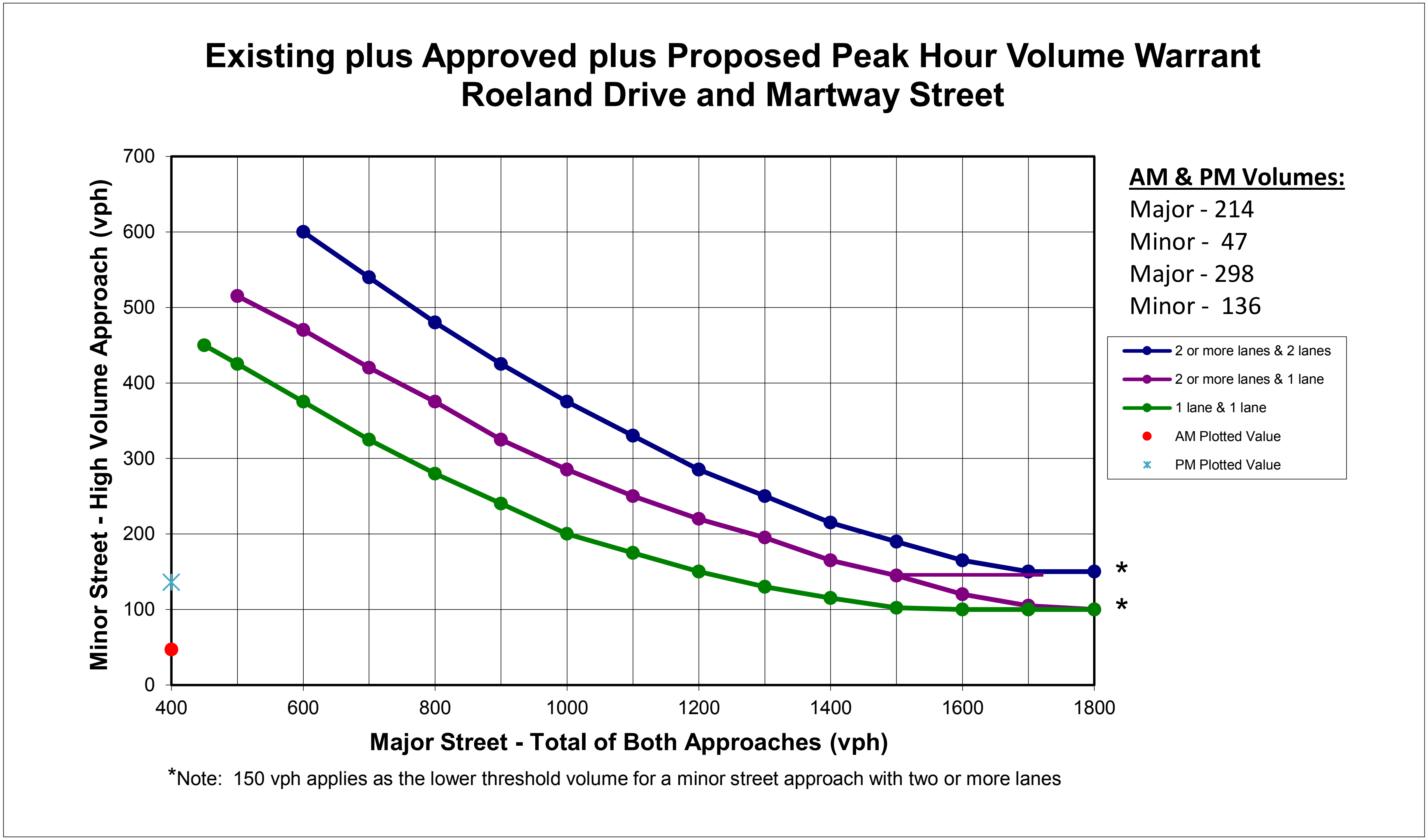
project no.:

drawn by: TCM

date: [redacted]

page 1 of 1

Signal Warrants


Existing plus Approved plus Proposed Peak Hour Volume Warrant
Roeland Drive and Martway Street
Minor Street - High Volume Approach (vph)
0
100
200
300
400
500
600
700
400
600
800
1000
1200
1400
1600
1800
Major Street - Total of Both Approaches (vph)
*Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes
*
*
AM & PM Volumes:
Major - 214
Minor - 47
Major - 298
Minor - 136
2 or more lanes & 2 lanes
2 or more lanes & 1 lane
1 lane & 1 lane
AM Plotted Value
PM Plotted Value

Trip Generation

Land Use: 310
Hotel

Description

A hotel is a place of lodging that provides sleeping accommodations and supporting facilities such as restaurants, cocktail lounges, meeting and banquet rooms or convention facilities, limited recreational facilities (pool, fitness room), and/or other retail and service shops. All suites hotel (Land Use 311), business hotel (Land Use 312), motel (Land Use 320), and resort hotel (Land Use 330) are related uses.

Additional Data

Studies of hotel employment density indicate that, on the average, a hotel will employ 0.9 employees per room.[1]

Twenty-five studies provided information on occupancy rates at the time the studies were conducted. The average occupancy rate for these studies was approximately 82 percent.

Some properties contained in this land use provide guest transportation services such as airport shuttles, limousine service, or golf course shuttle service, which may have an impact on the overall trip generation rates.

Time-of-day distribution data for this land use are presented in Appendix A. For the one center city core site with data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 8:30 and 9:30 a.m. and 3:15 and 4:15 p.m., respectively. On Saturday and Sunday, the peak hours were between 5:00 and 6:00 p.m. and 10:15 and 11:15 a.m., respectively.

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in California, District of Columbia, Florida, Georgia, Indiana, Minnesota, New York, Pennsylvania, South Dakota, Texas, Vermont, Virginia, and Washington.

For all lodging uses, it is important to collect data on occupied rooms as well as total rooms in order to accurately predict trip generation characteristics for the site.

Trip generation at a hotel may be related to the presence of supporting facilities such as convention facilities, restaurants, meeting/banquet space, and retail facilities. Future data submissions should specify the presence of these amenities. Reporting the level of activity at the supporting facilities such as full, empty, partially active, number of people attending a meeting/banquet during observation may also be useful in further analysis of this land use.

Source Numbers

170, 260, 262, 277, 280, 301, 306, 357, 422, 507, 577, 728, 867, 872, 925, 951

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[1] Buttke, Carl H. Unpublished studies of building employment densities, Portland, Oregon.

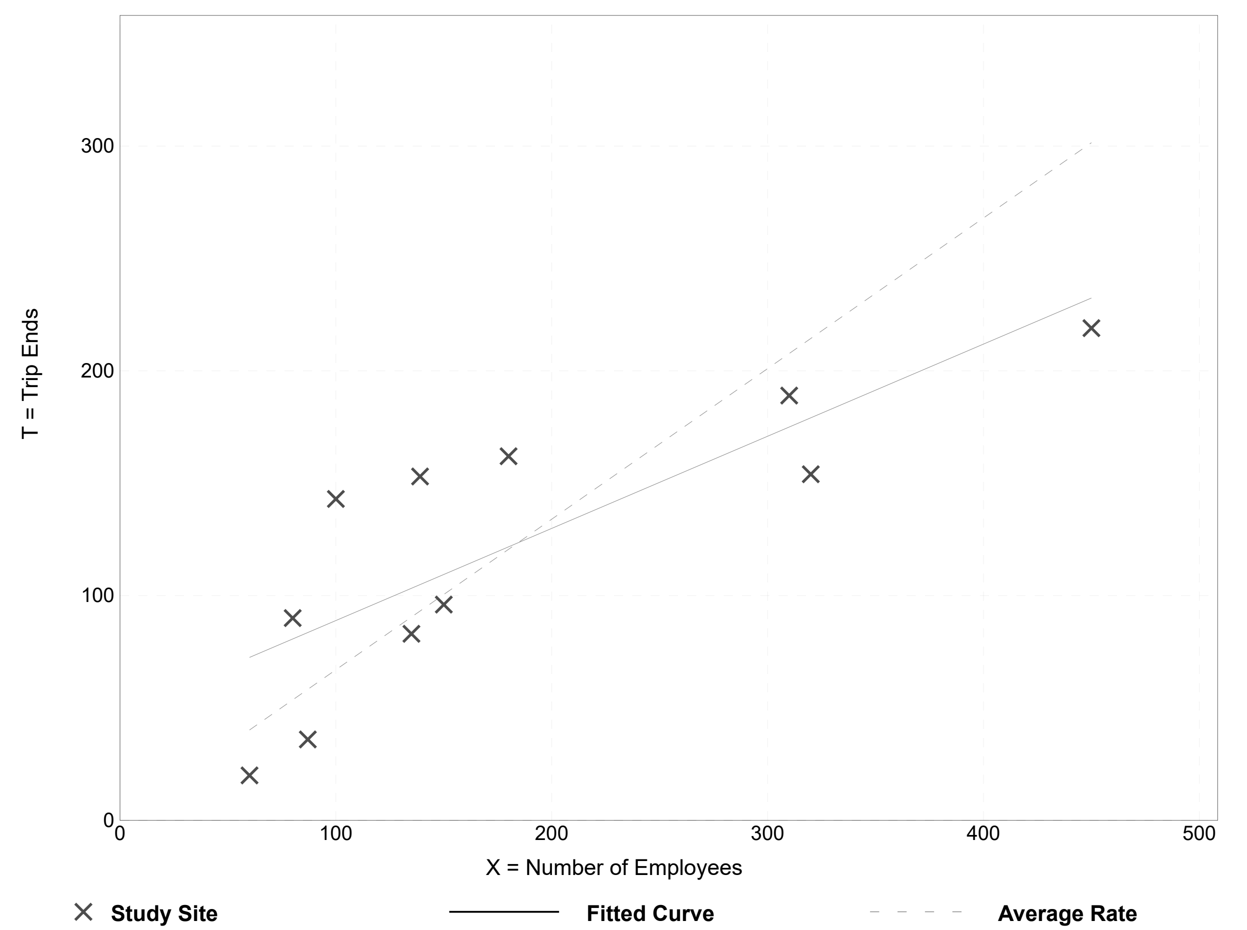
Hotel
(310)

Vehicle Trip Ends vs:	**Employees**
On a:	**Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	11
Avg. Num. of Employees:	183
Directional Distribution:	60% entering, 40% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.67	0.33 - 1.43	0.29

Data Plot and Equation



Fitted Curve Equation: $T = 0.41(X) + 47.90$ **$R^2 = 0.65$**

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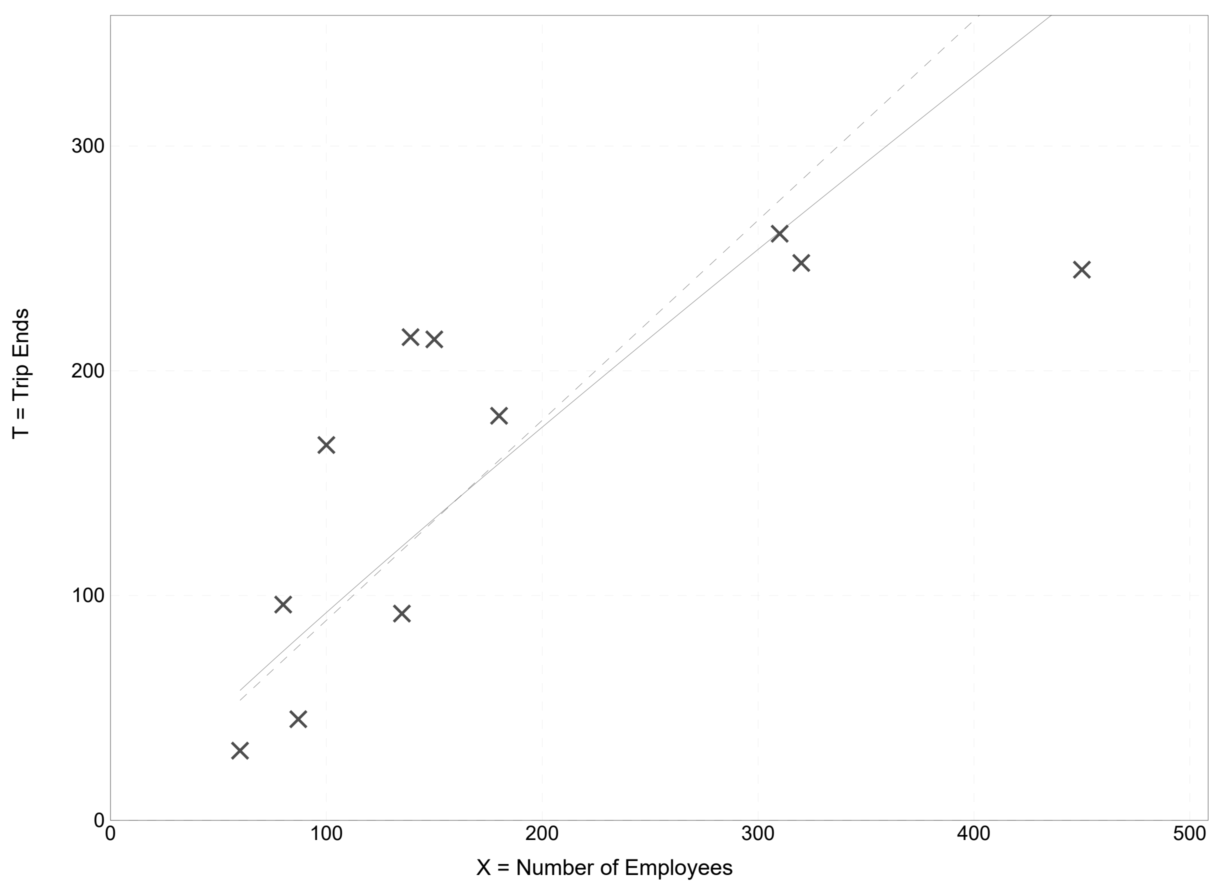
Hotel
(310)

Vehicle Trip Ends vs:	**Employees**
On a:	**Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	11
Avg. Num. of Employees:	183
Directional Distribution:	54% entering, 46% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.89	0.52 - 1.67	0.38

Data Plot and Equation



× **Study Site** — **Fitted Curve** - - - **Average Rate**

Fitted Curve Equation: Ln(T) = 0.92 Ln(X) + 0.29 **R^2= 0.64**

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Land Use: 431
Miniature Golf Course

Description

A miniature golf course consists of one or more individual putting courses. It may or may not include a limited game room or refreshment services. This land use is a stand-alone facility and is not part of a larger multipurpose entertainment or recreational facility. Golf course (Land Use 430), golf driving range (Land Use 432), and multipurpose recreational facility (Land Use 435) are related uses.

Additional Data

The site was surveyed in the 1990s in New Hampshire.

Source Number

393

Miniature Golf Course
(431)

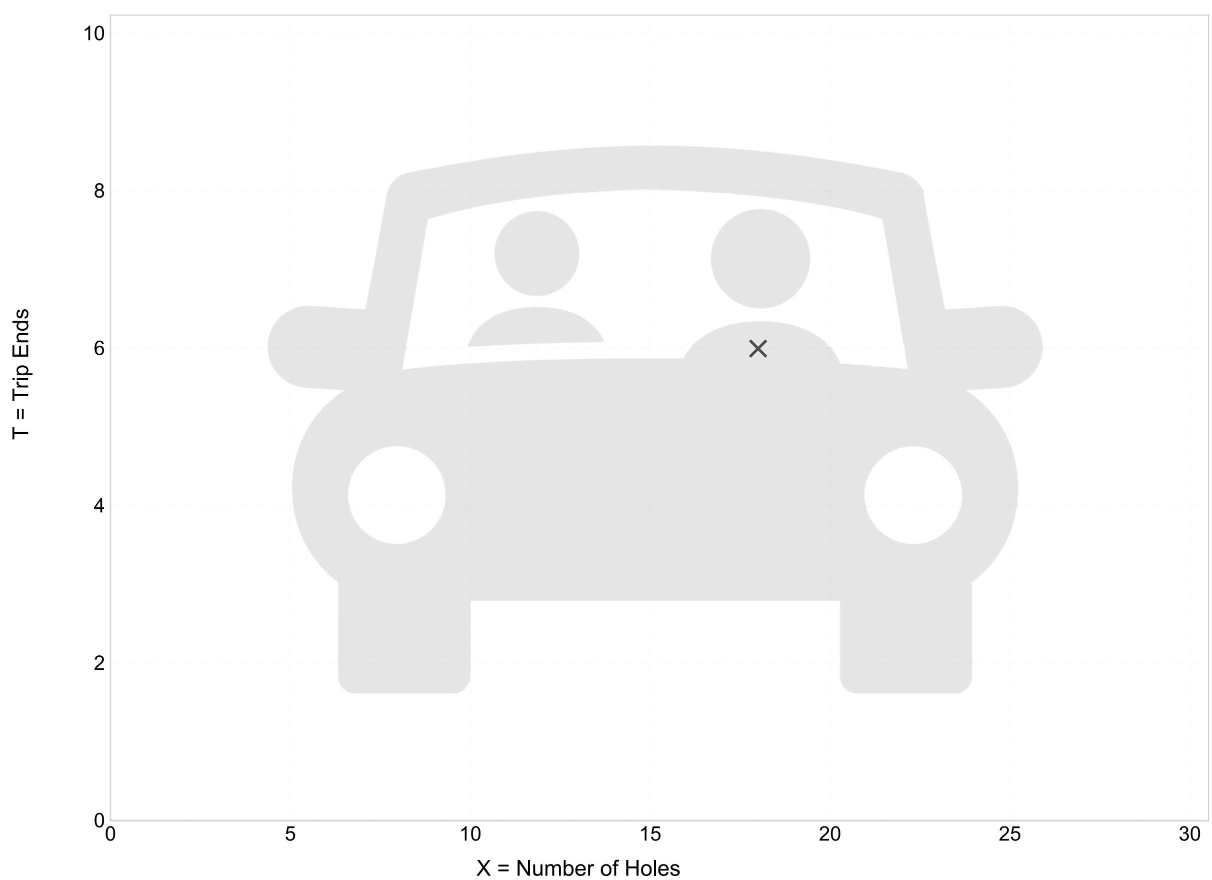
Vehicle Trip Ends vs:	**Holes**
On a:	**Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	1
Avg. Num. of Holes:	18
Directional Distribution:	33% entering, 67% exiting

Vehicle Trip Generation per Hole

Average Rate	Range of Rates	Standard Deviation
0.33	0.33 - 0.33	*

Data Plot and Equation

Caution – Small Sample Size



× **Study Site** - - - - **Average Rate**

Fitted Curve Equation: Not Given **R^2= ****

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Land Use: 432
Golf Driving Range

Description

A golf driving range is an outdoor facility that contains driving tees for golfers to practice. The facility may provide individual or small group lessons. Some sites have pro shops and/or small refreshment facilities. Driving ranges affiliated with full-sized golf courses are included in golf course (Land Use 430). Golf course (Land Use 430), miniature golf course (Land Use 431), and multipurpose recreational facility (Land Use 435) are related uses.

Additional Data

The sites were surveyed in the 1990s in California, Maryland, Massachusetts, New Hampshire, and New York.

Source Numbers

361, 363, 365, 393, 426, 517

Golf Driving Range
(432)

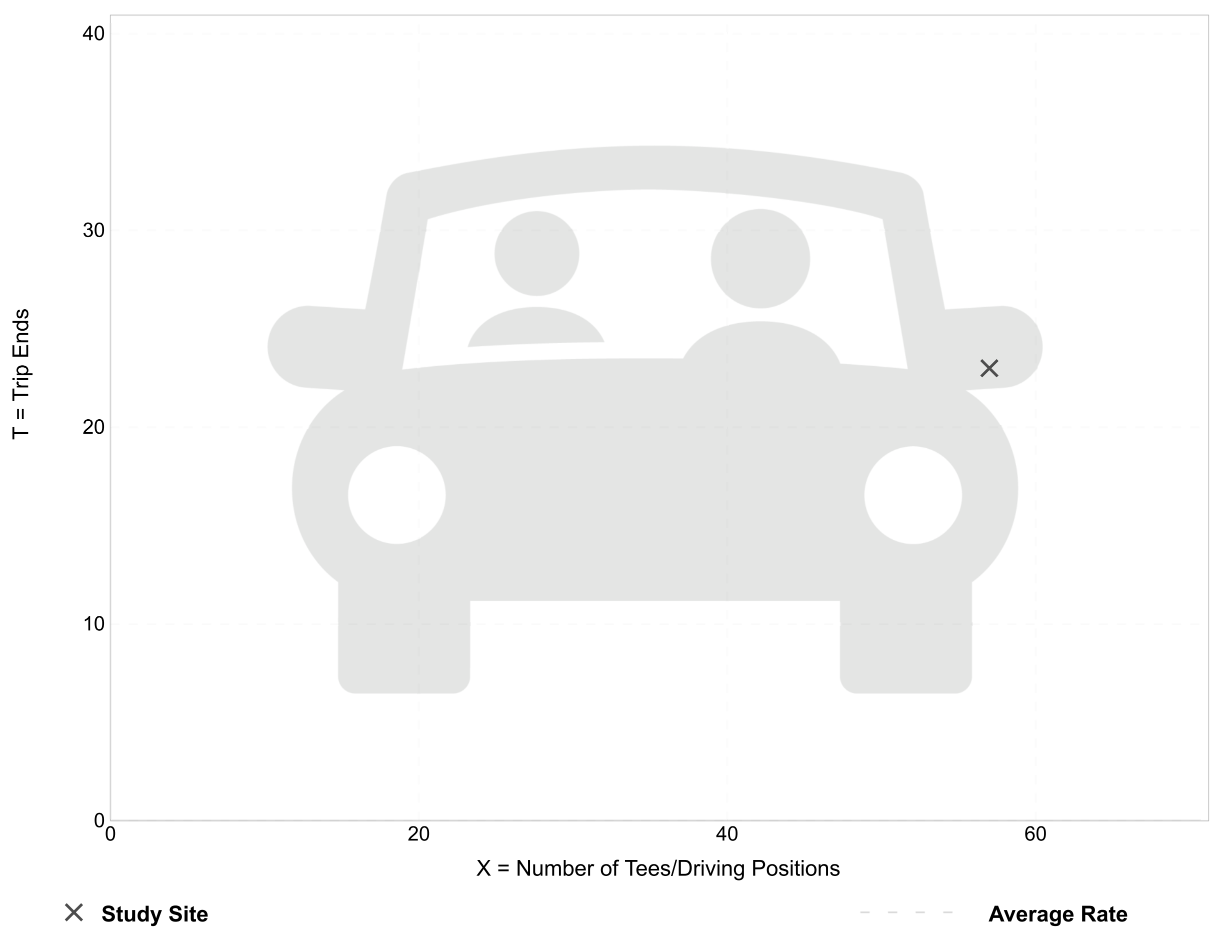
Vehicle Trip Ends vs:	**Tees/Driving Positions**
On a:	**Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	1
Avg. Num. of Tees/Driving Positions:	57
Directional Distribution:	61% entering, 39% exiting

Vehicle Trip Generation per Tee/Driving Position

Average Rate	Range of Rates	Standard Deviation
0.40	0.40 - 0.40	*

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= ****

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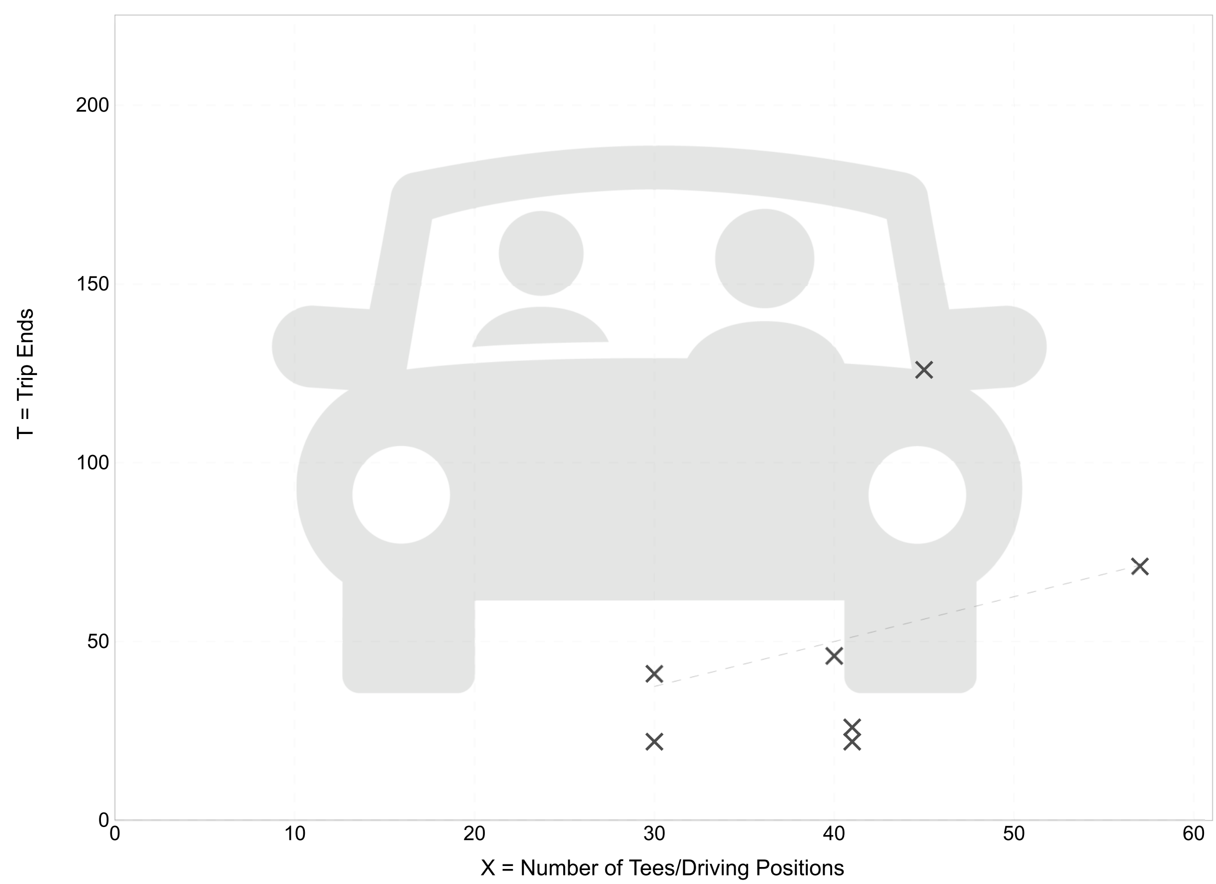
Golf Driving Range
(432)

Vehicle Trip Ends vs:	**Tees/Driving Positions**
On a:	**Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	7
Avg. Num. of Tees/Driving Positions:	41
Directional Distribution:	45% entering, 55% exiting

Vehicle Trip Generation per Tee/Driving Position

Average Rate	Range of Rates	Standard Deviation
1.25	0.54 - 2.80	0.79

Data Plot and Equation



Fitted Curve Equation: Not Given **R^2= ******

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Land Use: 435
Multipurpose Recreational Facility

Description

A multipurpose recreational facility contains two or more of the following land uses combined at one site: miniature golf, batting cages, video arcade, bumper boats, go-carts, and golf driving range. Refreshment areas may also be provided. Golf course (Land Use 430), miniature golf course (Land Use 431), golf driving range (Land Use 432), batting cages (Land Use 433), rock climbing gym (Land Use 434), and trampoline park (Land Use 436) are related uses.

Additional Data

The sites were surveyed in the 1990s and the 2000s in Oregon.

Specialized Land Use Data

A survey conducted in Pennsylvania in 1998 was submitted for an indoor race track facility containing a go-cart racing track, arcade, laser tag, restaurant, and party function rooms. The trip generation rates for this facility differ considerably from those contained in this land use. The site gross floor area was 118,000 square feet. The counted vehicle trips were as follows:

- 235 on a weekday
- 28 during the weekday, AM peak hour of the generator
- 29 during the weekday, PM peak hour of the generator
- 20 during the weekday, PM peak hour of adjacent street traffic
- 277 on a Saturday
- 34 during the Saturday peak hour of the generator

Source Numbers

583, 611, 618

Multipurpose Recreational Facility
(435)

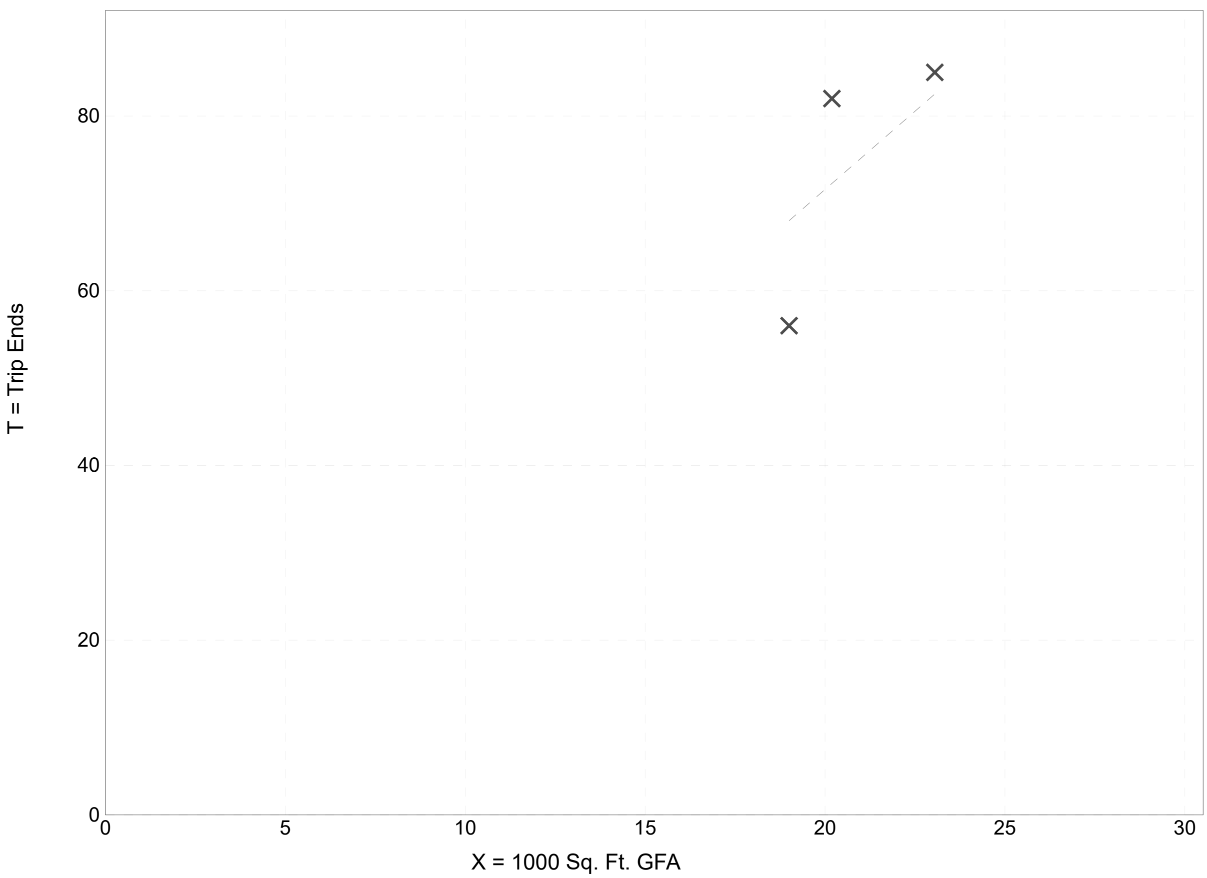
Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday,** **Peak Hour of Adjacent Street Traffic,** **One Hour Between 4 and 6 p.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	3
Avg. 1000 Sq. Ft. GFA:	21
Directional Distribution:	55% entering, 45% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
3.58	2.95 - 4.06	0.55

Data Plot and Equation

Caution – Small Sample Size



× **Study Site** — — — — **Average Rate**

Fitted Curve Equation: Not Given **R^2= ******

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Land Use: 437
Bowling Alley

Description

A bowling alley is a recreational facility that includes bowling lanes. A small lounge, restaurant and/or snack bar, video games, and pool tables may also be available.

Additional Data

The sites were surveyed in the 1990s, the 2000s, and the 2010s in Connecticut, Florida, and Texas.

Source Numbers

400, 721, 945

Bowling Alley
(437)

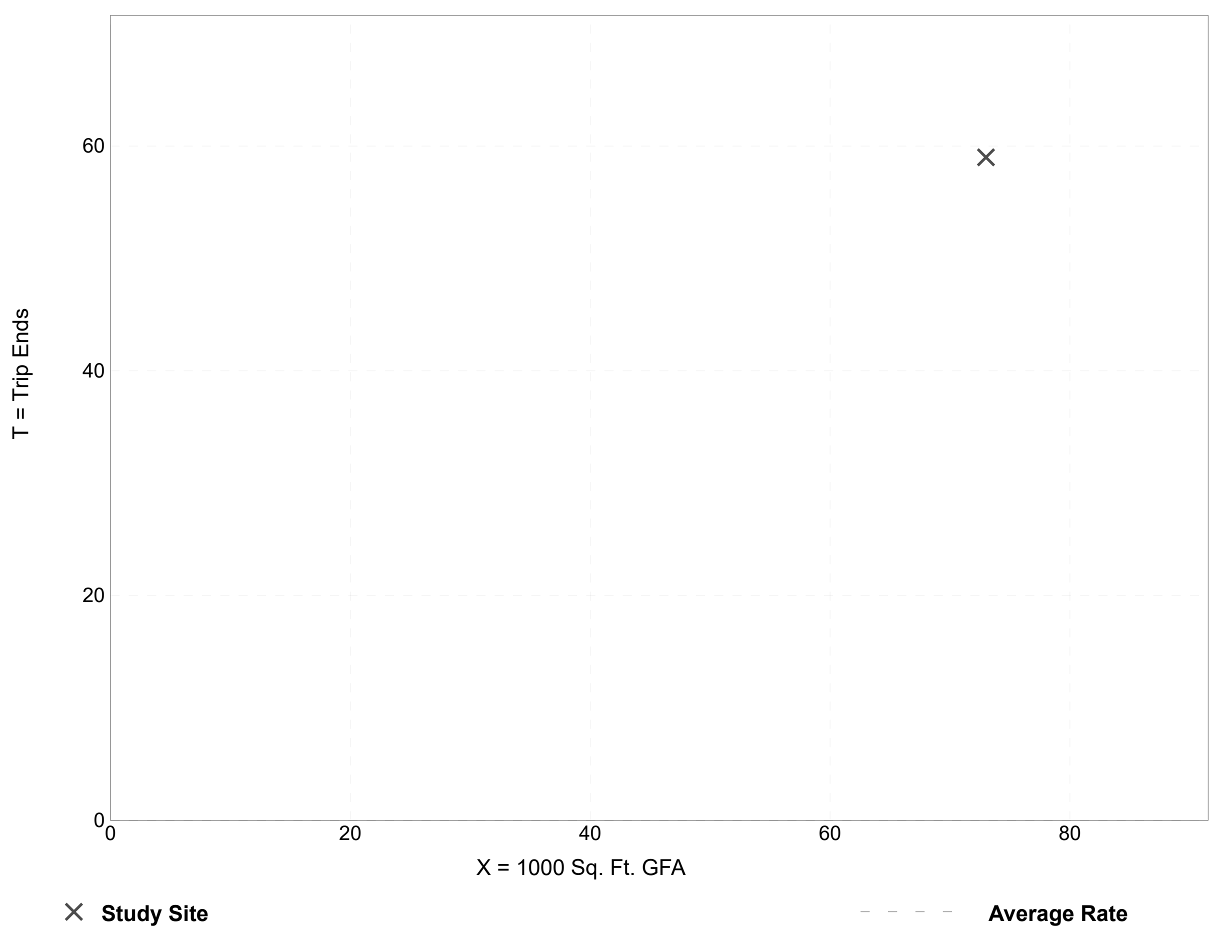
Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	1
Avg. 1000 Sq. Ft. GFA:	73
Directional Distribution:	95% entering, 5% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.81	0.81 - 0.81	*

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= **

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Bowling Alley
(437)

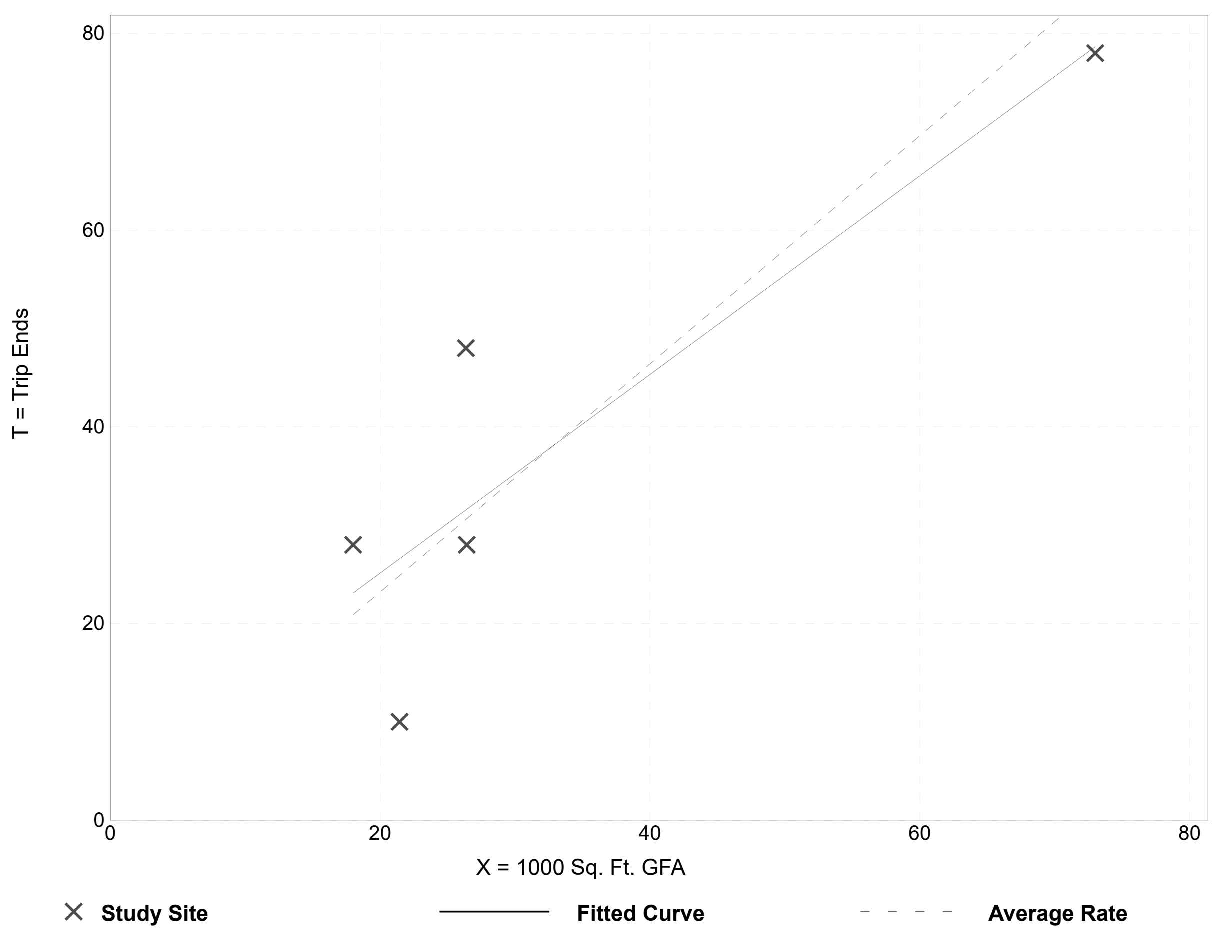
Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	5
Avg. 1000 Sq. Ft. GFA:	33
Directional Distribution:	65% entering, 35% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.16	0.47 - 1.82	0.44

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: $T = 1.01(X) + 4.92$

$R^2 = 0.78$

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Land Use: 445
Multiplex Movie Theater

Description

A multiplex movie theater consists of audience seating, a minimum of 10 screens, a lobby, and a refreshment area. The development generally has one or more of the following amenities: digital sound, tiered stadium seating, and moveable or expandable walls. Theaters included in this category are primarily stand-alone facilities with separate parking and dedicated driveways. All theaters in the category show only first-run movies or movies not previously seen through any other media. They may also have matinee showings. Movie theater (Land Use 444) is a related use.

Additional Data

Caution should be used when applying these data, as the peaking characteristics for this land use could have a significant impact on trip generation rates. Peaking at movie theaters typically occurred in time periods shorter than an hour. Movie theaters' start and end times may be staggered to reduce peak surging impacts.

Multiplex theaters typically house a smaller number of seats per screen than traditional theaters. For the 19 sites in Land Use 445 with data for both number of movie screens and number of seats, the average number of seats per movie screen was 230. For the eight sites in Land Use 444 with data for both number of movie screens and number of seats, the average number of seats per movie screen was 343.

The peak hour of the generator for multiplex movie theaters occurred during Friday and Saturday evenings between 6:00 p.m. and 10:00 p.m.

For additional information on multiplex movie theaters, refer to the ITE Informational Report, *Trip Generation Characteristics of Traditional and Multiplex Movie Theaters*.[2]

The sites were surveyed in the 1990s, the 2000s, and the 2010s in California, Connecticut, Georgia, Hawaii, New York, North Carolina, Ohio, Oregon, Pennsylvania, South Carolina, Texas, Virginia, and Wisconsin.

Source Numbers

418, 433, 443, 450, 451, 452, 453, 455, 456, 457, 458, 459, 513, 618, 959

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[2] *Trip Generation Characteristics of Traditional and Multiplex Movie Theaters*. Washington, DC, USA: Institute of Transportation Engineers, March 2001.

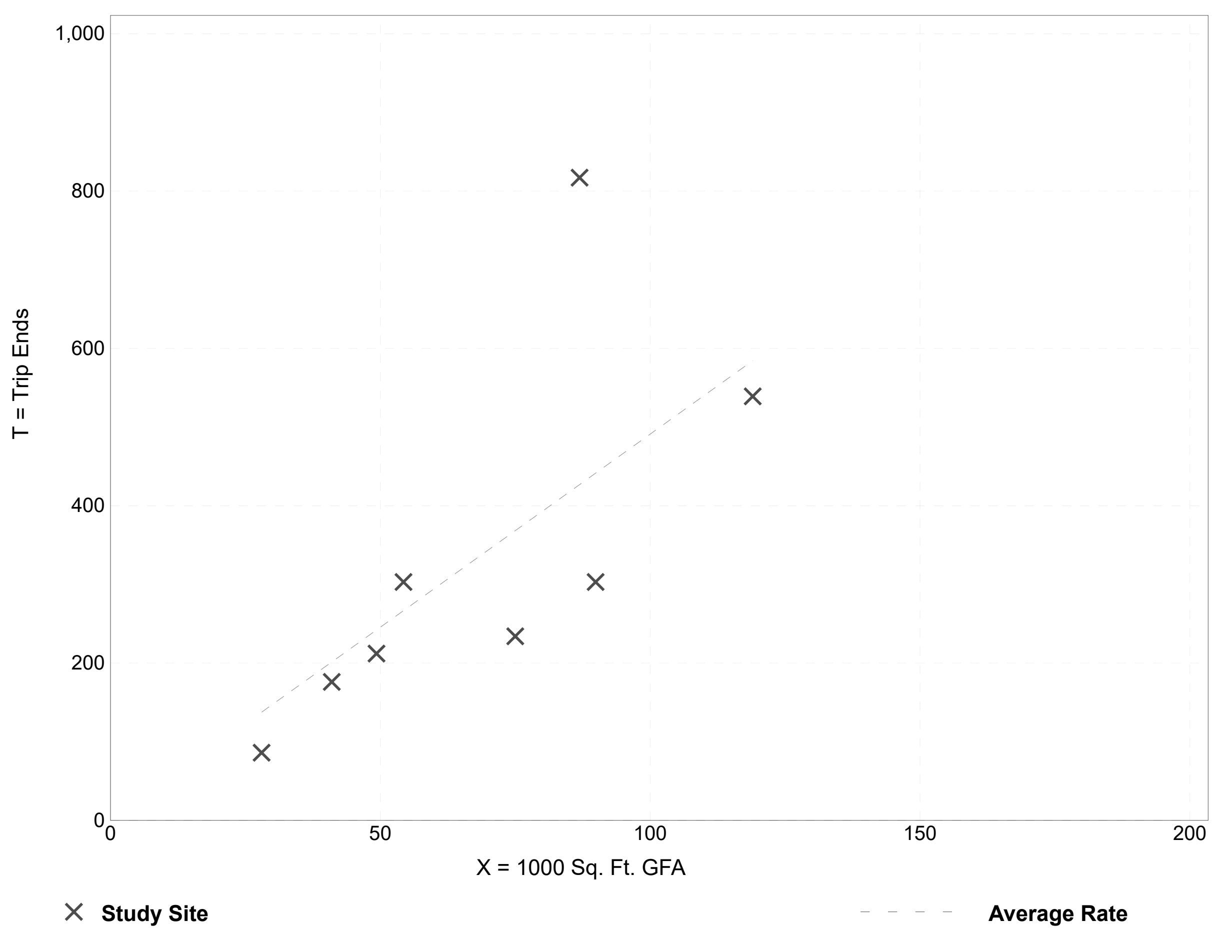
Multiplex Movie Theater
(445)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Friday, Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	8
Avg. 1000 Sq. Ft. GFA:	68
Directional Distribution:	62% entering, 38% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
4.91	3.07 - 9.40	2.24

Data Plot and Equation



Fitted Curve Equation: Not Given **R^2= ******

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Land Use: 710
General Office Building

Description

A general office building houses multiple tenants; it is a location where affairs of businesses, commercial or industrial organizations, or professional persons or firms are conducted. An office building or buildings may contain a mixture of tenants including professional services, insurance companies, investment brokers, and tenant services, such as a bank or savings and loan institution, a restaurant, or cafeteria and service retail facilities. A general office building with a gross floor area of 5,000 square feet or less is classified as a small office building (Land Use 712). Corporate headquarters building (Land Use 714), single tenant office building (Land Use 715), office park (Land Use 750), research and development center (Land Use 760), and business park (Land Use 770) are additional related uses.

If information is known about individual buildings, it is suggested that the general office building category be used rather than office parks when estimating trip generation for one or more office buildings in a single development. The office park category is more general and should be used when a breakdown of individual or different uses is not known. If the general office building category is used and if additional buildings, such as banks, restaurants, or retail stores are included in the development, the development should be treated as a multiuse project. On the other hand, if the office park category is used, internal trips are already reflected in the data and do not need to be considered.

When the buildings are interrelated (defined by shared parking facilities or the ability to easily walk between buildings) or house one tenant, it is suggested that the total area or employment of all the buildings be used for calculating the trip generation. When the individual buildings are isolated and not related to one another, it is suggested that trip generation be calculated for each building separately and then summed.

Additional Data

The average building occupancy varied considerably within the studies for which occupancy data were provided. The reported occupied gross floor area was 88 for general urban/suburban sites and 96 percent for the center city core and dense multi-use urban sites.

Time-of-day distribution data for this land use for a weekday, Saturday, and Sunday are presented in Appendix A. For the 16 general urban/suburban sites with data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 7:30 and 8:30 a.m. and 4:30 and 5:30 p.m., respectively.

For the three general urban/suburban sites with person trip data, the overall highest volumes during the AM and PM on a weekday were counted between 8:45 and 9:45 a.m. and 12:45 and 1:45 p.m., respectively. For the three dense multi-use urban sites with person trip data, the overall highest volumes during the AM and PM on a weekday were counted between 8:30 and 9:30 a.m. and 4:45 and 5:45 p.m., respectively. For the four center city core sites with person trip data, the overall highest volumes during the AM and PM on a weekday were counted between 9:00 and 10:00 a.m. and 12:45 and 1:45 p.m., respectively.

The average numbers of person trips per vehicle trip at the eight center city core sites at which both person trip and vehicle trip data were collected were as follows:

- 2.76 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 2.90 during Weekday, AM Peak Hour of Generator
- 2.91 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.
- 3.02 during Weekday, PM Peak Hour of Generator

The average numbers of person trips per vehicle trip at the 18 dense multi-use urban sites at which both person trip and vehicle trip data were collected were as follows:

- 1.47 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 1.47 during Weekday, AM Peak Hour of Generator
- 1.46 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.
- 1.53 during Weekday, PM Peak Hour of Generator

The average numbers of person trips per vehicle trip at the 23 general urban/suburban sites at which both person trip and vehicle trip data were collected were as follows:

- 1.30 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 1.34 during Weekday, AM Peak Hour of Generator
- 1.32 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.
- 1.41 during Weekday, PM Peak Hour of Generator

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in Alberta (CAN), California, Colorado, Connecticut, Georgia, Illinois, Indiana, Kansas, Kentucky, Maine, Maryland, Michigan, Minnesota, Missouri, Montana, New Hampshire, New Jersey, New York, Pennsylvania, Texas, Utah, Virginia, and Washington.

Source Numbers

161, 175, 183, 184, 185, 207, 212, 217, 247, 253, 257, 260, 262, 273, 279, 297, 298, 300, 301, 302, 303, 304, 321, 322, 323, 324, 327, 404, 407, 408, 418, 419, 423, 562, 734, 850, 859, 862, 867, 869, 883, 884, 890, 891, 904, 940, 944, 946, 964, 965, 972

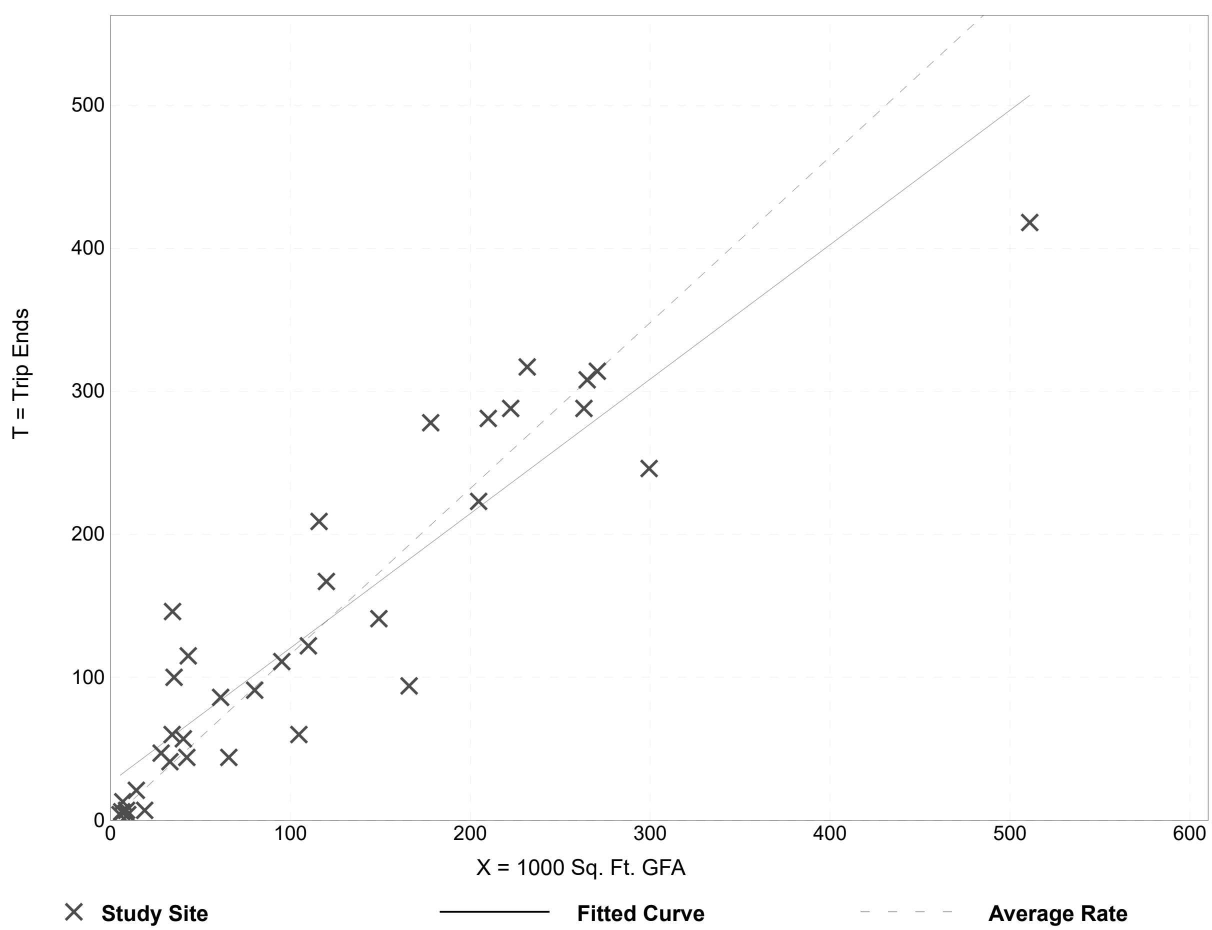
General Office Building
(710)

Vehicle Trip Ends vs: **1000 Sq. Ft. GFA**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 35
Avg. 1000 Sq. Ft. GFA: 117
Directional Distribution: 86% entering, 14% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.16	0.37 - 4.23	0.47

Data Plot and Equation



Fitted Curve Equation: $T = 0.94(X) + 26.49$ **$R^2 = 0.85$**

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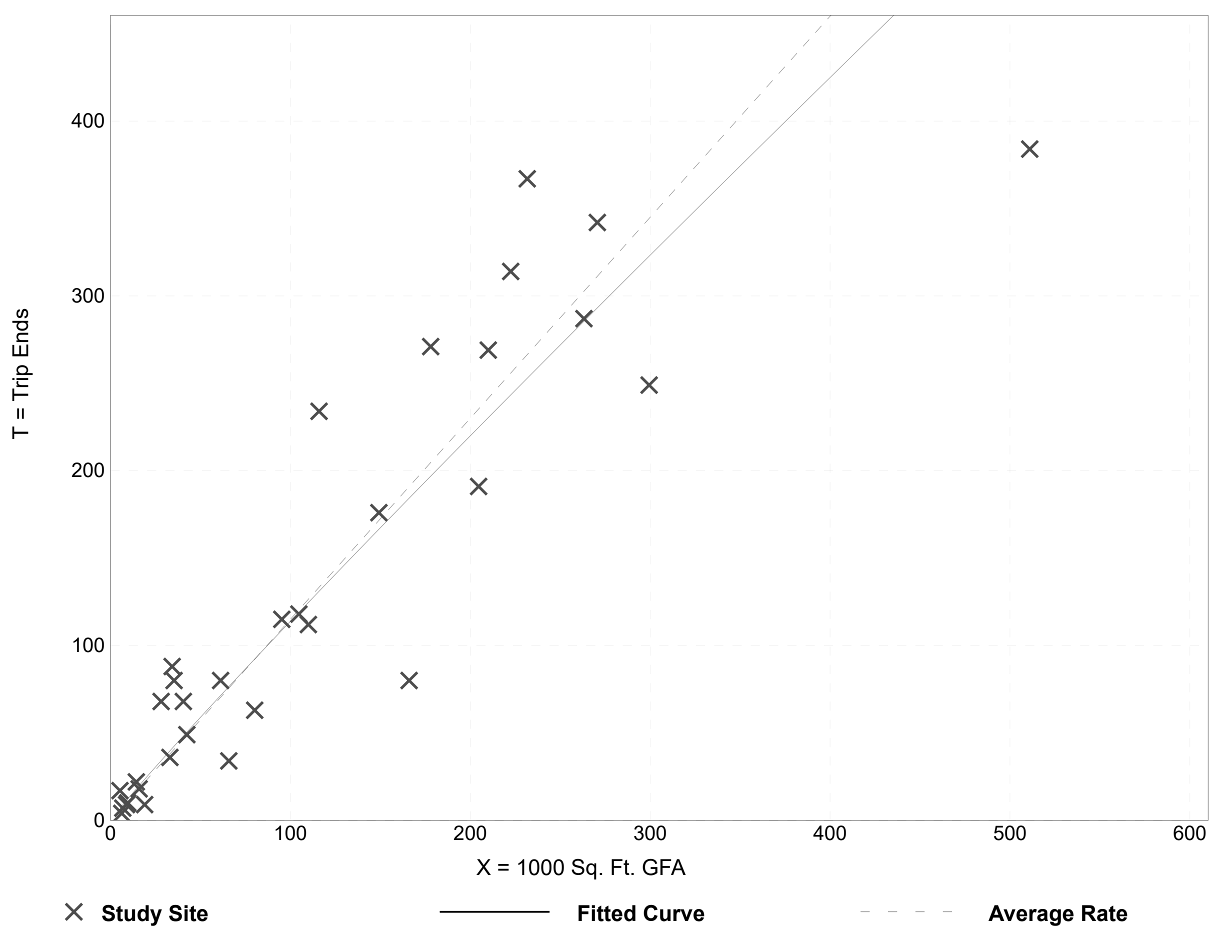
General Office Building
(710)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	32
Avg. 1000 Sq. Ft. GFA:	114
Directional Distribution:	16% entering, 84% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.15	0.47 - 3.23	0.42

Data Plot and Equation



Fitted Curve Equation: $Ln(T) = 0.95\ Ln(X) + 0.36$ **$R^2 = 0.88$**

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Land Use: 930
Fast Casual Restaurant

Description

A fast casual restaurant is a sit down restaurant with no wait staff or table service. Customers typically order off a menu board, pay for food before the food is prepared and seat themselves. The menu generally contains higher quality made to order food items with fewer frozen or processed ingredients than fast food restaurants. Quality restaurant (Land Use 931), high-turnover (sit-down) restaurant (Land Use 932), fast-food restaurant without drive-through window (Land Use 933), fast-food restaurant with drive-through window (Land Use 934), and fast-food restaurant with drive-through window and no indoor seating (Land Use 935) are related uses.

Additional Data

Time-of-day distribution data for this land use for a weekday and Saturday are presented in Appendix A. For the one general urban/suburban site with data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 11:30 a.m. and 12:30 p.m. and 12:00 and 1:00 p.m., respectively.

The sites were surveyed in the 2010s in Minnesota, South Carolina, Washington, and Wisconsin.

Source Numbers

861, 869, 939, 959, 962

Fast Casual Restaurant
(930)

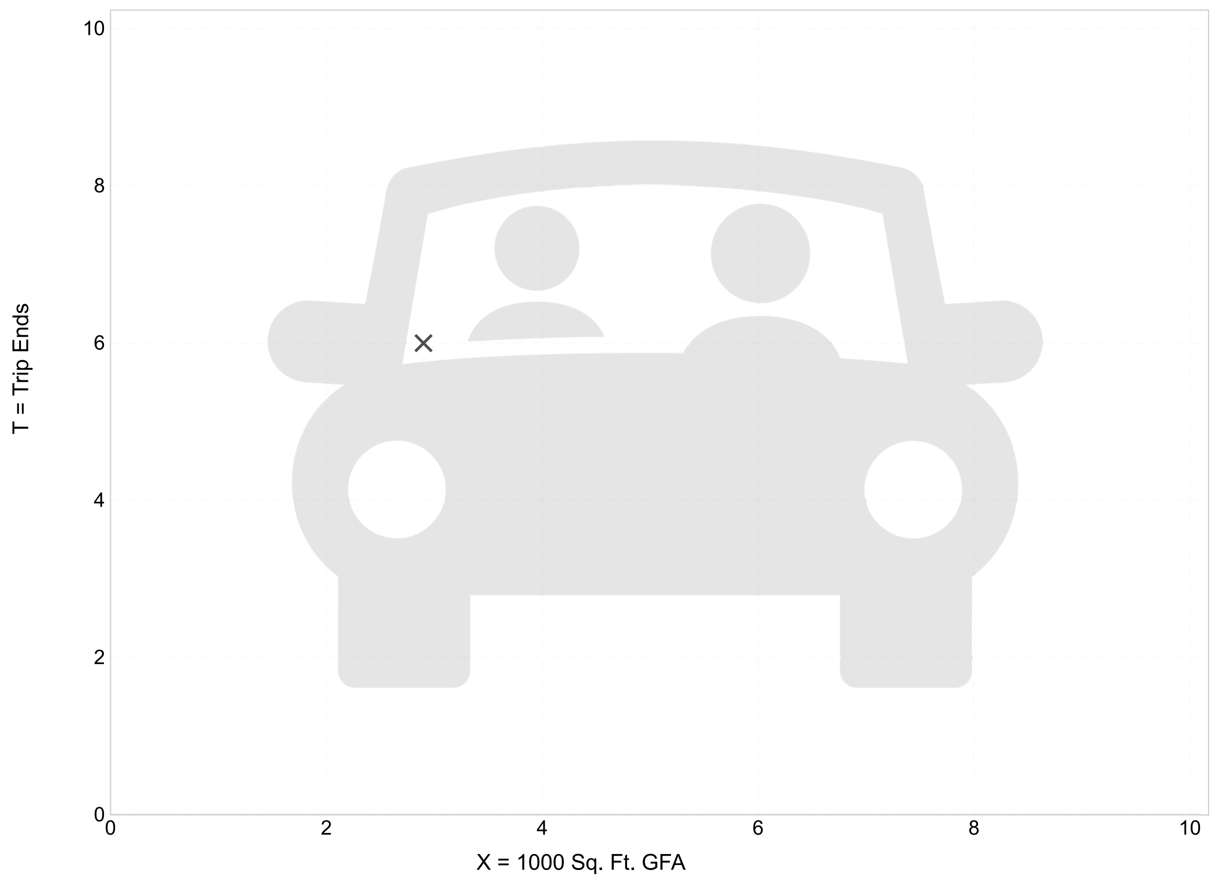
Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	1
Avg. 1000 Sq. Ft. GFA:	3
Directional Distribution:	67% entering, 33% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
2.07	2.07 - 2.07	*

Data Plot and Equation

Caution – Small Sample Size



Study Site **Average Rate**

Fitted Curve Equation: Not Given **R^2= ******

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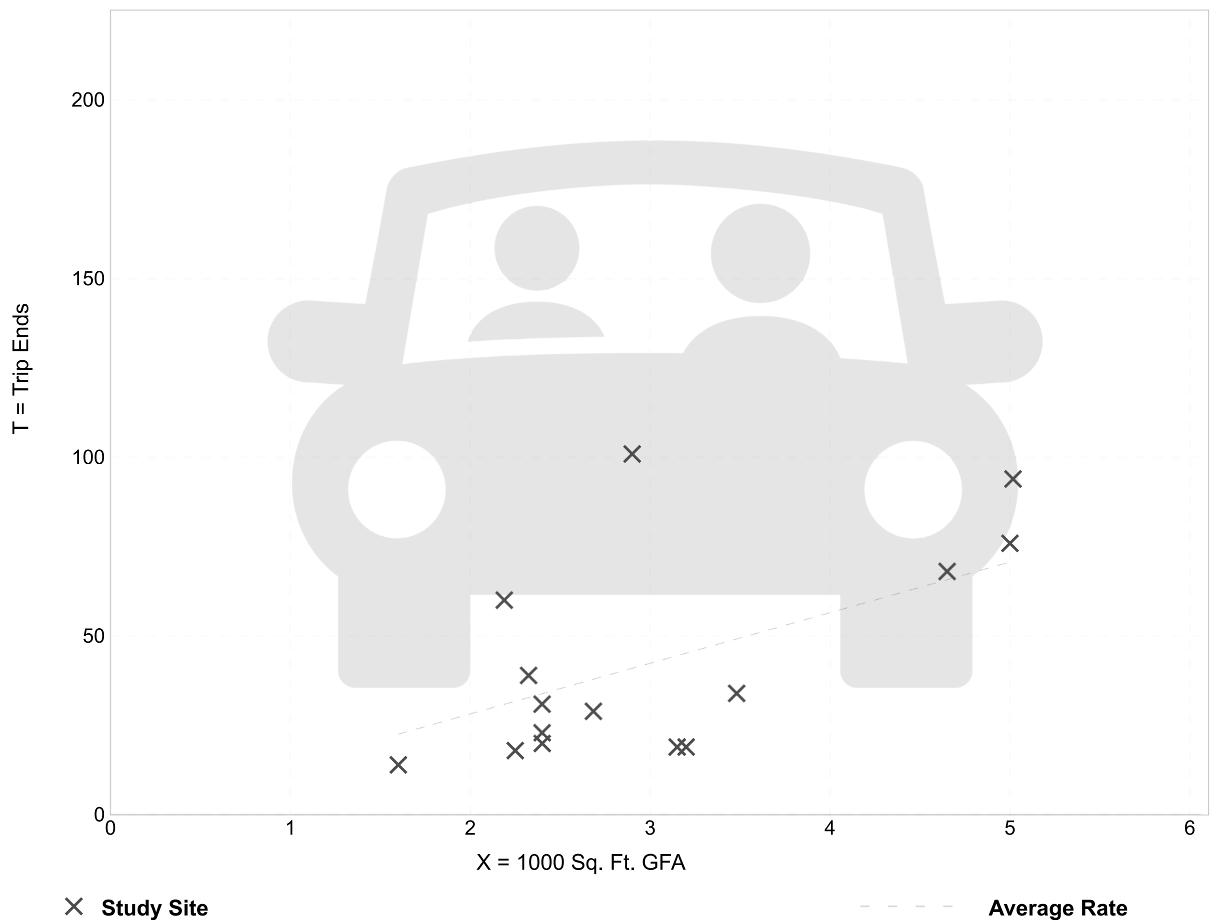
Fast Casual Restaurant
(930)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	15
Avg. 1000 Sq. Ft. GFA:	3
Directional Distribution:	55% entering, 45% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
14.13	5.94 - 34.83	7.72

Data Plot and Equation



Fitted Curve Equation: Not Given

R^2= ****

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Land Use: 932
High-Turnover (Sit-Down) Restaurant

Description

This land use consists of sit-down, full-service eating establishments with typical duration of stay of approximately one hour. This type of restaurant is usually moderately priced and frequently belongs to a restaurant chain. Generally, these restaurants serve lunch and dinner; they may also be open for breakfast and are sometimes open 24 hours a day. These restaurants typically do not take reservations. Patrons commonly wait to be seated, are served by a waiter/waitress, order from menus and pay for their meal after they eat. Some facilities contained within this land use may also contain a bar area for serving food and alcoholic drinks. Fast casual restaurant (Land Use 930), quality restaurant (Land Use 931), fast-food restaurant without drive-through window (Land Use 933), fast-food restaurant with drive-through window (Land Use 934), and fast-food restaurant with drive-through window and no indoor seating (Land Use 935) are related uses.

Additional Data

Users should exercise caution when applying statistics during the AM peak periods, as the sites contained in the database for this land use may or may not be open for breakfast. In cases where it was confirmed that the sites were not open for breakfast, data for the AM peak hour of the adjacent street traffic were removed from the database.

The outdoor seating area is not included in the overall gross floor area. Therefore, the number of seats may be a more reliable independent variable on which to establish trip generation rates for facilities having significant outdoor seating.

Time-of-day distribution data for this land use for a weekday, Saturday, and Sunday are presented in Appendix A. For the 38 general urban/suburban sites with data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 11:45 a.m. and 12:45 p.m. and 12:00 and 1:00 p.m., respectively.

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in Alberta (CAN), California, Florida, Georgia, Indiana, Kentucky, Massachusetts, Minnesota, New Hampshire, New Jersey, New York, Ohio, Oklahoma, Oregon, Pennsylvania, South Dakota, Texas, Vermont, and Wisconsin.

Source Numbers

126, 269, 275, 280, 300, 301, 305, 338, 340, 341, 358, 384, 424, 432, 437, 438, 444, 507, 555, 577, 589, 617, 618, 728, 868, 884, 885, 903, 927, 944, 961, 962, 977

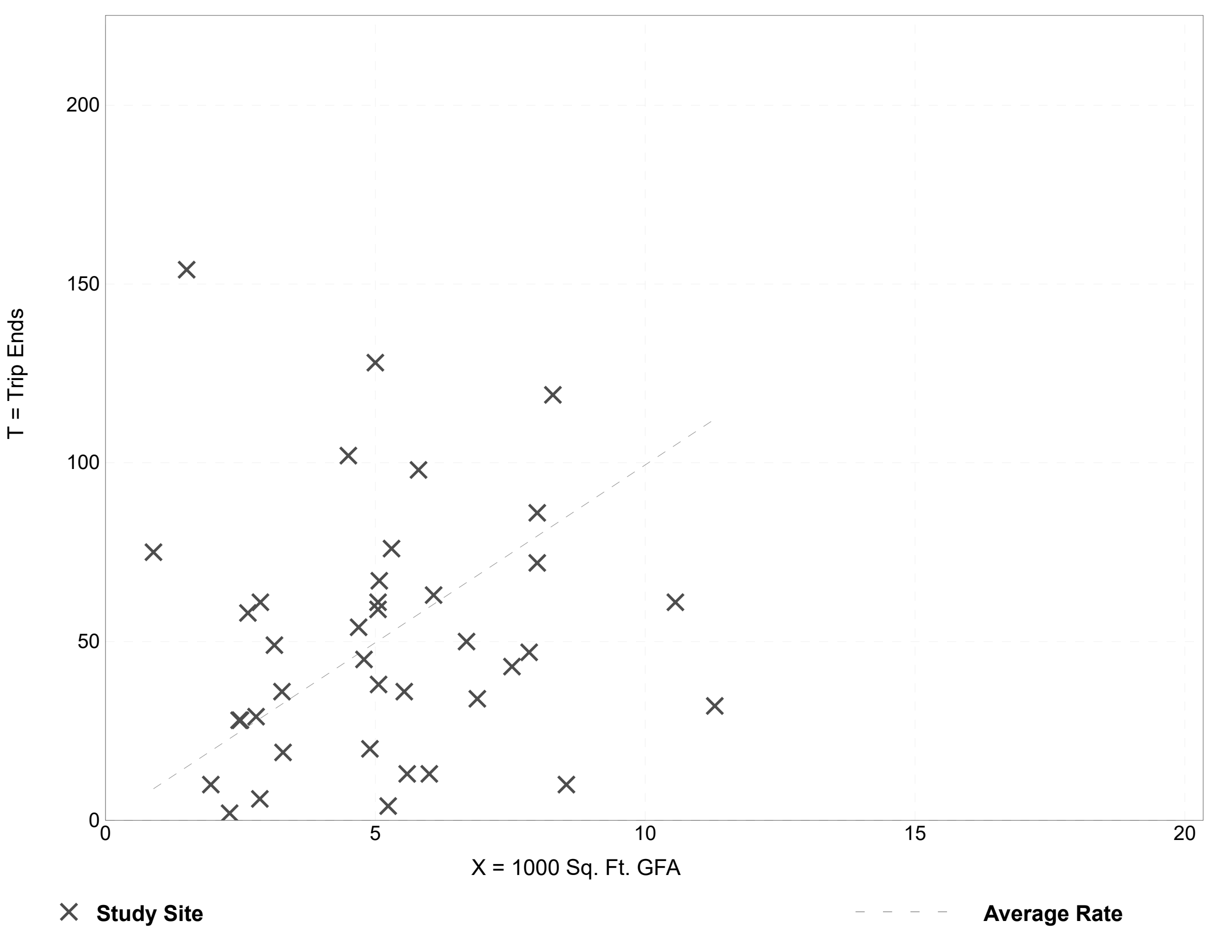
High-Turnover (Sit-Down) Restaurant
(932)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	39
Avg. 1000 Sq. Ft. GFA:	5
Directional Distribution:	55% entering, 45% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
9.94	0.76 - 102.39	11.33

Data Plot and Equation



Fitted Curve Equation: Not Given **R^2= ******

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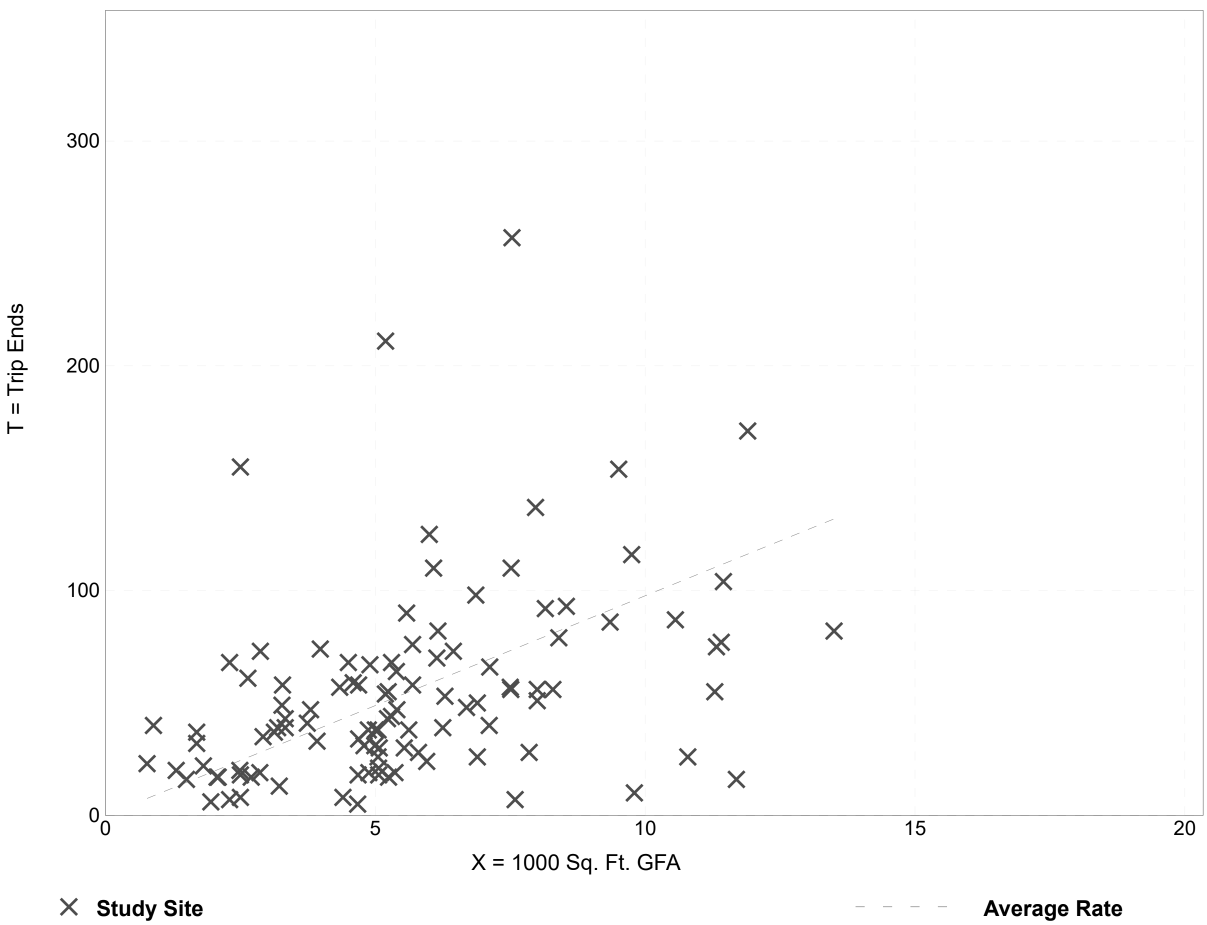
High-Turnover (Sit-Down) Restaurant
(932)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	107
Avg. 1000 Sq. Ft. GFA:	6
Directional Distribution:	62% entering, 38% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
9.77	0.92 - 62.00	7.37

Data Plot and Equation



Fitted Curve Equation: Not Given **R^2= ******

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Daily Trip Generation

ITE Code/Page	Land Use	Size		Trip Gen. Avg. Rate/Eq.	Daily Trips	Trip Distribution Enter	Trip Distribution Exit	Daily Trips Enter	Daily Trips Exit
				Approved					
220	Apartment	168	DU	Equation	1230	50%	50%	615	615
820	Shopping Center	54,594	SF	Equation	3984	50%	50%	1,992	1,992
				Full Development					
930	Fast Casual Resturant	24,221	SF	Average	7634	50%	50%	3,817	3,817
932	High-Turnover Sit Down	6,348	SF	Average	713	50%	50%	357	356
820	Shopping Center	984	SF	Equation	260	50%	50%	130	130
431	Miniature Golf Course	18	Holes	*	60	50%	50%	30	30
432	Golf Driving Range	18	Bays	Average	983	50%	50%	492	491
435	Multipurpose Recreational Facility	40000	SF	*	1440	50%	50%	720	720
437	Bowling Alley	18	Lanes	*	234	50%	50%	117	117
445	Multiplex Movie Theater*	10	Screens	*	1380	50%	50%	690	690
310	Hotel	202	Rooms	Equation	1854	50%	50%	927	927
710	General Office Building	105,000	SF	Equation	1113	50%	50%	557	556
Total					**20,885**			**10,444**	**10,441**

*No ITE Daily Trip Estimation Available assumed PM peak hour trips were 10% of daily

AM Peak Hour Trip Generation (Adjacent Street)

ITE Code/Page	Land Use	Size		Trip Gen. Avg. Rate/Eq.	AM Peak Hour Trips	Trip Distribution Enter	Trip Distribution Exit	AM Peak Hour Trips Enter	AM Peak Hour Trips Exit
				Approved					
220	Apartment	168	DU	Equation	79	23%	77%	19	60
820	Shopping Center	54594	SF	Equation	180	62%	38%	112	68
				Full Development					
930	Fast Casual Resturant	24221	SF	Average	51	67%	33%	35	16
932	High-Turnover Sit Down	6,348	SF	Average	64	55%	45%	36	28
820	Shopping Center	984	SF	Equation	153	62%	38%	95	58
431	Miniature Golf Course*	18	Holes	-	-	-	-	-	-
432	Golf Driving Range	18	Bays	Average	29	61%	39%	18	11
435	Multipurpose Recreational Facility	40000	SF	-	-	-	-	-	-
437	Bowling Alley	18	Lanes	Average	27	95%	5%	26	1
445	Multiplex Movie Theater*	10	Screens	-	-	-	-	-	-
310	Hotel	202	Rooms	Equation	96	59%	41%	57	39
710	General Office Building	105000	SF	Equation	126	86%	14%	109	17
	Total				**805**			**507**	**298**
	(Total w/ Internal Capture)				**637**			**423**	**214**
	Pass-by Reduction				**-**			**-**	**-**

*No ITE AM Trip Estimation Available

PM Peak Hour Trip Generation (Adjacent Street)

ITE Code/Page	Land Use	Size		Trip Gen. Avg. Rate/Eq.	PM Peak Hour Trips	Trip Distribution Enter	Trip Distribution Exit	PM Peak Hour Trips Enter	PM Peak Hour Trips Exit
				Approved					
220	Apartment	168	DU	Equation	94	63%	37%	60	34
820	Shopping Center	54594	SF	Equation	348	48%	52%	168	180
				Full Development					
930	Fast Casual Resturant	24221	SF	Average	343	55%	45%	189	154
932	High-Turnover Sit Down	6,348	SF	Average	63	62%	38%	40	23
820	Shopping Center	984	SF	Equation	18	48%	52%	9	9
431	Miniature Golf Course	18	Holes	Average	6	33%	67%	2	4
432	Golf Driving Range	18	Bays	Average	90	45%	55%	41	49
435	Multipurpose Recreational Facility	40000	SF	Average	144	55%	45%	80	64
437	Bowling Alley	18	Lanes	Average	23	65%	35%	16	7
445	Multiplex Movie Theater*	10	Screens	Average	138	51%	49%	71	67
310	Hotel	202	Rooms	Equation	126	51%	49%	65	61
710	General Office Building	105000	SF	Equation	120	16%	84%	20	100
	Total				**1513**			**761**	**752**
	(Total w/ Internal Capture)				**925**			**467**	**458**
	Pass-by Reduction				**103**			**50**	**53**
	(Total w/ Internal Capture and Pass-by Reduction)				**822**			**417**	**405**

NCHRP 8-51 Internal Trip Capture Estimation Tool			
Project Name:	Mission Gateway	**Organization:**	Olsson
Project Location:	Mission, KS	**Performed By:**	TCM
Scenario Description:	Existing + Approved	**Date:**	2/3/2020
Analysis Year:	2019	**Checked By:**	
Analysis Period:	**AM Street Peak Hour**	**Date:**	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office	710	105,000	SQF	126	109	17
Retail	820	55,578	SQF	333	207	126
Restaurant	932	30,569	SQF	115	71	44
Cinema/Entertainment	/432/435/437/	8/18/40000/18/1	Lanes/SF/Screens	56	44	12
Residential	220	168	DU	79	19	60
Hotel	310	202		96	57	39
All Other Land Uses[2]				0		
Total				805	507	298

Table 2-A: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses[2]						

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		5	11	0	0	0
Retail	4		16	0	0	0
Restaurant	14	6		0	1	1
Cinema/Entertainment	0	0	0		0	0
Residential	1	1	12	0		0
Hotel	3	5	4	0	0	

Table 5-A: Computations Summary

	Total	Entering	Exiting
All Person-Trips	805	507	298
Internal Capture Percentage	21%	17%	28%
External Vehicle-Trips[3]	637	423	214
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	20%	94%
Retail	8%	16%
Restaurant	61%	50%
Cinema/Entertainment	0%	0%
Residential	5%	23%
Hotel	2%	31%

[1]Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.
[2]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
[3]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A
[4]Person-Trips
*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

NCHRP 8-51 Internal Trip Capture Estimation Tool				
Project Name:	Mission Gateway		**Organization:**	Olsson
Project Location:	Mission, KS		**Performed By:**	TCM
Scenario Description:	Approved + Development		**Date:**	2/3/2020
Analysis Year:	2018		**Checked By:**	
Analysis Period:	**PM Street Peak Hour**		**Date:**	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)				Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units		Total	Entering	Exiting
Office	710	105,000	SQF		120	20	100
Retail	820	55,578	SQF		366	177	189
Restaurant	932	30,569	SQF		406	229	177
Cinema/Entertainment	/432/435/437/	8/18/40000/18/1	Lanes/SF/Screens		401	210	191
Residential	220	168	DU		94	60	34
Hotel	310	202			126	65	61
All Other Land Uses[2]							
Total					1513	761	752

Table 2-P: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips				Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized		Veh. Occ.	% Transit	% Non-Motorized
Office							
Retail							
Restaurant							
Cinema/Entertainment							
Residential							
Hotel							
All Other Land Uses[2]							

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		14	4	0	2	0
Retail	4		55	8	28	9
Restaurant	5	73		14	10	12
Cinema/Entertainment	1	7	7		2	1
Residential	1	14	7	0		1
Hotel	0	4	11	0	0	

Table 5-P: Computations Summary

	Total	Entering	Exiting
All Person-Trips	1,513	761	752
Internal Capture Percentage	39%	39%	39%
External Vehicle-Trips[3]	925	467	458
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	55%	20%
Retail	63%	55%
Restaurant	37%	64%
Cinema/Entertainment	10%	9%
Residential	70%	68%
Hotel	35%	25%

[1]Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

[2]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

[3]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

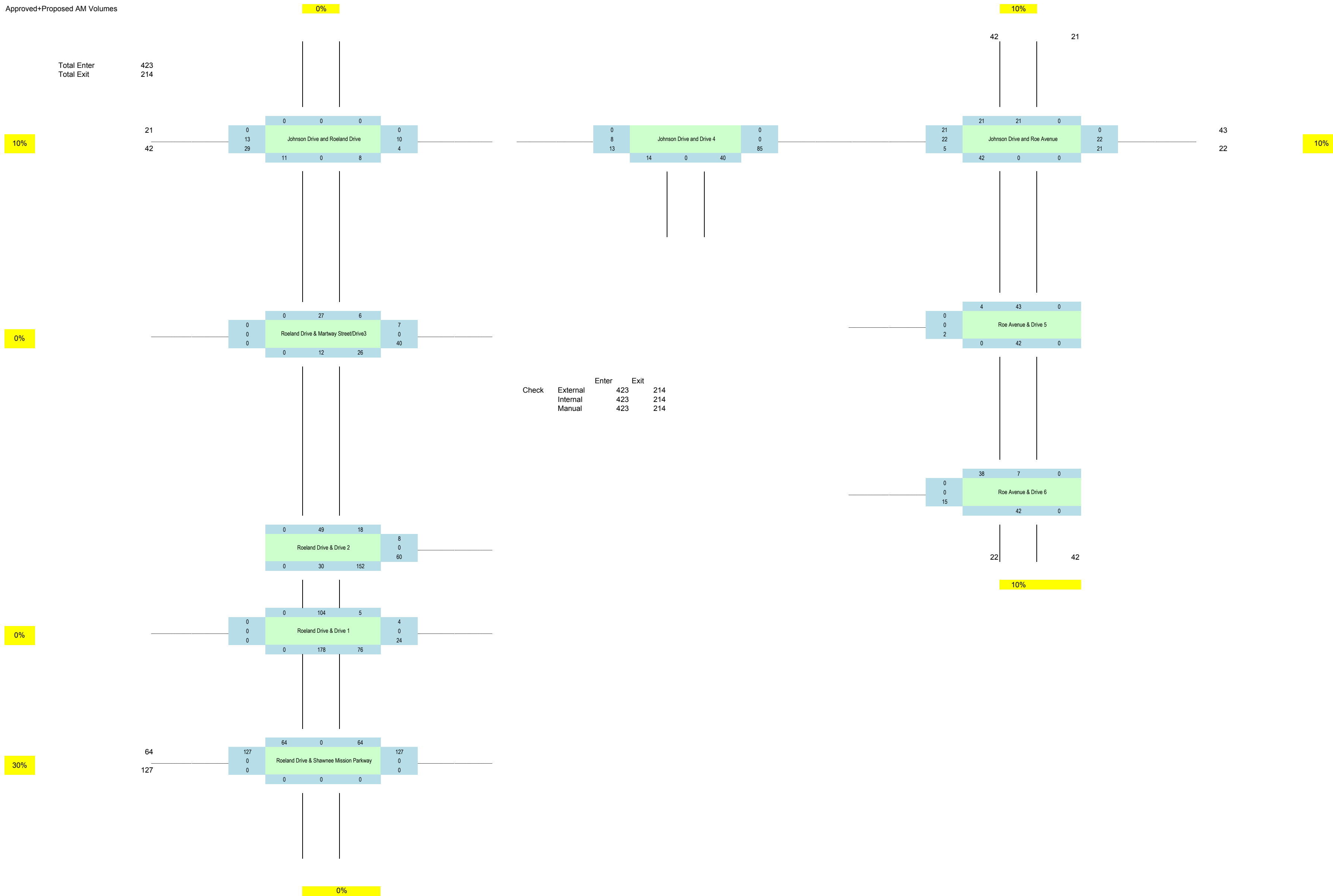
[4]Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Approved+Proposed AM Volumes

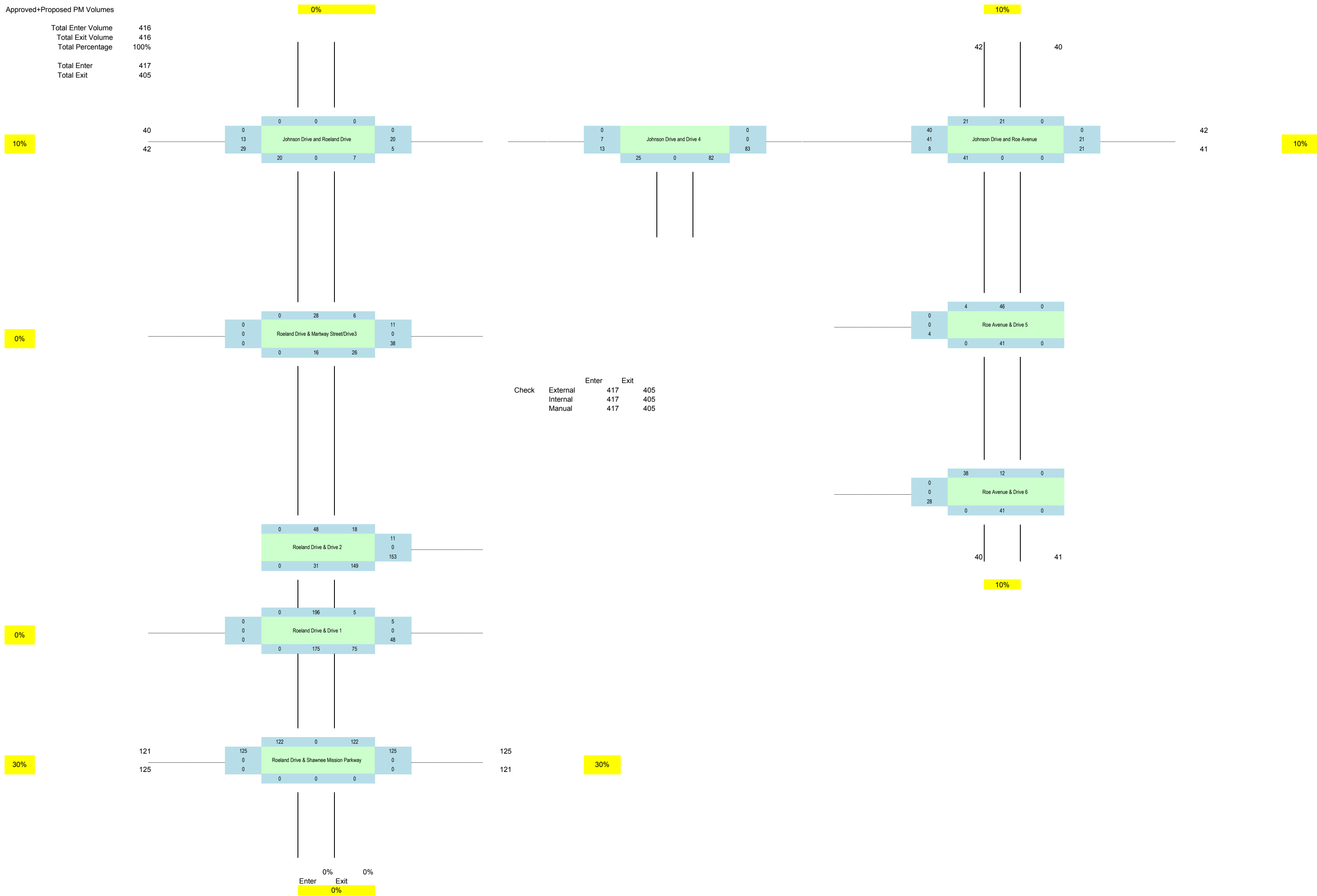
Total Enter	423
Total Exit	214



		Enter	Exit
Check	External	423	214
	Internal	423	214
	Manual	423	214

Approved+Proposed PM Volumes

Total Enter Volume	416
Total Exit Volume	416
Total Percentage	100%
Total Enter	417
Total Exit	405



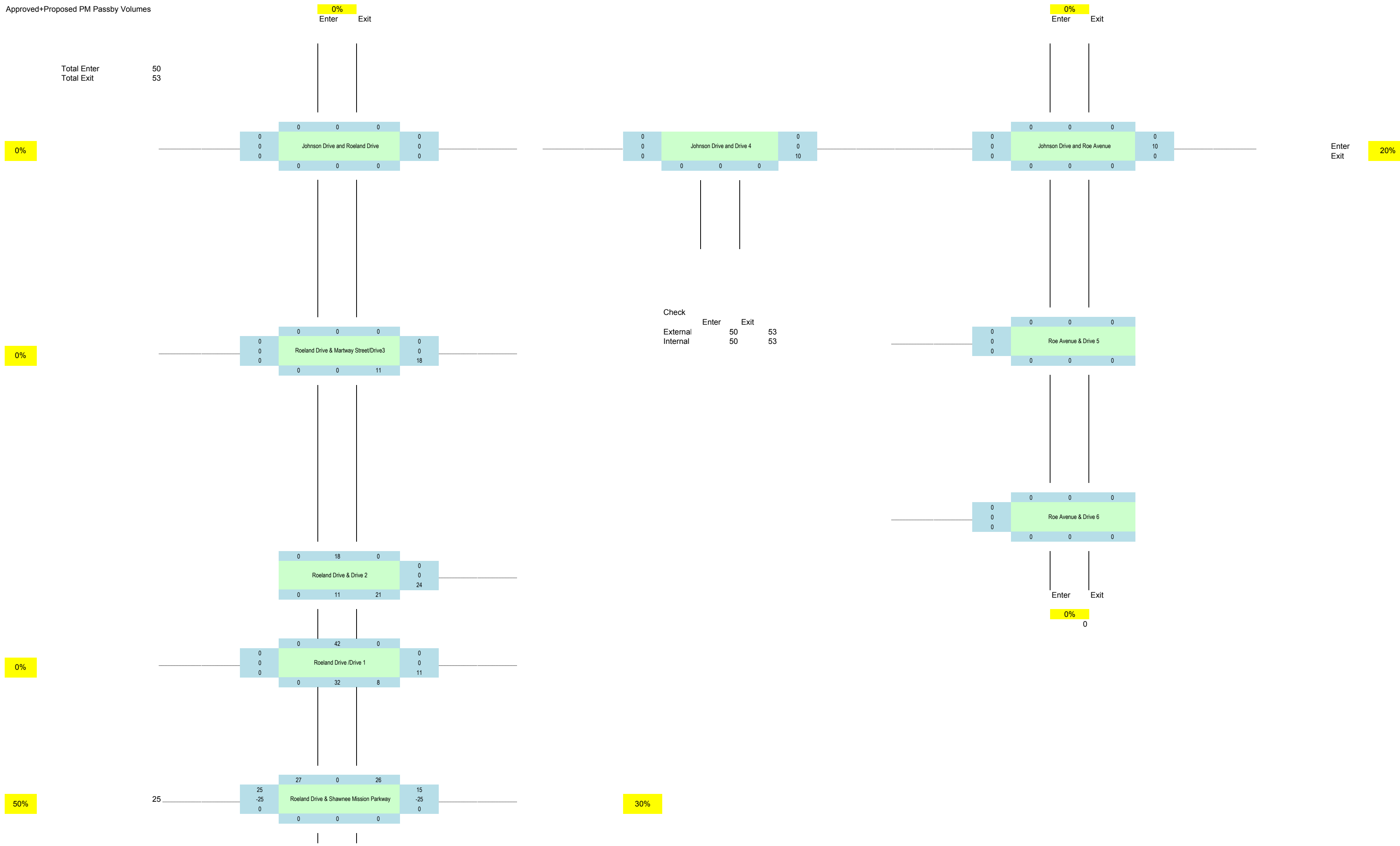
		Enter	Exit
Check	External	417	405
	Internal	417	405
	Manual	417	405

Approved+Proposed PM Passby Volumes

Total Enter	50
Total Exit	53

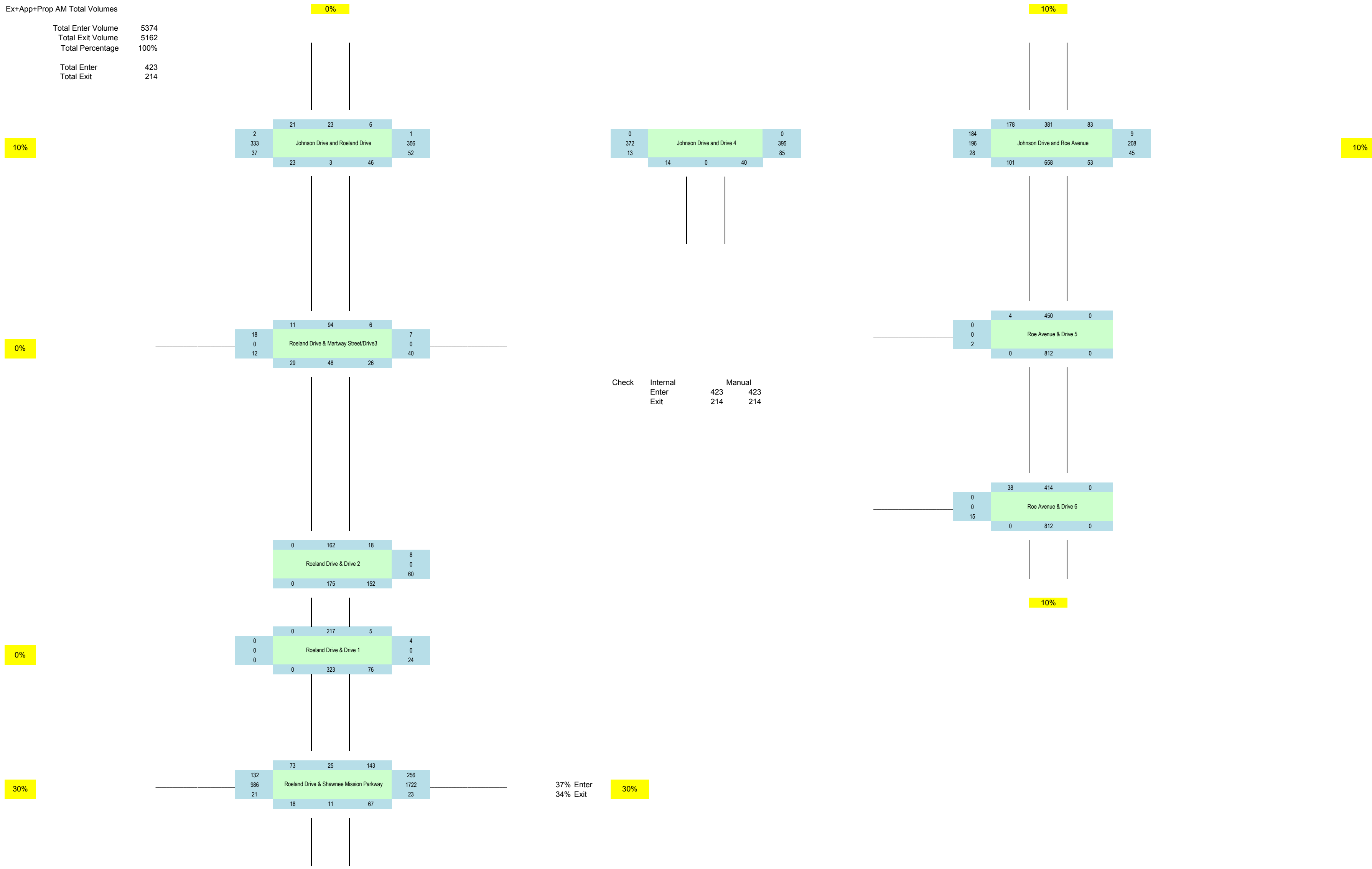
Check

	Enter	Exit
External	50	53
Internal	50	53



Ex+App+Prop AM Total Volumes

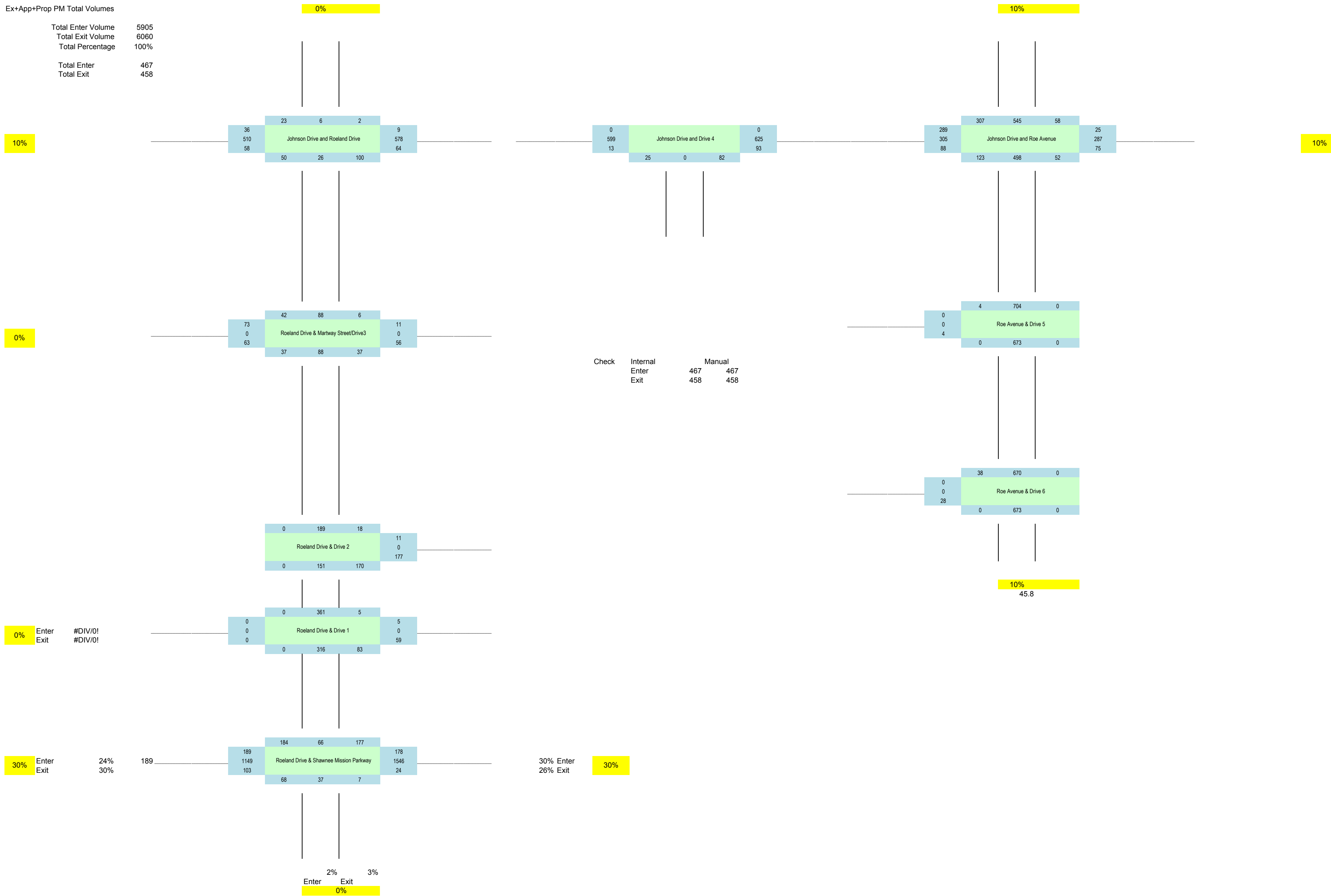
Total Enter Volume	5374
Total Exit Volume	5162
Total Percentage	100%
Total Enter	423
Total Exit	214



Check	Internal	Manual
Enter	423	423
Exit	214	214

Ex+App+Prop PM Total Volumes

Total Enter Volume	5905
Total Exit Volume	6060
Total Percentage	100%
Total Enter	467
Total Exit	458



Capacity Analysis

Lane Group	EBL	EBT	EBR	WBL	WBT	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	152	1174	28	37	2114	120	102	102	88
v/c Ratio	0.80	0.54	0.02	0.21	0.81	0.68	0.62	0.61	0.30
Control Delay	59.7	34.6	0.0	51.3	24.2	47.7	68.6	67.4	2.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	59.7	34.6	0.0	51.3	24.2	47.7	68.6	67.4	2.6
Queue Length 50th (ft)	121	473	0	26	505	44	81	81	0
Queue Length 95th (ft)	m142	488	m0	41	604	#128	136	96	0
Internal Link Dist (ft)		682			2401	499		330	
Turn Bay Length (ft)	345		310	170			100		125
Base Capacity (vph)	213	2178	1583	213	2614	176	189	193	315
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.71	0.54	0.02	0.17	0.81	0.68	0.54	0.53	0.28

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	132	986	21	23	1722	256	18	11	67	143	25	73
Future Volume (vph)	132	986	21	23	1722	256	18	11	67	143	25	73
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.5	4.0	4.5	5.5			4.5		4.5	4.5	4.5
Lane Util. Factor	1.00	0.95	1.00	1.00	*0.84			1.00		0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.98			0.91		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.99		0.95	0.97	1.00
Satd. Flow (prot)	1770	3539	1583	1770	4594			1677		1681	1717	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.99		0.95	0.97	1.00
Satd. Flow (perm)	1770	3539	1583	1770	4594			1677		1681	1717	1583
Peak-hour factor, PHF	0.87	0.84	0.75	0.63	0.95	0.85	0.63	0.95	0.85	0.87	0.63	0.83
Adj. Flow (vph)	152	1174	28	37	1813	301	29	12	79	164	40	88
RTOR Reduction (vph)	0	0	0	0	16	0	0	58	0	0	0	79
Lane Group Flow (vph)	152	1174	28	37	2098	0	0	62	0	102	102	9
Turn Type	Prot	NA	Free	Prot	NA		Split	NA		Split	NA	Perm
Protected Phases	1	6		5	2		4	4		8	8	
Permitted Phases			Free									8
Actuated Green, G (s)	12.9	72.1	120.0	8.7	67.9			8.5		11.7	11.7	11.7
Effective Green, g (s)	12.9	72.1	120.0	8.7	67.9			8.5		11.7	11.7	11.7
Actuated g/C Ratio	0.11	0.60	1.00	0.07	0.57			0.07		0.10	0.10	0.10
Clearance Time (s)	4.5	5.5		4.5	5.5			4.5		4.5	4.5	4.5
Vehicle Extension (s)	1.5	2.0		1.5	2.0			2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	190	2126	1583	128	2599			118		163	167	154
v/s Ratio Prot	c0.09	0.33		0.02	c0.46			c0.04		c0.06	0.06	
v/s Ratio Perm			0.02									0.01
v/c Ratio	0.80	0.55	0.02	0.29	0.81			0.53		0.63	0.61	0.06
Uniform Delay, d1	52.3	14.3	0.0	52.7	20.8			53.8		52.0	52.0	49.1
Progression Factor	0.73	2.22	1.00	1.00	1.00			1.00		1.00	1.00	1.00
Incremental Delay, d2	14.4	0.7	0.0	0.5	2.8			2.0		5.3	4.6	0.1
Delay (s)	52.5	32.5	0.0	53.2	23.6			55.8		57.3	56.5	49.2
Level of Service	D	C	A	D	C			E		E	E	D
Approach Delay (s)		34.1			24.1			55.8			54.6	
Approach LOS		C			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	30.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	70.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	211	269	52	264	158	765	72	97	405	205
v/c Ratio	0.54	0.42	0.37	0.61	0.29	0.46	0.08	0.25	0.26	0.25
Control Delay	46.7	36.4	50.8	46.4	12.6	20.7	0.2	11.8	19.0	3.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.7	36.4	50.8	46.4	12.6	20.7	0.2	11.8	19.0	3.6
Queue Length 50th (ft)	66	76	32	81	43	175	0	25	86	0
Queue Length 95th (ft)	96	108	66	118	56	244	0	51	122	37
Internal Link Dist (ft)		556		629		199			492	
Turn Bay Length (ft)	245		130		150		25	150		250
Base Capacity (vph)	457	701	145	473	551	1675	866	485	1630	840
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.46	0.38	0.36	0.56	0.29	0.46	0.08	0.20	0.25	0.24

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	184	196	28	45	208	9	101	658	53	83	381	178
Future Volume (veh/h)	184	196	28	45	208	9	101	658	53	83	381	178
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	211	225	44	52	236	28	158	765	0	97	405	0
Peak Hour Factor	0.87	0.87	0.64	0.86	0.88	0.32	0.64	0.86	0.74	0.86	0.94	0.87
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	285	421	81	68	312	37	628	1884		454	1849	
Arrive On Green	0.08	0.14	0.14	0.04	0.10	0.10	0.06	0.53	0.00	0.06	0.52	0.00
Sat Flow, veh/h	3456	2973	571	1781	3203	376	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	211	133	136	52	130	134	158	765	0	97	405	0
Grp Sat Flow(s),veh/h/ln	1728	1777	1768	1781	1777	1803	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	6.0	6.9	7.2	2.9	7.1	7.3	4.1	12.9	0.0	2.4	6.2	0.0
Cycle Q Clear(g_c), s	6.0	6.9	7.2	2.9	7.1	7.3	4.1	12.9	0.0	2.4	6.2	0.0
Prop In Lane	1.00		0.32	1.00		0.21	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	285	252	250	68	173	176	628	1884		454	1849	
V/C Ratio(X)	0.74	0.53	0.54	0.76	0.75	0.76	0.25	0.41		0.21	0.22	
Avail Cap(c_a), veh/h	449	338	336	125	231	234	628	1884		596	1849	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	44.8	39.8	39.9	47.6	43.9	44.0	9.9	14.1	0.0	10.3	13.0	0.0
Incr Delay (d2), s/veh	3.8	1.7	1.8	16.1	9.0	10.0	0.2	0.7	0.0	0.2	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	3.1	3.2	1.6	3.5	3.7	1.5	5.0	0.0	0.9	2.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	48.6	41.5	41.8	63.7	53.0	54.0	10.1	14.7	0.0	10.6	13.3	0.0
LnGrp LOS	D	D	D	E	D	D	B	B		B	B	
Approach Vol, veh/h		480			316			923	A		502	A
Approach Delay, s/veh		44.7			55.2			13.9			12.7	
Approach LOS		D			E			B			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	14.2	15.7	11.0	59.0	9.8	20.2	12.0	58.0
Change Period (Y+Rc), s	6.0	6.0	* 5.4	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	13.0	13.0	* 14	37.0	7.0	19.0	6.0	44.0
Max Q Clear Time (g_c+I1), s	8.0	9.3	4.4	14.9	4.9	9.2	6.1	8.2
Green Ext Time (p_c), s	0.3	0.5	0.1	5.3	0.0	1.0	0.0	2.8

Intersection Summary	
HCM 6th Ctrl Delay	26.2
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	8	347	55	60	387	4	46	52	72
v/c Ratio	0.01	0.31	0.05	0.08	0.30	0.00	0.12	0.12	0.24
Control Delay	7.0	13.9	0.1	6.7	9.7	0.0	16.2	7.0	18.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.0	13.9	0.1	6.7	9.7	0.0	16.2	7.0	18.4
Queue Length 50th (ft)	1	68	0	5	37	0	10	1	10
Queue Length 95th (ft)	2	183	0	25	201	0	18	16	37
Internal Link Dist (ft)		180			464			267	783
Turn Bay Length (ft)	100		100	130			100		
Base Capacity (vph)	739	1665	1431	721	1665	1431	405	884	398
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.21	0.04	0.08	0.23	0.00	0.11	0.06	0.18

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	333	37	52	356	1	23	3	46	6	23	21
Future Volume (veh/h)	2	333	37	52	356	1	23	3	46	6	23	21
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	8	347	55	60	387	4	46	4	48	12	32	28
Peak Hour Factor	0.25	0.96	0.67	0.86	0.92	0.25	0.50	0.75	0.95	0.50	0.72	0.75
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	355	512	434	410	624	528	531	36	431	122	93	72
Arrive On Green	0.01	0.27	0.27	0.07	0.33	0.33	0.06	0.29	0.29	0.11	0.11	0.11
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	1781	123	1480	181	848	655
Grp Volume(v), veh/h	8	347	55	60	387	4	46	0	52	72	0	0
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	1781	0	1604	1683	0	0
Q Serve(g_s), s	0.1	6.8	1.1	0.9	7.2	0.1	0.9	0.0	1.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.1	6.8	1.1	0.9	7.2	0.1	0.9	0.0	1.0	1.6	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.92	0.17		0.39
Lane Grp Cap(c), veh/h	355	512	434	410	624	528	531	0	466	287	0	0
V/C Ratio(X)	0.02	0.68	0.13	0.15	0.62	0.01	0.09	0.00	0.11	0.25	0.00	0.00
Avail Cap(c_a), veh/h	634	2128	1803	583	2128	1803	727	0	815	465	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	10.8	13.4	11.3	9.7	11.6	9.2	13.0	0.0	10.7	17.1	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.6	0.1	0.2	1.0	0.0	0.1	0.0	0.1	0.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	2.5	0.3	0.3	2.5	0.0	0.3	0.0	0.3	0.6	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.9	15.0	11.4	9.9	12.6	9.2	13.0	0.0	10.8	17.5	0.0	0.0
LnGrp LOS	B	B	B	A	B	A	B	A	B	B	A	A
Approach Vol, veh/h		410			451			98			72	
Approach Delay, s/veh		14.4			12.2			11.9			17.5	
Approach LOS		B			B			B			B	
Timer - Assigned Phs	1	2		4	5	6	7	8				
Phs Duration (G+Y+Rc), s	5.5	18.8		17.0	8.0	16.3	7.5	9.6				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0	5.0	5.0				
Max Green Setting (Gmax), s	7.0	47.0		21.0	7.0	47.0	7.0	9.0				
Max Q Clear Time (g_c+I1), s	2.1	9.2		3.0	2.9	8.8	2.9	3.6				
Green Ext Time (p_c), s	0.0	2.6		0.2	0.0	2.5	0.0	0.1				

Intersection Summary			
HCM 6th Ctrl Delay			13.4
HCM 6th LOS			B

Lane Group	EBL	EBT	EBR	WBL	WBT	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	152	1174	28	37	2114	120	164	40	88
v/c Ratio	1.02	0.56	0.02	0.28	0.85	0.56	0.72	0.17	0.26
Control Delay	107.8	38.0	0.0	58.0	27.5	35.6	69.2	49.0	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	107.8	38.0	0.0	58.0	27.5	35.6	69.2	49.0	1.9
Queue Length 50th (ft)	~128	475	0	27	524	40	122	28	0
Queue Length 95th (ft)	m#170	488	m0	44	604	100	#238	44	0
Internal Link Dist (ft)		682			2401	499		330	
Turn Bay Length (ft)	345		310	170			100		125
Base Capacity (vph)	149	2086	1583	140	2487	274	227	239	338
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.02	0.56	0.02	0.26	0.85	0.44	0.72	0.17	0.26

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	132	986	21	23	1722	256	18	11	67	143	25	73
Future Volume (veh/h)	132	986	21	23	1722	256	18	11	67	143	25	73
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	152	1174	0	37	1813	301	29	12	79	164	40	88
Peak Hour Factor	0.87	0.84	0.75	0.63	0.95	0.85	0.63	0.95	0.85	0.87	0.63	0.83
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	141	1910		200	2431	400	35	15	95	171	179	152
Arrive On Green	0.08	0.54	0.00	0.11	0.58	0.58	0.09	0.09	0.09	0.10	0.10	0.10
Sat Flow, veh/h	1781	3554	1585	1781	4198	690	400	165	1089	1781	1870	1585
Grp Volume(v), veh/h	152	1174	0	37	1352	762	120	0	0	164	40	88
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1571	1746	1654	0	0	1781	1870	1585
Q Serve(g_s), s	9.5	27.4	0.0	2.3	38.2	39.1	8.6	0.0	0.0	11.0	2.4	6.4
Cycle Q Clear(g_c), s	9.5	27.4	0.0	2.3	38.2	39.1	8.6	0.0	0.0	11.0	2.4	6.4
Prop In Lane	1.00		1.00	1.00		0.40	0.24		0.66	1.00		1.00
Lane Grp Cap(c), veh/h	141	1910		200	1819	1011	145	0	0	171	179	152
V/C Ratio(X)	1.08	0.61		0.18	0.74	0.75	0.83	0.00	0.00	0.96	0.22	0.58
Avail Cap(c_a), veh/h	141	1910		200	1819	1011	214	0	0	171	179	152
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	55.3	19.2	0.0	48.3	18.7	18.9	53.8	0.0	0.0	54.0	50.1	51.9
Incr Delay (d2), s/veh	98.1	1.5	0.0	0.2	2.8	5.2	10.2	0.0	0.0	56.8	0.2	3.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.0	10.8	0.0	1.0	13.1	15.6	4.0	0.0	0.0	7.6	1.1	2.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	153.4	20.7	0.0	48.4	21.5	24.1	64.0	0.0	0.0	110.8	50.4	55.6
LnGrp LOS	F	C		D	C	C	E	A	A	F	D	E
Approach Vol, veh/h		1326	A		2151			120			292	
Approach Delay, s/veh		35.9			22.8			64.0			85.9	
Approach LOS		D			C			E			F	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	14.0	75.0		15.0	19.0	70.0		16.0
Change Period (Y+Rc), s	4.5	5.5		4.5	5.5	* 5.5		4.5
Max Green Setting (Gmax), s	9.5	64.5		15.5	9.5	* 65		11.5
Max Q Clear Time (g_c+I1), s	11.5	41.1		10.6	4.3	29.4		13.0
Green Ext Time (p_c), s	0.0	11.1		0.2	0.0	5.8		0.0

Intersection Summary	
HCM 6th Ctrl Delay	33.3
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	24	0	4	0	323	76	5	217	0
Future Vol, veh/h	0	0	0	24	0	4	0	323	76	5	217	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	115	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	78	92	92	87	87	78	87	87	87
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	31	0	4	0	371	97	6	249	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	683	729	249	632	632	371	249	0	0	468	0	0
Stage 1	261	261	-	371	371	-	-	-	-	-	-	-
Stage 2	422	468	-	261	261	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	363	350	790	393	398	675	1317	-	-	1094	-	-
Stage 1	744	692	-	649	620	-	-	-	-	-	-	-
Stage 2	609	561	-	744	692	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	359	348	790	391	396	675	1317	-	-	1094	-	-
Mov Cap-2 Maneuver	359	348	-	391	396	-	-	-	-	-	-	-
Stage 1	744	688	-	649	620	-	-	-	-	-	-	-
Stage 2	605	561	-	740	688	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	14.6	0	0.2
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1317	-	-	-	412	1094	-	-
HCM Lane V/C Ratio	-	-	-	-	0.085	0.005	-	-
HCM Control Delay (s)	0	-	-	0	14.6	8.3	0	-
HCM Lane LOS	A	-	-	A	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	-	0.3	0	-	-

Intersection						
Int Delay, s/veh	1.6					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	60	8	175	152	18	162
Future Vol, veh/h	60	8	175	152	18	162
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	0	75	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	78	85	85	78	87
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	71	10	206	179	23	186

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	438	206	0	0	385	0
Stage 1	206	-	-	-	-	-
Stage 2	232	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	576	835	-	-	1173	-
Stage 1	829	-	-	-	-	-
Stage 2	807	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	564	835	-	-	1173	-
Mov Cap-2 Maneuver	626	-	-	-	-	-
Stage 1	829	-	-	-	-	-
Stage 2	791	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.2	0	0.9
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	626	835	1173	-
HCM Lane V/C Ratio	-	-	0.113	0.012	0.02	-
HCM Control Delay (s)	-	-	11.5	9.4	8.1	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	0.4	0	0.1	-

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	20	20	51	9	44	108	8	136
v/c Ratio	0.06	0.02	0.13	0.01	0.06	0.08	0.01	0.11
Control Delay	17.4	0.1	17.4	0.0	7.1	5.4	15.2	12.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.4	0.1	17.4	0.0	7.1	5.4	15.2	12.7
Queue Length 50th (ft)	2	0	4	0	0	0	0	0
Queue Length 95th (ft)	20	0	33	0	15	22	9	61
Internal Link Dist (ft)		773		54		238		267
Turn Bay Length (ft)	105				115		100	
Base Capacity (vph)	686	1033	396	1046	817	1350	860	1239
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.02	0.13	0.01	0.05	0.08	0.01	0.11

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	0	12	40	0	7	29	48	26	6	94	11
Future Volume (veh/h)	18	0	12	40	0	7	29	48	26	6	94	11
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	20	0	20	51	0	9	44	75	33	8	124	12
Peak Hour Factor	0.90	0.92	0.60	0.78	0.92	0.78	0.66	0.64	0.78	0.78	0.76	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	100	0	89	137	0	122	476	488	215	456	308	30
Arrive On Green	0.06	0.00	0.06	0.08	0.00	0.08	0.06	0.40	0.40	0.18	0.18	0.18
Sat Flow, veh/h	1781	0	1585	1781	0	1585	1781	1231	542	1286	1679	162
Grp Volume(v), veh/h	20	0	20	51	0	9	44	0	108	8	0	136
Grp Sat Flow(s),veh/h/ln	1781	0	1585	1781	0	1585	1781	0	1773	1286	0	1841
Q Serve(g_s), s	0.4	0.0	0.4	0.9	0.0	0.2	0.6	0.0	1.3	0.2	0.0	2.1
Cycle Q Clear(g_c), s	0.4	0.0	0.4	0.9	0.0	0.2	0.6	0.0	1.3	0.2	0.0	2.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.31	1.00		0.09
Lane Grp Cap(c), veh/h	100	0	89	137	0	122	476	0	703	456	0	338
V/C Ratio(X)	0.20	0.00	0.23	0.37	0.00	0.07	0.09	0.00	0.15	0.02	0.00	0.40
Avail Cap(c_a), veh/h	653	0	581	359	0	320	749	0	1137	573	0	506
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	14.8	0.0	14.8	14.4	0.0	14.0	8.4	0.0	6.3	11.0	0.0	11.8
Incr Delay (d2), s/veh	1.0	0.0	1.3	1.7	0.0	0.3	0.1	0.0	0.1	0.0	0.0	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.1	0.3	0.0	0.1	0.2	0.0	0.3	0.0	0.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.7	0.0	16.0	16.0	0.0	14.3	8.5	0.0	6.4	11.0	0.0	12.6
LnGrp LOS	B	A	B	B	A	B	A	A	A	B	A	B
Approach Vol, veh/h		40			60			152			144	
Approach Delay, s/veh		15.9			15.8			7.0			12.5	
Approach LOS		B			B			A			B	
Timer - Assigned Phs		2		4		6	7	8				
Phs Duration (G+Y+Rc), s		7.9		18.0		6.8	7.0	11.0				
Change Period (Y+Rc), s		* 5.4		5.0		5.0	5.0	5.0				
Max Green Setting (Gmax), s		* 6.6		21.0		12.0	7.0	9.0				
Max Q Clear Time (g_c+I1), s		2.9		3.3		2.4	2.6	4.1				
Green Ext Time (p_c), s		0.0		0.5		0.0	0.0	0.3				

Intersection Summary	
HCM 6th Ctrl Delay	11.2
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection						
Int Delay, s/veh	1.5					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	372	13	85	395	14	40
Future Vol, veh/h	372	13	85	395	14	40
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	150	-	100	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	86	86	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	388	14	99	459	15	43

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	402	0	823	395
Stage 1	-	-	-	-	395	-
Stage 2	-	-	-	-	428	-
Critical Hdwy	-	-	4.13	-	6.63	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.83	-
Follow-up Hdwy	-	-	2.219	-	3.519	3.319
Pot Cap-1 Maneuver	-	-	1155	-	327	653
Stage 1	-	-	-	-	680	-
Stage 2	-	-	-	-	626	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1155	-	299	653
Mov Cap-2 Maneuver	-	-	-	-	418	-
Stage 1	-	-	-	-	680	-
Stage 2	-	-	-	-	572	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.5	11.7
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	418	653	-	-	1155	-
HCM Lane V/C Ratio	0.036	0.067	-	-	0.086	-
HCM Control Delay (s)	13.9	10.9	-	-	8.4	-
HCM Lane LOS	B	B	-	-	A	-
HCM 95th %tile Q(veh)	0.1	0.2	-	-	0.3	-

Intersection						
Int Delay, s/veh	0					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↱		↑↑	↑↑	↱
Traffic Vol, veh/h	0	2	0	812	450	4
Future Vol, veh/h	0	2	0	812	450	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	100
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	78	92	92	85	78
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	3	0	883	529	5

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	265	-	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-	-
Pot Cap-1 Maneuver	0	733	0	-	-	-
Stage 1	0	-	0	-	-	-
Stage 2	0	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	733	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.9	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	-	733	-	-
HCM Lane V/C Ratio	-	0.003	-	-
HCM Control Delay (s)	-	9.9	-	-
HCM Lane LOS	-	A	-	-
HCM 95th %tile Q(veh)	-	0	-	-

Intersection						
Int Delay, s/veh	0.1					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	15	0	812	414	38
Future Vol, veh/h	0	15	0	812	414	38
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	100
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	78	78	92	85	78
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	19	0	883	487	49

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	244	-	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-	-
Pot Cap-1 Maneuver	0	757	0	-	-	-
Stage 1	0	-	0	-	-	-
Stage 2	0	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	757	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.9	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	-	757	-	-
HCM Lane V/C Ratio	-	0.025	-	-
HCM Control Delay (s)	-	9.9	-	-
HCM Lane LOS	-	A	-	-
HCM 95th %tile Q(veh)	-	0.1	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	217	1222	136	32	1852	152	142	145	209
v/c Ratio	0.88	0.61	0.09	0.17	0.82	0.83	0.73	0.72	0.57
Control Delay	57.6	7.4	0.0	49.6	31.1	85.8	72.4	71.3	12.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	57.6	7.4	0.0	49.6	31.1	85.8	72.4	71.3	12.8
Queue Length 50th (ft)	179	214	0	22	490	115	112	115	0
Queue Length 95th (ft)	m169	m229	m0	44	589	145	177	161	64
Internal Link Dist (ft)		682			2401	499		332	
Turn Bay Length (ft)	345		310	170			100		125
Base Capacity (vph)	272	1990	1583	228	2245	190	231	238	397
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.80	0.61	0.09	0.14	0.82	0.80	0.61	0.61	0.53

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	189	1149	103	24	1546	178	68	37	7	177	66	184
Future Volume (vph)	189	1149	103	24	1546	178	68	37	7	177	66	184
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.5	4.0	4.5	5.5			4.5		4.5	4.5	4.5
Lane Util. Factor	1.00	0.95	1.00	1.00	*0.84			1.00		0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.98			0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.97		0.95	0.98	1.00
Satd. Flow (prot)	1770	3539	1583	1770	4609			1791		1681	1733	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.97		0.95	0.98	1.00
Satd. Flow (perm)	1770	3539	1583	1770	4609			1791		1681	1733	1583
Peak-hour factor, PHF	0.87	0.94	0.76	0.75	0.95	0.79	0.77	0.71	0.58	0.87	0.79	0.88
Adj. Flow (vph)	217	1222	136	32	1627	225	88	52	12	203	84	209
RTOR Reduction (vph)	0	0	0	0	13	0	0	3	0	0	0	185
Lane Group Flow (vph)	217	1222	136	32	1839	0	0	149	0	142	145	24
Turn Type	Prot	NA	Free	Prot	NA		Split	NA		Split	NA	Perm
Protected Phases	1	6		5	2		4	4		8	8	
Permitted Phases			Free									8
Actuated Green, G (s)	18.7	65.7	120.0	9.3	56.3			12.1		13.9	13.9	13.9
Effective Green, g (s)	18.7	65.7	120.0	9.3	56.3			12.1		13.9	13.9	13.9
Actuated g/C Ratio	0.16	0.55	1.00	0.08	0.47			0.10		0.12	0.12	0.12
Clearance Time (s)	4.5	5.5		4.5	5.5			4.5		4.5	4.5	4.5
Vehicle Extension (s)	1.5	2.0		1.5	2.0			2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	275	1937	1583	137	2162			180		194	200	183
v/s Ratio Prot	c0.12	0.35		0.02	c0.40			c0.08		c0.08	0.08	
v/s Ratio Perm			0.09									0.02
v/c Ratio	0.79	0.63	0.09	0.23	0.85			0.83		0.73	0.72	0.13
Uniform Delay, d1	48.8	18.8	0.0	52.0	28.1			52.9		51.3	51.2	47.6
Progression Factor	1.06	0.36	1.00	1.00	1.00			1.00		1.00	1.00	1.00
Incremental Delay, d2	1.3	0.1	0.0	0.3	4.4			24.8		11.6	10.5	0.1
Delay (s)	52.9	6.9	0.0	52.3	32.6			77.8		62.8	61.7	47.8
Level of Service	D	A	A	D	C			E		E	E	D
Approach Delay (s)		12.6			32.9			77.8			56.1	
Approach LOS		B			C			E			E	

Intersection Summary			
HCM 2000 Control Delay	29.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	69.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	380	442	99	374	164	586	72	79	649	349
v/c Ratio	0.75	0.60	0.59	0.69	0.43	0.41	0.10	0.20	0.51	0.44
Control Delay	51.0	35.9	58.5	45.8	17.3	23.9	0.3	14.7	28.1	4.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.0	35.9	58.5	45.8	17.3	23.9	0.3	14.7	28.1	4.8
Queue Length 50th (ft)	118	121	60	116	56	149	0	26	177	0
Queue Length 95th (ft)	144	168	#106	153	74	185	0	39	214	55
Internal Link Dist (ft)		556		629		141			492	
Turn Bay Length (ft)	245		130		150		25	150		250
Base Capacity (vph)	512	816	172	635	407	1457	748	422	1285	797
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.74	0.54	0.58	0.59	0.40	0.40	0.10	0.19	0.51	0.44

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	289	305	88	75	287	25	123	498	52	58	545	307
Future Volume (veh/h)	289	305	88	75	287	25	123	498	52	58	545	307
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	380	332	110	99	334	40	164	586	0	79	649	0
Peak Hour Factor	0.76	0.92	0.80	0.76	0.86	0.63	0.75	0.85	0.72	0.73	0.84	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	443	502	164	125	424	50	434	1597		444	1520	
Arrive On Green	0.13	0.19	0.19	0.07	0.13	0.13	0.07	0.45	0.00	0.05	0.43	0.00
Sat Flow, veh/h	3456	2634	858	1781	3199	380	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	380	222	220	99	184	190	164	586	0	79	649	0
Grp Sat Flow(s),veh/h/ln	1728	1777	1716	1781	1777	1802	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	10.8	11.6	11.9	5.5	10.0	10.2	5.1	10.9	0.0	2.4	12.8	0.0
Cycle Q Clear(g_c), s	10.8	11.6	11.9	5.5	10.0	10.2	5.1	10.9	0.0	2.4	12.8	0.0
Prop In Lane	1.00		0.50	1.00		0.21	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	443	339	327	125	236	239	434	1597		444	1520	
V/C Ratio(X)	0.86	0.66	0.67	0.79	0.78	0.79	0.38	0.37		0.18	0.43	
Avail Cap(c_a), veh/h	449	409	395	143	320	324	520	1597		515	1520	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	42.7	37.4	37.6	45.8	42.0	42.0	14.8	18.2	0.0	14.7	20.0	0.0
Incr Delay (d2), s/veh	15.1	2.8	3.4	23.1	8.5	9.2	0.5	0.7	0.0	0.2	0.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.5	5.2	5.2	3.2	4.9	5.1	2.0	4.4	0.0	1.0	5.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	57.8	40.3	40.9	68.9	50.5	51.2	15.4	18.8	0.0	14.9	20.9	0.0
LnGrp LOS	E	D	D	E	D	D	B	B		B	C	
Approach Vol, veh/h		822			473			750	A		728	A
Approach Delay, s/veh		48.6			54.7			18.1			20.3	
Approach LOS		D			D			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	18.8	19.3	11.0	50.9	13.0	25.1	13.2	48.8
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	13.0	18.0	9.0	36.0	8.0	23.0	12.0	33.0
Max Q Clear Time (g_c+I1), s	12.8	12.2	4.4	12.9	7.5	13.9	7.1	14.8
Green Ext Time (p_c), s	0.0	1.1	0.1	3.9	0.0	1.8	0.2	4.1

Intersection Summary	
HCM 6th Ctrl Delay	33.9
HCM 6th LOS	C

Notes

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	48	593	64	82	664	24	60	153	52
v/c Ratio	0.12	0.62	0.07	0.18	0.69	0.03	0.19	0.35	0.23
Control Delay	6.4	16.7	0.2	6.7	18.4	0.1	25.4	10.6	20.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.4	16.7	0.2	6.7	18.4	0.1	25.4	10.6	20.7
Queue Length 50th (ft)	8	205	0	13	239	0	20	9	7
Queue Length 95th (ft)	16	307	0	26	369	0	55	61	15
Internal Link Dist (ft)		180			464			267	783
Turn Bay Length (ft)	100		100	130			100		
Base Capacity (vph)	409	1411	1234	457	1411	1234	331	702	297
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.42	0.05	0.18	0.47	0.02	0.18	0.22	0.18

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	36	510	58	64	578	9	50	26	100	2	6	23
Future Volume (veh/h)	36	510	58	64	578	9	50	26	100	2	6	23
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	48	593	64	82	664	24	60	28	125	4	12	36
Peak Hour Factor	0.75	0.86	0.91	0.78	0.87	0.38	0.83	0.93	0.80	0.50	0.50	0.64
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	317	775	657	370	813	689	448	75	334	73	44	113
Arrive On Green	0.06	0.41	0.41	0.08	0.43	0.43	0.06	0.25	0.25	0.10	0.10	0.10
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	1781	298	1332	60	443	1132
Grp Volume(v), veh/h	48	593	64	82	664	24	60	0	153	52	0	0
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	1781	0	1631	1635	0	0
Q Serve(g_s), s	0.8	15.7	1.4	1.4	18.0	0.5	1.6	0.0	4.5	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.8	15.7	1.4	1.4	18.0	0.5	1.6	0.0	4.5	1.7	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.82	0.08		0.69
Lane Grp Cap(c), veh/h	317	775	657	370	813	689	448	0	408	230	0	0
V/C Ratio(X)	0.15	0.77	0.10	0.22	0.82	0.03	0.13	0.00	0.37	0.23	0.00	0.00
Avail Cap(c_a), veh/h	433	1520	1288	451	1520	1288	550	0	592	320	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	11.0	14.5	10.3	10.3	14.3	9.4	19.2	0.0	17.9	24.2	0.0	0.0
Incr Delay (d2), s/veh	0.2	1.6	0.1	0.3	2.1	0.0	0.1	0.0	0.6	0.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	6.0	0.4	0.5	6.9	0.2	0.6	0.0	1.6	0.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	11.2	16.1	10.4	10.6	16.4	9.4	19.4	0.0	18.5	24.7	0.0	0.0
LnGrp LOS	B	B	B	B	B	A	B	A	B	C	A	A
Approach Vol, veh/h		705			770			213			52	
Approach Delay, s/veh		15.3			15.6			18.7			24.7	
Approach LOS		B			B			B			C	
Timer - Assigned Phs	1	2		4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.2	30.1		19.5	9.4	29.0	8.7	10.8				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0	5.0	5.0				
Max Green Setting (Gmax), s	7.0	47.0		21.0	7.0	47.0	7.0	9.0				
Max Q Clear Time (g_c+I1), s	2.8	20.0		6.5	3.4	17.7	3.6	3.7				
Green Ext Time (p_c), s	0.0	5.1		0.7	0.0	4.6	0.0	0.1				
Intersection Summary												
HCM 6th Ctrl Delay			16.1									
HCM 6th LOS			B									

Lane Group	EBL	EBT	EBR	WBL	WBT	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	217	1222	136	32	1852	152	203	84	209
v/c Ratio	1.18	0.63	0.09	0.24	0.84	0.70	0.81	0.32	0.52
Control Delay	131.9	7.9	0.0	56.9	32.3	65.9	74.3	49.8	11.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	131.9	7.9	0.0	56.9	32.3	65.9	74.3	49.8	11.3
Queue Length 50th (ft)	~208	404	0	24	503	113	150	57	0
Queue Length 95th (ft)	m#189	m229	m0	47	589	135	#280	97	65
Internal Link Dist (ft)		682			2401	499		332	
Turn Bay Length (ft)	345		310	170			100		125
Base Capacity (vph)	184	1935	1583	140	2203	293	256	269	408
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.18	0.63	0.09	0.23	0.84	0.52	0.79	0.31	0.51

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	189	1149	103	24	1546	178	68	37	7	177	66	184
Future Volume (veh/h)	189	1149	103	24	1546	178	68	37	7	177	66	184
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	217	1222	0	32	1627	225	88	52	12	203	84	209
Peak Hour Factor	0.87	0.94	0.76	0.75	0.95	0.79	0.77	0.71	0.58	0.87	0.79	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	294	1673		250	1922	265	105	62	14	230	242	205
Arrive On Green	0.17	0.47	0.00	0.14	0.45	0.45	0.10	0.10	0.10	0.13	0.13	0.13
Sat Flow, veh/h	1781	3554	1585	1781	4311	594	1038	613	142	1781	1870	1585
Grp Volume(v), veh/h	217	1222	0	32	1185	667	152	0	0	203	84	209
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1571	1763	1793	0	0	1781	1870	1585
Q Serve(g_s), s	13.9	33.3	0.0	1.9	40.2	40.5	10.0	0.0	0.0	13.4	4.9	15.5
Cycle Q Clear(g_c), s	13.9	33.3	0.0	1.9	40.2	40.5	10.0	0.0	0.0	13.4	4.9	15.5
Prop In Lane	1.00		1.00	1.00		0.34	0.58		0.08	1.00		1.00
Lane Grp Cap(c), veh/h	294	1673		250	1401	786	182	0	0	230	242	205
V/C Ratio(X)	0.74	0.73		0.13	0.85	0.85	0.83	0.00	0.00	0.88	0.35	1.02
Avail Cap(c_a), veh/h	294	1673		250	1401	786	291	0	0	230	242	205
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	47.6	25.6	0.0	45.2	29.6	29.6	52.9	0.0	0.0	51.4	47.6	52.3
Incr Delay (d2), s/veh	8.3	2.8	0.0	0.1	6.4	11.1	5.6	0.0	0.0	29.5	0.3	68.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.7	13.7	0.0	0.8	15.4	18.4	4.8	0.0	0.0	7.9	2.3	10.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	56.0	28.5	0.0	45.3	36.0	40.7	58.5	0.0	0.0	80.9	48.0	120.7
LnGrp LOS	E	C		D	D	D	E	A	A	F	D	F
Approach Vol, veh/h		1439	A		1884			152			496	
Approach Delay, s/veh		32.6			37.8			58.5			92.1	
Approach LOS		C			D			E			F	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	24.3	59.0		16.7	21.3	62.0		20.0				
Change Period (Y+Rc), s	4.5	5.5		4.5	4.5	5.5		4.5				
Max Green Setting (Gmax), s	12.5	53.5		19.5	9.5	56.5		15.5				
Max Q Clear Time (g_c+I1), s	15.9	42.5		12.0	3.9	35.3		17.5				
Green Ext Time (p_c), s	0.0	6.1		0.3	0.0	5.6		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			43.5									
HCM 6th LOS			D									

Notes

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	59	0	5	0	316	83	5	361	0
Future Vol, veh/h	0	0	0	59	0	5	0	316	83	5	361	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	115	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	78	92	92	87	87	78	87	87	87
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	76	0	5	0	363	106	6	415	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	846	896	415	790	790	363	415	0	0	469	0	0
Stage 1	427	427	-	363	363	-	-	-	-	-	-	-
Stage 2	419	469	-	427	427	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	282	280	637	308	322	682	1144	-	-	1093	-	-
Stage 1	606	585	-	656	625	-	-	-	-	-	-	-
Stage 2	612	561	-	606	585	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	278	278	637	306	320	682	1144	-	-	1093	-	-
Mov Cap-2 Maneuver	278	278	-	306	320	-	-	-	-	-	-	-
Stage 1	606	581	-	656	625	-	-	-	-	-	-	-
Stage 2	607	561	-	602	581	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	20.2	0	0.1
HCM LOS	A	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1144	-	-	-	318	1093	-	-
HCM Lane V/C Ratio	-	-	-	-	0.255	0.005	-	-
HCM Control Delay (s)	0	-	-	0	20.2	8.3	0	-
HCM Lane LOS	A	-	-	A	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	-	1	0	-	-

Intersection	
Int Delay, s/veh	3.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	177	11	151	170	18	189
Future Vol, veh/h	177	11	151	170	18	189
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	0	75	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	78	85	85	78	87
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	208	14	178	200	23	217

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	441	178	0	0	378	0
Stage 1	178	-	-	-	-	-
Stage 2	263	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	574	865	-	-	1180	-
Stage 1	853	-	-	-	-	-
Stage 2	781	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	563	865	-	-	1180	-
Mov Cap-2 Maneuver	623	-	-	-	-	-
Stage 1	853	-	-	-	-	-
Stage 2	766	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.4	0	0.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	623	865	1180	-
HCM Lane V/C Ratio	-	-	0.334	0.016	0.02	-
HCM Control Delay (s)	-	-	13.7	9.2	8.1	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	1.5	0.1	0.1	-

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	81	105	72	14	56	185	8	162
v/c Ratio	0.21	0.12	0.20	0.02	0.09	0.17	0.01	0.17
Control Delay	18.0	0.3	20.1	0.0	10.1	8.6	17.8	14.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.0	0.3	20.1	0.0	10.1	8.6	17.8	14.5
Queue Length 50th (ft)	15	0	14	0	9	27	1	23
Queue Length 95th (ft)	52	0	45	0	20	41	10	68
Internal Link Dist (ft)		773		54		238		267
Turn Bay Length (ft)	105				115		100	
Base Capacity (vph)	649	998	376	865	661	1210	615	933
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.11	0.19	0.02	0.08	0.15	0.01	0.17

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	73	0	63	56	0	11	37	88	37	6	88	42
Future Volume (veh/h)	73	0	63	56	0	11	37	88	37	6	88	42
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	81	0	105	72	0	14	56	138	47	8	116	46
Peak Hour Factor	0.90	0.92	0.60	0.78	0.92	0.78	0.66	0.64	0.78	0.78	0.76	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	243	0	216	168	0	150	408	483	164	381	202	80
Arrive On Green	0.14	0.00	0.14	0.09	0.00	0.09	0.07	0.36	0.36	0.16	0.16	0.16
Sat Flow, veh/h	1781	0	1585	1781	0	1585	1781	1334	454	1199	1274	505
Grp Volume(v), veh/h	81	0	105	72	0	14	56	0	185	8	0	162
Grp Sat Flow(s),veh/h/ln	1781	0	1585	1781	0	1585	1781	0	1789	1199	0	1779
Q Serve(g_s), s	1.6	0.0	2.3	1.4	0.0	0.3	0.9	0.0	2.8	0.2	0.0	3.2
Cycle Q Clear(g_c), s	1.6	0.0	2.3	1.4	0.0	0.3	0.9	0.0	2.8	0.2	0.0	3.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.25	1.00		0.28
Lane Grp Cap(c), veh/h	243	0	216	168	0	150	408	0	647	381	0	283
V/C Ratio(X)	0.33	0.00	0.49	0.43	0.00	0.09	0.14	0.00	0.29	0.02	0.00	0.57
Avail Cap(c_a), veh/h	566	0	503	311	0	277	612	0	994	476	0	424
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	14.8	0.0	15.1	16.1	0.0	15.6	10.4	0.0	8.6	13.5	0.0	14.7
Incr Delay (d2), s/veh	0.8	0.0	1.7	1.7	0.0	0.3	0.2	0.0	0.2	0.0	0.0	1.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	0.7	0.5	0.0	0.1	0.3	0.0	0.8	0.1	0.0	1.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.6	0.0	16.8	17.9	0.0	15.9	10.6	0.0	8.8	13.5	0.0	16.5
LnGrp LOS	B	A	B	B	A	B	B	A	A	B	A	B
Approach Vol, veh/h		186			86			241			170	
Approach Delay, s/veh		16.3			17.5			9.2			16.4	
Approach LOS		B			B			A			B	

Timer - Assigned Phs		2		4		6	7	8				
Phs Duration (G+Y+Rc), s		9.0		18.7		10.1	7.7	11.0				
Change Period (Y+Rc), s		* 5.4		5.0		5.0	5.0	5.0				
Max Green Setting (Gmax), s		* 6.6		21.0		12.0	7.0	9.0				
Max Q Clear Time (g_c+I1), s		3.4		4.8		4.3	2.9	5.2				
Green Ext Time (p_c), s		0.0		0.9		0.4	0.0	0.3				

Intersection Summary			
HCM 6th Ctrl Delay			14.0
HCM 6th LOS			B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection						
Int Delay, s/veh	2					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	599	13	93	625	25	82
Future Vol, veh/h	599	13	93	625	25	82
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	150	-	100	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	78	79	92	78	79
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	651	17	118	679	32	104

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	668	0	1236	660
Stage 1	-	-	-	-	660	-
Stage 2	-	-	-	-	576	-
Critical Hdwy	-	-	4.13	-	6.63	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.83	-
Follow-up Hdwy	-	-	2.219	-	3.519	3.319
Pot Cap-1 Maneuver	-	-	920	-	181	462
Stage 1	-	-	-	-	513	-
Stage 2	-	-	-	-	526	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	920	-	158	462
Mov Cap-2 Maneuver	-	-	-	-	293	-
Stage 1	-	-	-	-	513	-
Stage 2	-	-	-	-	459	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.4	15.9
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	293	462	-	-	920	-
HCM Lane V/C Ratio	0.109	0.225	-	-	0.128	-
HCM Control Delay (s)	18.8	15	-	-	9.5	-
HCM Lane LOS	C	C	-	-	A	-
HCM 95th %tile Q(veh)	0.4	0.9	-	-	0.4	-

Intersection						
Int Delay, s/veh	0					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	4	0	673	704	4
Future Vol, veh/h	0	4	0	673	704	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	100
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	78	92	92	85	78
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	5	0	732	828	5

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	414	-	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-	-
Pot Cap-1 Maneuver	0	587	0	-	-	-
Stage 1	0	-	0	-	-	-
Stage 2	0	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	587	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.2	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	-	587	-	-
HCM Lane V/C Ratio	-	0.009	-	-
HCM Control Delay (s)	-	11.2	-	-
HCM Lane LOS	-	B	-	-
HCM 95th %tile Q(veh)	-	0	-	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	28	0	673	670	38
Future Vol, veh/h	0	28	0	673	670	38
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	100
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	78	78	92	85	78
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	36	0	732	788	49

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	394	-	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-	-
Pot Cap-1 Maneuver	0	605	0	-	-	-
Stage 1	0	-	0	-	-	-
Stage 2	0	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	605	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.3	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	-	605	-	-
HCM Lane V/C Ratio	-	0.059	-	-
HCM Control Delay (s)	-	11.3	-	-
HCM Lane LOS	-	B	-	-
HCM 95th %tile Q(veh)	-	0.2	-	-

Merge Analysis

HCS7 Freeway Merge Report

Project Information

Analyst	TCM	Date	5/20/2019
Agency	Olsson	Analysis Year	2019
Jurisdiction	Mission, KS	Time Period Analyzed	AM
Project Description	EB Johnson Drive On-Ramp to NB Shawnee Mission Parkway		

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	45.0	25.0
Segment Length (L) / Acceleration Length (L_A),ft	1500	150
Terrain Type	Rolling	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i)	1252	339
Peak Hour Factor (PHF)	0.85	0.85
Total Trucks, %	0.02	0.02
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	1.000	1.000
Flow Rate (v_i),pc/h	1473	399
Capacity (c), pc/h	4500	1900
Volume-to-Capacity Ratio (v/c)	0.42	0.21

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Number of Outer Lanes on Freeway (N_O)	0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.339
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/mi/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influenece Area Speed (S_R), mi/h	44.0
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1473	Ramp Junction Speed (S), mi/h	44.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1872	Average Density (D), pc/mi/ln	21.3
Level of Service (LOS)	B	Density in Ramp Influence Area (D_R), pc/mi/ln	19.0

HCS7 Freeway Merge Report

Project Information

Analyst	TCM	Date	5/20/2019
Agency	Olsson	Analysis Year	2019
Jurisdiction	Mission, KS	Time Period Analyzed	PM
Project Description	EB Johnson Drive On-Ramp to NB Shawnee Mission Parkway		

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	45.0	25.0
Segment Length (L) / Acceleration Length (L_A),ft	1500	150
Terrain Type	Rolling	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i)	1332	417
Peak Hour Factor (PHF)	0.94	0.86
Total Trucks, %	0.02	0.02
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	1.000	1.000
Flow Rate (v_i),pc/h	1417	485
Capacity (c), pc/h	4500	1900
Volume-to-Capacity Ratio (v/c)	0.42	0.26

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Number of Outer Lanes on Freeway (N_O)	0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.340
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/mi/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influenece Area Speed (S_R), mi/h	44.0
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1417	Ramp Junction Speed (S), mi/h	44.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1902	Average Density (D), pc/mi/ln	21.6
Level of Service (LOS)	B	Density in Ramp Influence Area (D_R), pc/mi/ln	19.2

APPENDIX D

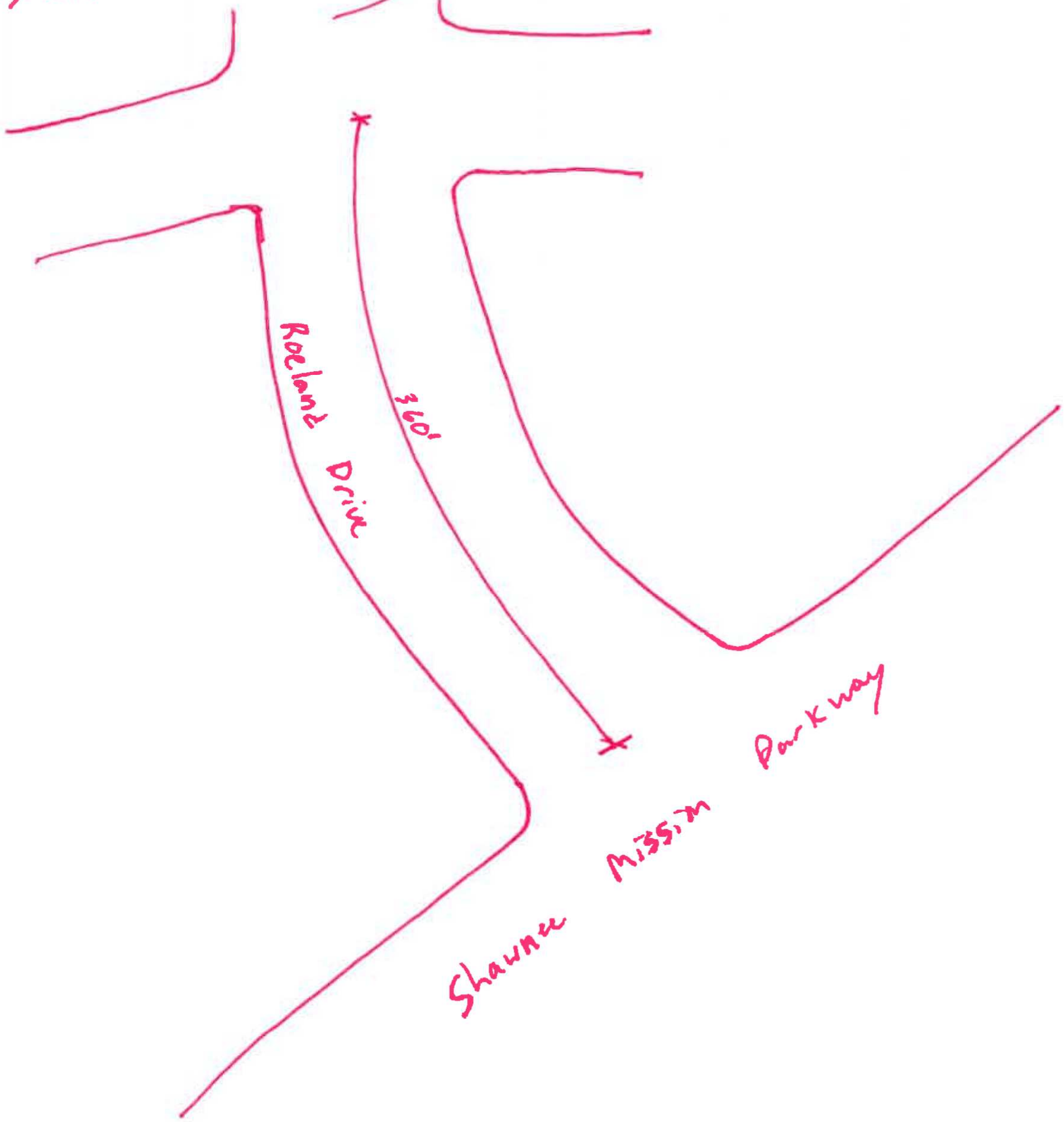
Future 2038

Drive Spacing – Influence Area Calculations

Drive 1 = $\boxed{360'}$ center to stop bar from SMP & Roeland Dr.

D_1 => Developer = 55'
D_2 => 115'
D_3 => 217'

= 55' + 115' + 217' = $\boxed{387'}$

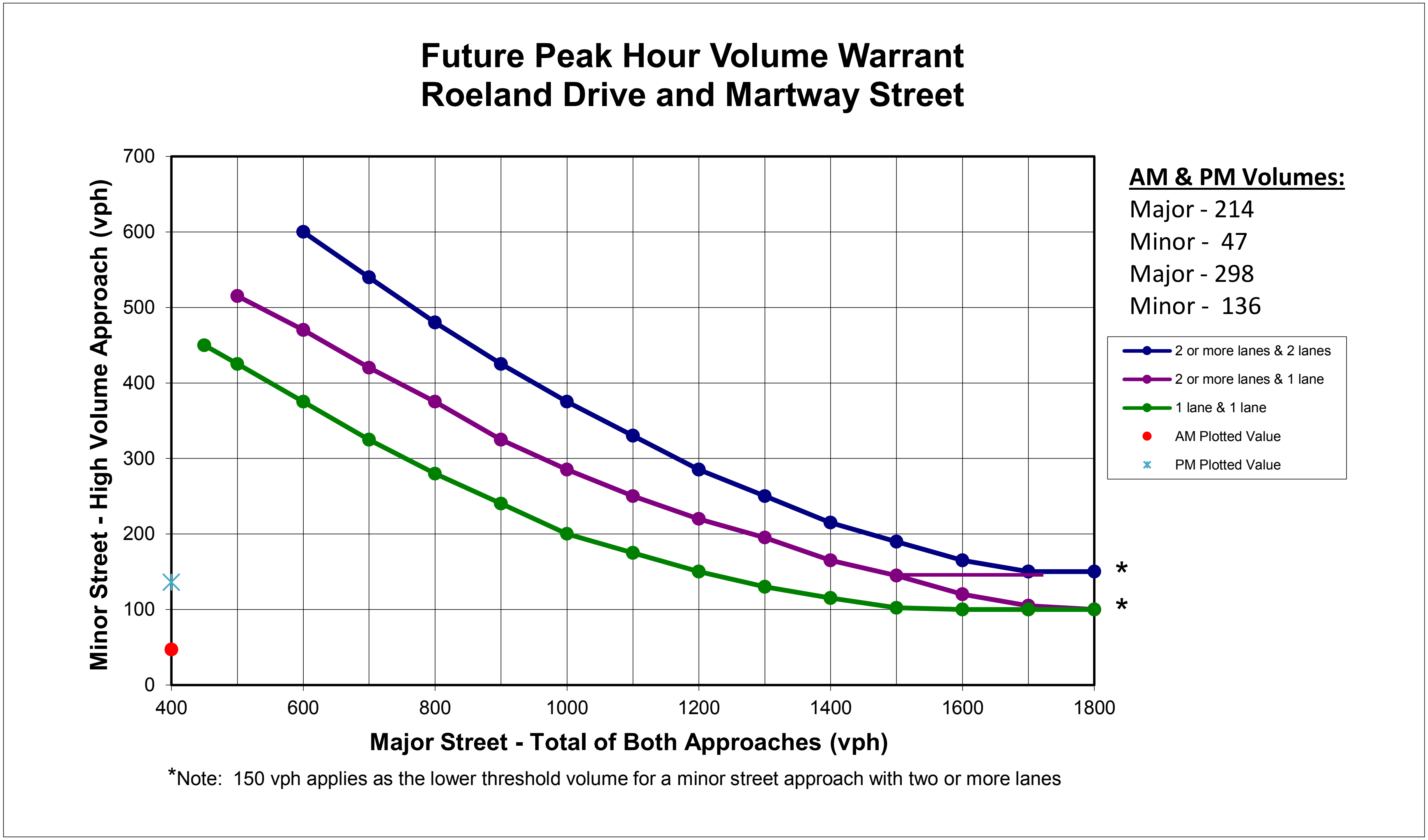


olsson

PROJECT: Future 017-2145 (Mission Gateway)

project no.:
drawn by: TCM
date:
page 1 of 1

Signal Warrants



Future Peak Hour Volume Warrant
Roeland Drive and Martway Street
Minor Street - High Volume Approach (vph)
700
600
500
400
300
200
100
0
400
600
800
1000
1200
1400
1600
1800
Major Street - Total of Both Approaches (vph)
*Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes
*
*
AM & PM Volumes:
Major - 214
Minor - 47
Major - 298
Minor - 136
2 or more lanes & 2 lanes
2 or more lanes & 1 lane
1 lane & 1 lane
AM Plotted Value
PM Plotted Value

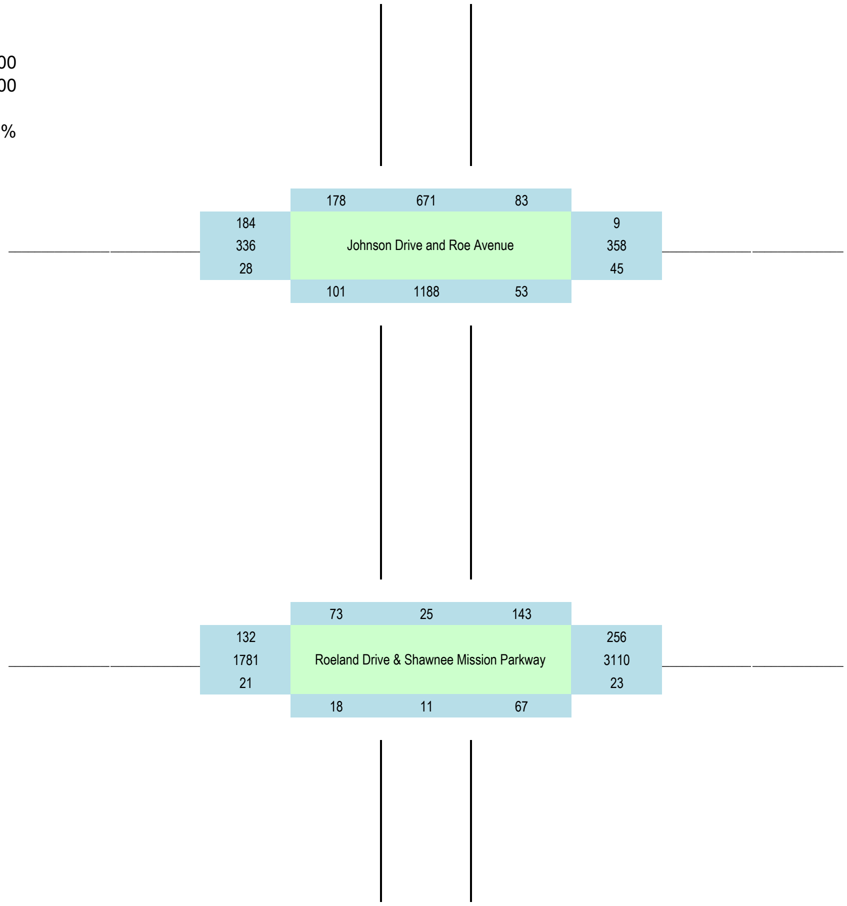
Future Growth

<table>
<tr><th>Year</th><th>2016</th><th>2015</th><th>2014</th><th>2013</th><th>2012</th><th>2011</th><th>2010</th></tr>
<tr><td>Volumes</td><td>26,600</td><td>25,700</td><td>20,400</td><td>20,100</td><td>23,700</td><td>22,600</td><td>20,300</td></tr>
<tr><td rowspan="12">Percent Growth From Year to Year</td><td colspan="7">4.61%</td></tr>
<tr><td colspan="6">3.31%</td><td></td></tr>
<tr><td colspan="5">2.93%</td><td></td><td></td></tr>
<tr><td colspan="4">9.79%</td><td></td><td></td><td></td></tr>
<tr><td colspan="3">14.19%</td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="2">3.50%</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td colspan="2">11.33%</td></tr>
<tr><td></td><td></td><td></td><td></td><td colspan="3">8.05%</td></tr>
<tr><td></td><td></td><td></td><td colspan="4">-0.33%</td></tr>
<tr><td></td><td></td><td colspan="5">0.12%</td></tr>
<tr><td></td><td colspan="6">4.83%</td></tr>
<tr><td colspan="7">4.61%</td></tr>
</table>

Red numbers seem artifically low. Percentages represent growth between years. For example, between 2016 and 2015 the growth was 3.5%, between 2016 and 2015 the growth rate was 14.19%, ect.

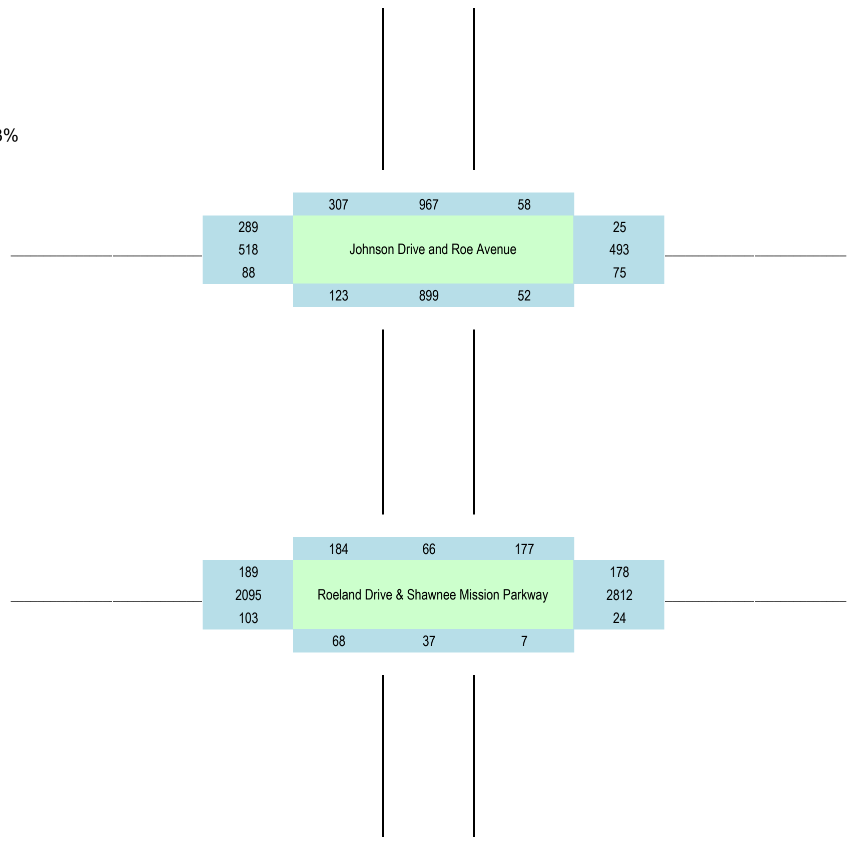
Future AM

Year 2012	23,700
Year 2016	26,600
Growth Rate	3%



Future PM

Growth Rate 3%




2013
TRAFFIC FLOW MAP
KANSAS STATE HIGHWAY SYSTEM
Kansas Department of Transportation
Bureau of Transportation Planning
IN COOPERATION WITH
U.S. Department of Transportation
Federal Highway Administration
Enlargement Scale
0 1 2 3 4 Miles
Annual Average Daily Traffic (AADT)
Traffic Counts Recorded in CY 2012
Legend
Road Key
Over 10,000
7,500 to 10,000
5,000 to 7,500
2,500 to 5,000
1,000 to 2,500
Less than 1,000
1000 Short-term Counter
1000 Vehicle Classifier
1000 Continuous Counter
2600 Total Volume
300 Heavy Commercial Traffic
Questions or comments regarding this map can be directed to:
Traffic and Field Operations Unit
(785) 296-3841 or email trafficcounts@ksdot.org
www.ksdot.org
Hays
Salina
Garden City
Manhattan
Junction City
Great Bend
Pittsburg
Winfield
Arkansas City
Dodge City
Liberal
McPherson
Hutchinson
Leavenworth
Galena
Baxter Springs
Lansing
Ottawa
Coffeyville
Emporia
Newton
Wichita
El Dorado
Andover
Augusta
Derby
Mulvane
Road Key
Over 70,000
50,000 to 70,000
30,000 to 50,000
10,000 to 30,000
Less than 10,000
Legend for Wichita Inset
Oskaloosa
Tonganoxie
Basehor
Kansas City
Topeka
Lawrence
Eudora
De Soto
Olathe
Road Key
Over 70,000
50,000 to 70,000
30,000 to 50,000
10,000 to 30,000
Less than 10,000
Legend for KC-Topeka Inset

2017
TRAFFIC FLOW MAP
KANSAS STATE HIGHWAY SYSTEM
Kansas Department of Transportation
Bureau of Transportation Planning
IN COOPERATION WITH
U.S. Department of Transportation
Federal Highway Administration
Enlargement Scale
0 1 2 3 4 Miles
Annual Average Daily Traffic (AADT)
Traffic Counts Recorded in CY 2016
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McPherson
Hutchinson
Newton
Ottawa
Coffeyville
Emporia
Leavenworth
Lansing
Galena
Baxter Springs
Wichita
El Dorado
Andover
Augusta
Derby
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Over 70,000
50,000 to 70,000
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Oskaloosa
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Olathe
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Over 70,000
50,000 to 70,000
30,000 to 50,000
10,000 to 30,000
Less than 10,000
Legend for KC-Topeka Inset

Capacity Analysis

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	211	430	52	435	158	1381	72	97	714	205
v/c Ratio	0.68	0.63	0.49	0.88	0.42	0.81	0.08	0.46	0.43	0.24
Control Delay	56.2	42.0	61.3	62.0	13.5	27.8	0.2	17.7	18.7	2.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.2	42.0	61.3	62.0	13.5	27.8	0.2	17.7	18.7	2.9
Queue Length 50th (ft)	68	134	33	143	42	398	0	25	153	0
Queue Length 95th (ft)	103	181	69	#221	49	468	0	50	201	33
Internal Link Dist (ft)		556		629		125			492	
Turn Bay Length (ft)	245		130		150		25	150		250
Base Capacity (vph)	313	679	108	495	378	1708	849	230	1663	852
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.67	0.63	0.48	0.88	0.42	0.81	0.08	0.42	0.43	0.24

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	184	336	28	45	358	9	101	1188	53	83	671	178
Future Volume (veh/h)	184	336	28	45	358	9	101	1188	53	83	671	178
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	211	386	44	52	407	28	158	1381	0	97	714	0
Peak Hour Factor	0.87	0.87	0.64	0.86	0.88	0.32	0.64	0.86	0.74	0.86	0.94	0.87
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	277	583	66	68	469	32	437	1744		237	1708	
Arrive On Green	0.08	0.18	0.18	0.04	0.14	0.14	0.06	0.49	0.00	0.06	0.48	0.00
Sat Flow, veh/h	3456	3217	365	1781	3374	231	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	211	212	218	52	214	221	158	1381	0	97	714	0
Grp Sat Flow(s),veh/h/ln	1728	1777	1805	1781	1777	1829	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	6.0	11.1	11.2	2.9	11.8	11.9	4.5	32.4	0.0	2.7	13.1	0.0
Cycle Q Clear(g_c), s	6.0	11.1	11.2	2.9	11.8	11.9	4.5	32.4	0.0	2.7	13.1	0.0
Prop In Lane	1.00		0.20	1.00		0.13	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	277	322	327	68	247	254	437	1744		237	1708	
V/C Ratio(X)	0.76	0.66	0.67	0.76	0.87	0.87	0.36	0.79		0.41	0.42	
Avail Cap(c_a), veh/h	311	322	327	107	249	256	437	1744		291	1708	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	45.0	38.1	38.1	47.6	42.1	42.2	12.7	21.2	0.0	17.9	16.9	0.0
Incr Delay (d2), s/veh	9.4	4.9	5.1	16.1	25.6	26.0	0.5	3.8	0.0	1.1	0.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.9	5.2	5.4	1.6	6.9	7.1	1.7	13.4	0.0	1.1	5.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	54.4	43.0	43.2	63.7	67.7	68.2	13.2	25.0	0.0	19.0	17.6	0.0
LnGrp LOS	D	D	D	E	E	E	B	C		B	B	
Approach Vol, veh/h		641			487			1539	A		811	A
Approach Delay, s/veh		46.8			67.5			23.8			17.8	
Approach LOS		D			E			C			B	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	14.0	19.9	11.0	55.1	9.8	24.1	12.0	54.1				
Change Period (Y+Rc), s	6.0	6.0	* 5.4	6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax), s	9.0	14.0	* 8.6	45.0	6.0	17.0	6.0	47.0				
Max Q Clear Time (g_c+I1), s	8.0	13.9	4.7	34.4	4.9	13.2	6.5	15.1				
Green Ext Time (p_c), s	0.1	0.0	0.1	6.7	0.0	0.9	0.0	5.3				

Intersection Summary				
HCM 6th Ctrl Delay			32.7	
HCM 6th LOS			C	

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	8	493	55	60	550	4	46	52	72
v/c Ratio	0.01	0.41	0.05	0.10	0.41	0.00	0.13	0.12	0.26
Control Delay	6.5	14.8	0.1	6.7	10.7	0.0	20.0	8.5	22.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.5	14.8	0.1	6.7	10.7	0.0	20.0	8.5	22.9
Queue Length 50th (ft)	1	164	0	10	125	0	13	1	16
Queue Length 95th (ft)	2	267	0	24	300	0	23	19	43
Internal Link Dist (ft)		180			464			267	783
Turn Bay Length (ft)	100		100	130			100		
Base Capacity (vph)	621	1495	1299	618	1495	1299	387	778	352
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.33	0.04	0.10	0.37	0.00	0.12	0.07	0.20

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	473	37	52	506	1	23	3	46	6	23	21
Future Volume (veh/h)	2	473	37	52	506	1	23	3	46	6	23	21
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	8	493	55	60	550	4	46	4	48	12	32	28
Peak Hour Factor	0.25	0.96	0.67	0.86	0.92	0.25	0.50	0.75	0.95	0.50	0.72	0.75
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	312	658	557	377	763	647	480	33	391	106	86	67
Arrive On Green	0.01	0.35	0.35	0.07	0.41	0.41	0.06	0.26	0.26	0.10	0.10	0.10
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	1781	123	1480	179	850	655
Grp Volume(v), veh/h	8	493	55	60	550	4	46	0	52	72	0	0
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	1781	0	1604	1684	0	0
Q Serve(g_s), s	0.1	11.0	1.1	1.0	11.7	0.1	1.0	0.0	1.2	0.2	0.0	0.0
Cycle Q Clear(g_c), s	0.1	11.0	1.1	1.0	11.7	0.1	1.0	0.0	1.2	1.8	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.92	0.17		0.39
Lane Grp Cap(c), veh/h	312	658	557	377	763	647	480	0	424	259	0	0
V/C Ratio(X)	0.03	0.75	0.10	0.16	0.72	0.01	0.10	0.00	0.12	0.28	0.00	0.00
Avail Cap(c_a), veh/h	551	1847	1565	516	1847	1565	640	0	708	404	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	10.5	13.6	10.4	9.6	11.8	8.4	15.6	0.0	13.3	20.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.7	0.1	0.2	1.3	0.0	0.1	0.0	0.1	0.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.1	0.3	0.3	4.1	0.0	0.4	0.0	0.4	0.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.6	15.3	10.4	9.8	13.1	8.4	15.7	0.0	13.4	20.6	0.0	0.0
LnGrp LOS	B	B	B	A	B	A	B	A	B	C	A	A
Approach Vol, veh/h		556			614			98			72	
Approach Delay, s/veh		14.8			12.8			14.5			20.6	
Approach LOS		B			B			B			C	

Timer - Assigned Phs	1	2		4	5	6	7	8				
Phs Duration (G+Y+Rc), s	5.6	24.4		17.6	8.3	21.7	7.7	9.8				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0	5.0	5.0				
Max Green Setting (Gmax), s	7.0	47.0		21.0	7.0	47.0	7.0	9.0				
Max Q Clear Time (g_c+I1), s	2.1	13.7		3.2	3.0	13.0	3.0	3.8				
Green Ext Time (p_c), s	0.0	4.1		0.2	0.0	3.7	0.0	0.1				

Intersection Summary	
HCM 6th Ctrl Delay	14.1
HCM 6th LOS	B

Lane Group	EBL	EBT	EBR	WBL	WBT	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	152	1875	28	37	3575	120	102	102	88
v/c Ratio	0.80	0.86	0.02	0.21	1.36	0.68	0.62	0.61	0.30
Control Delay	39.6	46.9	0.0	51.3	190.5	47.7	68.6	67.4	2.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.6	46.9	0.0	51.3	190.5	47.7	68.6	67.4	2.6
Queue Length 50th (ft)	126	815	0	26	~1473	44	81	81	0
Queue Length 95th (ft)	m90	m541	m0	41	#1580	#128	136	96	0
Internal Link Dist (ft)		682			2401	499		330	
Turn Bay Length (ft)	345		310	170			100		125
Base Capacity (vph)	213	2178	1583	213	2627	176	189	193	315
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.71	0.86	0.02	0.17	1.36	0.68	0.54	0.53	0.28

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	132	1781	21	23	3110	256	18	11	67	143	25	73
Future Volume (vph)	132	1781	21	23	3110	256	18	11	67	143	25	73
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.5	4.0	4.5	5.5			4.5		4.5	4.5	4.5
Lane Util. Factor	1.00	0.95	1.00	1.00	*0.84			1.00		0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.99			0.91		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.99		0.95	0.97	1.00
Satd. Flow (prot)	1770	3539	1583	1770	4635			1677		1681	1717	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.99		0.95	0.97	1.00
Satd. Flow (perm)	1770	3539	1583	1770	4635			1677		1681	1717	1583
Peak-hour factor, PHF	0.87	0.95	0.75	0.63	0.95	0.85	0.63	0.95	0.85	0.87	0.63	0.83
Adj. Flow (vph)	152	1875	28	37	3274	301	29	12	79	164	40	88
RTOR Reduction (vph)	0	0	0	0	7	0	0	58	0	0	0	79
Lane Group Flow (vph)	152	1875	28	37	3568	0	0	62	0	102	102	9
Turn Type	Prot	NA	Free	Prot	NA		Split	NA		Split	NA	Perm
Protected Phases	1	6		5	2		4	4		8	8	
Permitted Phases			Free									8
Actuated Green, G (s)	12.9	72.1	120.0	8.7	67.9			8.5		11.7	11.7	11.7
Effective Green, g (s)	12.9	72.1	120.0	8.7	67.9			8.5		11.7	11.7	11.7
Actuated g/C Ratio	0.11	0.60	1.00	0.07	0.57			0.07		0.10	0.10	0.10
Clearance Time (s)	4.5	5.5		4.5	5.5			4.5		4.5	4.5	4.5
Vehicle Extension (s)	1.5	2.0		1.5	2.0			2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	190	2126	1583	128	2622			118		163	167	154
v/s Ratio Prot	0.09	c0.53		0.02	c0.77			c0.04		c0.06	0.06	
v/s Ratio Perm			0.02									0.01
v/c Ratio	0.80	0.88	0.02	0.29	1.36			0.53		0.63	0.61	0.06
Uniform Delay, d1	52.3	20.3	0.0	52.7	26.0			53.8		52.0	52.0	49.1
Progression Factor	0.68	2.27	1.00	1.00	1.00			1.00		1.00	1.00	1.00
Incremental Delay, d2	2.1	0.6	0.0	0.5	164.8			2.0		5.3	4.6	0.1
Delay (s)	37.8	46.8	0.0	53.2	190.9			55.8		57.3	56.5	49.2
Level of Service	D	D	A	D	F			E		E	E	D
Approach Delay (s)		45.5			189.5			55.8			54.6	
Approach LOS		D			F			E			D	

Intersection Summary			
HCM 2000 Control Delay	131.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	97.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	24	0	4	0	323	76	5	217	0
Future Vol, veh/h	0	0	0	24	0	4	0	323	76	5	217	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	115	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	78	92	92	87	87	78	87	87	87
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	31	0	4	0	371	97	6	249	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	683	729	249	632	632	371	249	0	0	468	0	0
Stage 1	261	261	-	371	371	-	-	-	-	-	-	-
Stage 2	422	468	-	261	261	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	363	350	790	393	398	675	1317	-	-	1094	-	-
Stage 1	744	692	-	649	620	-	-	-	-	-	-	-
Stage 2	609	561	-	744	692	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	359	348	790	391	396	675	1317	-	-	1094	-	-
Mov Cap-2 Maneuver	359	348	-	391	396	-	-	-	-	-	-	-
Stage 1	744	688	-	649	620	-	-	-	-	-	-	-
Stage 2	605	561	-	740	688	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	14.6	0	0.2
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1317	-	-	-	412	1094	-	-
HCM Lane V/C Ratio	-	-	-	-	0.085	0.005	-	-
HCM Control Delay (s)	0	-	-	0	14.6	8.3	0	-
HCM Lane LOS	A	-	-	A	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	-	0.3	0	-	-

Intersection	
Int Delay, s/veh	1.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	60	8	175	152	18	162
Future Vol, veh/h	60	8	175	152	18	162
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	0	75	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	78	85	85	78	87
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	71	10	206	179	23	186

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	438	206	0	0	385	0
Stage 1	206	-	-	-	-	-
Stage 2	232	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	576	835	-	-	1173	-
Stage 1	829	-	-	-	-	-
Stage 2	807	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	564	835	-	-	1173	-
Mov Cap-2 Maneuver	626	-	-	-	-	-
Stage 1	829	-	-	-	-	-
Stage 2	791	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.2	0	0.9
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	626	835	1173	-
HCM Lane V/C Ratio	-	-	0.113	0.012	0.02	-
HCM Control Delay (s)	-	-	11.5	9.4	8.1	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	0.4	0	0.1	-

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	20	20	51	9	44	108	8	136
v/c Ratio	0.06	0.02	0.13	0.01	0.06	0.08	0.01	0.11
Control Delay	17.4	0.1	17.4	0.0	7.1	5.4	15.2	12.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.4	0.1	17.4	0.0	7.1	5.4	15.2	12.7
Queue Length 50th (ft)	2	0	4	0	0	0	0	0
Queue Length 95th (ft)	20	0	33	0	15	22	9	61
Internal Link Dist (ft)		773		54		238		267
Turn Bay Length (ft)	105				115		100	
Base Capacity (vph)	686	1033	396	1046	817	1350	860	1239
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.02	0.13	0.01	0.05	0.08	0.01	0.11

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	0	12	40	0	7	29	48	26	6	94	11
Future Volume (veh/h)	18	0	12	40	0	7	29	48	26	6	94	11
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	20	0	20	51	0	9	44	75	33	8	124	12
Peak Hour Factor	0.90	0.92	0.60	0.78	0.92	0.78	0.66	0.64	0.78	0.78	0.76	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	100	0	89	137	0	122	476	488	215	456	308	30
Arrive On Green	0.06	0.00	0.06	0.08	0.00	0.08	0.06	0.40	0.40	0.18	0.18	0.18
Sat Flow, veh/h	1781	0	1585	1781	0	1585	1781	1231	542	1286	1679	162
Grp Volume(v), veh/h	20	0	20	51	0	9	44	0	108	8	0	136
Grp Sat Flow(s),veh/h/ln	1781	0	1585	1781	0	1585	1781	0	1773	1286	0	1841
Q Serve(g_s), s	0.4	0.0	0.4	0.9	0.0	0.2	0.6	0.0	1.3	0.2	0.0	2.1
Cycle Q Clear(g_c), s	0.4	0.0	0.4	0.9	0.0	0.2	0.6	0.0	1.3	0.2	0.0	2.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.31	1.00		0.09
Lane Grp Cap(c), veh/h	100	0	89	137	0	122	476	0	703	456	0	338
V/C Ratio(X)	0.20	0.00	0.23	0.37	0.00	0.07	0.09	0.00	0.15	0.02	0.00	0.40
Avail Cap(c_a), veh/h	653	0	581	359	0	320	749	0	1137	573	0	506
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	14.8	0.0	14.8	14.4	0.0	14.0	8.4	0.0	6.3	11.0	0.0	11.8
Incr Delay (d2), s/veh	1.0	0.0	1.3	1.7	0.0	0.3	0.1	0.0	0.1	0.0	0.0	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.1	0.3	0.0	0.1	0.2	0.0	0.3	0.0	0.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.7	0.0	16.0	16.0	0.0	14.3	8.5	0.0	6.4	11.0	0.0	12.6
LnGrp LOS	B	A	B	B	A	B	A	A	A	B	A	B
Approach Vol, veh/h		40			60			152			144	
Approach Delay, s/veh		15.9			15.8			7.0			12.5	
Approach LOS		B			B			A			B	

Timer - Assigned Phs		2		4		6	7	8				
Phs Duration (G+Y+Rc), s		7.9		18.0		6.8	7.0	11.0				
Change Period (Y+Rc), s		* 5.4		5.0		5.0	5.0	5.0				
Max Green Setting (Gmax), s		* 6.6		21.0		12.0	7.0	9.0				
Max Q Clear Time (g_c+I1), s		2.9		3.3		2.4	2.6	4.1				
Green Ext Time (p_c), s		0.0		0.5		0.0	0.0	0.3				

Intersection Summary			
HCM 6th Ctrl Delay			11.2
HCM 6th LOS			B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	1.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	512	13	85	545	14	40
Future Vol, veh/h	512	13	85	545	14	40
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	150	-	100	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	86	86	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	533	14	99	634	15	43

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	547	0	1055	540
Stage 1	-	-	-	-	540	-
Stage 2	-	-	-	-	515	-
Critical Hdwy	-	-	4.13	-	6.63	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.83	-
Follow-up Hdwy	-	-	2.219	-	3.519	3.319
Pot Cap-1 Maneuver	-	-	1020	-	235	541
Stage 1	-	-	-	-	583	-
Stage 2	-	-	-	-	565	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1020	-	212	541
Mov Cap-2 Maneuver	-	-	-	-	344	-
Stage 1	-	-	-	-	583	-
Stage 2	-	-	-	-	510	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.2	13.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	344	541	-	-	1020	-
HCM Lane V/C Ratio	0.044	0.08	-	-	0.097	-
HCM Control Delay (s)	15.9	12.2	-	-	8.9	-
HCM Lane LOS	C	B	-	-	A	-
HCM 95th %tile Q(veh)	0.1	0.3	-	-	0.3	-

Intersection						
Int Delay, s/veh	0					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↱		↑↑	↑↑	↱
Traffic Vol, veh/h	0	2	0	1342	740	4
Future Vol, veh/h	0	2	0	1342	740	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	100
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	78	92	92	85	78
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	3	0	1459	871	5

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	436	-	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-	-
Pot Cap-1 Maneuver	0	568	0	-	-	-
Stage 1	0	-	0	-	-	-
Stage 2	0	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	568	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.4	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	-	568	-	-
HCM Lane V/C Ratio	-	0.005	-	-
HCM Control Delay (s)	-	11.4	-	-
HCM Lane LOS	-	B	-	-
HCM 95th %tile Q(veh)	-	0	-	-

Intersection						
Int Delay, s/veh	0.1					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↱		↑↑	↑↑	↱
Traffic Vol, veh/h	0	15	0	1342	704	38
Future Vol, veh/h	0	15	0	1342	704	38
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	100
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	78	78	92	85	78
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	19	0	1459	828	49

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	414	-	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-	-
Pot Cap-1 Maneuver	0	587	0	-	-	-
Stage 1	0	-	0	-	-	-
Stage 2	0	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	587	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.3	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	-	587	-	-
HCM Lane V/C Ratio	-	0.033	-	-
HCM Control Delay (s)	-	11.3	-	-
HCM Lane LOS	-	B	-	-
HCM 95th %tile Q(veh)	-	0.1	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	152	1875	28	37	3274	301	29	91	102	102	88
v/c Ratio	0.58	0.81	0.02	0.30	1.15	0.29	0.24	0.50	0.66	0.65	0.31
Control Delay	50.5	24.4	0.0	59.9	98.0	5.6	58.3	24.9	73.0	71.7	2.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.5	24.4	0.0	59.9	98.0	5.6	58.3	24.9	73.0	71.7	2.8
Queue Length 50th (ft)	48	811	0	28	~1193	41	22	9	81	81	0
Queue Length 95th (ft)	m31	m538	m0	44	#1299	77	37	62	#148	98	0
Internal Link Dist (ft)		682			2401			499		330	
Turn Bay Length (ft)	350		310	170		230	100		100		125
Base Capacity (vph)	300	2316	1583	125	2840	1025	125	188	163	166	293
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.51	0.81	0.02	0.30	1.15	0.29	0.23	0.48	0.63	0.61	0.30

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	132	1781	21	23	3110	256	18	11	67	143	25	73
Future Volume (vph)	132	1781	21	23	3110	256	18	11	67	143	25	73
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.5	4.0	4.5	5.5	5.5	4.5	4.5		4.5	4.5	4.5
Lane Util. Factor	0.97	0.95	1.00	1.00	*0.84	1.00	1.00	1.00		0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.87		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00
Satd. Flow (prot)	3433	3539	1583	1770	4694	1583	1770	1620		1681	1717	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00
Satd. Flow (perm)	3433	3539	1583	1770	4694	1583	1770	1620		1681	1717	1583
Peak-hour factor, PHF	0.87	0.95	0.75	0.63	0.95	0.85	0.63	0.95	0.85	0.87	0.63	0.83
Adj. Flow (vph)	152	1875	28	37	3274	301	29	12	79	164	40	88
RTOR Reduction (vph)	0	0	0	0	0	68	0	74	0	0	0	80
Lane Group Flow (vph)	152	1875	28	37	3274	233	29	17	0	102	102	8
Turn Type	Prot	NA	Free	Prot	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	1	6		5	2		4	4		8	8	
Permitted Phases			Free			2						8
Actuated Green, G (s)	9.2	76.7	120.0	5.1	72.6	72.6	8.1	8.1		11.1	11.1	11.1
Effective Green, g (s)	9.2	76.7	120.0	5.1	72.6	72.6	8.1	8.1		11.1	11.1	11.1
Actuated g/C Ratio	0.08	0.64	1.00	0.04	0.60	0.60	0.07	0.07		0.09	0.09	0.09
Clearance Time (s)	4.5	5.5		4.5	5.5	5.5	4.5	4.5		4.5	4.5	4.5
Vehicle Extension (s)	1.5	2.0		1.5	2.0	2.0	2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	263	2262	1583	75	2839	957	119	109		155	158	146
v/s Ratio Prot	0.04	c0.53		0.02	c0.70		c0.02	0.01		c0.06	0.06	
v/s Ratio Perm			0.02			0.15						0.01
v/c Ratio	0.58	0.83	0.02	0.49	1.15	0.24	0.24	0.16		0.66	0.65	0.06
Uniform Delay, d1	53.5	16.6	0.0	56.2	23.7	11.0	53.0	52.7		52.6	52.6	49.7
Progression Factor	0.93	1.41	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.2	0.3	0.0	1.9	73.4	0.6	0.4	0.2		7.5	6.6	0.1
Delay (s)	49.9	23.8	0.0	58.0	97.1	11.6	53.4	53.0		60.1	59.2	49.7
Level of Service	D	C	A	E	F	B	D	D		E	E	D
Approach Delay (s)		25.4			89.6			53.1			56.6	
Approach LOS		C			F			D			E	

Intersection Summary			
HCM 2000 Control Delay	65.6	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	87.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	380	673	99	613	164	1058	72	79	1151	349
v/c Ratio	0.81	0.77	0.72	0.92	0.85	0.78	0.10	0.39	0.89	0.46
Control Delay	56.6	40.8	73.4	60.1	57.5	33.1	0.3	19.4	39.6	6.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.6	40.8	73.4	60.1	57.5	33.1	0.3	19.4	39.6	6.6
Queue Length 50th (ft)	122	203	63	201	57	324	0	26	355	21
Queue Length 95th (ft)	142	270	#106	#281	#125	377	0	41	402	79
Internal Link Dist (ft)		556		629		141			492	
Turn Bay Length (ft)	245		130		150		25	150		250
Base Capacity (vph)	480	879	141	670	193	1361	709	217	1309	772
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.79	0.77	0.70	0.91	0.85	0.78	0.10	0.36	0.88	0.45

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	289	518	88	75	493	25	123	899	52	58	967	307
Future Volume (veh/h)	289	518	88	75	493	25	123	899	52	58	967	307
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	380	563	110	99	573	40	164	1058	0	79	1151	0
Peak Hour Factor	0.76	0.92	0.80	0.76	0.86	0.63	0.75	0.85	0.72	0.73	0.84	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	448	734	143	125	634	44	221	1395		233	1359	
Arrive On Green	0.13	0.25	0.25	0.07	0.19	0.19	0.06	0.39	0.00	0.05	0.38	0.00
Sat Flow, veh/h	3456	2966	578	1781	3370	235	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	380	337	336	99	302	311	164	1058	0	79	1151	0
Grp Sat Flow(s),veh/h/ln	1728	1777	1766	1781	1777	1828	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	10.8	17.6	17.7	5.5	16.6	16.7	5.7	25.8	0.0	2.6	29.6	0.0
Cycle Q Clear(g_c), s	10.8	17.6	17.7	5.5	16.6	16.7	5.7	25.8	0.0	2.6	29.6	0.0
Prop In Lane	1.00		0.33	1.00		0.13	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	448	440	437	125	334	344	221	1395		233	1359	
V/C Ratio(X)	0.85	0.77	0.77	0.79	0.90	0.91	0.74	0.76		0.34	0.85	
Avail Cap(c_a), veh/h	484	444	442	143	338	347	221	1395		286	1359	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	42.6	34.9	35.0	45.8	39.7	39.7	23.3	26.3	0.0	20.5	28.2	0.0
Incr Delay (d2), s/veh	12.6	7.7	8.0	23.1	26.1	26.1	12.5	3.9	0.0	0.9	6.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.3	8.4	8.5	3.2	9.6	9.9	3.0	11.1	0.0	1.1	13.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	55.2	42.6	43.0	68.9	65.8	65.8	35.9	30.2	0.0	21.3	34.9	0.0
LnGrp LOS	E	D	D	E	E	E	D	C		C	C	
Approach Vol, veh/h		1053			712			1222	A		1230	A
Approach Delay, s/veh		47.3			66.2			31.0			34.0	
Approach LOS		D			E			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	19.0	24.8	11.0	45.2	13.0	30.8	12.0	44.2
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	14.0	19.0	8.0	35.0	8.0	25.0	6.0	37.0
Max Q Clear Time (g_c+I1), s	12.8	18.7	4.6	27.8	7.5	19.7	7.7	31.6
Green Ext Time (p_c), s	0.2	0.1	0.0	4.0	0.0	1.9	0.0	3.4

Intersection Summary	
HCM 6th Ctrl Delay	41.9
HCM 6th LOS	D

Notes

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	48	841	64	82	901	24	60	153	52
v/c Ratio	0.17	0.80	0.07	0.27	0.80	0.02	0.23	0.39	0.28
Control Delay	6.6	23.3	0.1	7.5	22.4	0.0	29.9	11.8	22.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.6	23.3	0.1	7.5	22.4	0.0	29.9	11.8	22.8
Queue Length 50th (ft)	8	364	0	13	406	0	27	12	8
Queue Length 95th (ft)	16	#547	0	26	#680	0	55	61	15
Internal Link Dist (ft)		180			464			267	783
Turn Bay Length (ft)	100		100	130			100		
Base Capacity (vph)	297	1218	1085	309	1222	1088	267	566	234
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.69	0.06	0.27	0.74	0.02	0.22	0.27	0.22

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	36	723	58	64	784	9	50	26	100	2	6	23
Future Volume (veh/h)	36	723	58	64	784	9	50	26	100	2	6	23
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	48	841	64	82	901	24	60	28	125	4	12	36
Peak Hour Factor	0.75	0.86	0.91	0.78	0.87	0.38	0.83	0.93	0.80	0.50	0.50	0.64
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	254	976	827	298	1005	852	363	62	275	58	36	91
Arrive On Green	0.05	0.52	0.52	0.07	0.54	0.54	0.06	0.21	0.21	0.08	0.08	0.08
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	1781	298	1332	62	441	1132
Grp Volume(v), veh/h	48	841	64	82	901	24	60	0	153	52	0	0
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	1781	0	1631	1635	0	0
Q Serve(g_s), s	0.9	28.6	1.5	1.5	31.5	0.5	2.1	0.0	6.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.9	28.6	1.5	1.5	31.5	0.5	2.1	0.0	6.0	2.2	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.82	0.08		0.69
Lane Grp Cap(c), veh/h	254	976	827	298	1005	852	363	0	337	185	0	0
V/C Ratio(X)	0.19	0.86	0.08	0.28	0.90	0.03	0.17	0.00	0.45	0.28	0.00	0.00
Avail Cap(c_a), veh/h	333	1201	1018	350	1201	1018	430	0	468	253	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	13.7	15.2	8.7	12.9	15.1	8.0	26.4	0.0	25.4	31.9	0.0	0.0
Incr Delay (d2), s/veh	0.4	5.6	0.0	0.5	8.1	0.0	0.2	0.0	1.0	0.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	12.0	0.5	0.5	13.6	0.2	0.9	0.0	2.3	0.9	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.1	20.8	8.8	13.4	23.2	8.0	26.6	0.0	26.4	32.8	0.0	0.0
LnGrp LOS	B	C	A	B	C	A	C	A	C	C	A	A
Approach Vol, veh/h		953			1007			213			52	
Approach Delay, s/veh		19.6			22.0			26.4			32.8	
Approach LOS		B			C			C			C	
Timer - Assigned Phs	1	2		4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.7	44.3		20.1	9.9	43.2	9.2	10.9				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0	5.0	5.0				
Max Green Setting (Gmax), s	7.0	47.0		21.0	7.0	47.0	7.0	9.0				
Max Q Clear Time (g_c+I1), s	2.9	33.5		8.0	3.5	30.6	4.1	4.2				
Green Ext Time (p_c), s	0.0	5.9		0.6	0.0	6.1	0.0	0.1				
Intersection Summary												
HCM 6th Ctrl Delay			21.7									
HCM 6th LOS			C									

Lane Group	EBL	EBT	EBR	WBL	WBT	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	217	2229	136	32	3185	152	142	145	209
v/c Ratio	0.88	1.12	0.09	0.17	1.41	0.83	0.73	0.72	0.57
Control Delay	57.4	74.6	0.0	49.6	216.2	85.8	72.4	71.3	12.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	57.4	74.6	0.0	49.6	216.2	85.8	72.4	71.3	12.8
Queue Length 50th (ft)	180	~1196	0	22	~1356	115	112	115	0
Queue Length 95th (ft)	m103	m532	m0	44	#1473	145	177	161	64
Internal Link Dist (ft)		682			2401	499		332	
Turn Bay Length (ft)	345		310	170			100		125
Base Capacity (vph)	272	1990	1583	228	2254	190	231	238	397
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.80	1.12	0.09	0.14	1.41	0.80	0.61	0.61	0.53

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	189	2095	103	24	2812	178	68	37	7	177	66	184
Future Volume (vph)	189	2095	103	24	2812	178	68	37	7	177	66	184
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.5	4.0	4.5	5.5			4.5		4.5	4.5	4.5
Lane Util. Factor	1.00	0.95	1.00	1.00	*0.84			1.00		0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.99			0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.97		0.95	0.98	1.00
Satd. Flow (prot)	1770	3539	1583	1770	4644			1791		1681	1733	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.97		0.95	0.98	1.00
Satd. Flow (perm)	1770	3539	1583	1770	4644			1791		1681	1733	1583
Peak-hour factor, PHF	0.87	0.94	0.76	0.75	0.95	0.79	0.77	0.71	0.58	0.87	0.79	0.88
Adj. Flow (vph)	217	2229	136	32	2960	225	88	52	12	203	84	209
RTOR Reduction (vph)	0	0	0	0	6	0	0	3	0	0	0	185
Lane Group Flow (vph)	217	2229	136	32	3179	0	0	149	0	142	145	24
Turn Type	Prot	NA	Free	Prot	NA		Split	NA		Split	NA	Perm
Protected Phases	1	6		5	2		4	4		8	8	
Permitted Phases			Free									8
Actuated Green, G (s)	18.7	65.7	120.0	9.3	56.3			12.1		13.9	13.9	13.9
Effective Green, g (s)	18.7	65.7	120.0	9.3	56.3			12.1		13.9	13.9	13.9
Actuated g/C Ratio	0.16	0.55	1.00	0.08	0.47			0.10		0.12	0.12	0.12
Clearance Time (s)	4.5	5.5		4.5	5.5			4.5		4.5	4.5	4.5
Vehicle Extension (s)	1.5	2.0		1.5	2.0			2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	275	1937	1583	137	2178			180		194	200	183
v/s Ratio Prot	c0.12	c0.63		0.02	c0.68			c0.08		c0.08	0.08	
v/s Ratio Perm			0.09									0.02
v/c Ratio	0.79	1.15	0.09	0.23	1.46			0.83		0.73	0.72	0.13
Uniform Delay, d1	48.8	27.1	0.0	52.0	31.9			52.9		51.3	51.2	47.6
Progression Factor	1.06	0.58	1.00	1.00	1.00			1.00		1.00	1.00	1.00
Incremental Delay, d2	1.3	68.5	0.0	0.3	209.3			24.8		11.6	10.5	0.1
Delay (s)	52.8	84.2	0.0	52.3	241.2			77.8		62.8	61.7	47.8
Level of Service	D	F	A	D	F			E		E	E	D
Approach Delay (s)		77.1			239.3			77.8			56.1	
Approach LOS		E			F			E			E	

Intersection Summary			
HCM 2000 Control Delay	156.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.18		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	93.6%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	59	0	5	0	316	83	5	361	0
Future Vol, veh/h	0	0	0	59	0	5	0	316	83	5	361	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	115	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	78	92	92	87	87	78	87	87	87
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	76	0	5	0	363	106	6	415	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	846	896	415	790	790	363	415	0	0	469	0	0
Stage 1	427	427	-	363	363	-	-	-	-	-	-	-
Stage 2	419	469	-	427	427	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	282	280	637	308	322	682	1144	-	-	1093	-	-
Stage 1	606	585	-	656	625	-	-	-	-	-	-	-
Stage 2	612	561	-	606	585	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	278	278	637	306	320	682	1144	-	-	1093	-	-
Mov Cap-2 Maneuver	278	278	-	306	320	-	-	-	-	-	-	-
Stage 1	606	581	-	656	625	-	-	-	-	-	-	-
Stage 2	607	561	-	602	581	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	20.2	0	0.1
HCM LOS	A	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1144	-	-	-	318	1093	-	-
HCM Lane V/C Ratio	-	-	-	-	0.255	0.005	-	-
HCM Control Delay (s)	0	-	-	0	20.2	8.3	0	-
HCM Lane LOS	A	-	-	A	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	-	1	0	-	-

Intersection	
Int Delay, s/veh	3.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	177	11	151	170	18	189
Future Vol, veh/h	177	11	151	170	18	189
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	0	75	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	78	85	85	78	87
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	208	14	178	200	23	217

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	441	178	0	0	378	0
Stage 1	178	-	-	-	-	-
Stage 2	263	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	574	865	-	-	1180	-
Stage 1	853	-	-	-	-	-
Stage 2	781	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	563	865	-	-	1180	-
Mov Cap-2 Maneuver	623	-	-	-	-	-
Stage 1	853	-	-	-	-	-
Stage 2	766	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.4	0	0.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	623	865	1180	-
HCM Lane V/C Ratio	-	-	0.334	0.016	0.02	-
HCM Control Delay (s)	-	-	13.7	9.2	8.1	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	1.5	0.1	0.1	-

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	81	105	72	14	56	185	8	162
v/c Ratio	0.21	0.12	0.20	0.02	0.09	0.17	0.01	0.17
Control Delay	18.0	0.3	20.1	0.0	10.1	8.6	17.8	14.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.0	0.3	20.1	0.0	10.1	8.6	17.8	14.5
Queue Length 50th (ft)	15	0	14	0	9	27	1	23
Queue Length 95th (ft)	52	0	45	0	20	41	10	68
Internal Link Dist (ft)		773		153		238		267
Turn Bay Length (ft)	105				115		100	
Base Capacity (vph)	649	998	376	865	661	1210	615	933
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.11	0.19	0.02	0.08	0.15	0.01	0.17

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	73	0	63	56	0	11	37	88	37	6	88	42
Future Volume (veh/h)	73	0	63	56	0	11	37	88	37	6	88	42
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	81	0	105	72	0	14	56	138	47	8	116	46
Peak Hour Factor	0.90	0.92	0.60	0.78	0.92	0.78	0.66	0.64	0.78	0.78	0.76	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	243	0	216	168	0	150	408	483	164	381	202	80
Arrive On Green	0.14	0.00	0.14	0.09	0.00	0.09	0.07	0.36	0.36	0.16	0.16	0.16
Sat Flow, veh/h	1781	0	1585	1781	0	1585	1781	1334	454	1199	1274	505
Grp Volume(v), veh/h	81	0	105	72	0	14	56	0	185	8	0	162
Grp Sat Flow(s),veh/h/ln	1781	0	1585	1781	0	1585	1781	0	1789	1199	0	1779
Q Serve(g_s), s	1.6	0.0	2.3	1.4	0.0	0.3	0.9	0.0	2.8	0.2	0.0	3.2
Cycle Q Clear(g_c), s	1.6	0.0	2.3	1.4	0.0	0.3	0.9	0.0	2.8	0.2	0.0	3.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.25	1.00		0.28
Lane Grp Cap(c), veh/h	243	0	216	168	0	150	408	0	647	381	0	283
V/C Ratio(X)	0.33	0.00	0.49	0.43	0.00	0.09	0.14	0.00	0.29	0.02	0.00	0.57
Avail Cap(c_a), veh/h	566	0	503	311	0	277	612	0	994	476	0	424
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	14.8	0.0	15.1	16.1	0.0	15.6	10.4	0.0	8.6	13.5	0.0	14.7
Incr Delay (d2), s/veh	0.8	0.0	1.7	1.7	0.0	0.3	0.2	0.0	0.2	0.0	0.0	1.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	0.7	0.5	0.0	0.1	0.3	0.0	0.8	0.1	0.0	1.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.6	0.0	16.8	17.9	0.0	15.9	10.6	0.0	8.8	13.5	0.0	16.5
LnGrp LOS	B	A	B	B	A	B	B	A	A	B	A	B
Approach Vol, veh/h		186			86			241			170	
Approach Delay, s/veh		16.3			17.5			9.2			16.4	
Approach LOS		B			B			A			B	

Timer - Assigned Phs		2		4		6	7	8				
Phs Duration (G+Y+Rc), s		9.0		18.7		10.1	7.7	11.0				
Change Period (Y+Rc), s		* 5.4		5.0		5.0	5.0	5.0				
Max Green Setting (Gmax), s		* 6.6		21.0		12.0	7.0	9.0				
Max Q Clear Time (g_c+I1), s		3.4		4.8		4.3	2.9	5.2				
Green Ext Time (p_c), s		0.0		0.9		0.4	0.0	0.3				

Intersection Summary			
HCM 6th Ctrl Delay			14.0
HCM 6th LOS			B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	812	13	93	831	25	82
Future Vol, veh/h	812	13	93	831	25	82
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	150	-	100	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	78	79	92	78	79
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	883	17	118	903	32	104

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	900	0	1580	892
Stage 1	-	-	-	-	892	-
Stage 2	-	-	-	-	688	-
Critical Hdwy	-	-	4.13	-	6.63	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.83	-
Follow-up Hdwy	-	-	2.219	-	3.519	3.319
Pot Cap-1 Maneuver	-	-	753	-	109	340
Stage 1	-	-	-	-	399	-
Stage 2	-	-	-	-	461	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	753	-	92	340
Mov Cap-2 Maneuver	-	-	-	-	222	-
Stage 1	-	-	-	-	399	-
Stage 2	-	-	-	-	389	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.2	21.1
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	222	340	-	-	753	-
HCM Lane V/C Ratio	0.144	0.305	-	-	0.156	-
HCM Control Delay (s)	23.9	20.2	-	-	10.7	-
HCM Lane LOS	C	C	-	-	B	-
HCM 95th %tile Q(veh)	0.5	1.3	-	-	0.6	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	4	0	1074	1126	4
Future Vol, veh/h	0	4	0	1074	1126	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	100
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	78	92	92	85	78
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	5	0	1167	1325	5

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	663	-	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-	-
Pot Cap-1 Maneuver	0	404	0	-	-	-
Stage 1	0	-	0	-	-	-
Stage 2	0	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	404	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	-	404	-	-
HCM Lane V/C Ratio	-	0.013	-	-
HCM Control Delay (s)	-	14	-	-
HCM Lane LOS	-	B	-	-
HCM 95th %tile Q(veh)	-	0	-	-

Intersection						
Int Delay, s/veh	0.2					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↱		↑↑	↑↑	↱
Traffic Vol, veh/h	0	28	0	1074	1092	38
Future Vol, veh/h	0	28	0	1074	1092	38
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	100
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	78	78	92	85	78
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	36	0	1167	1285	49

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	643	-	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-	-
Pot Cap-1 Maneuver	0	416	0	-	-	-
Stage 1	0	-	0	-	-	-
Stage 2	0	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	416	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.5	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	-	416	-	-
HCM Lane V/C Ratio	-	0.086	-	-
HCM Control Delay (s)	-	14.5	-	-
HCM Lane LOS	-	B	-	-
HCM 95th %tile Q(veh)	-	0.3	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	217	2229	136	32	2960	225	88	64	142	145	209
v/c Ratio	0.82	0.99	0.09	0.26	1.08	0.23	0.71	0.48	0.77	0.76	0.72
Control Delay	72.4	33.4	0.0	58.6	68.6	5.5	84.6	60.4	78.0	76.7	35.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	72.4	33.4	0.0	58.6	68.6	5.5	84.6	60.4	78.0	76.7	35.0
Queue Length 50th (ft)	92	~1055	0	24	~1036	30	68	43	112	114	57
Queue Length 95th (ft)	m53	m527	m0	47	#1128	51	#113	69	#195	164	136
Internal Link Dist (ft)		682			2401			499		332	
Turn Bay Length (ft)	350		310	170		230			100		125
Base Capacity (vph)	271	2244	1583	125	2743	982	125	134	203	209	305
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.80	0.99	0.09	0.26	1.08	0.23	0.70	0.48	0.70	0.69	0.69

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	189	2095	103	24	2812	178	68	37	7	177	66	184
Future Volume (vph)	189	2095	103	24	2812	178	68	37	7	177	66	184
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.5	4.0	4.5	5.5	5.5	4.5	4.5		4.5	4.5	4.5
Lane Util. Factor	0.97	0.95	1.00	1.00	*0.84	1.00	1.00	1.00		0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	0.98	1.00
Satd. Flow (prot)	3433	3539	1583	1770	4694	1583	1770	1810		1681	1733	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	0.98	1.00
Satd. Flow (perm)	3433	3539	1583	1770	4694	1583	1770	1810		1681	1733	1583
Peak-hour factor, PHF	0.87	0.94	0.76	0.75	0.95	0.79	0.77	0.71	0.58	0.87	0.79	0.88
Adj. Flow (vph)	217	2229	136	32	2960	225	88	52	12	203	84	209
RTOR Reduction (vph)	0	0	0	0	0	59	0	7	0	0	0	116
Lane Group Flow (vph)	217	2229	136	32	2960	166	88	57	0	142	145	93
Turn Type	Prot	NA	Free	Prot	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	1	6		5	2		4	4		8	8	
Permitted Phases			Free			2						8
Actuated Green, G (s)	11.1	74.3	120.0	5.1	68.3	68.3	8.4	8.4		13.2	13.2	13.2
Effective Green, g (s)	11.1	74.3	120.0	5.1	68.3	68.3	8.4	8.4		13.2	13.2	13.2
Actuated g/C Ratio	0.09	0.62	1.00	0.04	0.57	0.57	0.07	0.07		0.11	0.11	0.11
Clearance Time (s)	4.5	5.5		4.5	5.5	5.5	4.5	4.5		4.5	4.5	4.5
Vehicle Extension (s)	1.5	2.0		1.5	2.0	2.0	2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	317	2191	1583	75	2671	900	123	126		184	190	174
v/s Ratio Prot	c0.06	c0.63		0.02	c0.63		c0.05	0.03		c0.08	0.08	
v/s Ratio Perm			0.09			0.10						0.06
v/c Ratio	0.68	1.02	0.09	0.43	1.11	0.18	0.72	0.46		0.77	0.76	0.54
Uniform Delay, d1	52.8	22.9	0.0	56.0	25.9	12.4	54.6	53.6		51.9	51.9	50.5
Progression Factor	1.29	1.31	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.4	10.9	0.0	1.4	54.8	0.5	15.1	1.0		16.5	15.0	1.6
Delay (s)	68.3	40.9	0.0	57.4	80.7	12.9	69.8	54.6		68.5	66.9	52.1
Level of Service	E	D	A	E	F	B	E	D		E	E	D
Approach Delay (s)		41.1			75.7			63.4			61.1	
Approach LOS		D			E			E			E	

Intersection Summary			
HCM 2000 Control Delay	60.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	90.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Merge Analysis

HCS7 Freeway Merge Report

Project Information			
Analyst	TCM	Date	5/20/2019
Agency	Olsson	Analysis Year	2019
Jurisdiction	Mission, KS	Time Period Analyzed	AM
Project Description	EB Johnson Drive On-Ramp to NB Shawnee Mission Parkway		

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	45.0	25.0
Segment Length (L) / Acceleration Length (L_A),ft	1500	150
Terrain Type	Rolling	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (V_i)	2047	479
Peak Hour Factor (PHF)	0.95	0.85
Total Trucks, %	0.02	0.02
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	1.000	1.000
Flow Rate (v_i),pc/h	2155	564
Capacity (c), pc/h	4500	1900
Volume-to-Capacity Ratio (v/c)	0.60	0.30

Speed and Density			
Upstream Equilibrium Distance (L_{EQ}), ft	-	Number of Outer Lanes on Freeway (N_O)	0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.373
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/mi/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influenece Area Speed (S_R), mi/h	43.9
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2155	Ramp Junction Speed (S), mi/h	43.9
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	2719	Average Density (D), pc/mi/ln	31.0
Level of Service (LOS)	C	Density in Ramp Influence Area (D_R), pc/mi/ln	25.6

HCS7 Freeway Merge Report

Project Information

Analyst	TCM	Date	5/20/2019
Agency	Olsson	Analysis Year	2019
Jurisdiction	Mission, KS	Time Period Analyzed	PM
Project Description	EB Johnson Drive On-Ramp to NB Shawnee Mission Parkway		

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	45.0	25.0
Segment Length (L) / Acceleration Length (L_A),ft	1500	150
Terrain Type	Rolling	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i)	2268	629
Peak Hour Factor (PHF)	0.94	0.86
Total Trucks, %	0.02	0.02
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	1.000	1.000
Flow Rate (v_i),pc/h	2413	731
Capacity (c), pc/h	4500	1900
Volume-to-Capacity Ratio (v/c)	0.70	0.38

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Number of Outer Lanes on Freeway (N_O)	0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.404
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/mi/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influenece Area Speed (S_R), mi/h	43.8
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2413	Ramp Junction Speed (S), mi/h	43.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3144	Average Density (D), pc/mi/ln	35.9
Level of Service (LOS)	D	Density in Ramp Influence Area (D_R), pc/mi/ln	28.8

SHANNON L. JEFFERIES
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19385
KANSAS
PROFESSIONAL ENGINEER

02.14.2020

MISSION GATEWAY

Mission, Kansas – 2020

Revised February 2020

Olsson Project No. 017-2145

CITY OF MISSION KANSAS

MEMORANDUM

Date: April 23, 2020

To: Mike Lee, Chair, and Members of the Planning Commission

From: Brian Scott, Assistant City Administrator

RE: Phase I Requirements For Projects When A Lender Is Not Involved

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At the November 25, 2019 meeting of the Planning Commission, Commissioner Troppito requested that we have a discussion at future commission meeting about requirements for Phase I environmental studies on development projects that may not be financed through a conventional loan from a financial institution or other similar type financing.

The following is taken from the minutes of that meeting:

Commission Troppito: "Commission for approval, in instances where a sophisticated financial institution is not involved, the reason for that being, if the developer/applicant cannot provide the Phase 1 environmental assessment that's adequate and within the timeframe to be recent enough to be considered under ANSI standards as being sufficient, then we should require one ourselves. I'd like you to look into that, get with the city attorney, and discuss it with Laura Smith, the city administrator, and come back with a recommendation on how to proceed with that. You know, at our next meeting."

Mr. Scott: "Okay. It may be a while before we meet again, but, yeah. We'll put that on the agenda for next time."

We have this discussion on the agenda for the April 27th meeting for further clarification and understanding.