Metropolitan Planning Organization of Johnson County

Date: June 29, 2017

To: Louise From; Mayor of University Heights

From: Kent Ralston; Executive Director
Emily Bothell; Assistant Transportation Planner

Re: Preliminary Trip Generation and Traffic Impact Analysis for the Planned Unit Development at 901 Melrose Avenue in University Heights

As requested by University Heights, Staff conducted a preliminary trip generation and traffic impact analysis for the proposed Planned Unit Development at 901 Melrose Avenue in University Heights, which is comprised of a 140 unit hotel.

Trip Generation Estimates

The following table provides estimates of future peak hour traffic volumes generated by the proposed hotel development. The estimates are based on information provided in the Planned Unit Development (PUD) application submitted by University Lake Partners II LLC. Estimates are provided with 100% of the estimated trips loading onto the south side of Melrose Avenue at a point immediately west of the railroad bridge. The following estimates shown in **Table 1** are based on the best available data and should be revised if any land-use or intensity changes are proposed.

Table 1: PUD Trip Generation Estimates

Land Use	ITE Code	Time of Day	Trip Generation Figure	Number of Hotel Rooms	Total Trips Generated	Entering	Exiting
Hotel	**310**	AM Peak Hour	0.56 trips/room	140 Rooms	78	48 (61%)	30 (39%)
	310	PM Peak Hour	0.59 trips/room		83	44 (53%)	39 (47%)

Source: Institute of Transportation Engineers – 7th Edition

It is estimated that the proposed hotel with 140 guest rooms would generate 78 new vehicle trips in the AM peak hour and 83 in the PM peak hour. During the AM peak hour, it is estimated that approximately 48 vehicles will enter the development while 30 will exit. In the PM peak hour, the volume of entering traffic is estimated at 44 vehicles, with exiting traffic estimated at 39 vehicles.

Assumptions

- The direction (east or west) of vehicle trips entering and exiting the development was generated by taking an average of the peak hour directional flow of existing traffic on Melrose Avenue and applying the average percentage to the trip generation estimates at the proposed intersection.
    - 70% of AM peak hour trips are traveling to/from the east and 30% are traveling to/from the west.
    - 30% of PM peak hour trips are traveling to/from the east and 70% are traveling to/from the west.

Gap Analysis

A gap analysis was conducted at the proposed development access location to determine the availability of gaps, of a particular size on Melrose Avenue, offered to the driver exiting the development. According to the *Highway Capacity Manual* (2010), the critical gap for the left-turn movement from the proposed access is 11 seconds/vehicle. The critical gap for the right-turn movement is approximately 10 seconds/vehicle. There should be at least one gap of adequate size for a vehicle to make a right- or left-turning movement during each minute of the peak hour. If the number of adequate gaps in the traffic stream on Melrose Avenue are less than these values, vehicles may be inclined to select inadequate gaps.

Table 2: Right- and Left-Turn Gap Analysis

	Right-Turn Movement			Left-Turn Movement	
	Total gaps	**Total gaps 10+ sec**	**Gaps per minute**	**Total gaps 11+ sec**	**Gaps per minute**
AM	192	51	0.85	47	0.78
PM	226	99	1.65	90	1.5

Staff collected gap counts from 7:15 – 8:15 a.m. and 4:45 – 5:45 p.m. in June 2017.[1] The number of acceptable gaps during both AM and PM peak hours are shown in **Table 2**. During the AM peak hour, the right-turn movement experiences .85 gaps per minute while the left-turn movement experiences .78 gaps per minute. During the PM peak hour, the right-turn movement is provided 1.65 gaps per minute whereas the left-turn movement is offered 1.5 gaps per minute. Based on these results, there are not adequate gaps for vehicles making a left- or right-turning movement during the AM peak hour but there are acceptable gaps during the PM peak hour.

Sight Distance

At a design speed of 25 mph, the recommended intersection sight distance for passenger cars turning left onto Melrose Avenue is 280 feet, and for cars turning right is 240 feet. Research suggests that when making right turns, drivers generally accept gaps that are slightly shorter than those accepted when making left turns. [2]

Sight distance was measured at the intersection of Melrose Avenue and the proposed development access on June 15th, 2017. Visibility to the west of the intersection is unlimited, whereas visibility to the east of the intersection is also unlimited but visually cluttered. The utility pole on the southeast corner of the intersection and the railing on the bridge are objects motorists have to look past and through. As westbound vehicles reach the bridge on Melrose Avenue they should be continuously visible to motorists exiting the proposed development.

While visibility to the east should be adequate for motorists exiting the proposed driveway, staff recommends exploring the possibility of relocating the utility pole at the southwest corner of the bridge to further reduce clutter and improve visibility.

[1] The gap counts were collected when the University of Iowa and the Iowa City Community School District were not in session. The additional traffic volumes generated by these education facilities may decrease the availability of gaps of a particular size at this intersection.

[2] American Association of State Highway and Transportation Officials. (AASHTO) *Geometric Design of Highways and Streets.* (2004).

Collisions

Staff reviewed collision data on Melrose Avenue at the intersections with Olive Court and Evashevski Drive as these existing intersections should perform similarly to the proposed access (both are tee intersections where traffic would exit onto Melrose Avenue and experience very similar gaps in traffic). As shown in **Table 3,** there is not a significant safety concern at these intersections. Between 2012 and 2016 there have been two collisions at the intersection of Melrose Avenue and Olive Court and one collision at the intersection of Evashevski Drive and Melrose Avenue.

Table 3: Collision Analysis

Intersection Location	Type of Crash	Number of Collisions	Year
Olive Ct & Melrose Ave	Driving too fast for conditions	1	2012
	Animal	1	2013
Evashevski Dr & Melrose Ave	Lost Control	1	2012

Capacity Analysis

Using peak hour counts collected in 2016 and 2017, intersection capacity analysis was analyzed for the following intersections with Melrose Avenue:

1. **Koser Avenue** – signalized
2. **Olive Court** – stop controlled
3. **PUD Access** – stop controlled
4. **Evashevski Drive** – stop controlled
5. **Hawkins Drive** – signalized

Intersection capacity was analyzed using unsignalized and signalized intersection capacity analysis methods outlined in the latest edition of the *Highway Capacity Manual* (HCM) and using *Synchro* software. When using HCM methods, control delay is calculated as seconds of delay per vehicle (s/veh) and a corresponding level of service (LOS) is also shown. Level of service describes operating conditions based on a number of factors including speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. **Table 4** (*Synchro* Exhibit 17-2) displays the LOS with control delay ranges at unsignalized stop-controlled intersections. A LOS A represents the best operating conditions (free-flow movement) and LOS F represents the worst conditions, i.e. extreme congestion and stop-and-go conditions.

Table 4: Level of Service Criteria for Stop-Controlled Intersections

Level of Service	Average Control Delay (s/veh)
A	0 - 10
B	> 10 - 15
C	> 15 - 25
D	> 25 - 35
E	> 35 - 50
F	> 50

At signalized intersections, delay and LOS are calculated using the same methodology but the delay parameters are a little longer. Longer delays are acceptable at signalized intersections because the driver has longer delay expectancy than at unsignalized intersections. **Table 5** (*Synchro* Exhibit 16-2) displays the LOS with its control delay ranges at signalized intersections.

Table 5: Level of Service Criteria for Signalized Intersections

Level of Service	Average Control Delay (s/veh)
A	< 10
B	> 10 - 20
C	> 20 - 35
D	> 35 -55
E	> 55 - 80
F	> 80

1. Koser Avenue & Melrose Avenue

Table 6 exhibits average delays and LOS under existing and proposed conditions. This intersection currently performs well at LOS B during the AM and PM peak periods. The north and southbound movements experience the greatest delay, however these movements only make-up 13% of total vehicles at this intersection.

Under proposed conditions, accounting for the additional trips generated from the PUD, the intersection experiences a marginal increase in delay. Delay increases by 1.0 s/veh during the AM peak period for the eastbound through movement and approximately 2 s/veh for the westbound through movement during the PM peak period. The north and southbound movements are virtually unaffected by the proposed development.

Table 6: Koser Avenue & Melrose Avenue

Direction	Existing Conditions				Proposed Conditions with PUD Trips			
	Control Delay (s/veh)		LOS		Control Delay (s/veh)		LOS	
	AM	PM	AM	PM	AM	PM	AM	PM
Melrose Avenue								
Eastbound								
- Left	6.3	6.7	A	A	6.3	6.7	A	A
- Through	15.5	8.5	B	A	16.9	8.6	B	A
- Right	0.0	0.0	A	A	0.0	0.0	A	A
Westbound								
- Left	17.0	10.2	B	B	16.5	10.8	B	B
- Through	18.1	17.0	B	B	16.4	19.0	B	B
- Right	0.0	0.0	A	A	0.0	0.0	A	A
Koser Avenue								
Northbound								
- Left	0.0	0.0	A	A	0.0	0.0	A	A
- Through	29.5	28.8	C	C	29.5	28.8	C	C
- Right	0.0	0.0	A	A	0.0	0.0	A	A
Southbound								
- Left	28.2	28.3	C	C	28.2	28.3	C	C
- Through/Right	0.0	0.0	A	A	0.0	0.0	A	A
Intersection	17.9	15.0	B	B	18.3	16.3	B	B

2. Olive Court & Melrose Avenue

Under existing conditions, the Olive Court and Melrose Avenue intersection performs very well at LOS A as shown in **Table 7**. The northbound movement experiences the greatest delay during the AM peak period at LOS C. Approximately, 70% of vehicles at this intersection are traveling eastbound during the AM peak period, which makes it difficult for northbound vehicles to find a gap, which increases delay. It should be noted that northbound vehicles make-up less than 1% of total traffic at the intersection.

Under proposed conditions, the intersection continues to perform at LOS A during both peak periods. The northbound and westbound movements experience a minor increase in delay as a result of the proposed development, with northbound Olive Court experiencing an acceptable LOS D during the AM peak period.

Table 7: Olive Court & Melrose Avenue

Direction	Existing Conditions				Proposed Conditions with PUD Trips[3]			
	Control Delay (s/veh)		LOS		Control Delay (s/veh)		LOS	
	AM	PM	AM	PM	AM	PM	AM	PM
Melrose Avenue								
Eastbound								
- Right/Through	0.0	0.0	A	A	0.0	0.0	A	A
Westbound								
- Left/Through	0.2	0.1	A	A	12.0	8.2	B	A
Olive Court								
Northbound								
- Left/Right	24.6	15.4	C	C	28.1	16.0	D	C
Intersection	0.2	0.2	A	A	0.1	0.2	A	A

[3] A 100' westbound left-turn lane on Melrose Avenue at Olive Court was included in the analysis as shown in the University Heights - Melrose Avenue Streetscape Improvements Plan.

3. PUD Access & Melrose Avenue

As shown in **Table 8**, delay at the proposed PUD access at Melrose Avenue is the greatest for the northbound left-turning movement during both peak periods when LOS E is expected. Overall, the intersection remains at LOS A as the percentage of vehicles traveling northbound make-up less than 1% of total traffic at the intersection.

Table 8: PUD Access & Melrose Avenue

Direction	Proposed Conditions with PUD Trips			
	Control Delay (s/veh)		LOS	
	AM	PM	AM	PM
Melrose Avenue				
Eastbound	0.0	0.0	A	A
Westbound				
-Left	12.3	8.3	B	A
-Through	0.0	0.0	A	A
PUD Access				
Northbound				
-Left	43.1	38.7	E	E
-Right	20.7	10.5	C	B
Intersection	0.7	1.2	A	A

4. Evashevski Drive & Melrose Avenue

The intersection of Evashevski Drive and Melrose Avenue currently performs at LOS A during both peak periods however during the AM peak hour the southbound left-turning movement fails with 60.1 s/veh of delay as shown in **Table 9**.

Under proposed conditions, the additional trips generated from the PUD will not significantly increase delay at this intersection. During the AM peak period, the southbound left-turning movement continues to operate at LOS F with an increase in delay of approximately 6 seconds per vehicle.

Table 9: Evashevski Drive & Melrose Avenue

Direction	Existing Conditions				Proposed Conditions with PUD Trips			
	Control Delay (s/veh)		LOS		Control Delay (s/veh)		LOS	
	AM	PM	AM	PM	AM	PM	AM	PM
Melrose Avenue								
Eastbound								
- Left	9.6	10.1	A	B	9.7	10.4	A	B
- Through	0.0	0.0	A	A	0.0	0.0	A	A
Westbound								
- Right/Through	0.0	0.0	A	A	0.0	0.0	A	A
Evashevski Drive								
Southbound								
- Right	11.0	35.8	B	E	11.1	41.0	B	E
- Left	60.1	36.0	F	E	66.3	42.2	F	E
Intersection	2.7	8.6	A	A	2.7	9.6	A	A

5. Hawkins Drive & Melrose Avenue

Under existing conditions at Hawkins Drive and Melrose Avenue, the intersection performs at LOS B during the AM peak period and LOS C during the PM peak period as shown in **Table 10**. The southbound left-turning movement experiences the greatest delay with 35.4 s/veh at LOS D.

Under proposed conditions, the intersection experiences minimal increases in delay. The additional trips generated from the PUD do not significantly impact this intersection.

Table 10: Hawkins Drive & Melrose Avenue

Direction	Existing Conditions				Proposed Conditions with PUD Trips			
	Control Delay (s/veh)		LOS		Control Delay (s/veh)		LOS	
	AM	PM	AM	PM	AM	PM	AM	PM
Melrose Avenue								
Eastbound								
- Left	12.2	10.4	B	B	12.1	11.2	B	B
- Through	11.5	7.9	B	A	11.6	8.0	B	A
Westbound								
- Through	30.7	25.7	C	C	28.2	27.0	C	C
- Right	25.2	17.1	C	B	23.1	16.9	C	B
Hawkins Drive								
Southbound								
- Left	27.8	35.4	C	D	29.8	35.4	C	D
- Right	23.5	29.6	C	C	24.8	29.6	C	C
Intersection	19.8	23.3	B	C	19.6	23.6	B	C

Left-Turn Lane Queuing

SimTraffic was used in order to generate queue lengths for the eastbound left-turning movement at Evashevski Drive and Melrose Avenue; and the westbound left-turning movement at the PUD and Melrose Avenue. *SimTraffic* is a simulation program that actually "observes" the queues. The model simulates the vehicle and reports whenever a vehicle is travelling less than 10 ft/s and is behind a queue of vehicles. At the end of the period, *SimTraffic* determines the maximum queue, the average of 2 minute maximum queues, and the 95th percentile queue.[4]

As shown in **Table 11**, the queue lengths do not exceed the available storage length of the center left-turn lane between Evashevski and the proposed PUD access which was calculated at approximately 300 feet. The simulation also indicates that the 300' center turn lane would simultaneously accommodate both left-turn maximum queues.

[4] The 95th percentile queue is the maximum back of queue with 95th percentile traffic volumes.

Table 11: Queue Lengths

	Evashevski Dr & Melrose Ave		PUD & Melrose Ave	
	EB Left-Turn Lane		WB Left-Turn Lane	
	AM	PM	AM	PM
95th % Queue (feet)	116	51	31	68
Average Queue (feet)	82	23	12	14
Maximum Queue (feet)	132	55	37	59

Summary of Findings

- It is estimated that the proposed hotel with 140 guest rooms would generate 161 total new trips during the AM and PM peak periods.
- During the AM peak hour today, there is a less than ideal number of adequate gaps for northbound vehicles exiting the proposed PUD access; however collision data at adjacent (similarly performing) intersections indicates there may not be a significant safety issue as a result.
- During the PM peak hour today, there are an acceptable number of adequate gaps for northbound vehicles exiting the proposed PUD access.
- Visibility to the west and east of the intersection appears to be unlimited, although there are some objects to the east that cause "visual clutter". This should be rectified as the project develops to the extent possible.
- Under existing and proposed conditions, all intersections within the study area operate at LOS C or better.
- Under proposed conditions, northbound traffic exiting the PUD access is expected to perform at LOS E during both peak periods. A LOS E at peak periods is not uncommon for an access onto an arterial street.
- Under proposed conditions, the queue lengths for turning motorists at Evashevski Drive and the proposed PUD access will not exceed the available storage length of the shared center left-turn lane on Melrose Avenue.

Given these findings, staff does not expect the proposed development to have a detrimental effect on overall traffic operations in the study area, nor does it appear that traffic generated by the development will experience undue delays entering/exiting the property.