

Mr. Brad Cooley
City of Lee's Summit, MO
Public Works

Re: Colton's Crossing Traffic Study
Hg Consult Project Number: 21.018

Mr. Cooley,
The purpose of this memo is to document the amount of traffic generated by the Colton's Crossing development, located within Lee's Summit. The development is located on Hamblen Road and shown below in **Figure 1**.



Figure 1: Project Vicinity Map

Existing Conditions

Currently, Hamblen Road is classified as a minor arterial according to Lee's Summit Functional Classification map. It is a two-lane, paved roadway with open ditches and a posted speed limit

twenty-four (24) feet of pavement, as well as construct six-foot wide paved shoulders. These improvements are in accordance with the City’s unimproved road policy. Hook Road will also be constructed as the east-west arterial through the development. The preliminary plat also shows the intersection spacing between Hamblen Road and Hamblen Court is over 900’, which complies with the City’s spacing requirement of 660’ between intersections.

Other improvements constructed by this project include sidewalks throughout the public roadway system in accordance with City regulations. The project also includes the installation of over 5,000 feet of water line to provide the site with water. Additionally, the project has been coordinated with the adjacent landowner to the west and preserved 100’ of right-of-way for the future extension of Hook Road from Route 291.

Proposed Trip Generation

The amount of traffic generated by the proposed development has been calculated by the *Institute of Transportation Engineer’s, Trip Generation Manual, 11th Edition*. The amount of traffic expected to be generated by the proposed site for the typical weekday, am peak hour and pm peak hour is summarized in the table shown below.

Table 1 - Colton's Crossing Trip Generation						
Land Use	Number of Units	Weekday	AM Peak Hour		PM Peak Hour	
			Entering	Exiting	Entering	Exiting
Single Family Detached	135	1330	25	73	83	49
Single Family Attached (Duplex)	60	432	9	20	19	15
	TOTAL	1762	34	93	102	64

The table above shows that there will be approximately 127 trips generated in the AM peak hour, and 166 trips generated in the PM peak hour.

Trip distributions are assumed to estimate where traffic is coming from and going to help study the impacts to the area. The distributions attempted to replicate the existing traffic patterns, entering and exiting, for both the AM and PM peak hours. The section north of Hook Drive has 26% of the lots in the development so 26% of the entering and exiting vehicles were assumed to use these entrances with the remaining 74% using the entrances for the parcels south of Hook Drive. In the AM 63% of entering and exiting traffic comes is northbound while 64% of entering and exiting traffic comes is southbound in the PM peak hour.

Traffic Operations

Traffic was analyzed using Synchro traffic modeling software, the industry standard for intersections based on the Highway Capacity Manual. Synchro calculates several Measures of Effectiveness (MOEs) based on traffic volumes, lane configurations, and type of intersection control. Some of the more commonly used MOE's are Delay, Queue lengths, and Level of Service. Level of Service (LOS) is a qualitative measure used to relate the quality of traffic service. The HCM defines LOS for signalized and unsignalized intersections as a function of the average vehicle control delay. LOS ranges from A (unimpeded driving, no delays) to F (highly congested roads, high delays). The table below gives the average vehicle delay ranges for each Level of Service.

Level of Service (LOS)	Control Delay per Vehicle (sec.)	
	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

The existing conditions of Hamblen Road is a two-lane road with no intersections so this condition is not analyzed in Synchro. Below are the results for the Existing plus Proposed Development traffic for the AM and PM peak hours. In all tables, Delay is the average control delay per vehicle and listed in seconds. (U) denotes an unsignalized intersection.

Existing + Build AM - Avg. Delay/LOS				
	NB	SB	EB	WB
Baxter Ln/Hamblen Rd (U)	0/A	0/A	9/A	-
Colton's Dr/Hook Rd (U)	8/A	9/A	0/A	5/A
Hamblen Rd/Hook Rd (U)	-	9/A	5/A	0/A
Dustin Dr/Hook Rd (U)	9/A	9/A	7/A	1/A

Existing + Build PM - Avg. Delay/LOS				
	NB	SB	EB	WB
Baxter Ln/Hamblen Rd (U)	1/A	0/A	9/A	-
Colton's Dr/Hook Rd (U)	8/A	9/A	0/A	6/A
Hamblen Rd/Hook Rd (U)	-	9/A	3/A	0/A
Dustin Dr/Hook Rd (U)	10/A	10/A	1/A	2/A

In the Existing plus Build scenarios, all intersections are expected to operate at LOS A for both the AM and PM peak hours.

Access Management Compliance

In review of the City's access management regulations, the project will construct Hook Road, which will provide a ½-roadway section for a future major arterial roadway. Per the Access Management Code, a right-turn lane is warranted at Hook Road and Hamblen for the west-bound to north-bound movement because the turning volumes are above the threshold established in the Access Management Code. The Access Management Code requires left turn lanes be constructed on all arterial roadways at intersections with other roads where turning traffic is twenty (20) vehicles in an hour, as well as arterial-to-arterial connections. The left-turn lane shall be 250-feet long plus taper. This requirement indicates that left turn lanes need to be constructed for eastbound traffic on Hook Road at the intersection of Hamblen Road, and eastbound and westbound left-turn lanes at the intersection of Hook Road with Hamblen Court/Dustin Drive. An eastbound/westbound left-turn lane at the intersection of Hook Road and Coltons Crossing Drive is not currently needed. This is due to Hook Road terminating at the western project terminus, therefore there is no conflicting traffic for these movements. When Hook Road is extended west of the project limits, these turn lanes will be required.

In addition, the roadway intersections exceed the City's spacing requirement of 660'. Pedestrian connectivity is provided throughout the development. All roadway connections have adequate throat length and will comply with the City's regulations pertaining to roadway spacing and design.

Unimproved Road Policy

The project will also make improvements to Hamblen Road. The current condition of Hamblen Road is a 20-foot wide travel-way. The project will widen Hamblen Road by four feet to provide 24-feet of travel-way and also construct six-foot wide, paved shoulders. The limits of these improvements will be from Thompson Drive to the development (intersection with Hook Road). These improvements and limits were discussed with City staff and conform to the Unimproved Road Policy. A left-turn lane will also be required at the intersection of Hamblen Road and Hook Road because of the arterial-arterial connection. The cross-section is acceptable because of the expected traffic volumes on Hamblen Road are expected to reach the volumes required for a full urban standard of 11,000 vehicles per day.

Future-Year Traffic Analysis and Considerations

Most of the adjacent land parcels to this development are currently undeveloped. Knowing that they may develop in the future means that the roadway network will need to accommodate this future traffic.

Traffic growth of existing traffic assumed to be 2% for 20 years was calculated for future conditions. Higher developed areas may experience lower growth while more undeveloped areas may experience higher growth rates. Given the nature of Hamblen Road with the tight “S” curve around the at-grade railroad crossing to the north, and the “T” intersection to the residential Gambrell Street to the south a fairly moderate growth rate was assumed. The Synchro results for this scenario are shown in the tables below.

Build 2042 AM - Avg. Delay/LOS				
	NB	SB	EB	WB
Baxter Ln/Hamblen Rd (U)	0/A	0/A	9/A	-
Colton's Dr/Hook Rd (U)	8/A	9/A	0/A	5/A
Hamblen Rd/Hook Rd (U)	-	9/A	5/A	0/A
Dustin Dr/Hook Rd (U)	10/A	0/A	7/A	1/A

Build 2042 PM - Avg. Delay/LOS				
	NB	SB	EB	WB
Baxter Ln/Hamblen Rd (U)	1/A	0/A	10/A	-
Colton's Dr/Hook Rd (U)	8/A	9/A	0/A	6/A
Hamblen Rd/Hook Rd (U)	-	10/B	3/A	0/A
Dustin Dr/Hook Rd (U)	10/A	0/A	6/A	2/A

Additionally, the long-range plan for Hook Road is to connect from the east, cross the railroad tracks, extend to Ranson Road, and then extend to the west to the Route 291 Outer Road which connects directionally to north Route 291. This scenario can be seen to attract more traffic long-term than Hamblen Road. Hamblen Road 2042 volumes were approximately quadrupled to assume traffic volumes for Hook Road, directional to be westbound in the AM and eastbound in the PM. The Interim conditions are for two lanes on Hook Road while the Ultimate plan is for it to be four lanes. Results of the two-lane Interim scenarios are in the tables below.

Build 2042 Interim Hook AM - Avg. Delay/LOS				
	NB	SB	EB	WB
Baxter Ln/Hamblen Rd (U)	0/A	0/A	9/A	-
Colton's Dr/Hook Rd (U)	9/A	13/B	0/A	5/A
Hamblen Rd/Hook Rd (U)	-	13/B	1/A	0/A
Dustin Dr/Hook Rd (U)	13/B	12/B	0/A	0/A

Build 2042 Interim Hook PM - Avg. Delay/LOS				
	NB	SB	EB	WB
Baxter Ln/Hamblen Rd (U)	1/A	0/A	10/A	-
Colton's Dr/Hook Rd (U)	10/B	16/C	0/A	1/A
Hamblen Rd/Hook Rd (U)	-	18/C	0/A	0/A
Dustin Dr/Hook Rd (U)	22/C	0/A	9/A	1/A

Even in the two-lane section of Hook Road, the roadway network is expected to operate at LOS C or better in the PM Peak periods. As other parcels of land are developed, improvements will be made to the adjacent roadway network. The roadway network constructed and improved by this project will be able to meet the needs of the foreseeable future traffic demand.

Lee's Summit Thoroughfare Master Plan Review

In review of the current TFMP, Exhibit 2, it shows Doc Henry Road as a 4 lane North-South arterial extending from M-150 to the proposed alignment of an East-West arterial, Hook Road. The majority of the Doc Henry alignment is located outside of the Lee's Summit city limits in the City of Greenwood. This alignment had been discussed during the preliminary development design within a previous project, Cobey Creek, and determined to be a less than a desirable alignment due to Greenwood's building of a portion of the road with a 3-lane section of road with no consideration of width expansion and their intention of the road being built no further than Gambrell Road, due to the topography further north of Gambrell Road being in the floodway.

Per the Cobey Creek project, the future north-south arterial has been shown to be approximately 1400 feet west of Doc Henry Road with a 4-lane road through a 4 legged round-a-bout and potentially being extended north from that location. Based on this alternate arterial alignment, no consideration for the extension of Doc Henry Road into the Colton's Crossing project has been made. Additionally, with consideration of the Greenway Master Plan, a future 100' right-of-way width would be adequate to provide a four-lane roadway, plus median, and a sidewalk on one side of the roadway and a shared-use path on the other.

With consideration of Hook Road with regards to the TFMP, the existing alignment shown in the TFMP did not take into consideration current topography and floodway/floodplain limits. The alignment of Hook Road was designed with these constraints in consideration. It is proposed that Hook Road will be the 1/2-section of a future major arterial. The intersection spacing along Hook Road meets the spacing requirements set forth in the Access Management Code.

Conclusions and Recommendations

The following conclusions and recommendations are made regarding the Colton's Crossing Development and the impacts to the local roadway system.

- Existing Hamblen Road currently carries approximately 1,000 vehicles per day.
- The proposed development will generate 127 AM peak hour trips, and 186 PM peak hour trips.
- This project will improve Hamblen Road from the intersection of Hook Drive to the intersection of Thompson Drive, a distance of approximately 2,800 feet. The improvements include widening Hamblen Road by four feet to provide 24-feet of travel way, and the construction of six-foot wide, paved shoulders. These improvements conform with the Unimproved Roadway Policy. A southbound left-turn lane from Hamblen Road to Hook Road is required per the AMC (arterial-to-arterial connection). The left-turn lane should be 250-feet long plus taper.
- This project will construct Hook Drive, which will provide a ½-roadway section for an arterial roadway and connecting intersections will exceed the City's intersection spacing requirement of 660'.
- A right-turn lane from westbound Hook Road to northbound Hamblen Road is required due to the proposed turning volumes. The right-turn lane should be 250-feet long plus a taper per the AMC.
- Left-turn lanes are required by the AMC on all connections with arterial streets. Based on this requirement, left-turn lanes are required at the Hook Road/Hamblen Road and Hook Road/Hamblen Court intersections. The turn lanes should be 250-feet long plus taper per the Access Management Code.
- Eastbound and westbound Left-turn lanes at Hook Road/Coltons Drive will be required once Hook Road is expanded to the west of the project but are not required with this project.
- The development will construct new sidewalk along Hook Drive and throughout the development which will provide facilities for a walkable environment.

- Given the low volume of existing roadway traffic and the trips generated by this development, stop controlled intersections will operate adequately after the development is constructed and into the foreseeable future.

Please let me know if you have any questions regarding this memo.

Sincerely,
Nathan Hladky
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Hg Consult, Inc.

