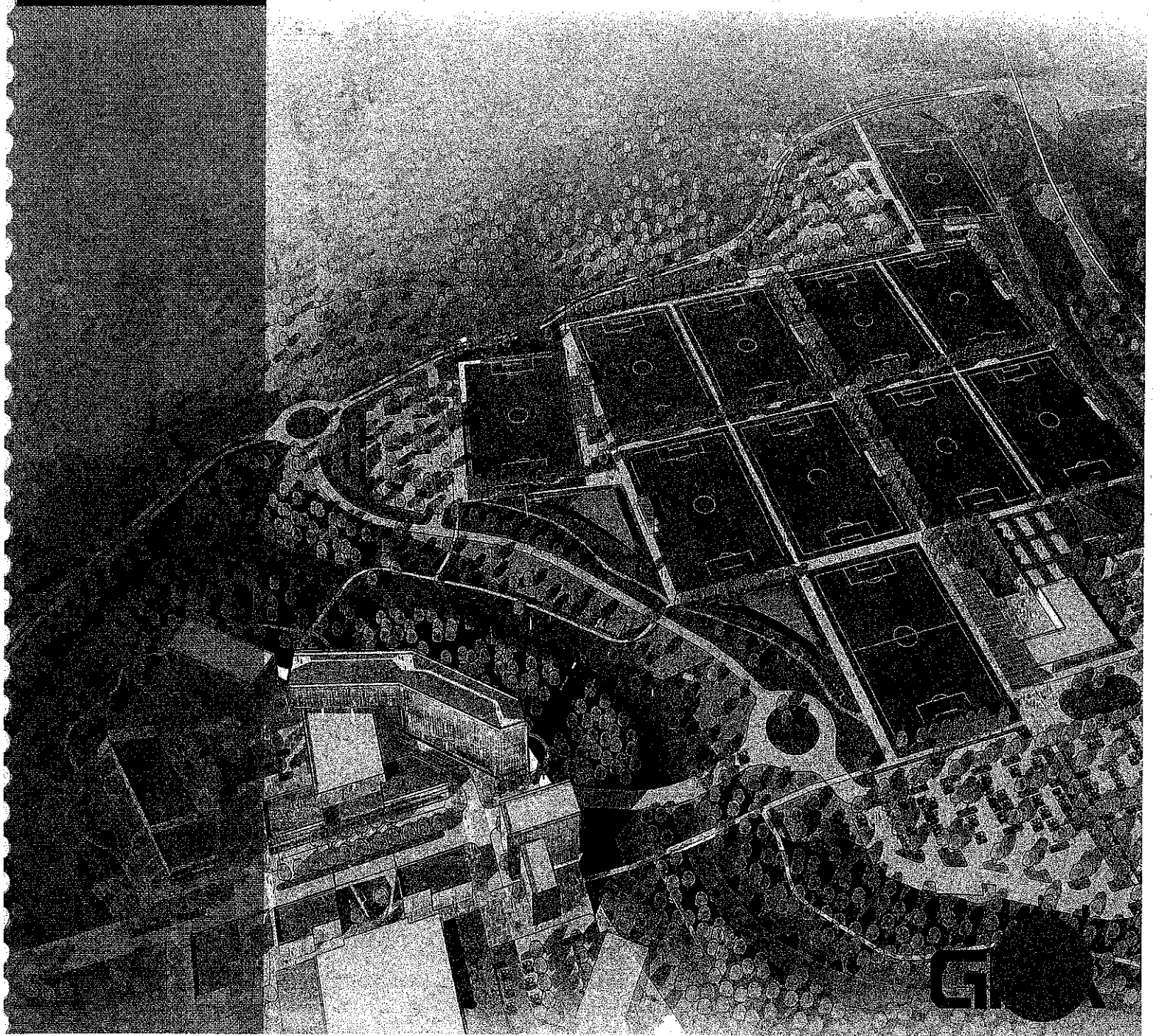


Paragon Star Development Traffic Impact Study Report

Lee's Summit, Missouri

July 11, 2016



TRAFFIC IMPACT STUDY REPORT
Proposed Paragon Star Development
I-470 & View High Drive (Lee's Summit, Missouri)
Submitted on July 11, 2016

Project: Paragon Star is a proposed mixed-use development, combining a sports complex with a variety of commercial, retail, and residential land uses located within an adjacent mixed-use urban "village." The proposed Paragon Star development specifically supported by this traffic impact study represents only the 120-acre Redevelopment Project Area 1 (i.e., RPA 1) described in the Tax Increment Financing (TIF) Plan that has been previously approved by the City of Lee's Summit. The proposed site plan for the Paragon Star development is illustrated on the attached *Exhibit 1*.

For the purposes of this traffic impact study, the proposed Paragon Star development has been considered in two separate phases of construction. Phase 1 of the proposed development would include: a soccer complex with 10 playing fields and a 20,000-square foot clubhouse; a 120-room hotel; 80,000 square feet of retail space; 90,000 square feet of office space; and 220 multi-family / apartment dwelling units. The future full build-out of the proposed development would also include: 4 additional soccer fields and a 120,000-square foot indoor recreational center; another 120-room hotel plus 30,000 square feet of adjacent conference center space; an additional 50,000 square feet of retail space; an additional 50,000 square feet of office space; and another 220 multi-family / apartment dwelling units.

Location: The proposed Paragon Star RPA 1 development area would be located within the northeast quadrant of the existing Interstate-470 (i.e., I-470) interchange with View High Drive, as depicted on *Exhibit 1*.

Description: This traffic impact study has evaluated the existing traffic conditions within the vicinity of the proposed Paragon Star development site during the typical weekday commuter peak hours, as well as during the Saturday mid-day peak hour. The study area for this traffic impact study has been based upon direction received from City public works staff, and generally includes the View High Drive corridor from Chipman Road northward through the I-470 interchange and to the Lee's Summit / Kansas City boundary. As required by the City process, this traffic impact study has also included an evaluation of the expected traffic impacts associated with several previously approved and/or currently planned developments located generally in the vicinity of the New Longview developments. In addition, the expected traffic impacts of the proposed Paragon Star mixed-use development area for both its planned Phase 1 and full build-out levels have also been determined during this study. At the direction of City staff, no future traffic volume scenarios were analyzed during this traffic study due to the uncertainty regarding the timing of the future Paragon Star development or other improvements along the I-470 corridor.

EXISTING CONDITIONS

Existing Land Uses: The proposed 120-acre Paragon Star development site is currently vacant, covered by grasslands and woodlands. The Little Blue River crosses through a multiple-cell box culvert under View High Drive just to the north of the I-470 interchange, and the river floodway meanders throughout the development site as shown on *Exhibit 1*. The proposed development site is currently zoned with a combination of agricultural (AG) and commercial (CP-2) zoning. However, the rezoning and preliminary development plan application for this Paragon Star RPA 1 site requests a change in zoning to a Planned

Mixed-Use District (PMIX) for the entire property. It should also be noted that several properties included within the proposed Paragon Star development site are owned by the City of Lee's Summit and Jackson County.

The adjacent land uses surrounding the proposed Paragon Star development are either residential or low-intensity commercial uses in nature. Along the west side of View High Drive between the I-470 interchange and Chipman Road, the existing land uses include a greenhouse / nursery facility, an electrical substation, the Life Church of Kansas City, and several single-family residential dwellings. Along the eastern side of this roadway segment, a large vacant property is located in the southeastern quadrant of the I-470 / View High Drive interchange that will be developed in the future as Paragon Star's Redevelopment Project Area 2 (i.e., RPA 2). To the south of this vacant property, the land uses southward to Chipman Road are all single-family residential subdivisions and estates. To the north of the I-470 interchange, most of the adjacent property is also vacant and covered with grasslands and woodlands. The nearest adjacent land uses to the proposed Paragon Star development area are the New Birth Christian Center on the east side of View High Drive and the World Revival Church on the west / south side of the roadway. Beyond these church properties, single-family and multi-family residential uses abut the existing View High Drive corridor into Kansas City.

Existing Street Network and Traffic Controls: The proposed Paragon Star mixed-use development is generally bounded by I-470 on the south, View High Drive on the west, and the former Rock Island railroad line on the east. To the south of I-470, View High Drive generally provides a four-lane, divided arterial roadway cross-section with a posted speed limit of 40 miles per hour (mph). Within the north-south segment of View High Drive between I-470 and Chipman Road, there are also two minor, stop sign-controlled intersections with Meers Road and Old View High Drive that were considered during this traffic impact study. To the south of the unsignalized Chipman Road intersection, the speed limit on View High Drive increases to 45 mph.

Chipman Road is currently a two-lane, undivided east-west roadway located about one-half mile south of the I-470 corridor that is also classified as an arterial on the City's "Thoroughfare Master Plan." The posted speed limit on Chipman Road is currently 35 mph. The City's master plan also identifies Chipman Road as a "deficient roadway" in need of future widening from View High Drive, across the narrow bridge crossing located about one-half mile to the east, to the NW Bent Tree Drive intersection. The westbound approach of Chipman Road is currently controlled by a stop sign at its intersection with View High Drive.

A tight diamond configuration is currently provided for the I-470 interchange with View High Drive. The unsignalized ramp terminal intersections within this tight diamond interchange are spaced approximately 450 feet apart, measured center to center of intersection. Under the I-470 interchange bridges, a total of four travel lanes are currently provided on View High Drive. In both the northbound and southbound directions on View High Drive, an exclusive left-turn lane and a single through lane are currently provided at each respective ramp terminal intersection.

To the north of the I-470 interchange area, View High Drive generally provides only a two-lane, undivided roadway cross-section. The posted speed limit on this segment of the arterial roadway is 35 mph. The primary access connection to the proposed Paragon Star development will be provided onto this segment of View High Drive. Currently, a horizontal curve along the View High Drive alignment may somewhat limit the available sight distances near the location of the proposed access street connection into the development. However, in conjunction with the proposed Paragon Star development project, this segment of View High Road will be realigned

and widened to provide a median-divided, four-lane cross-section to the north of the I-470 interchange. In addition, a multi-lane roundabout is proposed to create a four-legged intersection, with the southern and western legs of existing View High Drive aligning with the proposed Paragon Parkway and View High Parkway legs to the east and north, respectively. The realigned roadway and roundabout configurations should be designed to ensure that adequate sight distances are provided at this access intersection. In addition, the sight distance conditions should be improved due to the reduced vehicle speeds that will be associated with circulating through the roundabout intersection.

Existing Peak Hour Traffic Volumes: Peak period intersection turning movement counts at the primary study intersections along the View High Drive corridor were obtained by GBA personnel. The area-wide turning movement counts were performed during both the morning and evening commuter peak periods for a typical weekday on Thursday, November 19, 2015, prior to the Thanksgiving holiday. Intersection turning movement data was collected between 6:45 a.m. and 8:15 a.m. during the morning peak period, and from 4:45 p.m. to 6:15 p.m. during the evening peak period. Likewise, traffic counts were performed during a typical Saturday mid-day peak period between 11:30 a.m. and 1:15 p.m. on November 14, 2015.

It should be noted that all of the study intersections were previously counted in November 2012 in anticipation of this proposed development project. Due to the project delays experienced in the interim, the intersection of View High Drive with Chipman Road and the two I-470 ramp terminals were re-counted in November 2015 as described above. The minor intersections of Meers Road and Old View High Drive were not re-counted. Instead, the 2015 counts at the three primary intersections within the I-470 interchange and at Chipman Road were balanced along the View High Drive study corridor with the 2012 peak hour turning movements at these two minor intersections.

Based upon these completed traffic counts, the area-wide morning peak hour at the study intersections was determined to occur between 7:00 a.m. and 8:00 a.m. Likewise, the critical evening peak hour within the study area was determined to occur between 5:00 p.m. and 6:00 p.m. Finally, the critical Saturday mid-day peak hour was found to be from 11:30 a.m. to 12:30 p.m. The critical morning, evening, and Saturday mid-day peak hour turning movements at the study intersections within the vicinity of the proposed Paragon Star mixed-use development are depicted on the attached **Figures 1, 2, and 3**, respectively. It should be noted that the first number shown for each individual vehicle movement on these figures represents the total traffic volume observed during the respective peak hour, while the number shown in parenthesis indicates the number of heavy vehicles observed within each particular vehicle movement.

PROPOSED CONDITIONS

Proposed Land Uses: The proposed Paragon Star RPA 1 site would be a Planned Mixed-use District (PMIX) development, combining a large sports complex with a variety of commercial, retail, and residential land uses located within an adjacent mixed-use urban "village." Phase 1 of the proposed development would include: a soccer complex with 10 playing fields and a 20,000-square foot clubhouse; a 120-room hotel; 80,000 square feet of retail space; 90,000 square feet of office space; and 220 multi-family / apartment dwelling units.

The future full build-out of the proposed Paragon Star RPA 1 development site would also include: 4 additional soccer fields and a 120,000-square foot indoor recreational center; another 120-room hotel plus 30,000 square feet of adjacent conference center space; an additional

50,000 square feet of retail space; an additional 50,000 square feet of office space; and another 220 multi-family / apartment dwelling units. Much of this additional land use program would be accommodated through the replacement of surface parking lots constructed during Phase 1 with structured parking facilities in the ultimate configuration. However, it should be noted that the particular details and internal layout of this planned urban "village" are still under development, and were not specifically evaluated during this traffic impact study.

Proposed Access Plan: As described previously, the primary access to the proposed Paragon Star mixed-use development will be provided by a street connection via Paragon Parkway at a multi-lane roundabout intersection onto the improved segment of View High Drive north of the I-470 interchange. This proposed roundabout intersection would be located approximately 950 feet, measured center to center of intersection, to the north of the existing westbound I-470 ramp terminal intersection.

From this primary roundabout intersection, a median-divided, four-lane extension of View High Parkway will be provided to the north / east to serve the northern portions of the Paragon Star soccer complex. A secondary multi-lane roundabout intersection of View High Parkway with River Road is proposed to be located about 1,350 feet to the northeast of the primary roundabout intersection. It should be noted that future thoroughfare plans for Kansas City indicate a further extension of this parkway to intersect Bannister Road either north of this roundabout location or to the northeast toward the existing 98th Street / Norfleet Avenue intersection.

In addition, a secondary access is currently planned from View High Drive into the southern parking areas of the urban "village" within the Paragon Star development site. Based on preliminary discussions with City and MoDOT staffs, this intersection has been restricted to serve only right-in, right-out (i.e., RIRO) traffic movements for the purposes of this traffic study. This RIRO driveway would be located about 300 feet, center to center, north of the westbound I-470 ramp terminal intersection. The driveway is currently proposed to be located as far north as possible away from the interchange area, while remaining on the south side of the Little Blue River box culvert crossing. This RIRO driveway would be located farther north than the existing access drive that currently serves the development property, which is already located outside of MoDOT's current limit of controlled access according to available property records.

There are currently no existing access driveways or street connections that align with the proposed access points that will serve the Paragon Star development. Therefore, there should be no detrimental impacts on the existing access conditions that serve the adjacent developments in the vicinity of this project.

Trip Generation: Estimates of the expected trip generation for the proposed Paragon Star mixed-use development were based upon the information provided in the latest edition (i.e., 9th ed.) of the Institute of Transportation Engineers' (ITE) "*Trip Generation Manual*." It should be noted that supplemental trip generation information previously obtained from the Overland Park soccer complex was also considered during this trip generation process. It was determined that the 10 soccer fields proposed during Phase 1 could potentially host up to 15 simultaneous games, based upon typical field operations to accommodate various player age groups. Likewise, with 14 soccer fields ultimately provided by the full build-out condition, a total of 21 simultaneous games could potentially occur. Therefore, these proposed trip generation estimates include additional trips to account for the typical soccer complex operations. It was determined that this methodology for estimating the trip generation for the proposed soccer complex land use correlated very well with the actual on-site traffic data obtained at the local Overland Park soccer complex.

The attached **Table 1** depicts the anticipated weekday, morning peak hour, and evening peak hour trip generation estimates for both the proposed Phase 1 and planned full-build development programs, based upon the available ITE trip generation data for each respective land use type. Likewise, **Table 1** also depicts the expected daily trip generation estimate on a typical Saturday, as well as during the Saturday mid-day peak hour.

As shown in **Table 1**, Phase 1 of the proposed Paragon Star mixed-use development would be expected to generate approximately 550 and 1,230 total trips, respectively, during the critical morning and evening weekday commuter peak hours. During the morning peak hour, the site would be expected to generate 336 inbound trips and 209 outbound trips. A total of 610 inbound trips and 617 outbound trips would be expected in association with the Phase 1 development during the evening peak hour. Likewise, the Phase 1 development would be expected to generate nearly 1,500 total peak hour trips during the Saturday mid-day peak hour, with 760 inbound trips and 733 outbound trips estimated.

The full build-out of the proposed Paragon Star mixed-use development would be expected to generate approximately 1,100 and 2,100 total trips, respectively, during the critical morning and evening commuter peak hours, as shown in **Table 1**. During the morning peak hour, the site would be expected to generate 654 inbound trips and 435 outbound trips. A total of 1,062 inbound trips and 1,047 outbound trips would be expected in association with the full development of Paragon Star during the evening peak hour. Likewise, the full-build development would be expected to generate over 2,300 total peak hour trips during the Saturday mid-day peak hour, with 1,185 inbound trips and 1,135 outbound trips expected.

Trip Distribution: Estimates of the expected trip distribution patterns throughout the study area considered the existing street network and the current traffic patterns. However, given the regional nature of the proposed Paragon Star development and the expected draw of visitors to its soccer complex from outside of the Kansas City metropolitan area, more emphasis was placed on the available interstate access to the site over the local connectivity of View High Drive to adjacent development areas both north and south of the site. Based upon these travel pattern considerations, the following trip distribution pattern was developed and utilized to assign the development-related traffic to the surrounding roadway network:

To / from the north via View High Drive	10%
To / from the east via I-470	35%
To / from the south via View High Drive	10%
To / from the west via I-470	45%

With this expected trip distribution pattern and the location of the proposed Paragon Star mixed-use development site, a total of 90 percent of the site-generated traffic volumes would ultimately be expected to pass through the I-470 interchange with View High Drive during the critical peak hours. The remaining 10 percent of the development-related traffic would be expected to arrive and/or depart via View High Drive to the north / west of the site.

It should be noted that the respective access drive turning movements were based upon the locations of the planned land uses within the development site and their weighted contributions to the overall trip generation estimates. The planned RIRO drive was assumed to serve about 15 percent of the inbound trips to the Paragon Star development, but only about 5 percent of the outbound traffic volume. Approximately 10 percent of the inbound and outbound trips were assumed to access the development site via the secondary roundabout intersection of View High Parkway with River Road. The remainder of the site-generated traffic volumes would be expected to utilize the primary roundabout access intersection of Paragon Parkway with View

High Drive / Parkway for ingress and egress. For the purposes of this study, no site-generated trips have been assigned to any future parkway extension north / northeast from the site due to the uncertainty associated with Kansas City's plans.

Approved Traffic Volumes: As required by the City's traffic impact study process, this traffic study has also included an evaluation of the expected traffic impacts associated with several previously approved and/or currently planned developments located generally in the vicinity of the New Longview developments. Traffic impacts along the View High Drive study corridor from the following previously approved developments were considered in this study: unbuilt New Longview commercial uses; unbuilt Residences at New Longview apartments; the Winterset Valley (10th Plat) single-family subdivision; the Goddard School daycare facility; the Kessler Ridge single-family subdivision; and the Autumn Leaves memory care facility. This traffic study has also included additional traffic from another mixed-use development that is currently planned to be located in the vicinity of Third Street with View High Drive / Longview Boulevard.

City staff provided GBA with the previously approved traffic impact studies and trip generation data that were used to determine the additional traffic volumes expected to travel along the View High Drive study corridor during the critical weekday peak hours. In addition, GBA personnel prepared a supplementary estimate of the expected trip generation from these previously approved or currently planned developments, in order to estimate the anticipated traffic volumes along the study corridor during the Saturday mid-day peak hour. As a result of these calculations, the following approved plus planned traffic volumes were determined to also travel the View High Drive study corridor for the purposes of this traffic study:

	Southbound on View High Drive	Northbound on View High Drive	Total Two-Way Traffic on View High Drive
Weekday Morning Peak Hour	246 vph	328 vph	574 vph
Weekday Evening Peak Hour	583 vph	517 vph	1,100 vph
Saturday Mid-day Peak Hour	545 vph	442 vph	987 vph

The volumes in this table represent the additional approved plus planned traffic volumes that were assigned along the View High Drive study corridor to the north of the Chipman Road intersection. Within the I-470 interchange area, these additional traffic volumes were then proportioned through the ramp terminal intersections based upon the current distribution patterns exhibited during each of the respective peak hours counted by GBA personnel. In addition to the approved plus planned morning and evening turning movements specified by the third-party consultant for the currently planned mixed-use development, GBA also utilized a 90% / 10% distribution pattern in order to determine the expected approved plus planned turning movements at the Chipman Road intersection during the Saturday mid-day peak hour.

Traffic Assignments: The approved plus planned traffic volumes listed in the table and described above were then combined with the existing turning movement counts during each respective peak hour in order to obtain the resulting traffic volumes for the "existing plus approved" traffic scenario that are depicted on the attached **Figures 4, 5, and 6**, respectively. It should be noted that the first number shown for each individual vehicle movement on these figures represents the total traffic volume expected during the respective peak hour, while the number shown in parenthesis indicates the amount of "approved plus planned" traffic that is estimated within each particular vehicle movement.

The previously described trip generation estimates and trip distribution patterns for the proposed Paragon Star development were utilized to assign the site-generated trips attributed to the Phase 1 and the full build-out scenarios to the study intersections and the surrounding street network. The attached **Figures 7, 8, and 9** depict the resulting traffic volume assignments for the "existing plus approved plus Phase 1 site" traffic scenario during the morning and evening commuter peak hours and the Saturday mid-day peak hour, respectively. **Figures 10, 11, and 12** depict the respective peak hour design traffic volumes for the proposed Paragon Star development's full build-out scenario. It should be noted that the first number shown for each individual vehicle movement on these figures represents the total traffic volume expected during the respective peak hour, while the number shown in parenthesis indicates the amount of "approved plus planned" traffic that is estimated within each particular vehicle movement. The final number shown in brackets indicates the amount of site-generated traffic from the Paragon Star mixed-use development that is estimated within each particular vehicle movement.

CAPACITY ANALYSES

Intersection Analyses: A series of volume / capacity analyses were performed for each respective traffic volume scenario at the study intersections utilizing Version 8.0 of the Trafficware Synchro / SimTraffic software package. For the capacity analyses of the proposed roundabout intersections, version 7.0 Plus of the SIDRA software was used. The resulting Synchro and/or SIDRA Levels of Service (LOS) for the overall study intersections, as well as LOS and 95th-percentile queuing for individual lane groups, are shown on the attached **Figures 13 through 24**. A description of the "Highway Capacity Manual" LOS criteria used in these analyses for both signalized and unsignalized / roundabout traffic control conditions is provided on the attached **Exhibit A**.

The completed capacity analyses for any signalized traffic control options utilized the optimized traffic signal timing cycles, splits, and offsets from the Synchro software in order to provide the optimal overall intersection and/or interchange performances, even with the increased traffic volumes for each traffic scenario resulting from either the development-related trip generation and the approved plus planned background growth.

In general, this traffic study has determined the additional lane requirements, traffic control needs, and optimal traffic signal operations to improve movement capacities and provide acceptable Levels of Service at the study intersections. As will be further described in the following sections of this report, the potential reconfiguration of the I-470 / View High Drive interchange will likely also be required in order to adequately serve the anticipated design traffic volumes. These interchange configuration alternatives will be detailed in the following sections as well.

Existing Conditions: The results of the completed capacity analyses for the existing traffic volumes, lane configurations, and traffic control conditions are shown on the attached **Figures 13, 14, and 15** for the morning and evening weekday peak hours and the Saturday mid-day peak hour, respectively. Most individual vehicle movements at the study intersections are indicated to operate at LOS "D" or better during the critical peak hours. As shown on **Figure 13**, the westbound left-turn movement from I-470 onto southbound View High Drive is currently indicated to operate at a LOS "F" with an expected queue of about 750 feet in length during the morning peak hour. This failing operation can be attributed to the extremely heavy northbound left-turn within the interchange from View High Drive onto westbound I-470 that limits the turning opportunities for these off-ramp vehicles.

The attached **Tables 2 and 3** depict the MUTCD traffic signal warrant evaluations for the existing traffic conditions at the I-470 ramp terminal intersections. As shown on **Table 2**, it was determined that the peak hour traffic warrant (i.e., Warrant 3) would not be satisfied at the westbound off-ramp, even during the failing morning peak hour condition. However, a traffic signal would be warranted at the eastbound ramp terminal intersection based on the extremely heavy off-ramp traffic volumes during the evening peak hour, as shown on **Table 3**.

As a combined result of the completed capacity analyses and signal warrant evaluations, a signalized "system" option is also depicted on **Figures 13, 14, and 15** that provides improved operations within the existing tight diamond interchange. Due to the limited number of travel lanes available on View High Drive under the I-470 bridges, shared left-turn / through lane configurations will be required to accommodate the significant turning movements within this interchange. A dual left-turn lane approach would actually be required for the northbound movements at the westbound ramp terminal intersection. These types of shared lane configurations would require "split" phasing and coordinated signal operations to provide the optimal results, so this option includes a system of two interconnected traffic signals to control the overall interchange. With these proposed traffic signalization improvements, the ramp terminal intersections would be expected to operate at overall LOS "C" or better during all of the critical peak hours. Most individual movements would be expected to operate at LOS "D" or better, although the westbound left-turn movement would still be expected to operate at LOS "E" during its critical morning peak hour.

Existing + Approved Conditions: The results of the completed capacity analyses for the "existing plus approved" traffic volume conditions are shown on the attached **Figures 16, 17, and 18** for the morning and evening weekday peak hours and the Saturday mid-day peak hour, respectively. Likewise, the MUTCD traffic signal warrant evaluations shown on **Tables 4, 5, and 6** indicate that traffic signals would be warranted at both of the I-470 interchange ramp terminals and at the intersection of View High Drive with Chipman Road under this traffic volume condition, prior to the addition of any site-generated traffic volumes from the proposed Paragon Star mixed-use development.

As shown on the figures, the signalized tight diamond interchange alternative would be expected to provide overall LOS "C" operations within the interchange during all critical peak hours. The morning peak hour would remain the critical time frame during which the heavy northbound View High Drive to westbound I-470 left-turn movement would need to be accommodated. As shown on **Figure 16**, although the northbound left-turn queues are indicated to be contained within the available 360 feet of vehicle storage between the tight diamond ramp terminals, an additional northbound vehicle queue over 400 feet in length would be expected south of the interchange area. Additionally, the analysis results indicate that vehicle queues between 200 and 450 feet in length can be expected on the westbound off-ramp during the critical peak hour conditions.

Since these types of operational concerns are indicated during this "existing plus approved" traffic condition, prior to the addition of any traffic from the proposed Paragon Star mixed-use development, it is likely that more substantial interchange improvements will be needed to accommodate the previously approved projects and the proposed development, as well as provide the necessary reserve capacity to allow future development and traffic growth within the area.

Therefore, the LOS figures for this traffic volume scenario also include the operational results for other alternatives that would represent more significant reconfigurations of the interchange itself, but would not require the reconstruction of the existing I-470 bridges over View High

Drive. The first improvement option would be to replace both of the existing ramp terminal intersections with multi-lane roundabout configurations. Based on GBA's conceptual layouts of this roundabout option, approximately 380 feet of storage would be provided between these roundabout intersections, measured stop bar to stop bar. As shown on the LOS figures, the dual roundabout interchange configuration would be expected to operate at overall LOS "B" during all critical peak hours, and all individual movements would also be expected to operate at LOS "B" or better with acceptable queuing. The multi-lane roundabouts would provide for dual entry on any approaches needing the extra capacity. Only one additional bypass lane would be required to serve the heavy eastbound I-470 to southbound View High Drive off-ramp movement during the evening peak hour condition.

Another improvement option that could be considered is the reconfiguration of the existing tight diamond into a diverging diamond interchange (DDI). Conceptual layouts of this DDI alternative indicate that approximately 525 feet of vehicle storage would be available between the stop bars at the signalized cross-over intersections. As shown on the LOS figures for the "existing plus approved" traffic volume scenario, the DDI interchange would be expected to provide overall LOS "B" operations during all of the critical peak hour conditions analyzed. In addition, all individual movements would be expected to operate at LOS "B" or better with acceptable vehicle queuing conditions.

Existing + Approved + Phase 1 Site Conditions: The results of the completed capacity analyses for the "existing plus approved plus Phase 1 Site" traffic volume conditions are shown on the attached **Figures 19, 20, and 21** for the morning and evening weekday peak hours and the Saturday mid-day peak hour, respectively. Again, these figures depict the results of the three previously described interchange improvement alternatives.

Although the completed capacity analyses indicate that the tight diamond interchange with "split-phased" traffic signals would be expected to provide overall LOS "D" or better operations, many individual vehicle movements are indicated to experience poor LOS "E" or "F" operations. In addition, the expected vehicle queues between the interchange ramp terminals can no longer be expected to be contained within the available storage distance, particularly for the northbound movements. Therefore, the signalized tight diamond interchange configuration appears to be an infeasible solution for handling the additional traffic associated with further development of the Paragon Star site or other future area-wide growth.

As shown on the LOS figures, both the roundabout and DDI interchange alternatives are indicated to adequately serve the traffic volumes for this development scenario. Appropriately designed, both of these potential interchange alternatives would be expected to provide LOS "B" or better operations for the overall ramp terminal intersections, as well as all individual vehicle movements. In addition, the vehicle queuing conditions for all movements within the interchange area would be acceptable for either of these potential reconfiguration types.

Existing + Approved + Full Site Conditions: The results of the completed capacity analyses for the "existing plus approved plus Full Site" traffic volume conditions are shown on the attached **Figures 22, 23, and 24** for the morning and evening weekday peak hours and the Saturday mid-day peak hour, respectively. Again, these figures depict the results of the three previously described interchange improvement alternatives.

The completed capacity analyses indicate that the tight diamond interchange alternative with "split-phased" traffic signals would be expected to provide poor LOS "E" or "F" operations under this volume scenario, for both overall intersections and many individual vehicle movements. In

addition, significant vehicle queues would be expected throughout the interchange area, again indicating this option's infeasibility to handle the anticipated traffic loads.

As shown on these LOS figures, the roundabout alternative would still be expected to provide overall LOS "C" or better traffic operations for the overall intersections, as well as LOS "D" or better operations for all individual vehicle movements. Vehicle queuing levels for the southbound movements on View High Drive approaching the interchange area are indicated to become significant in length under this traffic volume scenario. Southbound queues up to 400 feet in length are indicated during the evening peak hour, while 500 to 600 foot queues are expected during the Saturday mid-day peak hour. With more than 800 feet available between the westbound interchange ramp roundabout and the adjacent roundabout serving the Paragon Star development, these queues would not be expected to detrimentally impact the northern roundabout's operations. However, additional mitigation in the form of a bypass lane for the southbound right-turn movements at the ramp terminal could be considered to address this critical queuing condition.

Alternately, the DDI interchange alternative would be expected to provide LOS "B" or better operations for the overall ramp terminal intersections, as well as LOS "C" or better operations for all individual vehicle movements within the interchange area. In addition, the vehicle queuing conditions for all movements within the interchange area would be acceptable for the DDI configuration. In general, it appears from the completed analyses that the DDI alternate would serve these projected design traffic volumes more efficiently than the comparable roundabout alternative, and could also provide more reserve capacity within the interchange to serve additional developments within the City, as well as accommodate regional background traffic growth.

With the addition of traffic signalization, the Chipman Road intersection with View High Drive would be expected to provide overall LOS "C" or better operations, with all individual vehicle movements operating at LOS "D" or better. Vehicle queuing conditions at this intersection would also be acceptable, with no queue exceeding 300 feet in length.

As shown on the LOS figures, all other unsignalized and roundabout intersections outside of the interchange area would be expected to provide adequate traffic operations during the critical peak hour conditions analyzed. Although the eastbound approach to the Meers Road intersection is indicated at times to operate at LOS "E" or "F," this is not uncommon for a minor side street location onto an arterial roadway. Vehicle queuing is not indicated to be excessive, and therefore no mitigations would be recommended to address this operational condition.

ACCESS MANAGEMENT CODE COMPLIANCE

As required, the Lee's Summit Access Management Code (LSAMC) was reviewed in comparison to the submitted preliminary development plan for the Paragon Star RPA 1 site in order to identify any inconsistencies. The pertinent findings of this review are briefly described below.

Figure 10-1 in the LSAMC indicates the desired connection spacing requirements within the functional area of an interchange. This figure indicates a recommended distance of 750 feet away from an interchange ramp to the first restricted access point. At only 300 feet north of the existing westbound I-470 ramp terminal, the planned RIRO driveway into the Paragon Star mixed-use development does not meet this separation criterion and may require variances or other considerations from the City and/or MoDOT.

Likewise, *Figure 10-1* indicates a desirable spacing distance of 1,320 feet (i.e., one-quarter mile) from an interchange ramp to the nearest full access intersection. However, according to Section 15.1.D.1 of the LSAMC, intersections along major arterial roadways like View High Drive should be spaced a minimum of 660 feet (i.e., one-eighth mile) apart. The primary roundabout intersection serving the proposed Paragon Star development site is located about 950 feet to the north of the westbound interchange ramp; therefore, this particular arterial intersection spacing criterion is satisfied even though the desired interchange to intersection spacing is not. The spacing distance of about 1,350 feet between the planned roundabouts located at either end of the View High Parkway segment also satisfies the code requirement for arterial roadways.

Section 15.1.D.3 of the LSAMC indicates a required spacing of at least 300 feet along a commercial collector roadway. It seems appropriate for the planned, internal east-west Paragon Parkway connector to be classified as such. With the first internal intersection located nearly 375 feet to the east of the westbound stop bar at the primary roundabout intersection, it appears that this intersection spacing requirement will also be satisfied. It should be noted that this 300-foot spacing criteria should also be considered within the urban "village" portion of the Paragon Star development as its layout is refined. If River Road is also to be classified as a commercial collector roadway, then it may be necessary to relocate the first access driveway into the proposed surface parking lot on the east side of the road approximately 100 feet farther to the south in order to satisfy the desired spacing criterion.

Section 16 of the LSAMC indicates that both left-turn lanes and right-turn lanes should be constructed to provide at least 250 feet of vehicle storage, plus an appropriate taper, on arterial streets intersecting another arterial. GBA's engineers have complied with this criterion as the conceptual interchange improvement layouts have been developed, and the completed analyses have indicated that turn lanes of this length are satisfactory within both the roundabout and DDI interchange alternatives.

Finally, the intersection sight distance criteria contained in Section 17 of the LSAMC should be considered as the planned roadways and roundabout intersections are designed to ensure that the LSAMC and AASHTO recommendations are met for all new intersections.

MULTI-MODAL CONSIDERATIONS

The accommodation of bicyclists and pedestrians will be a primary focus within the proposed Paragon Star mixed-use development. As shown on the site plan depicted on *Exhibit 1*, a trail head is being planned within the southeastern portion of the development. This trail head will provide direct connectivity between the Little Blue Trace Trail that travels east-west through the development toward Longview Lake with the north-south Katy Trail that runs along the eastern boundary of the development. Further, any potential improvement options for the I-470 / View High Drive interchange will also likely include a shared-use path under the I-470 bridges. This shared-use path will provide direct connectivity between the Paragon Star development and the existing sidewalks along both sides of View High Drive to the south of the interchange. For either of the potential interchange alternatives, the construction of the shared-use path will most likely be accommodated behind the bridge piers on the east side of View High Drive, so that pedestrians will not have to cross the heaviest turning movements within the interchange.

Based upon the completed traffic counts, the existing heavy vehicle experience is relatively low in this area of the City. There are relatively few destinations for large semi-trailer vehicles located within the study area. It is expected that city delivery trucks (WB-40), single unit

vehicles (SU-30) and school / coach busses would all represent the appropriate design vehicles which should be considered during the design of any interchange reconfigurations and/or the internal street networks within the proposed Paragon Star mixed-use development.

Finally, with the former Rock Island railroad line running north-south along the eastern boundary of the proposed development, there is a future possibility of commuter rail service being available. Park-and-ride facilities or a transfer station could also be provided near the trail head.

SUMMARY & CONCLUSIONS

The completed capacity analyses indicate that some minor operational concerns may currently exist at the interchange of I-470 with View High Drive during the existing peak hour conditions. It may already be appropriate to consider the signalization of the ramp terminal intersections in order to improve the traffic operations, particularly for the off-ramp turning movements. However, the existing four-lane cross-section on View High Drive under the I-470 bridges limits improvement options within the interchange area, and would likely require non-standard "split-phased" signal operations to accommodate shared lane configurations.

As a result, the signalization of the existing tight diamond interchange would be expected to represent only a short-term solution for the interchange. The completed analyses for the "existing plus approved" traffic volume scenario indicate that more significant improvements would be necessary to allow any development to occur within the City other than those projects that have already been approved or are currently planned in the vicinity of the New Longview developments.

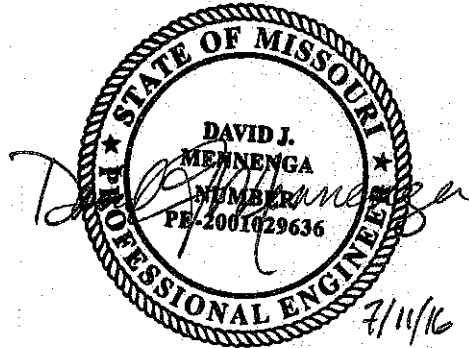
In order to accommodate the site-generated traffic volumes from the proposed Paragon Star mixed-use development, either multi-lane roundabouts could be constructed at both of the I-470 ramp terminal intersections or the interchange could be reconfigured into a DDI. While the completed capacity analyses indicate that acceptable results could be achieved with either interchange configuration, the DDI configuration may be preferred from an operational standpoint simply due to the extra reserve capacity that it appears to provide. This reserve capacity within the interchange would accommodate additional traffic from future developments within the City and/or regional growth.

However, it should be noted that these operational considerations are only one factor to be considered during the selection of a preferred interchange alternative. Construction costs, right-of-way needs, utility impacts, etc. should be determined for each of the alternate interchange types to further inform the selection process. Finally, additional studies and geometric evaluations should continue to be pursued by the development team, including the Traffic Safety and Operations (TS&O) report needed to obtain MoDOT and FHWA approval of any proposed interchange modifications.

We appreciate the opportunity to be of service on this very important project. If additional information is required, please feel free to contact us.

Respectfully submitted,

GEORGE BUTLER ASSOCIATES, INC.



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cc: BDB, CEL, file

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EXHIBIT A

Level of Service Definitions

Level of service criteria are outlined in the 2010 edition of the "Highway Capacity Manual" (HCM) for both signalized and unsignalized intersections. The HCM defines the level of service as a measure of the quality of traffic flow. There are six different levels of service for each facility type, each representing a range of operating conditions. Each level of service is designated by a letter from "A" to "F", with "A" being the most desirable condition and "F" being the least desirable condition. The level of service criteria, as reported by the 2010 HCM, for both signalized and unsignalized intersections are listed below:

Unsignalized Intersections		Signalized Intersections	
Level of Service	Average Control Delay (sec/veh)	Level of Service	Control Delay per Vehicle (sec)
A	≤ 10	A	≤ 10
B	> 10 and ≤ 15	B	> 10 and ≤ 20
C	> 15 and ≤ 25	C	> 20 and ≤ 35
D	> 25 and ≤ 35	D	> 35 and ≤ 55
E	> 35 and ≤ 50	E	> 55 and ≤ 80
F	> 50	F	> 80

Table 1

Trip Generation Summary
 Institute of Transportation Engineers (9th Edition)

Paragon Star Development
 Lee's Summit, MO

LAND USE CODE	LAND USE	FLOOR AREA Sq. Ft.	MISC. Quantity	WEEKDAY ADT (VPD)	A.M. PEAK HOUR (VPH)		P.M. PEAK HOUR (VPH)		WEEKEND ADT (VPD)		SAT PEAK HOUR (VPH)	
					IN	OUT	IN	OUT	IN	OUT	IN	OUT
PHASE 1												
310	Hotel		120 Room	701	38	26	37	35	860	49	38	
820	Shopping Center	80,000		5,875	84	52	248	268	8,028	393	363	
710	General Office Building	90,000		1,212	155	21	30	149	215	21	18	
220	Apartment		220 Unit	1,457	22	89	90	49	1,471	55	55	
488	Soccer Complex		15 Fields	1,070	10	7	178	88	5,000*	230	249	
495	Recreational Community Center	20,000		677	27	14	27	28	182	12	10	
				10,992	336	209	610	617	15,756	760	733	
PHASE 1 TOTALS:												
FULL SITE												
310	Hotel		240 Room	1,775	75	52	73	71	2,015	95	75	
820	Shopping Center	130,000		8,054	113	70	343	371	10,901	539	498	
710	General Office Building	140,000		1,696	220	30	40	195	316	33	28	
220	Apartment		440 Unit	2,790	44	175	169	91	3,198	100	100	
488	Soccer Complex		21 Fields	1,498	13	10	249	123	5,000*	337	365	
495	Recreational Community Center	20,000		677	27	14	27	28	182	12	10	
495	Recreational Community Center	120,000		4,059	162	84	161	168	1,092	69	59	
				20,549	654	435	1,062	1,047	24,704	1,185	1,135	
FULL SITE TOTALS:												