



Simulation Model Network

CVG Circulation Study

Boone & Kenton County
KYTC Item No. N/A



Executive Summary

August 2019



Executive Summary

The Cincinnati/Northern Kentucky International Airport (CVG) Circulation Study was initiated by the Kentucky Transportation Cabinet (KYTC) District 6 in January 2018 to investigate current and likely future roadway system needs in portions of Boone and Kenton Counties affected by growth surrounding the airport. The area surrounding CVG is currently undergoing tremendous growth, including a \$1.5 billion worldwide Amazon Prime Air Cargo Hub on the south side of CVG's property. The proposed open date for the new facility is scheduled for 2021 with full operations expected by 2026. This facility will primarily serve as an "air-to-air" sort and distribution center with limited truck operations. The study area for the CVG Circulation Study is shown in **Figure ES-1**.

Study Goal

The goal of the CVG Circulation Study is to evaluate future traffic operations around the study area that will be impacted by proposed developments and to analyze improvement concepts to address future traffic needs.

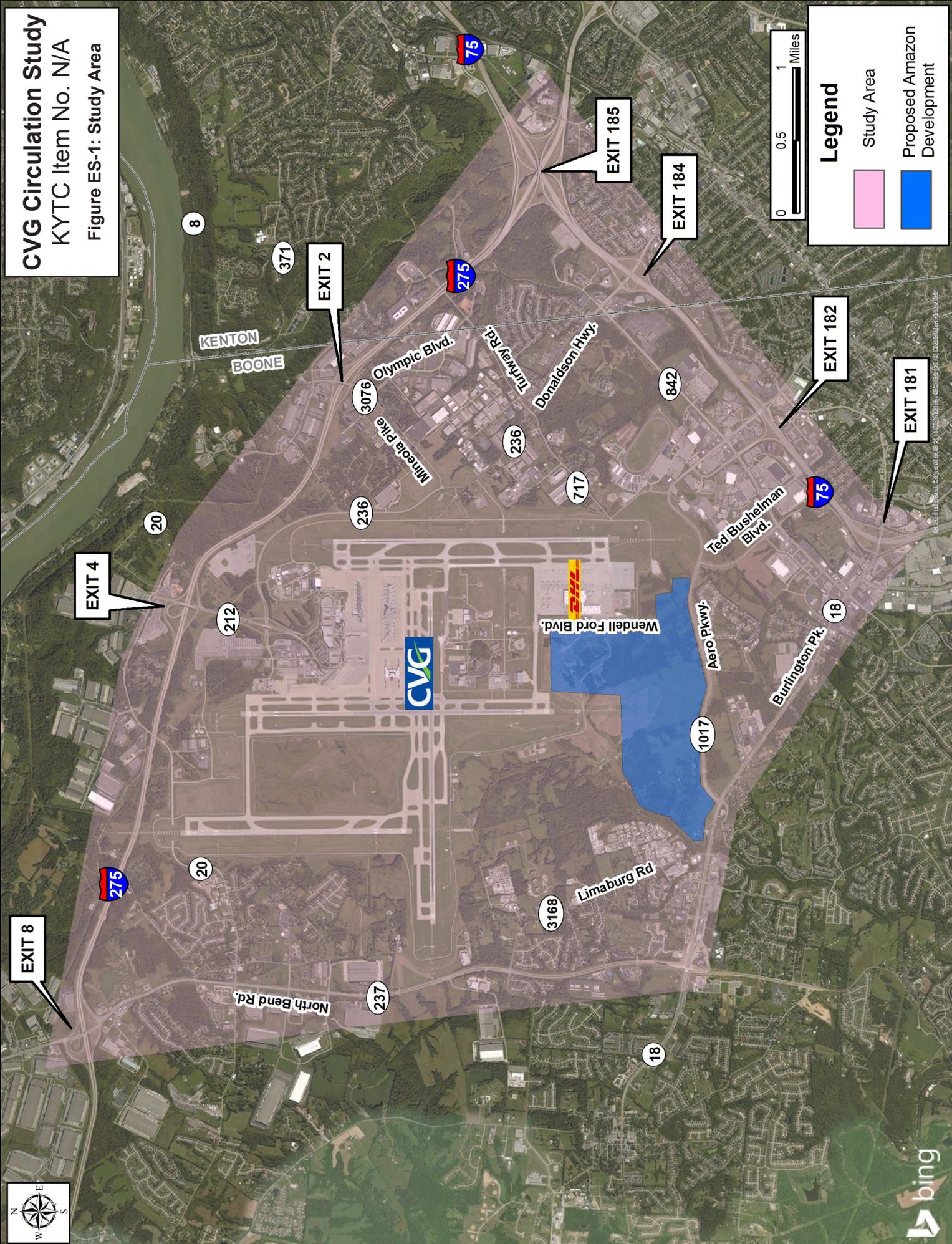
Planned and Committed Improvements

There are nine projects within the study area listed in Kentucky's FY 2018 – FY 2024 Highway Plan, as shown in **Figure ES-2**, and described below:

- Item No. 6-78.00 (not shown):** I-275 / Graves Road interchange (continuation of 6-8953, an interchange justification study (IJS)). This project is on the periphery of the subject study area. *This project is advancing as a design-build project and is slated for construction to begin in late 2019.*
- Item No. 6-79.00:** I-75/I-275 Interchange Modification Report (IMR) to improve safety and operations. This project is on the periphery of the subject study area. *This project is in the preliminary engineering stages.*
- Item No. 6-433.00:** Improve safety along KY 717 (Turfway Road) at the 90-degree bend near the Cincinnati/Northern Kentucky International Airport. *This project is currently under design.*
- Item No. 6-439.00:** Widen KY 3159 (Ted Bushelman) from Doering Drive to KY 1017 (Aero Parkway) to provide a two-way left-turn lane to improve traffic flow for future development. *This project is currently under design.*
- Item No. 6-444.00:** KY 236 (Donaldson Road) from KY 3706 (Mineola Pike) to KY 842 (Houston Road). *Based on the recommendations from this study, the project was combined with 6-445.00 and advertised for Preliminary Engineering and Environmental Analysis in February 2019.*
- Item No. 6-445.00:** KY 3076 (Mineola Pike) from KY 236 (Donaldson Road) to I-275. *Based on the recommendations from this study, the project was combined with 6-444.00 and advertised for Preliminary Engineering and Environmental Analysis in February 2019.*
- Item No. 6-937.00 (not shown):** Spot improvements and congestion mitigation in Boone County for Amazon development. *The results of this study will influence this project. Construction Phase funds scheduled for FY 2018.*
- Item No. 6-937.01 (not shown):** Spot improvements and congestion mitigation in Boone County for the Amazon development. *The results of this study will influence this project. Construction Phase funds scheduled for FY 2019.*
- Wendell Ford Widening/Extension (not shown):** Widen the existing roadway to five lanes and extend south to Aero Parkway at the Ted Bushelman intersection. *This project is being completed by Amazon and is expected to be open prior to Amazon's 2021 open-to-traffic year.*

CVG Circulation Study
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Figure ES-1: Study Area



CVG Circulation Study
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Figure ES-2:
Planned & Committed Projects



KYTC 6-445.00
KY 3076 (Mineola Pike)

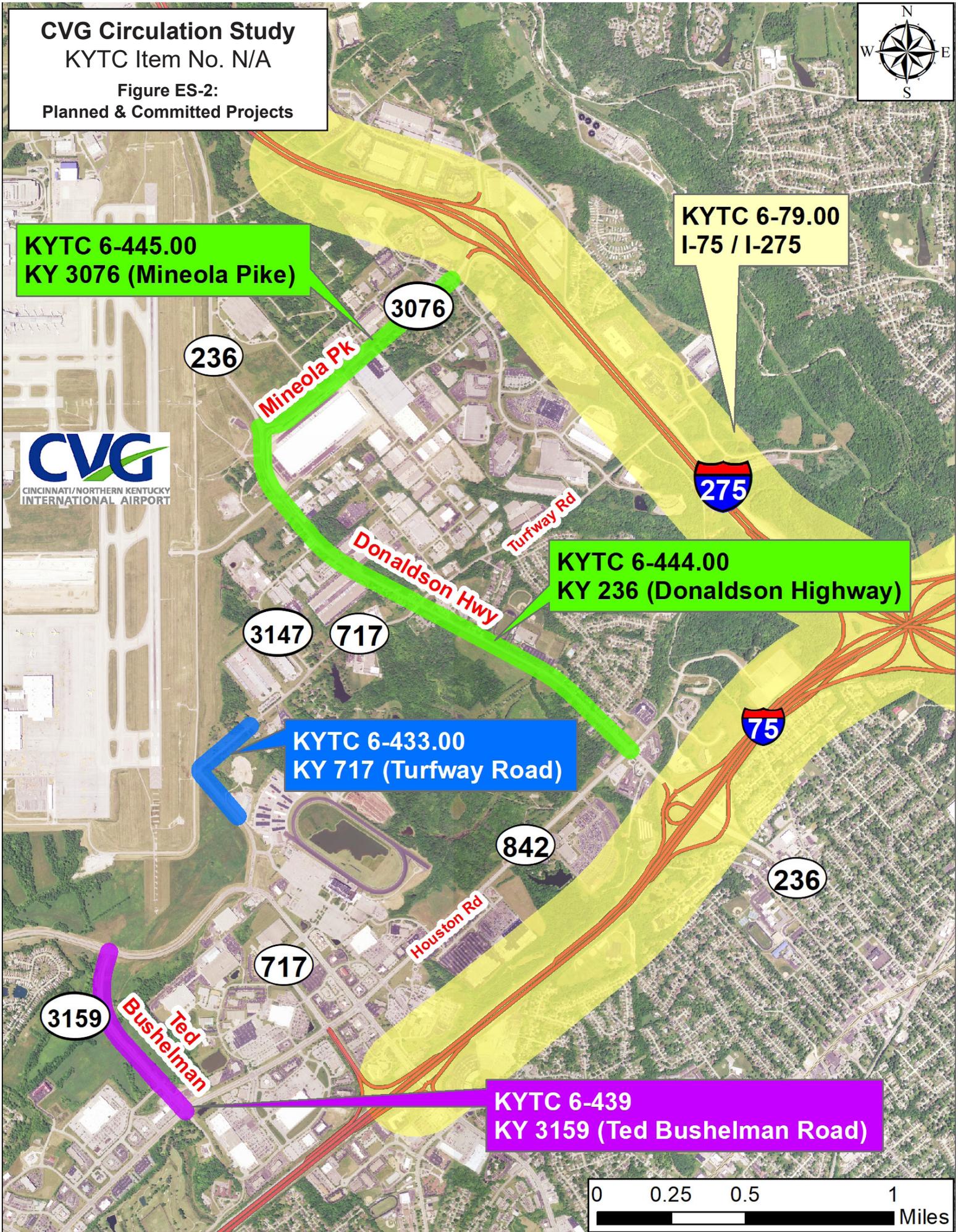
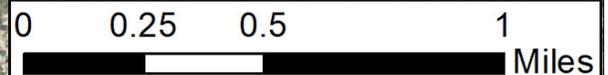
KYTC 6-79.00
I-75 / I-275



KYTC 6-444.00
KY 236 (Donaldson Highway)

KYTC 6-433.00
KY 717 (Turfway Road)

KYTC 6-439
KY 3159 (Ted Bushelman Road)



Future Conditions

Background traffic forecasts for roadways within the study area were developed using outputs from the Ohio-Kentucky-Indiana Regional Council of Governments (OKI) regional travel demand model. The OKI model did not include information for a number of planned traffic generators including the proposed Amazon development as well as several other significant developments. Below is a discussion of the expected developments and their impacts to future traffic conditions.



A traffic impact study (TIS) for Amazon's proposed development was conducted in 2018 and suggested a series of improvements to facilitate improved traffic flow. The CVG Air Cargo Hub TIS was received by KYTC in October 2018. Following is a summary of findings from the report:

- The proposed Air Cargo Hub will be accessed by employees via three entrances from Aero Parkway and one entrance from Wendell Ford Boulevard. A separate entrance to the truck staging area will be from Wendell Ford Boulevard.
- The proposed operations include day and night shifts with identical staffing assumed for both. The day shift is from 8:00 AM – 2:30 PM and the night shift is from 9:30 PM – 4:00 AM. Shift times will be staggered 30 minutes to accommodate employee parking and security clearance. This moves the traffic demand peaks outside the traditional peak hours of traffic flow to 6:30 – 7:30 AM and 2:30 – 3:30 PM.
- By the 2021 open-to-traffic year, approximately 1,500 employees are anticipated per shift (3,000 total employees). By full buildout in 2026, the shift count increases to approximately 3,100 employees (6,200 total employees).
- Previously planned projects are anticipated to be complete by the open-to-traffic year of 2021, including the Wendell Ford Boulevard widening to five lanes with extension to Aero Parkway and widening Ted Bushelman Boulevard to five lanes.
- In 2021, 1,518 Amazon trips are anticipated during the AM shift change (6:30 – 7:30 AM) and 1,530 Amazon trips are anticipated during the PM shift change (2:30 – 3:30 PM).

Based on findings from the TIS, KYTC has required Amazon to make the following improvements:

1. Burlington Pike at Aero Parkway

- Stripe a second southbound left-turn lane on Aero Parkway before 2021
- Install right-turn and a right-turn overlap on westbound Burlington Pike to Aero Parkway before 2026

2. Turfway Road at Aero Parkway

- Install right-turn lane on Turfway Road to Aero Parkway before 2021
- Extend left-turn lane onto Turfway Road from Aero Parkway before 2021

3. Houston Road at Ted Bushelman

- Extend southwestbound right-turn lane to Ted Bushelman Boulevard before 2021

4. Aero Parkway at Ted Bushelman

- Install exclusive right-turn lane from Ted Bushelman Boulevard to Aero Parkway before 2021

5. Donaldson Highway at South Airfield Road

- Install right-turn lane and right-turn overlap from Donaldson Highway to South Airfield Road before 2021

6. Donaldson Highway at Mineola Pike

- Install right-turn lane and right-turn lane overlap from Donaldson Highway to Mineola Pike before 2021

7. Aero Parkway

- Widen the entire length of Aero Parkway to accommodate the required number of lanes, proposed entrances, and signals per the approved TIS before 2026

There are nine additional developments expected in the study area that, collectively, will result in greater peak hour traffic demand than the proposed Amazon Air Cargo Hub. **Figure ES-3** shows the location and estimated number of trips produced by each of these developments. Where a traffic impact study is not available, the 8th Edition of the ITE Trip Generation Manual was used to forecast trip numbers. By 2021, these developments are expected to generate an additional 3,500 trips during the AM peak (7:30 – 8:30 AM) and 3,500 trips during the PM peak (4:30 – 5:30 PM).

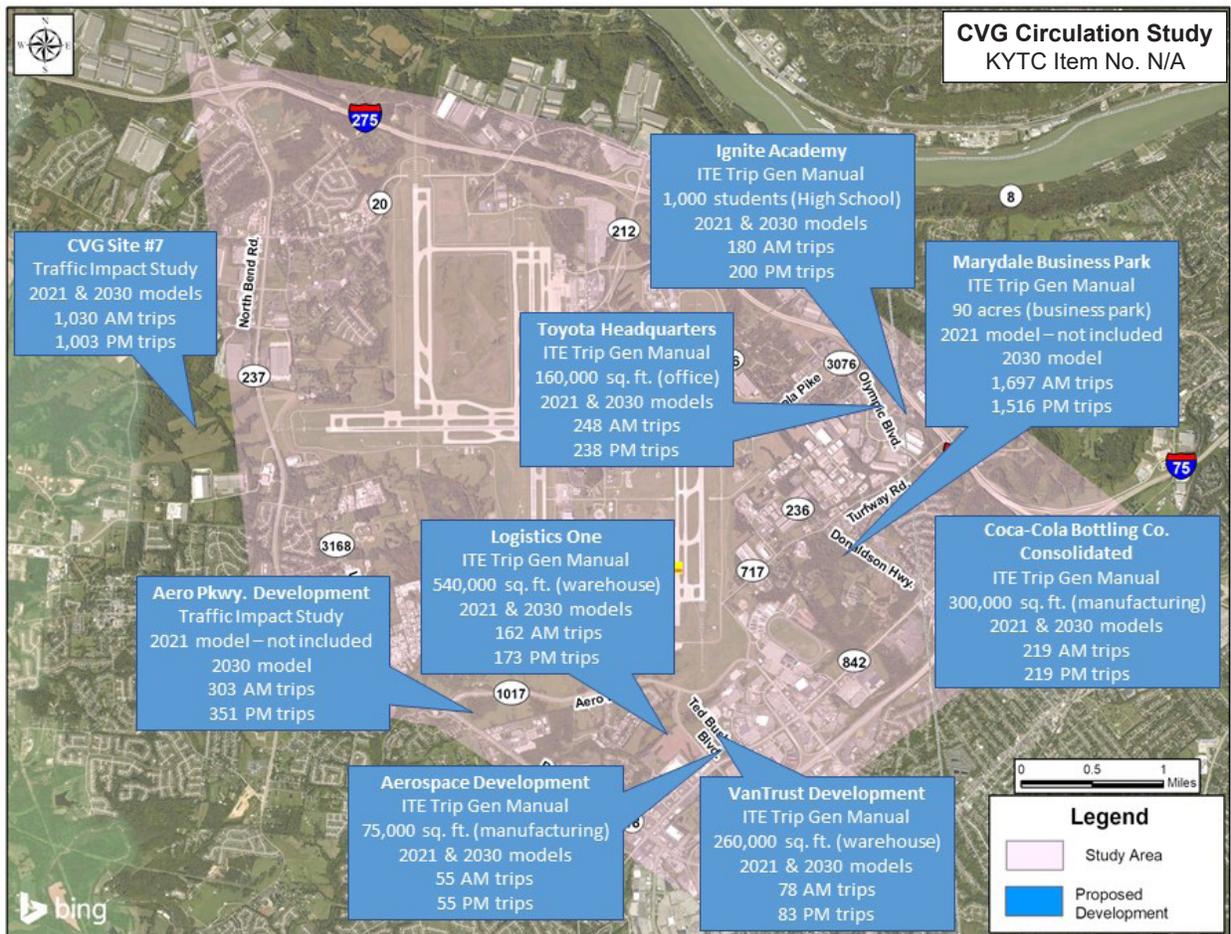


Figure ES-3: Planned and Committed Developments within the Study Area
(Source: Boone County and KYTC District 6)

Development of Improvement Concepts

Over the course of the study, the Project Team worked to identify and evaluate improvement concepts to improve traffic flow in the study area. These concepts were carried forward for further evaluation and eventual recommendations at the conclusion of the study. The primary focus was on improving access to and from the adjacent freeway system. A simulation model was developed to assist in analyzing the traffic impacts related to future growth within the study area.

Table ES-1: Recommended Improvement Concepts Cost Estimates

Priority	Improvement Concept	SYP/ CHAF ID	Description	Total Cost	Design	Right-of-Way	Utilities	Construction
1	1a	6-444	Widen existing KY 236 (Donaldson Hwy.)	\$10,240,000	\$1,130,000	\$600,000	\$1,000,000	\$7,510,000
	1b	6-445	Widen existing KY 3076 (Mineola Pk.)	\$11,960,000	\$970,000	\$3,800,000	\$750,000	\$6,440,000
	1c	6-444 / 6-445	Realign Turfway/ Donaldson and construct a SPUI at S Airfield Rd.	\$37,750,000	\$4,430,000	\$3,600,000	\$250,000	\$29,470,000
2	2a	20190066	Convert Turfway and Thoroughbred from two-way to one-way and construct new I-75 access	\$18,200,000	\$1,900,000	\$3,400,000	\$250,000	\$12,650,000
	2b		Extend auxiliary lanes / C-D on I-75	\$38,880,000	\$4,720,000	\$2,500,000	\$250,000	\$31,410,000
3	3a	20190058	Convert KY 18 (Burlington Pike) to a Superstreet	\$18,270,000	\$1,930,000	\$3,000,000	\$500,000	\$12,840,000
	3b	20190063	Reconstruct the KY 18 interchange with I-75	\$24,000,000	\$3,000,000	\$500,000	\$500,000	\$20,000,000
	3c	20190064	Grade separate KY 18 at Houston and Mall Rd.	\$39,780,000	\$3,590,000	\$9,800,000	\$2,500,000	\$23,890,000

1a	LOCATION (Boone/Kenton Counties)	PROJECT PRIORITY
	Kenton County: KY 842 (Houston Road, MP 2.684) to Boone County line (MP 2.801) Boone County: Kenton County line (MP 0) to KY 717 (Turfway Road, MP 0.767)	#1

DESCRIPTION (Item No. 6-444) Widen existing KY 236 (Donaldson Highway) from west of the I-75 interchange in Kenton County to west of Turfway Road (KY 717) in Boone County.	COST ESTIMATES BY PHASE Total: \$10,240,000	Design: \$1,130,000 ROW: \$600,000 Utilities: \$1,000,000 Construction: \$7,510,000
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Donaldson Highway serves a mix of commercial and light industrial land uses and provides a direct connection between the Cincinnati/Northern Kentucky International Airport (CVG) and I-75 at exit 184. A proposed realignment west of Turfway Road (Concept 1c) would direct Donaldson Highway directly into the airport via the South Airfield Road tunnel, ultimately making this one of the most direct options connecting the eastern portion of the airport/airfield to I-75. The current traffic volume west of Houston Road (KY 842) is about 15,000 vehicles per day (VPD) and is expected to increase to about 34,000 VPD by 2030.

Because of anticipated growth in traffic demand and its direct connection to I-75, Donaldson Highway should be widened to provide four travel lanes. This will ultimately connect to a reconfigured I-75 interchange currently under study as part of KYTC Item No. 6-79. A raised median should be considered along the widened portion of Donaldson as KYTC Access Management guidelines would recommend a non-traversable median for roadways carrying more than 24,000 VPD. Based on the recommendations from the CVG Circulation Study, KYTC Item No. 6-79 was combined with KYTC Item No. 6-445.00 and advertised for Preliminary Engineering and Environmental Analysis in February 2019.

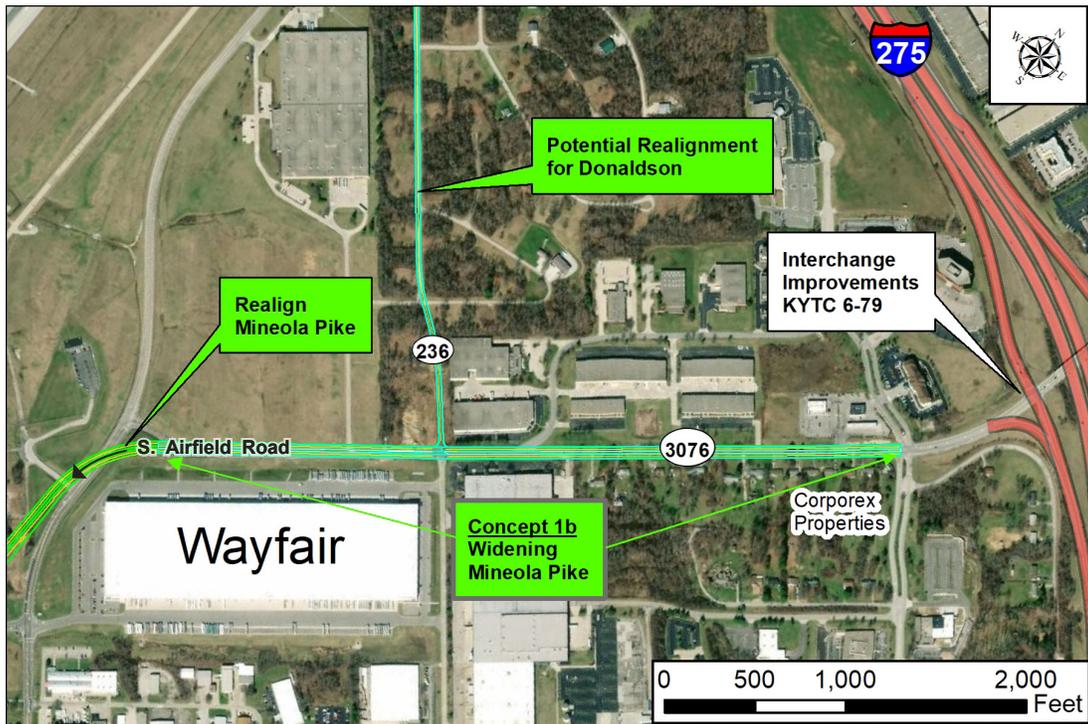


1b	LOCATION (Boone/Kenton Counties)	PROJECT PRIORITY
	KY 236 (Donaldson Highway, MP 0.0) to I-275 interchange (MP 1.013)	#1

DESCRIPTION (Item No. 6-445) Widen existing KY 3076 (Mineola Pike) from Donaldson Highway (KY 236) to I-275 (KYTC Item No. 6-445.00)	COST ESTIMATES BY PHASE	Design: \$970,000 ROW: \$3,800,000 Utilities: \$750,000 Construction: \$6,440,000
	Total: \$11,960,000	

This two-lane roadway connects the east and south sides of the Cincinnati/Northern Kentucky International Airport (CVG) to I-275 and will ultimately serve as a primary interstate connection for Amazon trucks and employees. The existing route includes two 11 to 12-foot-wide lanes with three-foot shoulders that increase to 10 feet approaching the I-275 interchange. Current traffic volumes range from about 6,800 vehicles per day (VPD) near Donaldson Highway to about 15,000 VPD near the I-275 interchange. By 2030, these volumes are expected to increase to 13,000 near Donaldson and 22,500 VPD near the I-275 interchange.

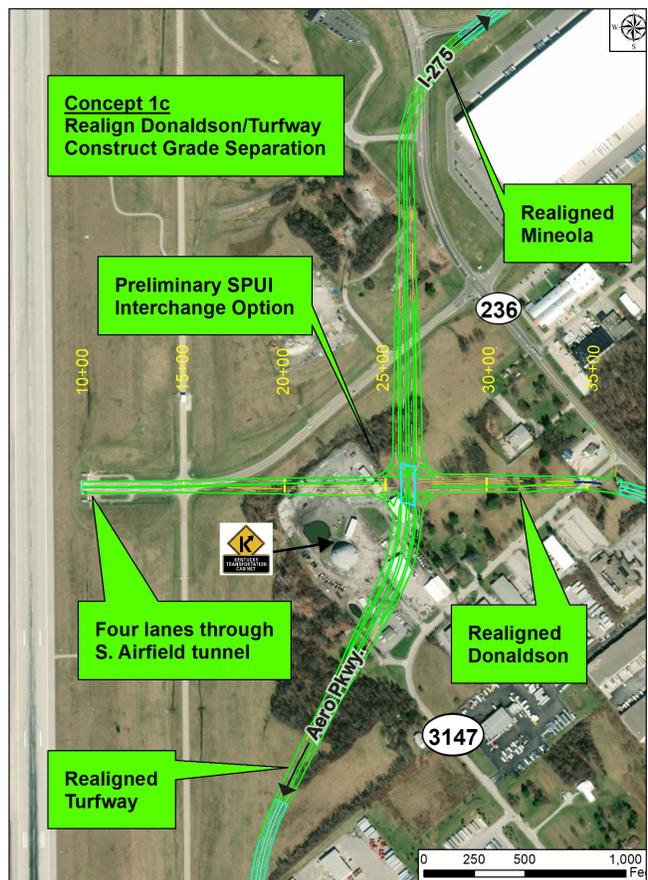
Because of anticipated growth in traffic demand and its direct connection to I-275, Mineola Pike should be widened to provide four travel lanes. A raised median should be considered along the widened portion as KYTC Access Management guidelines would recommend a non-traversable median for roadways carrying more than 24,000 VPD. Based on the recommendations from the CVG Circulation Study, the project was combined with KYTC Item No. 6-444.00 and advertised for Phase 1 Preliminary Engineering in February 2019.



1c	LOCATION (Boone/Kenton Counties)	PROJECT PRIORITY
	KY 717 (Turfway Road), KY 236 (Donaldson Highway), and KY 3076 (Mineola Pike)	#1

<p>DESCRIPTION (Item No. 6-444/6-445) Realign Turfway Road, connecting to Donaldson Highway and Mineola Pike at a new interchange east of S. Airfield Road and connecting Donaldson directly into S. Airfield Road.</p>	<p>COST ESTIMATES BY PHASE</p> <p>Total: \$37,750,000</p>	<p>Design: \$4,430,000 ROW: \$3,600,000 Utilities: \$250,000 Construction: \$29,470,000</p>
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KYTC Item No. 6-433.00 is a project that will address existing curvature issues on Turfway Road north of Aero Parkway (KY 1017). The Kenton County Airport Board (KCAB) expressed interest in constructing a more significant realignment of Turfway Road such that it directly ties into Mineola Pike, providing a more direct connection from Amazon’s facility on Aero Parkway to I-275. To further improve interstate connectivity, the proposed project includes realigning Donaldson Highway west of Turfway Road to enter the airport directly via the tunnel on S. Airfield Road. This would provide a direct connection from the Cincinnati/Northern Kentucky International Airport (CVG) to I-75.



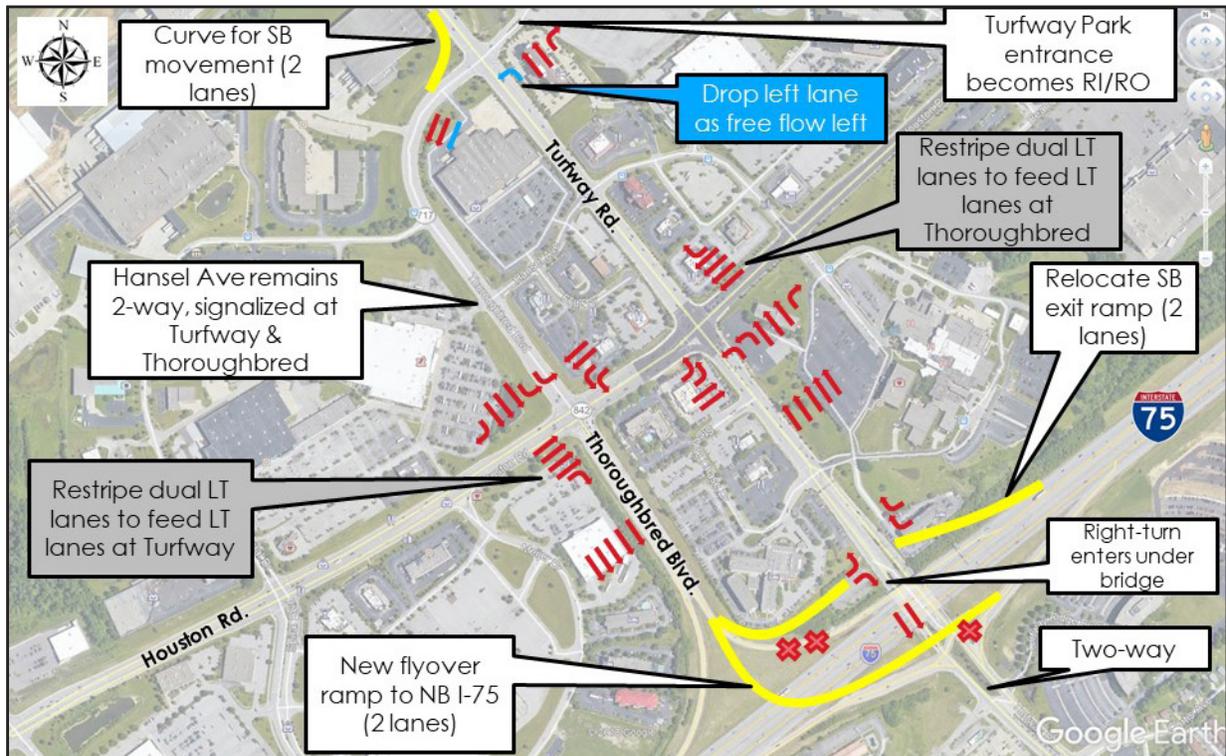
The S. Airfield Tunnel is wide enough to accommodate four lanes through restriping and reducing the shoulder widths. As a result, future traffic demand in the Donaldson Highway corridor is anticipated to increase significantly and the new intersection of Donaldson Highway, Turfway Road, and S. Airfield Road is recommended to be grade separated. For purposes of this study, a single point urban interchange (SPUI) has been considered at this location.

2a	LOCATION (Boone County)	PROJECT PRIORITY #2
	KY 1017 (Turfway Road) from KY 1017 (Aero Parkway) (MP 2.5) to KY 18 (Burlington Pike) (MP 3.4), KY 717 (Thoroughbred Boulevard) from KY 842 (Houston Road) (MP 0) to Turfway (MP 0.368)	

DESCRIPTION (CHAF 20190066) Convert Turfway Road and Thoroughbred Boulevard from two-way to one-way traffic flow and construct new I-75 access.	COST ESTIMATES BY PHASE Total: \$18,200,000	Design: \$1,900,000 ROW: \$3,400,000 Utilities: \$250,000 Construction: \$12,650,000
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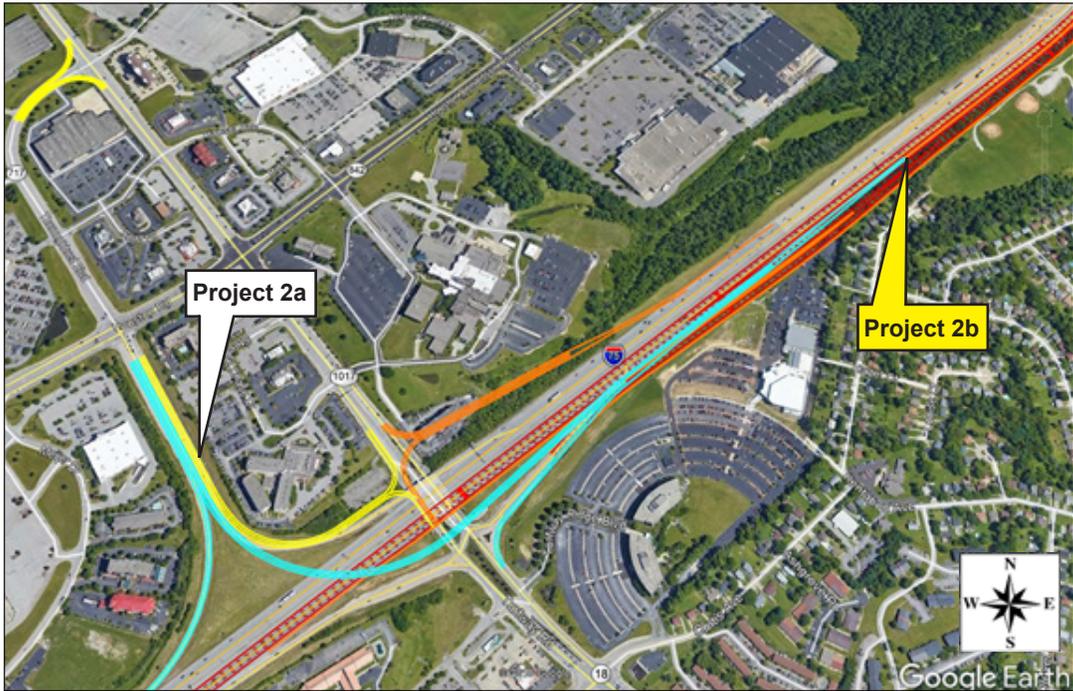
Thoroughbred Boulevard provides access to southbound I-75, and access to northbound I-75 is provided at Turfway Road. In the southbound direction, I-75 traffic can only enter and exit I-75 at Thoroughbred and does not have access to Turfway. In the northbound direction, I-75 traffic can exit directly onto Turfway. These corridors connect directly to Aero Parkway, providing a direct connection from Amazon to I-75.

The proposed concept converts Thoroughbred Boulevard and Turfway Road to a one-way couplet. This involves converting Turfway Road to a northbound one-way street and Thoroughbred Boulevard to a southbound one-way street from Aero Parkway to I-75. Access to/from I-75 is improved, including the addition of a flyover ramp to NB I-75 from Thoroughbred Boulevard, the removal of the SB I-75 off ramp to Thoroughbred Boulevard, the addition of a ramp from Thoroughbred Boulevard to Turfway Road, and the relocation of the SB I-75 ramp to Turfway Road.



2b	LOCATION (Boone County)	PROJECT PRIORITY
	I-75 from KY 1017 (Turfway Road, Exit 182) to I-275 (Exit 185)	#2
DESCRIPTION (CHAF 20190066) Extend auxiliary lanes / Collector-Distributor (C-D) System on I-75.	COST ESTIMATES BY PHASE Total: \$38,880,000	Design: \$4,720,000 ROW: \$2,500,000 Utilities: \$250,000 Construction: \$31,410,000

The construction of Project 2a results in the need to provide additional lanes on I-75. The proposed concept is to extend a collector-distributor system or auxiliary lanes south of I-275 to connect to the proposed access changes proposed for the northbound I-75 entrance ramp from Thoroughbred Boulevard and the southbound exit ramp proposed to Turfway Road.

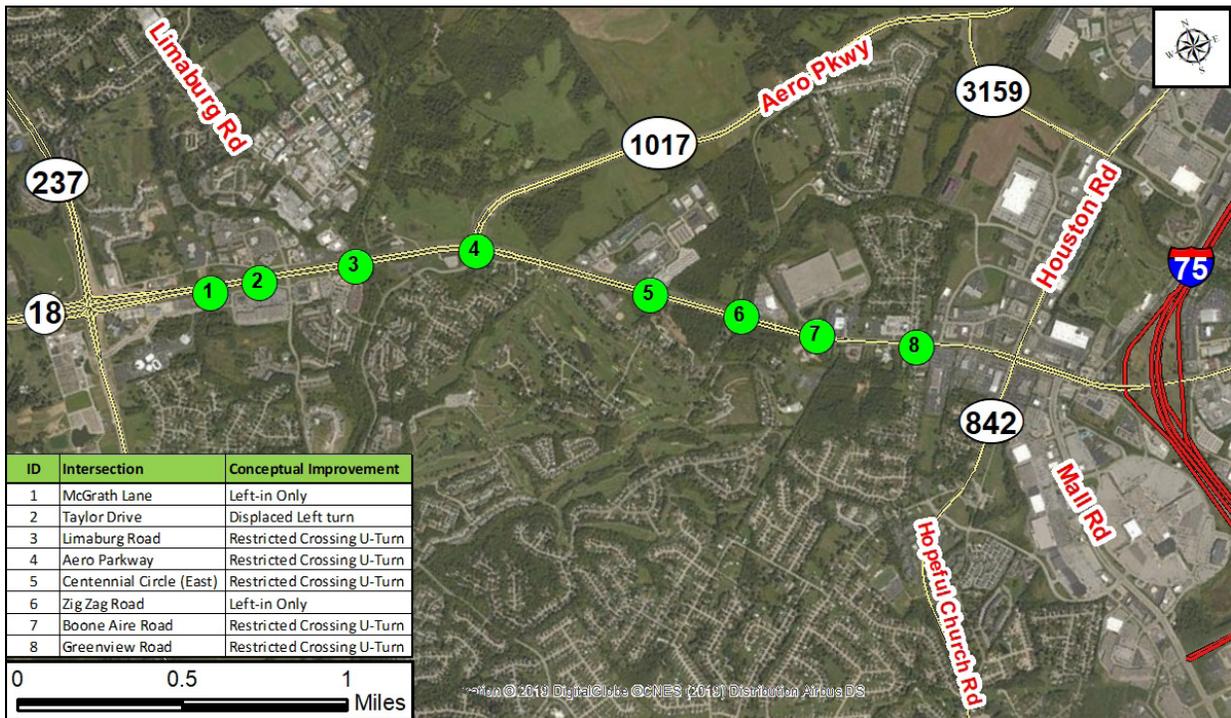


3a	LOCATION (Boone County)	PROJECT PRIORITY
	KY 18 (Burlington Pike) from KY 237 (Bend Road, MP 11.778) to west of KY 842 (Houston Road, MP 14.630)	#3

DESCRIPTION (CHAF 20190058) Convert KY 18 (Burlington Pike) to a Superstreet	COST ESTIMATES BY PHASE	Design: \$1,930,000 ROW: \$3,000,000 Utilities: \$500,000 Construction: \$12,840,000
	Total: \$18,270,000	

The four-lane Burlington Pike suffers from recurring congestion that extends beyond the traditional AM and PM peak hours. Currently carrying 31,000 vehicles per day (VPD) west of Aero Parkway and 49,000 VPD east, future demand is expected to increase to 38,000 VPD to the west end and 59,000 to the east by 2030. A traditional widening project, to provide six travel lanes, has long been considered for the corridor.

However, the proposed concept is to reconstruct Burlington Pike as a Superstreet. This would require intersections along Burlington Pike to be converted to Superstreet intersections. A Superstreet intersection is also known as a Restricted Crossing U-turn (RCUT) intersection or a J-turn intersection. The RCUT intersection differs from a conventional intersection by eliminating the left-turn and through movements from cross street approaches, instead requiring drivers to turn right onto the main road and then make a U-turn maneuver at a median opening downstream from the intersection. Benefits of superstreets include increased capacity and improved safety. A four-lane Superstreet provides similar overall traffic operations while minimizing right-of-way needs compared to a six-lane widening.

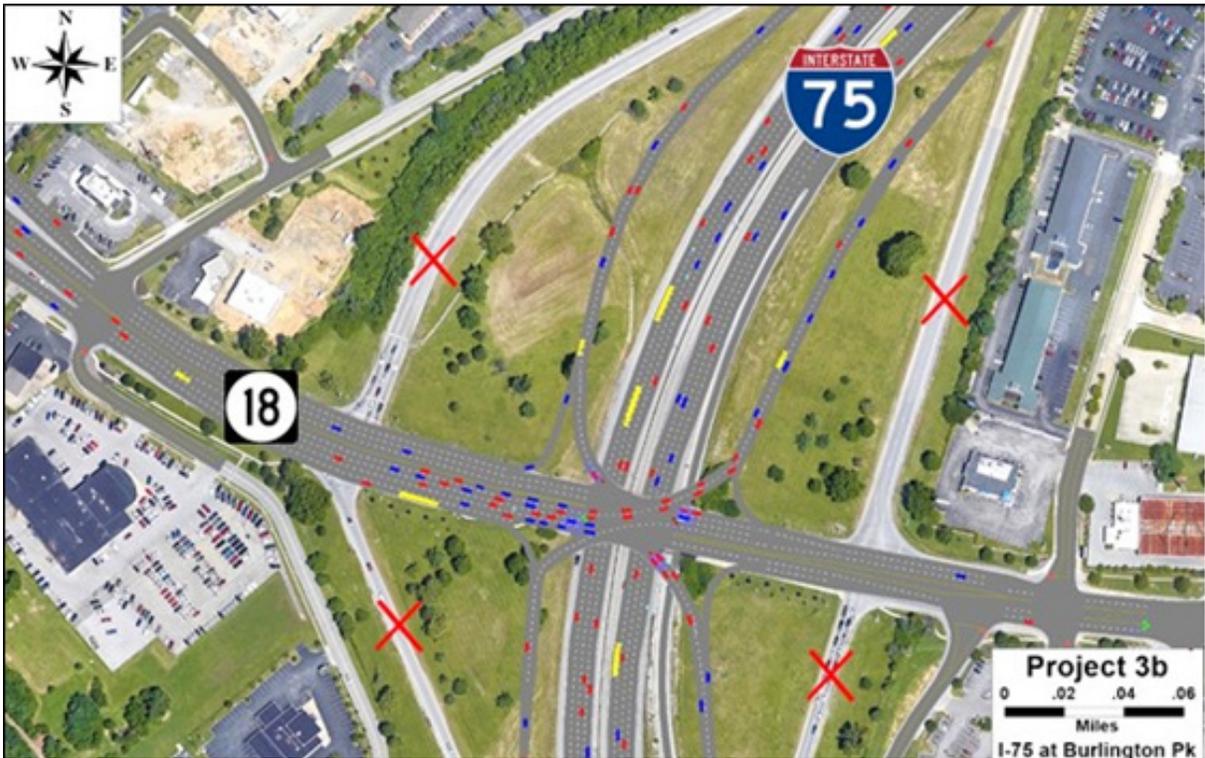


3b	LOCATION (Boone County)	PROJECT PRIORITY
	I-75 at KY 18 (Burlington Pike, Exit 181)	#3

DESCRIPTION (CHAF 20190063) Reconstruct the Burlington Pike interchange with I-75.	COST ESTIMATES BY PHASE Total: \$24,000,000	Design: \$3,000,000 ROW: \$500,000 Utilities: \$500,000 Construction: \$20,000,000
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The Burlington Pike interchange with I-75 is a conventional diamond interchange with signalized ramp terminals. The Burlington Pike intersections with Mall Road and Houston Road (KY 842) are located immediately west of the interchange, resulting in four congested, signalized intersections located in a stretch of less than one half mile. West of the interchange, Burlington currently carries about 49,000 vehicles per day (VPD) which is expected to increase to 59,000 VPD by 2030. The 2018 Boone County Transportation Plan recommended an Interchange Modification Report (IMR) to be performed for the interchange to develop and evaluate alternatives.

To improve traffic flow and increase separation between signalized intersections, the proposed concept is to reconstruct the interchange as a Single Point Urban Interchange (SPUI). While other options should be considered during subsequent project phases, a SPUI would likely be most compatible with the improvements proposed in Project 3c (See next project sheet), increasing separation between signals.



3c	LOCATION (Boone County)	PROJECT PRIORITY
	KY 18 (Burlington Pike) from west of KY 842 (Houston Road, MP 14.630) to east of Mall Road (MP 14.748)	#3
DESCRIPTION (CHAF 20190064) Grade separate Burlington Pike at Houston Road and Mall Road.	COST ESTIMATES BY PHASE Total: \$39,780,000	Design: \$3,590,000 ROW: \$9,800,000 Utilities: \$2,500,000 Construction: \$23,890,000

The Burlington Pike intersections with Houston Road and Mall Road serve a tremendous volume of traffic (both turning volumes as well as through traffic on Burlington Pike) and are located approximately 700 feet apart. Closing or rerouting these two streets is impractical as the area is densely developed and their combined traffic volume (approximately 40,000 vehicles per day (VPD)) could not be reasonably accommodated using other travel routes.

To improve traffic flow, the proposed improvement concept is to construct grade separations to carry Burlington Pike over both Houston Road and Mall Road. A series of parallel, one-way frontage roads would be provided to connect Burlington Pike to the two intersections and to adjacent businesses. This concept requires modification of the Burlington Pike interchange with I-75 located immediately to the east, as proposed in Project 3b.

