K10 CORRIDOR

Appendix B

Alternatives Screening Memo

K10 CORRIDOR

K-10 Capacity Improvements

Alternatives Analysis Memo

April 2024

K10 CORRIDOR

Kansas Department of Transportation

KDOT IKE THE EISENHOWER LEGACY TRANSPORTATION PROGRAM

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1.0 Introduction and Background History

The purpose of this technical report is to describe the alternatives for screening, proposed screening criteria, and to document the results of the Initial (Tier 1) and Reasonable (Tier 2) screening process for the K-10 Capacity Improvements Project Environmental Assessment (EA).

1.1. Project Background

K-10 is one of Kansas' most important and fastest growing corridors. Serving nearly 70,000 vehicles per day, K-10 provides a vital connection between the southwest region of the Greater Kansas City metro area to Lawrence and I-70. The K-10 Transportation Study was conducted by the Kansas Department of Transportation (KDOT), Mid-America Regional Council (MARC), and the Lawrence-Douglas County Metropolitan Planning Organization (MPO) in 2005. The purpose of the study was to identify needed future improvements for the K-10 Corridor between the City of Lawrence and the Kansas City metro area. The study evaluated existing and future traffic conditions, developed mainline widening and interchange configurations, and provided public engagement activities. Recognizing the importance of this corridor, KDOT has made significant investments starting with the K-10 Transportation Study, which led to projects like the South Lawrence Trafficway (SLT) East Leg in Lawrence and the Johnson County Gateway at the K-10/I-435 Interchange. Progress continues with the SLT West Leg now in the Eisenhower Legacy Transportation (IKE) Program pipeline.

Although these investments addressed critical needs, challenges remain on K-10 including aging infrastructure throughout much of the corridor. Additionally, routine congestion during the morning and evening peak periods, particularly east of K-7, impacts commuter traffic daily. Geometric configurations are outdated and inadequate to support current demand and contribute to safety issues. K-10 is poised to experience unprecedented new growth dynamics. Additionally, planned development of a large manufacturing operation on the west end of the project corridor near De Soto is anticipated to further stress traffic conditions along the entire study corridor.

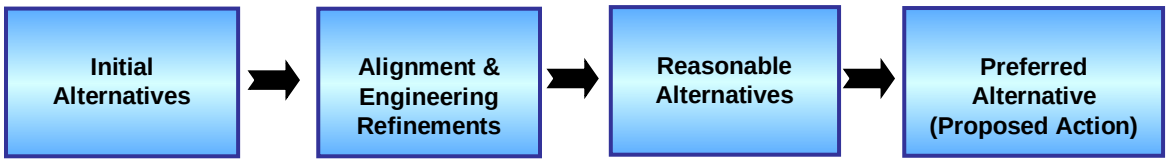
2.0 Overview of K-10 Alternatives Development Process

The alternatives development process entailed screening of the alternatives to determine which warrant further consideration for the project. The Initial Alternatives Screening, or Tier 1, was qualitative in nature as described later in this document. Under the Tier 1 screening, all Initial Alternatives were evaluated against the Purpose and Need criteria established for the project.

Based on the screening of the Initial Alternatives, the alternatives development process transitioned into a second round called Reasonable Alternative(s), or Tier 2 screening, as more than one alternative proved feasible and prudent to consider as the Preferred Alternative for the project. These Reasonable Alternatives were further evaluated quantitively to determine their potential impacts in comparison to the No-Build Alternative and each other.

Through the screening of the Reasonable Alternatives a Preferred Alternative, or Proposed Action, was selected. This Preferred Alternative is the alternative that meets the Purpose and Need for the project while avoiding, minimizing, or mitigating impacts to both the natural and human environment, and considers engineering and costs, and public and stakeholder input. **Figure 2-1** illustrates the alternatives development process for the project.

Figure 2-1: Alternatives Development Process



The Preferred Alternative will be carried forward and evaluated alongside the No-Build alternative as part of the EA. The process of screening alternatives with an ascending level of detail assures decision-makers of the fulfillment of the improvement's goals, while fostering informed consent with reviewing agencies, stakeholders, and the public.

3.0 Alternatives Development and Screening

Alternatives Considered

As part of the environmental clearance process, a No-Build Alternative is used as a benchmark for comparison against the other improvement alternatives being evaluated. A total of six alternatives were considered. The range of potential alternatives include the following:

- No-Build
- Improvement of Alternate Routes
- Existing Capacity Management
- Multimodal
- Add Capacity – Traditional Widening
- Add Capacity – Express Toll Lanes

3.1. No-Build

As part of the environmental clearance process, a No-Build Alternative is used as a benchmark for comparison against other alternatives being evaluated to improve a project. The No-Build Alternative means that no roadway and/or bridge reconstruction or capacity improvements would be constructed on the K-10 corridor. This alternative will include ongoing maintenance of the K-10 corridor along with minor pavement and bridge rehabilitation and ongoing maintenance. This alternative also includes all future projects that are currently planned and already committed within the corridor's project area and noted in state, regional, and local transportation improvement plans through the 2060 design year of the project.

The following improvements are committed within the corridor:

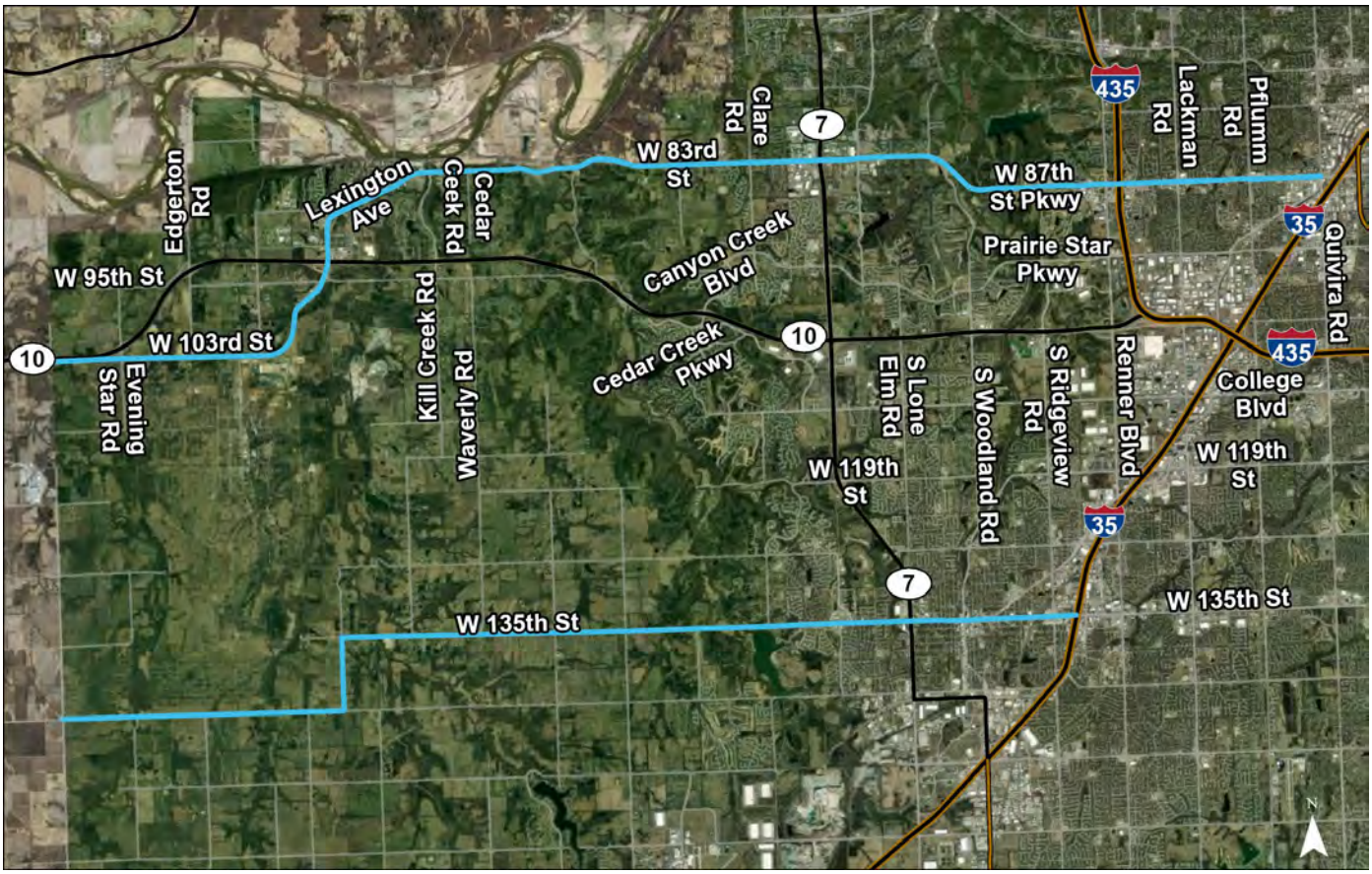
- Widening 95th Street from Renner Boulevard to Loiret Boulevard (Connected KC)
- Widening Woodland Road between K-10 and College Boulevard from two lanes to four lanes and adding turn lanes at each intersection (Connected KC)
- Add capacity to the interchange at the intersection of Cedar Creek Parkway and K-10 (Connected KC)
- New interchange at K-10 and Lone Elm Road (Connected KC)
- Improve the interchange at K-7 and Prairie Star Parkway with sidewalk and mixed-use trail, streetlights, and enclosed storm drainage (Connected KC)
- Add capacity to K-10 from the Douglas/Johnson County line to I-435 (Connected KC)
- K-10 Reconstruction (no added capacity, surfacing) from K-10/K-7 Junction to I-435/K-10 Junction (Metro Area TIP)
- East-Bound Lexington Avenue Bridge Rehabilitation (Bridge #177) on K-10 (Metro Area TIP)
- West-Bound Lexington Avenue Bridge Rehabilitation (Bridge #176) on K-10 (Metro Area TIP)
- West-bound and east-bound bridges (Bridges #178 & #179) over Kill Creek on K-10, Bridge Rehabilitation (Metro Area TIP)
- K-7 improvements south of K-10 to Harold Road (Metro Area TIP)
- I-435 Guardrail Updates beginning at Junction K-10 to Midland Drive (Metro Area TIP)
- Local Road Improvement at various locations around the K-10/Lexington Avenue Interchange (Metro Area TIP)

- New Interchnage at K-10 and Moonlight Road/Prairie Star Parkway (Connected KC)
- Add capacity to K-10 and Woodland Road Interchange (Connected KC)
- New 4-Lane Roadway: Clare Road from Prairie Star Parkway to K-10
- Reconfiguration of the K-10/K-7 interchange as part of The Gateway Project (Connected KC)
- Widening Ridgeview Road to 6-Lanes between K-10 and College Boulevard (Connected KC)
- Widening Lackman Road from 101st Street to 105th Street (Connected KC)

3.2. Improvement of Alternate Routes

This alternative includes improvements to parallel and supporting arterial roadways on the local city or country roadway network such as W 87th Street, W 83rd Street, Lexington Avenue, and W 103rd Street or Santa Fe Street, W 135th Street, and W 143rd Street rather than directly improving K-10 as shown in **Figure 3-1.**

Figure 3-1 – Improvement of Alternate Routes



Strategies for improving alternate routes could include:

- Intersection improvements;
- Upgrading and coordinating traffic signals;
- Building additional travel lanes;
- Transit improvements such as new bus routes, more frequent routes, or bus rapid transit; or
- Enhanced traveler information and other technology improvements to better manage traffic flow and safety.

In order to make these types of improvements to alternate routes, local (city or county) or area transit agency funding and programming commitments would be required.

3.3. Existing Capacity Management

This alternative evaluates strategies to better manage the capacity of the existing lanes and access points on the K-10 corridor. These strategies include low-cost ways to improve traffic operations and safety of the existing roadway to increase traveler mobility, improve safety, and reduce traffic bottlenecks.

These types of strategies fall into two key categories:

- Travel Demand Management (TDM) Strategies – Strategies that manage the travel demand along the corridor such as ridesharing, staggering work shifts, alternative work hours, and telecommuting by working from home.
- Transportation Systems Management (TSM) Strategies – Strategies that manage traffic operations and safety through the use of technology or enhanced traveler information. This includes:
    - KC Scout type traveler information on travel times, incidents, or delays;
    - Traffic signal coordination and modernization;
    - Roadway signage improvements;
    - Ramp metering through traffic signals on ramps that help regulate the flow of vehicles entering the corridor from local interchanges; and
    - Queue warning systems that alert motorists of approach slowdowns or traffic backups ahead on the roadway.

3.4. Multimodal

This alternative considers strategies to improve travel for all modes of transportation, rather than just passenger vehicles. This includes addition of or improvements to bicycle and pedestrian facilities and trails parallel to or crossing K-10, as well as transit service

enhancements including intercity bus services, fixed route transit, on-demand, demand-response or Paratransit services, micro transit, and rail to improve corridor throughput.

Bicycle and Pedestrian improvements could include:

- Improving trails located parallel to or crossing the corridor;
- Adding sidewalks or designated bicycle and pedestrian areas to corridor bridge crossings in urban areas; and
- Other bicycle and pedestrian improvement strategies identified in state, regional, and local plans including the following:
    - The K-10 Transportation Study indicated that, due to safety concerns, additional bicycle/pedestrian trails around K-10 would not be accepted without sufficient amount of ROW around the corridor. If additional ROW was purchased, a trail system could be constructed along K-10. The proposed trail would need to be separated by fencing or some other physical barrier to promote safety for pedestrians and bicyclists.
    - Recommended bicycle and pedestrian-ways improvements from the De Soto 2021 Comprehensive Plan include the addition of sidewalks along all roads within the city and the creation of local and regional trails to support driverless families/individuals and promote more healthy and active lifestyles within the community. Some specific recommendations include sidewalks installed from apartments adjacent to the K-10 corridor to Harps, install new and connect existing trails along rivers and creeks, and to expand current bike routes and trails.
    - Recommended bicycle and pedestrian-ways improvements from the City of Lenexa Parks, Recreation, and Open Space Comprehensive Plan include the expansion of the bikeways and trails to better connect the various parks, commercial, and residential areas, development of major and minor trailheads, and the development of trail design and maintenance standards.
    - The Plan Olathe Comprehensive Plan includes a system of interconnected trails that connects people to neighborhoods, services, and adjacent regional trails.

Transit Options Analysis

A standalone evaluation of transit alternatives was completed for this study, the full results can be found in **Appendix A**. The evaluation considered strategies to improve and expand transit service within the study area. This included transit service enhancements to improve corridor throughput. The evaluation included a detailed analysis of existing transit conditions and providers, a needs assessment, and a two-

tiered evaluation of potential solutions. An evaluation was completed for seven transit alternatives:

- Microtransit
- Addition of a new interregional bus line (Manhattan – KCMO Interregional Line)
- K-10 Connector Improvements
- Private Shuttle Service
- Vanpool Service
- Passenger Rail
- Redesign the K-10 Connector into an Interregional Line

3.5. Add Capacity – Traditional Widening

This alternative considers the reconstruction of pavement and bridges along the corridor and constructing an additional general-purpose lane in each direction of travel. The alternative also incorporates additional capacity to improve connections to and from interchange ramps along the corridor, such as auxiliary lanes, which provide a continuous lane of travel between closely spaced interchange entrance ramps and exit ramps.

Geometric and condition improvements include:

- Add an additional travel lane in each direction;
- Reconfigure portions of interchange at K-10 and K-7;
- Reconfigure portions of interchange at K-10 and I-435;
- Reconfigure portions of interchange at I-435 and I-35;
- Reconfigure the interchange at K-7 and Prairie Star Parkway;
- Reconfigure the interchange at Lackman Road and I-435.
- Reconfigure interchanges along K-10 at Evening Star Road, Lexington Avenue, Woodland Road, and Renner Road;
- Additional interchange at Lone Elm Road;
- Improvements to local interchanges and supporting cross streets; and,
- Reconstruction of existing pavement and bridges.

If this alternative is selected, improvements likely would be constructed in phases. Decisions on phasing would be based on funding availability and when traffic congestion and safety needs warrant the improvements along the corridor. For this

analysis, the full buildout of the alternative prior to the project design year is considered when rating against the screening criteria.

3.6. Add Capacity – Express Toll Lanes

This alternative includes adding an additional lane in each direction of travel that would provide express toll service along the corridor by managing congestion in the lanes through pricing, vehicle eligibility, and access strategies. This alternative also includes reconstruction of bridges and pavement in the corridor.

Geometric and condition improvements include:

- Add an additional travel lane in each direction for express toll lane service;
- Reconfigure portions of interchange at K-10 and K-7;
- Reconfigure portions of interchange at K-10 and I-435;
- Reconfigure portions of interchange at I-435 and I-35;
- Reconfigure the interchange at K-7 and Prairie Star Parkway;
- Reconfigure the interchange at Lackman Road and I-435.
- Reconfigure interchanges along K-10 at Evening Star Road, Lexington Avenue, Woodland Road, and Renner Road;
- Additional interchange at Lone Elm Road;
- Improvements to local interchanges and supporting cross streets; and,
- Reconstruction of existing pavement and bridges.

If this alternative is selected, improvements likely would be constructed in phases. Decisions on phasing would be based on funding availability and when traffic congestion and safety needs warrant the improvements along the corridor. For this analysis, the full buildout of the alternative prior to the project design year is considered when rating against the screening criteria.

4.0 Screening Criteria

Screening Criteria were developed across four broad categories covering various aspects of the project and community input.

Screening Criteria Categories:

- Project Purpose and Need
- Natural and Human Environment (Tier 2 Screening Only)
- Engineering and Cost (Tier 2 Screening Only)

- Public and Stakeholder Input (Tier 2 Screening Only)

Each broad category contains several criteria, discussed below. Ratings for each alternative are summarized in a Screening Matrix.

4.1. Purpose and Need Screening Criteria

The Purpose and Need for the project is defined as follows:

The proposed project is needed to modernize and expand the K-10 Corridor from west of the interchange at Evening Star Road to the I-435/I-35/K-10 Interchange in Johnson County, Kansas. The corridor has become insufficient to meet current and future mobility needs, resulting in worsening safety, reliability, and congestion. There is also a need to address the corridor's issues with transportation improvements that offer long-term sustainability and flexibility for all users.

The proposed project is needed to:

- ***Enhance safety performance*** to address high crash areas and congestion related crashes.
- ***Improve traffic operations*** by reducing congestion and delay within the corridor to meet existing and future travel demands.
- ***Improve infrastructure condition*** and address ongoing operations and maintenance needs impacting long-term travel reliability and life-cycle costs.
- ***Provide flexible transportation choices*** by accommodating the needs of all users and modes.
- ***Support local and regional growth*** through coordinated transportation improvements consistent with current and future land use.

The screening criteria to evaluate meeting the Purpose and Need are defined as:

- **Enhance Safety Performance –** This group of screening criteria evaluates the extent to which each alternative addresses crash frequency and congestion-related crashes.
    - **Change in Congestion-Related Crashes –** This screening criteria evaluates the extent to which an alternative potentially reduces the number and severity of congestion-related crashes, such as rear-end, sideswipe and sudden changes in speed.
    - **Improve Bicycle and Pedestrian Safety Along Crossroads** – This screening criteria evaluates the extent to which an alternative improves safety for bicycles and pedestrians along crossings over or under K-10.

- **Improve Traffic Operations** – This group of screening criteria evaluates the extent to which each alternative improves traffic operations to meet existing and future travel demands.
    - **Change in Travel Level of Service on K-10** – This screening measure is rated using LOS reporting, with a scale encompassing LOS A (best) through LOS F (worst). This measure evaluates the change in LOS along the corridor over existing and future No-Build conditions.
    - **Change in Travel Speed** – This measure evaluates the change in travel speed along the corridor over existing and future No-Build conditions.
- **Improve Infrastructure Condition** - This group of screening criteria evaluates the extent to which each alternative addresses infrastructure condition and ongoing operations and maintenance needs, supporting environmental stewardship, as well as improving long-term traveler reliability.
    - **Change in Roadway and Bridge Condition** – This measure is a high-level indicator of an alternative's ability to address existing roadway and bridge infrastructure condition deficiencies.
    - **Support Environmental Sustainability** – This measure evaluates the alternative's ability to support environmental stewardship best management practices.
- **Provide Flexible Transportation Choices** – This group of screening criteria evaluates the extent to which the alternative provides flexible choices for all users and modes.
    - **Access and Connectivity to Bicycle and Pedestrian Facilities** – This measure evaluates each alternative's ability to maintain or improve access and connectivity of bicycle and pedestrian facilities along and across the corridor. This factor is not evaluating a bicycle and pedestrian facility on the K-10 travel lanes or shoulder.
    - **Reliability for Transit Riders** – This measure evaluates each alternative's ability to provide a reliable transit experience for users through the corridor.
- **Support Local and Regional Growth –** This group of screening criteria evaluates the extent to which an alternative accommodates planned population, land use, and other growth and development in the study area and the Kansas City region.
    - **Compatibility with Local Planning –** This measure evaluates an alternative's compatibility and consistency with city and county planning and land use goals for future growth and development.

- **Compatibility with Regional Planning –** This measure evaluates an alternative's compatibility and consistency with regional Metropolitan Planning Organization (MPO), MARC, planning and land use goals for future growth and development.

4.2. Natural and Human Environment Screening Criteria

All initial alternatives are evaluated against the Purpose and Need criteria for the project. Only those alternatives that satisfy the Purpose and Need criteria are then carried through for qualitative analysis as Reasonable Alternatives against Natural and Human Environment criteria, Engineering and Cost criteria, and Public Stakeholder Input criteria.

The natural environmental impacts are related to physical features of the landscape. The human environmental impacts include any community, neighborhood, environmental justice, and business resources that may be affected by the proposed project alternatives.

- **Park and Recreational Impacts –** This measure includes the number and extent of parks or designated recreational areas impacted by each alternative.
- **Community Facility Impacts –** This measure includes the number of community facilities impacted by each alternative.
- **Environmental Justice Impacts –** This measure considers direct and indirect impacts to identified environmental justice (EJ) populations, including low-income and minority populations. Direct impacts include factors such as relocations as related to needed right-of-way or potential funding mechanisms. Indirect impacts are any indirect or cumulative impacts to EJ populations.
- **Natural Resource Impacts –** This measure assesses impacts to natural resources including wetlands, streams, floodplains (100-year floodplain and floodway), critical habitat, and threatened and endangered (T&E) species.
- **Hazardous Material Impacts –** This screening measure includes a relative rating based on the number of hazardous materials and contaminated sites potentially impacted by each alternative.
- **Cultural and Historical Site Impacts –** This screening measure indicates impacts to archeological, cultural, and historic sites including those listed or eligible for listing on the state or national register of historic places.
- **Air Quality, Emissions, and Energy Impacts –** This screening measure indicates an alternative's potential impact on local and regional air quality, greenhouse gas emissions, and energy resources.

- **Indirect and Cumulative Impacts –** This screening measure indicates positive, neutral, or negative indirect and combined impacts from any environmental criteria.

4.3. Engineering and Cost Screening Criteria

The study team is evaluating each alternative for potential engineering and cost considerations including roadway and interchange geometrics, right-of-way and displacement impacts, project construction timeline, phasing, maintenance of traffic and constructability, as well as the ability to address project costs and funding needs. Like the Natural and Human Environment criteria, only Initial Alternatives that satisfy the Purpose and Need criteria are evaluated qualitatively against the Engineering and Cost criteria.

- **Roadway and Interchange Geometrics –** This is a high-level assessment of the alternative's ability to improve roadway and interchange geometric deficiencies, such as horizontal and vertical curves, weaving and merging distances, and turning radii.
- **Right-of-Way Impacts** – This is a high-level assessment of right-of-way needs from private property for each alternative. A more comprehensive, quantifiable assessment will be made as the study progresses.
- **Residential or Business Displacements** – This is a high-level assessment of potential displacements to residences and/or businesses for each alternative. A more comprehensive, quantifiable assessment will be made as the study progresses.
- **Timing of Construction** – This criterion is a high-level assessment to determine which alternative(s) can be advanced through the project development pipeline and constructed under the fastest timeline.
- **Ease of Project Phasing, Maintenance of Traffic, and Constructability** – This high-level measure is intended to determine the ease or complexity of project phasing, staging and anticipated road closures during construction.
- **Estimated Construction Costs** – This screening measure evaluates the relative level of anticipated construction costs for implementing each alternative.
- **Estimated Life-Cycle Costs** – This screening measure evaluates the anticipated costs of operating and maintaining each alternative over its expected life cycle.

4.4. Public and Stakeholder Input Screening Criteria

The project team is evaluating each alternative based on public and stakeholder input received on the alternatives. This input is being provided through numerous sources

and includes a broad cross section of interested stakeholders and the general public. Input received from public and stakeholder activities, such as stakeholder interviews and presentations, Advisory Group meetings, public information meetings, statistically valid community surveys, community focus group sessions, and social media outreach is incorporated into the screening process for the alternatives using public comment tools on the website, at meetings, and through social media channels to document public and stakeholder feedback on the project.

- **Public and Stakeholder Input** - screening measure indicates positive, neutral, or negative reactions from stakeholders and the public on each alternative and is captured via the project team's public and stakeholder outreach activities.

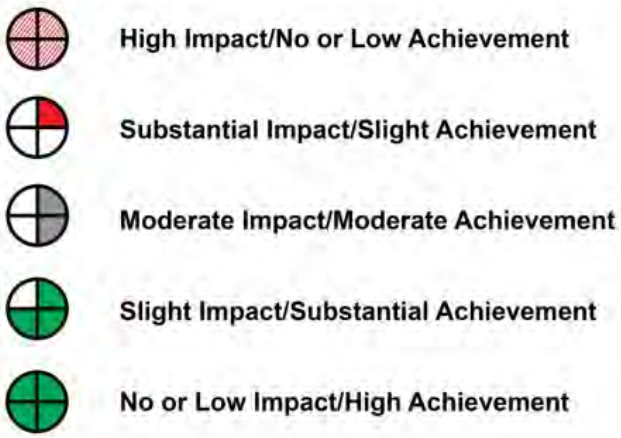
4.5. Screening Rating System

The initial range of alternatives are rated qualitatively using a Harvey balls/ideograms rating system (**Figure 4-1**). Where applicable, quantifiable data on the criteria is included in the environmental consequences and impact analysis for the EA for the No-Build and any proposed actions being carried forward from the initial screening of alternatives as Reasonable Alternatives (Tier 2 screening).

Each symbol relates to the extent of achieving a Purpose and Need goal or the level of potential impacts. Criteria for Tier 1 screening are classified as impact related or achievement related. Achievement related criteria evaluate items related to project Purpose and Need goals and impact related criteria evaluate items related to environmental or cost impacts of an alternative.

Alternatives have been compared against the No-Build Alternative and each other for each criterion. Differences or similarities in ratings indicate differences or similarities between the alternatives at achieving the criteria.

Figure 4-1: Harvey Balls/Ideograms Rating System



- **High Impact/No or Low Achievement** – This rating denotes that achievement-based criteria and goals are not met (or very negligible), or there are high environmental or engineering/cost impacts.
- **Substantial Impact/Slight Achievement** – This rating indicates some success at addressing achievement-based criteria and goals, or there are substantial environmental and engineering/cost criteria related impacts.
- **Moderate Impact/Moderate Achievement** – This rating indicates a mid-level of success at addressing achievement-based criteria and goals, or there are some environmental and engineering/cost criteria related impacts.
- **Slight Impact/Substantial Achievement** – This rating indicates increasing success at addressing achievement-based criteria and goals, or lower levels of environmental or engineering/cost related impacts. Achievement based criteria might be met under this rating, however an alternative could be rated as substantial achievement if another alternative exceeds it at addressing the criteria.
- **No or Low Impact/High Achievement** – This rating indicates the highest level of success at meeting achievement-based criteria and goals. Achievement-based criteria are fully met under this rating. This rating can also indicate that there are approximately zero or very low impacts for environmental and engineering/cost criteria.

5.0 Screening of Initial Alternatives

In November 2023 the Purpose and Need Statement for the project was shared with Agencies and Native Tribes identified as Participating Agencies as part of the EA. They were asked to review, comment and provide concurrence if desired. Participating Agencies providing a response, included:

- U.S. Environmental Protection Agency (USEPA)
- Kansas Department of Health and Environment (KDHE)
- Kansas Water Office
- City of Lenexa
- Osage Nation of Oklahoma
- Mid America Regional Council

The Initial Alternatives Screening of all alternatives is based upon the Purpose and Need and the screening criteria established as a result. Please see **Appendix B** for the full Initial Alternatives Screening Matrix.

5.1. Purpose and Need Screening

The Purpose and Need Screening considered all Initial Alternatives for the project. Each alternative was evaluated across several criteria under each component of the Purpose and Need.

Enhance Safety Performance – Adding new lanes of travel capacity through either traditional widening or adding express toll lanes (ETL) have the most potential to improve the safety of the corridor as it will address crashes caused by stop and go traffic and includes improvements to roadway, ramp, and interchange geometrics along the corridor.

Improve Traffic Operations – The additional capacity alternatives have the highest potential rating for improving traffic operations as they would add additional lanes to reduce congestion and delay within the corridor.

Improve Infrastructure Condition – Adding additional capacity through traditional widening and express toll lanes both have the highest rating to improve the infrastructure condition. Traditional widening and express toll lanes would impact long-term travel reliability and life-cycle costs through additional capacity in the corridor to accommodate larger traffic volumes.

Provide Flexible Transportation Choices – The Multimodal Alternative offers improved access to transit, bicycle, and pedestrian connections in the study area, which provides additional traveler flexibility and mode choice. Additionally, both additional capacity alternatives offer lane management strategies that are flexible and adaptable to changing corridor conditions.

Support Local and Regional Growth – The alternatives that add new lanes of capacity in addition to the existing capacity management were evaluated to best align with the various city and the region's anticipated growth strategies. These alternatives are incorporated into the planned and committed transportation improvements within state, regional and local planning documents to help accommodate future growth plans. The other alternatives were evaluated to moderately align with future growth strategies as they provide improved multimodal connections and enhanced traveler information technologies and demand management strategies that are included in local and regional goals and area plans.

5.2. Initial Alternatives Dismissed from Further Considerations

Through the Purpose and Need Screening several alternatives did not meet the Purpose and Need of the project. The Improvement of Alternate Routes, Existing Capacity Management and Multimodal alternatives as stand-alone alternatives do not satisfy the Purpose and Need for the project. Components of those alternatives may ultimately be incorporated as part of the Preferred Alternative, if appropriate and coordinated with city, county, region, and transit agency plans and commitments.

Improvement of Alternate Routes – This Initial Alternative was eliminated from consideration as a stand-alone alternative due to its low achievement at improving safety performance and infrastructure condition, connectivity to bicycle and pedestrian facilities, and reliability for transit riders. In addition, it did not have a high rating in being compatible with local planning.

Existing Capacity Management – This Initial Alternative was eliminated from consideration as a stand-alone alternative due to its low achievement at reducing congestion and improving infrastructure condition issues along the K-10 corridor. This alternative also performs poorly when compared to other Initial Alternatives at providing flexible choices.

Multimodal – This Initial Alternative was eliminated from consideration as a stand-alone alternative due to its low achievement at reducing congestion and improving traffic operations along the K-10 corridor. The alternative has moderate, even substantial achievement at reaching the project's goals of providing flexible choices and some aspects of supporting local and regional growth. A full consideration of transit specific alternatives considered and their viability can be found in **Appendix A**. Although this alternative is eliminated from consideration as a stand-alone solution due to the above reasons, individual elements may be incorporated into the Preferred Alternative.

5.3. Initial Alternatives Retained for Further Development

The two "Add Capacity" alternatives, as well as the No-Build Alternative to continue to serve as a baseline, were retained from the Initial Alternatives Screening for further development and screening as Reasonable Alternatives. These alternatives have been shown to satisfy the Purpose and Need of the project. No alternative was shown to score well across all screening criteria.

No-Build Alternative – As previously described, the No-Build Alternative makes no capacity improvements to the K-10 corridor other than those directly related to on-going maintenance and/or rehabilitation of the facility or those already committed or programmed by local, state, or regional funding programs. This alternative fails to meet several components of the Purpose and Need for the project. This alternative, however, is retained throughout the NEPA process and its potential impacts are utilized as a basis of comparison to the Build Alternatives.

Traditional Widening Alternative – This alternative was carried forward for analysis as a Reasonable Alternative due to its ability to meet all elements of the Purpose and Need criteria, most at a high level. This alternative is anticipated to enhance safety and reduce congestion along the K-10 corridor while promoting sustainability and accommodating local and regional growth. The Traditional Widening Alternative is expected to manage congestion and offer long-term corridor travel reliability while maintaining a smaller footprint and lower construction costs than the ETL Alternative. Impacts to the Natural and Human Environment as well as Engineering and Cost

related criteria will be quantified for this alternative as part of the Reasonable Alternatives Analysis.

Express Toll Lanes (ETL) Alternative – The ETL Alternative was carried forward for analysis as a Reasonable Alternative due to its ability to meet the Purpose and Need criteria established for the project. This alternative is anticipated to enhance safety and reduce congestion along the K-10 corridor, while promoting sustainability, providing flexible choices, and supporting local and regional growth. The ETL Alternative is expected to manage congestion and offer long-term corridor travel reliability with a slightly larger overall footprint and, therefore, higher construction costs than the Traditional Widening Alternative. Impacts to the Natural and Human Environment as well as Engineering and Cost related criteria will be quantified for this alternative as part of the Reasonable Alternatives Analysis.

Based on the Tier 1 screening, both the Traditional Widening and ETL Alternatives merit additional analysis. However, the ETL alternative cannot advance as a viable alternative without the consent of the community, and approvals by the KTA Board, and State Finance Council as required by Kansas Statute KSA 68,20-120. If the necessary consent and approvals are not secured, the ETL Alternative will be dismissed.

6.0 Reasonable Alternatives

As described in Section 5.3, three alternatives were carried forward for additional detailed development and analysis as Reasonable Alternatives. These alternatives are the No-Build Alternative, Traditional Widening Alternative, and the ETL Alternative. The two Build Alternatives were carried forward for their ability to satisfy the Purpose and Need of the project. Figures depicting the configurations of the Traditional Widening and ETL Alternatives can be found in **Appendix D** and **Appendix E**, respectively. Although the No-Build Alternative does not satisfy the Purpose and Need screening criteria, it is considered a benchmark for comparison against the Build Alternatives.

7.0 Reasonable Alternatives Screening

The Reasonable Alternatives were screened against additional screening criteria in a similar fashion as the Initial Alternatives utilizing the Harvey Balls rating system. A detailed quantifiable analysis was done for select environmental and engineering criteria.

Screening Criteria Categories:

- Project Purpose and Need
- Natural and Human Environment
- Engineering and Cost
- Public and Stakeholder Input

The Traditional Widening and ETL Alternatives were evaluated for engineering, traffic, safety, and environmental impact analysis. A full screening matrix for the Reasonable Alternatives Screening can be found in **Appendix C**. The following details the analysis and results.

7.1. Purpose and Need Screening

The ratings for the Purpose and Need Screening from the Initial Alternatives Screening were carried forward to be utilized as the Reasonable Alternatives Screening. This is a recognition that the ability of the alternatives to satisfy the Purpose and Need has remained unchanged.

7.2. Natural and Human Environment Screening

The Natural and Human Environment Screening of the Reasonable Alternatives was conducted using quantifiable data where appropriate. Generally, the Traditional Widening Alternative has a smaller right-of-way and impact footprint than the ETL therefore, fewer impacts are seen to environmental features or community facilities and resources. The No-Build Alternative generally has more favorable ratings since it is a "no action" strategy and does not cause physical impacts to the natural and manmade environment.

Parks and Recreational Areas and Community Facilities – There are anticipated to be minor impacts from each alternative to adjacent recreational trail connections and bike lanes as well as parks. Both alternatives would impact approximately 0.18 acres of parks, 3,643 feet of bike lanes, and 12,856 feet of recreational trails. It is anticipated that all impacts to parks and recreational trails would be able to be mitigated and replaced in-kind to restore access. There are properties containing two community facilities located within the construction limits of both alternatives that would be impacted, these include a church and school. Impacts are related to grading and construction activities and would not impact the functional use of either resource.

Environmental Justice – EJ areas include areas along the corridor at the Block Group level that meet state, regional, county, and city level thresholds for designated low-income or minority populations. The EJ analysis also includes low-income and minority populations that use K-10 to access jobs and other major activity centers from throughout the Kansas City region. For both alternatives, direct property impacts are anticipated to be minor, with the exception of potential relocations. Both alternatives are anticipated to displace four residential properties. All four properties are located within a low-income and minority Block Group.

Noise – The ETL Alternative has a wider right-of-way footprint than the Traditional Widening Alternative, shifting traffic closer to sensitive noise receptors such as residences, schools, churches, and other community facilities. A noise analysis was not completed for this Tier 2 Screening. Upon selection of the Preferred Alternative, KDOT will complete a noise study to evaluate if any areas of the corridor qualify for noise

abatement measures based on being reasonable and feasible. A general assessment of potential receptors was conducted and determined similar impacts from both alternatives.

Natural Environment – This category evaluates potential impacts to water resources such as wetlands, streams, and floodplains, as well as critical plant and animal habitat and designated Threatened and Endangered Species. There will be some impacts under both alternatives to habitat, streams, wetlands, and floodplains crossing the corridor, however, these impacts are not expected to be substantial and will be mitigated. These impacts are the same or less under the Traditional Widening Alternative than the ETL. There are anticipated to be no impacts to ponds within the corridor under either alternative.

Approximately 8.96 acres of wetlands are anticipated to be impacted as a result of the Traditional Widening Alternative and approximately 9.26 acres of wetlands as a result of the ETL Alternative. Additionally, the Traditional Widening Alternative will impact approximately 18,195 feet of streams, and 19.38 acres of floodway and 100-year floodplains; the ETL Alternative will have a slightly higher impact with over 18,850 feet of streams and 20.15 acres of Floodway and 100-year Floodplains anticipated to be impacted. The project team will obtain all necessary permits and use best management practices for construction and ongoing maintenance to provide for long-term corridor resiliency and environmental stewardship.

Hazardous Materials – Both the Traditional Widening and ETL Alternative are anticipated to have similar impacts to locations with identified hazardous materials. Both alternatives are shown to impact two previous underground storage tank (UST) locations. Both sites are considered closed according to the KDHE. Any impacts are expected to be minor in nature and remediation will be completed as necessary.

Cultural and Historic Sites – Impacts to cultural and historic sites are not known at this time, however both the Traditional Widening and ETL Alternative would have similar impacts due to similar footprints. Review of the Kansas Historic Resources Inventory does not show any listed properties along the K-10 Corridor. KDOT is currently working with the SHPO to determine if there are any potentially eligible sites that have not previously been identified. If any sites are identified the preferred alternative will be evaluated for impacts. If impacts or potential impacts are identified, coordination will be conducted with the SHPO.

Air Quality, Emissions, and Energy Impacts – Both build alternatives alleviate stop and go traffic congestion along the corridor to varying degrees, and therefore will have positive impacts on the region's air quality, as well as a reduction in greenhouse gas emissions.

Indirect and Cumulative Impacts – Both build alternatives are expected to have indirect and cumulative impacts from their construction and operation. The ETL Alternative, having a larger footprint, is expected to have slightly greater indirect and

cumulative impacts than the Traditional Widening Alternative. Additionally, the ETL Alternative will have impacts from the tolling component of the managed travel lane and its influence on Kansas City regional travelers accessing K-10.

7.3. Engineering and Cost Screening

The Traditional Widening and ETL Alternatives were evaluated against the Engineering and Cost Criteria. The No-Build Alternative was also carried forward as a benchmark for comparison.

Generally, the Traditional Widening Alternative has a smaller right-of-way footprint than the ETL Alternative, therefore fewer impacts are expected to engineering and cost factors such as right-of-way displacements.

Roadway and Interchange Geometrics – Both build alternatives would address current roadway, ramp, and interchange deficiencies.

Right-of-Way Impacts and Residential or Business Displacements – The smaller footprint of the Traditional Widening Alternative requires 0.05 acres less of additional right-of-way than the ETL Alternative. Both alternatives will require four residential property displacements and would impact the property of three additional residences. There would be no business displacements, however, multiple businesses would be indirectly impacted due to construction of either alternative. Two community facilities (a church and a school) will have property impacts due to construction requiring additional right-of-way.

Ease of Phasing, Maintenance of Traffic, and Constructability – The ETL Alternative requires fewer construction phases than the Traditional Widening Alternative, which has a positive impact on the traveling public. This is due to the need to construct larger portions of the corridor at once to create a viable toll lane system. The Traditional Widening can be phased in smaller pieces as congestion worsens along the corridor. Due to this the Traditional Widening was rated higher for its ability to be phased in a way that better meets the needs of the corridor.

Construction Cost – The Traditional Widening Alternative is expected to cost $40 million (in 2023 dollars) less to build than the ETL Alternative because it requires a smaller footprint.

Life-Cycle Costs – The Traditional Widening Alternative is anticipated to have lower life-cycle costs than the ETL Alternative as the ETL requires additional life-cycle costs for toll related infrastructure including wider pavement to accommodate the buffer between ETL and general purpose lanes and additional infrastructure for direct connect ramps at I-435. This additional infrastructure would need to be maintained over the life of the facility and, therefore, contribute to increased lifecycle costs. All other life-cycle costs are expected to be the same for both facilities.

7.4. Public and Stakeholder Screening

Input received from public and stakeholder activities such as stakeholder interviews and presentations, Advisory Group meetings, public information meetings, community surveys, community focus groups, and social media outreach is incorporated into the screening process for the alternatives using public comment tools on the website, at meetings and through social media channels to document public and stakeholder feedback on the project. The Traditional Widening Alternative has received more positive feedback from the public and stakeholders than the ETL Alternative.

8.0. Recommended Preferred Alternative (Proposed Action)

8.1. Recommended Preferred Alternative (Proposed Action) Description

The Traditional Widening Alternative was selected as the Recommended Preferred Alternative, designated as the Proposed Action for the K-10 Capacity Improvements Project. The Traditional Widening Alternative was recommended by the K-10 Project team due to its ability to meet the Purpose and Need of the project, address congestion and traffic safety concerns within the corridor, results in fewer impacts to the natural and human environment over the other Build Alternative, and its ability to provide a lower cost solution. KDOT will work with local partners to accommodate multimodal, existing capacity management, improvement of alternate routes, and other complementary improvements to the preferred alternative. A map series showing the Traditional Widening Alternative can be found in **Appendix D**.

The Traditional Widening Alternative met the Purpose and Need of the project by:

- **Enhancing Safety Performance –** The implementation of the Traditional Widening Alternative will enhance safety performance through adding new lanes of travel capacity which will address crashes caused by stop and go traffic and include improvements to roadway, ramp, and interchange geometrics along the corridor.
- **Improving Traffic Operations –** The Traditional Widening Alternative and the ETL Alternatives had the highest ratings for improving traffic operations. The Traditional Widening Alternative would provide more capacity options for all vehicles. Additional lanes would also increase the overall corridor's travel speed and increase the corridor's throughput.
- **Improve Infrastructure Condition –** Adding additional capacity has the highest rating to improve the infrastructure condition through the replacement of pavement and bridges along the corridor. The addition of lanes through traditional widening would impact long-term travel reliability and life-cycle costs through additional capacity in the corridor.

- **Provide Flexible Transportation Choices –** The Traditional Widening Alternative offers additional capacity through the addition of lanes for other modes of transportation, such as transit, by alleviating roadway congestion. In addition, as a result of construction, there will be improved access to transit, bicycle, and pedestrian connections in the study area.
- **Support Local and Regional Growth –** Both the Traditional Widening and ETL Alternatives were evaluated to best align with the various city and the region's anticipated growth strategies. These alternatives are incorporated into the planned and committed transportation improvements within state, regional, and local planning documents to help accommodate future growth plans.

The Traditional Widening Alternative is shown to have fewer natural and human environment impacts then the ETL Alternative. This includes fewer displacements of floodplains, wetlands, and streams. This is due to the smaller footprint of the Traditional Widening Alternative than the ETL Alternative.

From an engineering and cost standpoint the Traditional Widening Alternative has an overall lower construction cost of $1.16 billion, which is $40 million lower than the ETL Alternative. The Traditional Widening Alternative has an overall lower life-cycle cost than the ETL Alternative due to the lack of tolling infrastructure. The Traditional Widening Alternative has fewer right-of-way impacts.

The No-Build Alternative, while not a Reasonable Alternative, was carried forward for evaluation as a point of comparison against the Build Alternatives. The No-Build Alternative does not meet the Purpose and Need for the project and was not selected as the Recommended Preferred Alternative due to the presence of a constructible, fundable, and viable Build Alternative that met the Purpose and Need for the project. The No-Build Alternative, however, will be carried through to the EA to serve as the basis of comparison.

K10 CORRIDOR

Appendix A

Transit Alternatives Analysis Memo

K10 CORRIDOR

K-10 Capacity Improvements

Transit Analysis Memo

April 2024

K10 CORRIDOR

Kansas Department of Transportation

KDOT IKE AT WORK

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1.0 Introduction

Highway systems must accommodate a number of different mode types, including freight transport, private automobiles, and public transportation systems to enhance access to communities along the corridor. The K-10 corridor, connecting suburban communities of the Kansas City metro area to communities such as Lawrence, De Soto and Eudora, is no exception. As land uses change along the corridor, there is a need to better understand the role of multimodal transportation in and around the corridor and nearby communities. Understanding whether or not public transportation can be used to address future travel demand in the corridor, or if public transportation should play a supporting role to address future demand were key considerations of this study.

The following objectives were established to guide the development of alternative approaches to multimodal transportation in the corridor:

- Service must provide an alternative to single occupant private auto for employees of the Astra Enterprise Park.
- Service must provide transit options for persons without access to autos for work and non-work trips within the study area.
- Service must enhance mobility in the area.
- Service must provide linkages among existing transit services and facilities in the study area.

As part of this study, a high level analysis was conducted on a number of potential multimodal public transportation alternatives for the K-10 corridor. These alternatives were evaluated through two tiers to determine their feasibilty. The results of this analysis will determine if multimodal approaches should be part of the larger K-10 Corridor Capacity improvements Project. All **Figures** referenced in this document can be found in **Appendix A**.

2.0 Existing Conditions

Existing plans, service providers, and case studies provided a baseline for the needs assessment and alternatives analysis. These existing conditions helped determine if multimodal public transportation could be utilized in the K-10 corridor.

2.1 Existing Plans Review

Kansas Active Transportation Plan (KDOT 2023)[1]

This plan was produced in conjunction with the Kansas Department of Transportation (KDOT) *Long Range Transportation Plan* (LRTP) and the Kansas *Strategic Highway Safety Plan* (SHSP), which identifies the vulnerability of active transportation users and discusses strategies to reduce frequency and severity of crashes involving bike/pedestrian users. An analysis of crash data across the state prompted the production of this plan to guide the creation of policies that reduce crash risk to active transportation users. Active transportation is a term for primarily human-powered modes of transportation such as walking, bikes, scooters, wheelchairs, and includes both motorized and non-motorized modes. The plan's goals are stated as:

- Improve safety by reducing the frequency and severity of crashes.
- Invest in underserved communities and prioritize the needs of populations that rely on active transportation.
- Increase regular use of active transportation.
- Promote active transportation to support health and improve quality of life.
- Normalize active transportation within the overall transportation system.
- Maintain and preserve sources of investment and funding.

Strategies to implement these goals that pertain to the K-10 corridor study include:

- Identify opportunities for long-distance route connections between communities and facilitate the development of side paths, traditional trails, and rail-trail connections.
- Promote micromobility programs that provide equitable access to transportation options.
- Use mode split data for all trip purposes (not just work) to better understand trends in active transportation.
- Promote and support state bicycle routes, trails, scenic & historic byways, and the communities along them.

[1] https://www.ksdot.gov/Assets/wwwksdotorg/KansasATP/documents/Kansas_Active_Transportation_Plan.pdf

Transportation 2050 (Lawrence-Douglas County Metropolitan Planning Organization (MPO), 2023)[2]

This plan identifies future multimodal transportation needs, goals, and strategies within the Lawrence-Douglas County region. The specific objectives relevant to the K-10 corridor study include:

- Provide a transportation system that supports multimodal options that are affordable, sustainable, efficient, safe, and easy to use.
- Elevate equity in transportation planning and investments by prioritizing the fair and just distribution of benefits and burdens related to transportation and by ensuring traditionally underrepresented communities participate in decision making.
- Increase the percentage of trips made using active, shared, and low carbon transportation modes to reduce vehicle miles traveled.
- Strive for equitable outcomes when maintaining existing infrastructure and designing new facilities by considering mobility needs for all ages and abilities.

Strategies to achieve these and the other objectives include a variety of transit related strategies that include:

- Expanding bike/pedestrian routes regionally
- Improve/expand multimodal transit options with a focus on equity and transit disadvantaged communities.
- Improvement of transit amenities and expansion of park and rides to connect modes.
- Addressing barriers to access
- Improvement of wayfinding infrastructure
- Exploration of new technologies
- Maintain considerations of safety and sustainability in the planning processes

The plan recommends several multimodal transit options such as vanpool, employee shuttle programs, active transportation, and car share. The City of Lawrence is in the process of implementing a new transit transfer center at Bob Billings Parkway and Crestline Drive, with seven local routes and two regional routes now being routed to this location instead of the downtown location. Phase 2 of the plan includes a Sunday Microtransit service as well as a system-wide fare free service. Future projects planned

[2] https://assets.lawrenceks.org/mpo/T2050/T2050.pdf

along the project corridor are minimal but include the expansion of K-10 to six lanes from Lawrence to the Johnson County line.

Comprehensive Plan for Unincorporated Douglas County 2040 (Lawrence-Douglas County MPO 2023)[3]

This plan dictates visions and goals for Douglas County, with an emphasis on maintaining the separation between urban and rural areas. Transportation goals for the region align with the goals laid out in other plans, specifically enhancing the multimodal network and connectivity with a special emphasis on transit dependent and senior users. They also specify the importance of safety, sustainability, and technological advancement within the transit network.

LRTP 2020-2045 (KDOT 2021)[4]

KDOT's *LRTP* pledges a commitment to improving safety and technology, promotion of alternative fuels, and continued development of the multimodal transportation network across the state.

KDOT supports local active transportation efforts through project coordination, funding, and technical assistance, to help reduce gaps in state-owned transportation facilities that pose a negative effect on active transportation efforts. One of these efforts is the establishment of funding through the Eisenhower Legacy Transportation Program (IKE) that goes towards paying for low-cost improvement measures for active transportation crossings at uncontrolled highway intersections. Kansas houses a robust bicycle network across the state that connects to various national routes including United States Bicycle Routes 66 and 76, the American Discovery Trail, the Lewis & Clark Trail, and the TransAmerica Trail.

The *LRTP* states that the state is divided into Coordinated Transit Districts (CTD), with the project area being in the Urban Corridor (CTD-1). The plan states that 145 transit and paratransit operators operate within 82 counties in the state, as of 2019, with the largest number of trips taking place in the four largest metropolitan cities. Kansas City and Lawrence are two of these cities and are located on either end of the study area.

Comprehensive Plan (City of Eudora 2020)[5]

The City of Eudora is located east of the City of Lawrence, on the north side of the K-10 corridor. During public outreach, Eudora residents expressed that bike/pedestrian and transit facilities are lacking and/or need improvement. The plan highlights several sidewalk priority areas within the city. Specific to this study is the sidewalk connecting to and crossing the K-10 corridor at Church Street, marked as a priority in the plan. Similarly, an expansion of the City's bike network will follow this same sidewalk

[3] https://assets.lawrenceks.org/pds/planning/plan-2040/Plan-2040.pdf
[4] https://www.ksdot.gov/Assets/wwwksdotorg/bureaus/burTransPlan/Documents/KDOT_LRTP.pdf
[5] https://www.cityofeudoraks.gov/DocumentCenter/View/1508/Eudora-Comprehensive-Plan_w-Appendix_2020-12-19?bidId=

connection at Church Street and cross the corridor. This bike network expansion will add many other planned bike routes in addition. The City is not currently served by the K-10 Connector route, operated by Johnson County Transit between Lawrence and Overland Park. A short-term goal of the plan is to include a K-10 Connector stop near east Eudora. Conversations should be continued with RideKC (the shared brand identity for the transit systems operating in the Kansas City region) and KDOT regarding service expansion options.

Urban Corridor Coordinated Public Transit – Human Service Transportation Plan-CDT 1 (KDOT 2018)[6]

This plan was developed with the purpose of identifying needs and a framework for local and regional transit agencies to advance mobility in the region. The plan identifies goals and strategies for each county in the region and general timelines for accomplishment. Based on an analysis of demographic data for transit disadvantaged populations (elderly/seniors, poverty populations, transit dependent), Douglas County was ranked as Medium Priority with Shawnee and Johnson, being ranked as High Priority. Douglas County is considered to be a support to its neighbors with a higher priority. The implementation plan for Douglas County identifies key themes for the plan, strategies, and estimated time frames for implementation. Notable strategies include several regional transit initiatives that involve coordination with regional transit providers and with key employment and activity centers.

Smart Moves 3.0 Kansas City Regional Transit Plan (Mid-America Regional Council 2017)[7]

Smart Moves 3.0 is the Kansas City region's 20-year plan for transit and mobility. It builds on a solid foundation of prior planning and prepares the region for greater choices in the rapidly evolving transportation environment.

The Smart Moves 3.0 plan envisions a mobility landscape that includes efficient, high-ridership transit service linked by well-located mobility hubs where riders can transfer from one fixed route to another or connect with mobility services to get where they need to go. This plan also recognizes that efficient transit thrives on density.

The Smart Moves plan does not include service in the K-10 corridor in its specific recommendations. However, the plan does list goals that include the expansion of transit modes, connecting people to goods and services, and maximizing the existing transit system.

Commuter Park & Ride Study (Lawrence-Douglas County MPO 2013)[8]

This study was part of a series of Multimodal Planning Studies conducted by the Lawrence-Douglas County MPO. The goal of the study was to identify potential

[6] https://www.ksdot.gov/Assets/wwwksdotorg/bureaus/burTransPlan/pubtrans/CTD_1_Urban_Corridor.pdf
[7] http://www.kcsmartmoves.org/
[8] https://assets.lawrenceks.org/assets/mpo/study/reports/park.pdf

locations for park and rides within the county. The recommended park and ride locations pertinent to this study are as follows:

- South Lawrence
- Eudora
- Baldwin City
- Additional exploration is needed for a location in east Lawrence.

5 County Regional Transportation Study (KDOT, MARC, Lawrence-Douglas County MPO 2010-2013)

This study was conducted in cooperation with KDOT, The Mid-America Regional Council (MARC), and the Lawrence-Douglas County MPO, to identify multimodal transportation needs and to develop strategies to address these needs.

Phase 1 (2010)[9]

Phase 1 assesses the multimodal transportation needs for the five County study area.

K-10 was identified as a corridor with transportation deficiencies and opportunities. Recommendations that resulted from the completion of Phase 1 include:

- Increase transit-oriented development in the region.
- Create safer and connected pedestrian and bicycle facilities.
- Expand park and ride locations and facilities.
- Expand pedestrian networks to better connect to transit facilities.
- Better serve lower density areas with public transit.
- Provide service that is more competitive to auto travel and are accessible/meet the needs of aging, rural, or transit disadvantaged communities.

Phase 2 (2013)[10]

Phase 2 prioritizes the needs identified in Phase 1 and develops strategies to address the needs. Phase 2 established a framework for decision making regarding transit projects and lists out recommended and not recommended

[9] https://kdotapp.ksdot.gov/5CountyStudy/get_more_info/reports.aspx
[10] https://kdotapp.ksdot.gov/5CountyStudy/get_more_info/reportsPhase2.aspx

improvements along various corridors with time frames and cost estimates. Several transit-oriented strategies were identified along the K-10 corridor:

- Expand operating hours/service for the K-10 Connector Service (2020-2030).
- Construct bicycle path across K-7 on Prairie Star Parkway to connect existing paths (2020-2030).
- Expand park and ride facilities at KTA Lecompton Toll Plaza (2020-2030).
- Construct park and ride facilities near Eudora and De Soto (2020-2030).
- Bicycle/Pedestrian facilities: Consider on all new or reconstructed bridges of K-10 (2020-2030).
- Construct park and ride facilities near US-59 and near E. 1750 Street (2020-2030).

The study also reports that 53% of surveyed residents in the area would choose public transportation if the system in the area was more robust. The survey also reported that there is a greater need/desire for bike/pedestrian infrastructure and for public transportation that will meet the needs of populations that are aging in place.

Kansas Statewide Intercity Bus Study (KDOT 2012)[11]

This study examined intercity bus service in Kansas, determined whether there were additional needs in the state, and developed recommendations to address those needs. Intercity bus (ICB) service is a unique mode of transportation, able to cover long distances comparable to those of domestic air or rail travel but using a non-exclusive right-of-way: the public highway system. The Federal Transit Administration (FTA) defines ICB as – Regularly scheduled bus service for the general public, using an over-the-road bus, that:

- Operates with limited stops over fixed routes connecting two or more urban areas not in close proximity or connecting one or more rural communities with an urban area not in close proximity.
- Has the capacity for transporting baggage carried by passengers.
- Makes meaningful connections with scheduled intercity bus service to more distant points.

Over-the-road travel gives intercity buses flexibility unavailable to other modes, allowing them to serve more remote, rural destinations. Consequently, intercity buses have the

[11] https://www.ksdot.gov/Assets/wwwksdotorg/bureaus/burTransPlan/pubtrans/pdf/Kansas%20Intercity%20Bus%20Study%20Final%20Report.pdf

potential to serve many populations that might not otherwise have long-distance travel options. The study did not include a specific recommendation for the K-10 corridor. Furthermore, transit service in the Johnson County – Lawrence corridor may not meet the FTA definition of intercity bus service because it would not connect nonurbanized areas with the intercity bus network.

K-10 Transportation Study (KDOT 2005)[12]

This study was sponsored by KDOT, MARC, and the Lawrence-Douglas County MPO, to identify needed improvements to the K-10 corridor. In section 6.2 of this report, transit service on the corridor is discussed with a multitude of potential future routes and services. According to this report a potential fixed-route service along the corridor, to be jointly developed by Lawrence Transit and Johnson County Transit, would include stops with supporting park & ride facilities at the following locations:

- KU Edwards Campus
- Johnson County Community College
- K-10/I-435 industrial area
- Woodland Road area
- K-10/K-7 industrial area
- Lexington Avenue in De Soto
- Church Street in Eudora
- KU Lawrence Campus (Student Union)
- Downtown Lawrence (9th/Massachusetts)

This report notes that any form of transit service along the K-10 corridor would require that both Johnson County Transit and Lawrence Transit step up to advocate for such service.

2.2 Existing Service Providers

Intercity Bus Services

Intercity bus services carry passengers long distances between cities or towns. Unlike local transit services, intercity routes do not have frequent stops, and typically have one stop per city/town. Intercity bus services, especially for those in more rural areas, is a more accessible form of long-range travel. A map showing intercity bus terminals and routes can be seen in **Figure A-1** in **Appendix A**.

[12] https://www.ksdot.gov/Assets/wwwksdotorg/bureaus/burTransPlan/pdf/K10/K10FinalReport.pdf

Greyhound

Greyhound Lines operates the largest intercity bus service in North America, operating approximately 1,700 coaches and serving thousands of destinations across the continent. Their mission statement is: “Greyhound is dedicated to giving millions of customers a safe, comfortable, affordable, and convenient way to travel”. Near the K-10 corridor study area, Greyhound has a stop at the Lawrence Station located Downtown at Vermont Street & W 7th Street. Tickets and passes cannot be purchased at the station and must be purchased online. Popular destinations from this stop, according to Greyhound’s website, include:[13]

- Kansas City, KS
- Kansas City, MO
- Des Moines, IA
- Fort Dodge, IA
- Columbia, MO

Greyhound also has a stop in Kansas City, Kansas located at the 47th Street Transit Center. Tickets are not sold at this station and must be purchased online. Popular destinations from this station include:[14]

- Oklahoma City, OK
- St. Louis, MO
- Russellville, MO
- Phoenix, AZ
- Shreveport, LA
- Dallas, TX

Greyhound has a third stop located in downtown Kansas City, Missouri at the 1101 Troost Avenue bus station. Tickets can be purchased at kiosks in-person at this station. Popular destinations from this station include:[15]

- St. Louis, MO
- Springfield, MO
- Dallas, TX

[13] Greyhound website, Lawrence bus station, https://www.greyhound.com/en-us/bus-station-600270
[14] Greyhound website, Kansas City, KS station, https://www.greyhound.com/en-us/bus-station-600259
[15] Greyhound website, Kansas City, MO station, https://www.greyhound.com/en-us/bus-station-590546

- Houston, TX
- Tulsa, OK
- Lewisville, TX
- Lincoln, Nebraska
- Chicago, Illinois

Jefferson Lines

Jefferson Lines is a regional intercity bus company similar to Greyhound. Their mission statement is: "From our home in America's heartland, we connect people with places. Our transportation company provides scheduled service and a full range of group travel sources. We earn our customer's business by understanding what they value and require when they travel with us. Then we provide service that exceeds their expectations". Jefferson Lines provides travel to 14 states including Kansas, and limited charter services in Minnesota and Montana. They currently have a station in Kansas City, Missouri at the 1101 Troost Avenue bus station, shared with Greyhound. Tickets may be purchased in-person.[16]

Other Regional Routes

In 2014, the KDOT Regional Transit Business Model proposed several regional routes to address needs to link local services and inter-regional services. Based on these recommendations, four regional routes have been implemented and are operated by various agencies throughout the State, such as the 81 Connection operated by OCCK between Belleville and Salina. None of these regional routes created based on the KDOT model operate near the K-10 corridor.[17]

Fixed-Route Transit Services

Fixed-route transit services include local bus service, express bus services, commuter bus services, and Bus Rapid Transit (BRT) services. These services generally form the core transit service of an agency/city. The fixed-route services operated by the various agencies in the study corridor area can be seen in **Figure A-2**.

Kansas City Area Transportation Authority (KCATA)

The KCATA connects the greater Kansas City region to transit opportunities through several services and is part of the RideKC service umbrella.

The KCATA operates 38 local bus routes that serve Kansas City and the greater metro area. These services include three MAX high frequency bus routes in addition to the local routes. Most local routes operate from approximately 5:00 AM through midnight,

[16] Jefferson Lines Website, https://www.jeffersonlines.com/about-jefferson-lines/mission-and-history/
[17] KDOT CTD 1 Coordinated Public Transportation Plan, KDOT, https://www.ksdot.gov/Assets/wwwksdotorg/bureaus/burTransPlan/pubtrans/CTD_1_Urban_Corridor.pdf

Monday through Friday, with a frequency of 30 minutes to an hour. The MAX high frequency routes share the same service span as local service, but at a frequency of 20 minutes.[18] In 2021 the KCATA provided 9,468,338 unlinked passenger trips, most of these trips (9,138,447, or 96.5% of all trips) being provided by either their local or MAX bus services. As part of the RideKC service umbrella, these bus services are fare free as of December 2023. KCATA revenue comes from a mix of local, state, and federal funding.

Johnson County Transit (JCT)

JCT provides public transit services to Johnson County, KS.

JCT operates 13 local bus routes and falls under the RideKC service umbrella. These services typically operate from 5:00 AM through 10 PM Monday through Friday. Most of these routes have an hourly frequency.[19] The K-10 Connector that runs along the K-10 corridor is operated by JCT. JCT provided 232,561 unlinked passenger trips in 2021. Approximately 62.5% of all trips were served using their fixed-route bus service. As part of RideKC, fixed route service is fare free as of December 2023.

Lawrence Transit

Lawrence Transit is provided by the City of Lawrence and local bus service serves the City and the University of Kansas. Their stated mission is "Together, the City of Lawrence and the University of Kansas will provide safe, affordable, reliable, and responsive public transportation services to enhance the social, economic, and environmental well-being of the community".[20]

Lawrence Transit operates 19 routes providing access throughout the City and University. These routes operate from 6:00 AM to 8:00 PM Monday through Friday, with a few routes operating on Saturdays. Most of the service has a frequency of 30 or 60 minutes.[21] Most routes stop service over the summer (May – Mid August), following the University schedule and resume services at the beginning of the Fall semester.[22] In 2021, Lawrence Transit provided 639,527 unlinked passenger trips on their services, with 90.9% of all trips utilizing fixed-route services. As of January 1, 2023, Lawrence Transit has transitioned to a fare free service.

Microtransit

Microtransit is a technology-enabled demand response service that fills a niche between traditional fixed-route transit services and ride hailing services. Microtransit offers flexible scheduling of vehicles (which can be buses, vans, sedans, etc.) to meet the

[18] RideKC Routes, https://ridekc.org/routes
[19] RideKC Routes, https://ridekc.org/routes/category/johnson-county
[20] Lawrence Transit Website, https://lawrencetransit.org/routes/
[21] Lawrence Transit website, Route redesign Study, https://lawrencetransit.org/wp-content/uploads/2022/05/Task-1-Market-Analysis.pdf
[22] Lawrence Transit website, Service calendar, https://lawrencetransit.org/service-calendar/

demand of riders. These services are used to extend/enhance the efficiency and accessibility of nearby local transit services. A map of microtransit services nearby the K-10 corridor study area can be seen in **Figure A-3**.

Johnson County Microtransit

JCT provides a microtransit service that covers an approximately 180 square mile segment of Johnson County along I-35. This service area extends from Mission and Shawnee in the North to Edgerton and Gardner in the south. The service is split into a North and South zone, with the two zones containing an overlapping area (this can be seen in **Figure A-3** as the darker pink area). The service operates from 6:00 AM to 8:00 PM seven days a week. Fares were $3 for a trip within a zone, or $5 for trips that cross zones or go to either Ward Parkway or the Country Club Plaza.[23] Payments can be made on the RideKC Microtransit app or with cash in the vehicle. As of January 1, 2024, fares for the microtransit service are $5 for the first five miles, and $2 per each additional mile.[24]

On-Demand, Demand-Response, and Paratransit Services

On-demand, Demand-Response, and paratransit services are similar transit services provided by cities and agencies where a vehicle will pick up passengers within a specific service area. These services can be reserved in advance or they can be requested for immediate service. These services can be public or private and only cater to specific clientele such as seniors or disabled persons associated with a specific residential facility or care provider.

RideKC Freedom

RideKC Freedom is the KCATA's paratransit service that provides transit service to qualifying seniors, persons with a disability, and low-income riders. Service is provided throughout Johnson and Wyandotte Counties in Kansas, and the Cities of Kansas City and Independence in Missouri. RideKC Freedom is split into two services: RideKC Freedom, and RideKC Freedom On-demand. **Table 1** showcases the differences between the two services.[25]

[23] Johnson County Microtransit, RideKC, https://ridekc.org/assets/uploads/route-schedules/499swk.pdf
[24] Fare Increase for Johnson County Microtransit, Johnson County Government, https://www.jocogov.org/newsroom/fare-increase-johnson-county-micro-transit
[25] RideKC Freedom On-Demand, RideKC, https://ridekc.org/mobility-services/ridekc-freedom-ondemand#map

Table 1: RideKC Freedom Services

Freedom On-Demand	Freedom
No advance reservations required	Schedule at least 24-hours in advance
Curb-to-curb service	Door-to-door service
Booking a trip: Use app or call (816) 842-9070	Booking a trip: Call (816) 842-9070
Pay with cash, credit/debit, or use the mobile app	Pay cash
$5 for the first mile, $2 per mile after	ADA $3 per trip Non-ADA cost based on total miles traveled.
Up to 60 subsidized one-way trips per month	Unlimited daily trips
Book a trip for friend or family members	Book a trip for friend or family members

RideKC Vanpool

The RideKC vanpool service has partnered with Enterprise to bring a vanpool service to the Kansas City area, available in the Counties of Jackson, Johnson, Wyandotte, Clay, Cass, Platte, and Leavenworth. Interested riders can sign up online, detailing where their daily commute starts and originates, and if there are any matches for a vanpool in the area you will be added to that group. Members of this vanpool service pay a monthly fee via an online payment app to access the service.[26]

Lawrence Transit On-Demand

Lawrence Transit On-Demand is a shared ride service that operates within the city limits of Lawrence. The service provides door-to-door service that operates from 8:00 PM to 6:00 AM Monday through Friday, and from 8:00 PM to midnight on Saturday. As of January 1, 2024, the service will extend Saturday hours to 6:00 AM, and introduce Sunday services from 8:00 PM to midnight. Trips can be reserved up to five days in advance and can be booked using the mobile app. Reservations can be made at any time. As part of the Lawrence Transit system, this service is fare free as of 2023.[27]

Private Service Providers

There are several private companies and agencies that provide on-demand, demand-response, or paratransit services near the K-10 corridor study area. These services, and the areas that they operate within, can be found in **Table 2**.

[26] RideKC Vanpool, RideKC, https://ridekc.org/rider-guide/vanpool
[27] Lawrence Transit On-Demand, Lawrence Transit, https://lawrencetransit.org/on-demand/

Table 2: Private Service Providers

Organization	Clientele	Service Area	Hours of Operation	Fares	Funding	Notes
Bert Nash Community Mental Health Center[28]	Elderly, disabled	Douglas County	9:00 AM to 5:00 PM seven days per week	Free	Section 5310	Bert Nash clients only
Cottonwood Inc.[29]	Disabled	Douglas County	7:00 AM to 10:00 PM Monday - Friday	Free	Section 5310	
Independence Inc. [30]	General public	Douglas County	8:00 AM to 5:00 PM Monday – Friday	In-Town - $3 Douglas County - $5 Out-of-Town Medical - $30	N/A	
Presbyterian Manors Inc.[31]	Elderly	City of Lawrence	8:30 AM to 4:00 PM Monday – Friday	Free	Section 5310	Presbyterian Manor clients only
Senior Resource Center for Douglas County[32]	Elderly	Douglas County	7:00 AM to 3:30 PM Monday – Friday	Within Lawrence - $4 Rural – Lawrence - $6	Section 5310	

Ride-Hailing Companies

Ride-hailing companies offer similar services to taxis to pick up riders. Riders request a pick-up online using a mobile app or website that matches them with a nearby driver that accepts the request. Unlike taxis, these vehicles cannot legally be hailed from the street. Uber and Lyft provide services within the K-10 corridor study area.

[28] Bert Nash Community Mental Health Center, KU Transit Center, https://kutc.ku.edu/bert-nash-community-mental-health-center
[29] Cottonwood Inc., KU Transit Center, https://kutc.ku.edu/cottonwood-inc
[30] Independence Inc. General Public Transportation, Independence Inc, https://independenceinc.org/transportation/
[31] Presbyterian Manor, KU Transit Center, https://kutc.ku.edu/presbyterian-manor-lawrence
[32] Senior Resource Center for Douglas County, KU Transit Center, https://kutc.ku.edu/senior-resource-center-douglas-county-inc-formerly-douglas-county-senior-services-inc

Rail

Rail Owners

The two main rail owners near the K-10 project study area are BNSF and Union Pacific (UP). UP owns most rail north of the Kansas River and BNSF owns most track south of the river. In addition, an abandoned US Army rail spur, currently severed at Commerce Drive in De Soto, leads directly to the Astra Enterprise Park, potentially connecting the area directly to the freight rail network. These rail networks can be seen in **Figure A-4**.

Amtrak

Amtrak operates their services in the area on BNSF-owned rail. They service one station within the City of Lawrence and are open 24 hours a day seven days a week. Tickets and passes cannot be purchased at the station and must be purchased online. This station offers service to the Southwest Chief train and takes approximately one hour to get to Kansas City Union Station heading East, or 40 minutes to get to Topeka heading West.[33]

2.3 Case Studies

The following case studies provide KDOT with examples of intercity and regional transit service from other states. Three case studies were selected to offer lessons learned and best practices regarding transit service design in the K-10 corridor study area. **Table 3** provides a high-level overview of each case study.

Table 3: Case Studies

Type	Existing Service	Case Study		
Corridor	**K -10**	**I-25**	**I-35**	**I-380**
State	Kansas	Colorado	Oklahoma	Iowa
Cities	Overland Park to Lawrence	Denver to Colorado Springs	Oklahoma City to Norman	Cedar Rapids to Iowa City
Service Name	K-10 Connector	Bustang South Line	Norman Express – Route 024	380 Express
Service Type	Commuter Bus	Commuter Bus	Commuter Bus	Commuter Bus
Operator	Johnson County Transit, Transdev	CDOT, Ace Transportation	EMBARK, Oklahoma City	East Central Iowa COG, Windstar Lines
Fare	Fare-Free	$5.00-$12.00	$3.00	$3.50
Trips per Day	M-TH: 21 EB, 22 WB Friday: 19 EB/WB	8	9	22
Operating Days	Monday - Friday	Seven days per week	Monday - Friday	Monday – Friday
Number of Stops	4	10	9	8

[33] Lawrence, Kansas, Amtrak Website, https://www.amtrak.com/stations/lrc

Colorado – I-25 Commuter Bus

The Colorado Department of Transportation (CDOT) began an intercity bus program in 2015 initially with services connecting Denver to Colorado Springs, Fort Collins and Glenwood Springs. The program, known as Bustang, has since been expanded to over 20 routes. In Fiscal Year (FY) 2022, Bustang carried approximately 28,000 riders or on average approximately 2,300 riders monthly. Ridership increased in FY 2023 with approximately 40,000 riders annual and approximately 3,300 riders monthly.

CDOT Bustang administers and funds the program, no local funding is used. CDOT initiated the interregional transit program and collaborates with municipalities along the routes to provide input on local stops and connections with other transit. In FY 2023 Bustang had operating costs of approximately $1.8 million and a monthly average of $154,000. For the case study, the focus was on the I-25 corridor between Denver and Colorado Springs, the Bustang south line.

CDOT contracts with a private contractor for operations although CDOT owns the buses, a fleet of 29 over the road coaches with many passenger amenities. The program has been very popular and is regarded as successful. The strategy is to provide an attractive high-level service to compete with personal vehicle travel. The service operates with limited stops along the route and with eight trips southbound and northbound each day. The service operates on weekends with a reduced schedule.

The Bustang fare is based on distance traveled, with a single trip ranging from $5 to $12. CDOT has plans to expand the program and the fleet to 50 buses as funding permits.

Oklahoma – I-35 Commuter Bus

In Oklahoma, the I-35 corridor is served by a commuter bus service (Norman Express Route 024[34]) between downtown Oklahoma City, the University of Oklahoma's Medical Center, the State Capitol, and the City of Norman. The Norman Express is funded and operated by Embark, Oklahoma City's transit agency. No funding is received from the state or Norman.

The Norman Express operates nine round trips per day with somewhat irregular frequencies between 5:30 a.m. and 7:16 p.m. The route does not operate on weekends. The route averages 83 passengers per weekday and charges a single trip fare of $3.00 but also offers a variety of weekly, daily, and monthly passes. EMBARK owns and operates one transit style bus for the Norman Express. These buses do not have the same amenities as other regional bus services (wi-fi, restrooms etc.) and often does not provide competitive commute times as compared to a passenger vehicle.

In December 2023, the Norman Express underwent changes to its route. The route was simplified in Oklahoma City and remained unchanged in Norman. This simplified

[34] https://embarkok.com/use/schedules

alignment focuses on providing service to the University of Oklahoma Health Center and the Downtown Oklahoma City Transit Center. The changes provide more direct service to the highest ridership destinations along the route.

Iowa – I-380 Commuter Bus

The Iowa Department of Transportation (Iowa DOT) Public Transit Bureau administers federal and state transit grants and provides technical assistance to Iowa's 19 urban public transit systems and 16 regional public transit systems.

In Iowa, the I-380 corridor is served by a commuter bus service (380Express[35]) that connects Cedar Rapids to Iowa City. The 380Express is managed by Corridor Rides (Corridor Rides is administered by the East Central Iowa Council of Governments (ECICOG)) and operated by Windstar Lines, Inc. (Windstar). The 380Express was originally a traffic mitigation measure to relieve congestion along the I-380 corridor during reconstruction beginning in 2018. The service was championed by a state legislator which was key to initiating the service. While reconstruction is mainly complete, the service has been so successful that Iowa DOT extended the contract with the bus operator Windstar until 2026. Instrumental in the program's success was Iowa DOT helping ECICOG navigate the various jurisdictional and agency boundaries along the route. The service focuses on commuters to the University of Iowa Medical Center but is open to the public which strengthens ridership.

The service is fully funded through Iowa DOT state highway funds, has an operating cost of approximately $1.5 million per year, and earns approximately $250,000 in revenue from passenger fares. Iowa DOT contributes some of the success of the service to high quality bus service that draws riders. The 380Express utilizes charter buses that provide Wi-Fi, comfortable seats, and access to a restroom.

The service operates at a high level of service with 22 trips per day in either direction. The 380Express operates at 30-minute headways during peak hours and one-hour headways at off-peak, Monday through Friday. Over the road coaches with passenger amenities such as reclining seats, luggage racks and Wi-Fi add to the attractiveness of the service, a key to its success. The route charges a single trip fare of $3.50, but also offers monthly passes for $125. As of 2023, the 380Express had an average of 305 riders per day, surpassing ridership prior to 2020.

Additionally, a vanpool program is available through Corridor Rides. The vanpool program is operated by Enterprise. In FY 2023 the program had approximately 19,000 riders. The 380Express is not considered "intercity" and is not eligible for Federal Transportation Administration (FTA) 5311 funding. To be eligible a service must provide a connection between nonurbanized areas. There is no dedicated funding for the 380Express.

[35] https://www.380express.com/schedule.php

2.3.1 Lessons Learned

After reviewing peer cities interregional commuter transit services there are several lessons learned that can be used in the assessment of transit service in the K-10 Corridor.

- Interregional services have been successful, demonstrating there is a need for these services to augment the transportation system. While ridership is modest compared to intracity transit, the services do provide both a means for transportation among individuals without access to private automobiles and an option to private automobile travel for individuals with auto access.
- A recurring theme was the importance of fast, frequent, and high-quality service to draw sustainable ridership. Amenities such as Wi-Fi, comfortable seats, and access to a restroom can help make the service more enticing than driving in a personal vehicle. A commuter service needs to operate quickly and frequently. The service needs to be competitive (speed, price, etc.) compared to the passenger vehicle.
- State involvement is an important factor for success. Interregional services by their nature require coordination among multiple agencies. For example, in Iowa, the state DOT helped navigate the complicated jurisdictional and agency boundaries. Colorado is an example of a successful statewide interregional transit program that was initiated by CDOT to address transportation objectives beyond local transit jurisdictions.
- State funding can be the key to a successful venture that addresses limitations of local support for interjurisdictional transit service.
- Another key theme was the need for a strong champion for a service and to ensure that there is a strong existing ridership pool to support the service. Programs need to have a strong champion who will advocate for intercity service.
- Commuter service needs to serve a larger population than just one employer, which will help ridership. All three services in the case studies are available to the public.

3.0 Needs Assessment

A transit need assessment was conducted to better understand the transportation needs of the populations within the K-10 corridor study area. The transit needs assessment determined if there is a significant market along the K-10 corridor that can be supported by transit. It identified if residents along the K-10 corridor have any unmet transit needs and if so, identify what type of transit service would be appropriate for the population.

This section discusses the various “indicators of demand” which measure the potential for a transit market. Indicators include the following and are discussed in detail below:

- Population density
- Employment density
- Activity density
- Zero-vehicle household density
- Low-Income household density
- Density of residents under the age of 18 (school-age youth)
- Density of senior residents (65+)

Another important factor in this needs assessment is civil rights and economic justice. Minority populations have historically been transportation disadvantaged and ensuring equitable and supportive levels of service to these individuals can be an important goal for a transit system.

3.1 Demand

The following sections discuss the indicators of demand that supported the transit market assessment. These factors examined the socio-economic situation for the people of an area and act as “indicators” of potential need for transportation services. Analyzing demand provided an accurate understanding of the transit needs of the population by examining who the people are and what life situation they are in. The data used in these analyses comes from MARC (population and employment data, at the Traffic Analysis Zone (TAZ) level) and from the 2021 5-Year American Community Survey (ACS) (All other data, at the census block level).

3.1.1 Indicator of Demand: Population Density

Population density is a key metric in assessing the overall strength of transit markets as most individual’s trips start and end at their homes. **Figures A-5 and A-6** show population density at the TAZ level around the K-10 corridor study area in 2019 and 2050. In 2019, the major population densities were in Lawrence, Eudora, De Soto, Olathe, Lenexa, and Overland Park. In 2050, these population centers remain much the same as 2019, with the greater Kansas City metro area experiencing a general increase in density, particularly in areas of Olathe, Overland Park, and Lenexa. Outside of these areas, density is relatively low. These low-density areas cannot support most forms of public transit except for on-demand services.

3.1.2 Indicator of Demand: Employment Density

Figures A-7 and A-8 show employment density at the TAZ level along the K-10 corridor study area in 2019 and 2050. Employment density denotes where people work as well as important travel destinations. Particularly in areas with high amounts of retail and

service industries, employment density can also be an indicator of places that are likely to have high amounts of economic activity. The largest concentrations of employment are locations in the downtown and university areas of Lawrence, portions of Overland Park and Leawood between I-435 and US-69, Mission, and downtown Olathe. Employment concentrations in 2050 are expected to remain in the same areas, but with additional growth in employment density in northeastern Olathe and eastern Lenexa along I-35 in the area's industrial parks. Additionally, the Astra Enterprise Park, located south of De Soto, is expected to add approximately 15,000 jobs. While this did not significantly alter the density of the TAZ due to its large area, it is a not insignificant addition to the area.

3.1.3 Indicator of Demand: Activity Density

Figures A-9 and A-10 show a bivariate map of employment and population densities for 2019 and 2050 using the data obtained from MARC. Population is shown in shades of pink, and employment in shades of blue. Areas high in both employment and population are shades of purple. The darker the color, the greater the amount of population or employment in an area. This map shows which areas have a mix of land uses, which can contribute to potential ridership. Transit routes serving these mixed-use areas generally have higher transit ridership than those with single uses. Some corridors that connect between high employment and high population areas can also see a higher potential ridership. Using these maps, the current highest density activity areas along the K-10 corridor are large parts of Lawrence and portions of Olathe, Lenexa, and Overland Park along the I-35 corridor. There are large areas of high employment/low population density in Lenexa around the interchange of I-35 and K-10, and in southwestern Olathe leading to Gardner. Alternatively, there are not high concentrations of high population/low employment density in any specific place, and instead are scattered throughout the area.

As seen in **Figure A-10**, much of the major activity densities in 2050 are the same as in 2019. The major difference for the K-10 corridor study area is a large employment increase at the Astra Enterprise Park (which is expected to employ 15,000 individuals according to the K-10 Land Use report).

3.1.4 Indicator of Demand: Zero-vehicle Households

The availability of personal vehicles is another factor that affects transit demand in an area. While people who do not own personal vehicles do not use transit by default, they have much fewer options than those who do. As a result, transit is an incredibly useful option of reaching areas they need to go. If transit does not present a realistic way of getting to their destination, they will find other means such as cycling, walking, or getting a ride from family/friends. **Figure A-11** shows the density of households with zero vehicles as of 2021. Areas in bright yellow represent a high concentration of households without access to a personal vehicle. Along the K-10 corridor study area, the highest density of households without a personal vehicle are areas around KU in Lawrence (likely due to the student population) and in scattered portions of the greater Kansas

City metro area, but areas outside of these have access to at least one personal vehicle.

3.1.5 Indicator of Demand and Equity: Low-Income Households

Identifying low-income households is an indicator of demand as these populations are less likely to own a personal vehicle or may have difficulty with the cost of owning and maintaining a personal vehicle and may utilize transit in lieu of a personal vehicle. Understanding where low-income populations are located is also a civil rights consideration for transit systems, as transit is often a key lifeline for these individuals to access employment opportunities, healthcare, education, food, and other necessities. Without this lifeline, low-income households are effectively barred from accessing these opportunities. **Figure A-12** shows concentrations of low-income populations along the K-10 corridor as of 2021. Lawrence has many areas of high low-income density around the KU campus (likely due to the student population), and there are also high concentrations of low-income individuals focused around the downtown Olathe area and eastern Lenexa.

3.1.6 Indicator of Demand: Residents under 18

Residents under 18 are also an indicator of transit demand as a large portion of the population under 18 cannot drive and can rely on transit. **Figure A-13** shows the density of residents under the age of 18 as of 2021. The highest concentrations of youth are in portions of central and southeast Olathe, Overland Park, and portions of southwest Lawrence.

3.1.7 Indicator of Demand: Senior Residents

Senior residents (those over the age of 65) are another indicator of demand as they are less likely to own cars than the general population, a potential advantage for transit. **Figure A-14** shows the density of senior residents along the K-10 corridor study area as of 2021. Most senior residents are located in the same areas as those under the age of 18, notably southwest Lawrence, central and southeast Olathe, and Overland Park.

3.1.8 Indicator of Equity: Minority Population

Another indicator of demand is the number of minority (non-white) populations. The objective is to ensure equitable access to transit services for these communities. As shown in **Figure A-15,** areas of dense minority populations along the K-10 corridor as of 2021 include southern Lawrence, central and southeastern Olathe, eastern Lenexa, and central Overland Park.

3.1.9 Indicator of Equity: Environmental Justice Populations

Environmental Justice populations are comprised of both low-income and minority populations. As some of the most vulnerable populations, communities of low-income minority populations have the highest need for transit services. These populations, shown in **Figure A-16** as the areas in dark shades of purple, must be considered when

discussing potential transit services to prevent disproportionately high adverse effects from transportation projects. Large portions of Lawrence, Olathe, and northern Overland Park have high concentrations of these communities.

3.1.10 Indicator of Demand: Commute Flows

Another indicator of transit demand are the flows of commuters in the K-10 corridor study area. By analyzing commuting patterns potential transit routes that can serve residents can be identified. **Table 4** shows the commute flows between Johnson and Douglas Counties according to 2020 5-Year American Community Survey data.

Table 4: Commute flows between Johnson and Douglas Counties.

County of Residence	County of Workplace	# of Commuters
Johnson County	Douglas County	2,779
Douglas County	Johnson County	7,088

As shown, there are approximately three times as many commuters entering Johnson County as there are commuters entering Douglas County. Work trips tend to be more consistently timed and transit may be a useful tool to serve these commuters. While peak time-only routes may be attractive to serve these commuters, it leaves a gap in service during off-peak hours. If a service does not provide off-peak service, commuters will find an alternate way to travel rather than use transit services.

3.2 Unmet Needs

The following section highlights the unmet transit needs of the populations in and surrounding the K-10 corridor that were identified from the transit needs analysis (Section 3.1). Many of the unmet needs identified below do not impact the K-10 Corridor Study Area directly but affect areas adjacent to or nearby the K-10 Corridor Study Area.

3.2.1 Zero-Vehicle Households

Current transit services from the KCATA, Lawrence Transit, and Johnson County Transit provide service to the majority of areas identified as having high densities of zero-vehicle households. The Johnson County Transit microtransit zone covers all zero-vehicle households identified in the analysis for Johnson County. To this end, the needs of this demographic can be seen as being met, although the service is limited in most of these areas.

3.2.2 Low-Income Individuals

The current routes and microtransit zones provide service to most areas identified as having high densities of low-income individuals. There are some areas with higher densities of low-income individuals in eastern Lenexa and Shawnee, just north of the corridor study area, that are not served by transit service. These groups are all covered by the Johnson County microtransit system and the RideKC Freedom paratransit system.

3.2.3 Residents Under 18

Lawrence Transit covers most areas with high densities of under 18 residents in Douglas County. While Johnson County Transit's routes and microtransit zones cover many areas with a high density of residents under 18, there are many areas that remain without transit service. Areas with high densities of residents under 18 without access to public transit include northern Shawnee, west Olathe, southeast Olathe, and areas of Gardner.

3.2.4 Seniors (65+)

Most areas with high densities of senior residents are covered by either Lawrence Transit's and Johnson County Transit's fixed-route or microtransit services. All other areas have access to the RideKC Freedom services that provide paratransit service within Johnson County. These needs are being met, but service levels are limited.

3.2.5 Minority Populations

Most areas identified as having large densities of minority populations are served by either Lawrence Transit or Johnson County Transit services, but there are areas without access to traditional transit services. These areas include northern Shawnee, northern Lenexa, southeast Olathe, and areas of Gardner. While not served by traditional transit services, these populations are still served by RideKC Freedom paratransit and the Johnson County microtransit services. These needs are being met, but service levels are limited.

3.2.6 Environmental Justice Populations

The majority of areas identified as having higher densities of potential environmental justice populations are covered by existing fixed route systems but there are a number of areas that are not currently served by traditional transit services. These areas include Eudora, central Lenexa, portions of central and southern Olathe, and areas of Overland Park south of 135th Street. The option of RideKC Freedom or Johnson County microtransit service remains for these populations. These needs are being met, but service levels are limited.

3.2.7 Astra Enterprise Park

The most significant change affecting transportation demand in the corridor is the Astra Enterprise Park. The Panasonic plant, scheduled to open in 2025, is expected to employ 4,000 and a total of 15,000 jobs are anticipated over time in the entire Astra Enterprise Park. While it is not known where these employees will reside, it is reasonable to anticipate that they will be dispersed throughout the area, including areas outside the K-10 corridor. With these types of developments existing population centers usually provide a significant portion of the employees. Population centers in Douglas and Johnson counties are likely to have concentrations of Astra Enterprise employees. De Soto and other communities in western Johnson County and eastern Douglas

County are preparing for an increase in new housing to accommodate the growth in employment.

This type of employment is difficult to serve with transit for several reasons. The dispersal of origins results in a lack of employee concentration necessary to support transit or other forms of ridesharing. Shift work further reduces concentrations of employees and requires transit to have longer service spans making transit less cost effective. Transit service to light industrial and distribution employment areas has not been effective in the Kansas City region.

3.3 Conclusions and Recommendations

The K-10 Corridor study area and its surroundings are not high potential transit markets even with the growth in employment at the Astra Enterprise Park due to low population densities and a lack of continuous corridors with employment and population densities sufficient to support transit.

Eudora and De Soto do not have general purpose transit although they do have paratransit service for mobility limited populations. The corridor in Johnson County does have transit and/or paratransit service. But the service levels are relatively low in most areas, which means access to the service is limited and possible destinations are limited. These communities do not have significant unmet transit needs, although transit service is at minimal levels. The potential for additional employment at the Astra Enterprise Park is an opportunity to improve and expand transit service in the corridor in the future. Decisions on additional transit service will be more a matter of policy rather than addressing absolute needs. Current transit service will not serve the commuter market.

Due to the large increase in employment expected at the Astra Enterprise site, some form of transit could be deployed to serve work trips. This is a policy decision and not an absolute need required for the functioning of the Astra Enterprise site.

Transit and ridesharing could be a complement to roadway improvements and would enhance mobility in an area with very limited transit options.

It is recommended that any future transit projects along the K-10 corridor take these conclusions into account:

- To address the general need for transit in the area some form of on-demand transit would be best suited to serve the low-density areas.
- To address the objective of addressing employment related transportation demand some form of transit specifically tailored to the market would have the greatest likelihood of success.
- Some form of interregional service seems warranted to connect communities that do not have outside transit connections.

4.0 Alternatives Analysis

Based on the results of the transit needs assessment an initial list of transit alternatives was developed to potentially serve the K-10 corridor. This list of alternatives was evaluated at a high level and screened using a set of criteria based on the study objectives.

A set of objectives were established to guide the development of alternative approaches to multimodal transportation in the corridor:

- Service must provide an alternative to single occupant private auto for employees of the Astra Enterprise Park site.
- Service must provide transit options for persons without access to autos for work and non-work trips within the study area.
- Service must enhance mobility in the area.
- Service must provide linkages among existing transit services and facilities in the study area.

4.1 Tier 1 Transit Analysis and Screening

Based on the needs assessment performed, seven alternatives were identified that may benefit the corridor and the industries at the Astra Enterprise Park. These transit options were:

Passenger Rail

Amtrak currently operates the Southwest Chief train service between Los Angles and Chicago, with stops in Lawrence and Kansas City, Missouri. While a new stop at De Soto for that service is unlikely, a new short-line passenger railroad with a stop in De Soto, immediately north of the Astra Enterprise Park, and other cities such as Lawrence and Kansas City, Kansas could provide passenger rail service to the city and the industrial park. Kansas City, Kansas has a concentration of potential employees for the firms in Astra Enterprise Park. This service would utilize the currently abandoned US Army rail spur leading into the Astra Enterprise Park to provide a direct connection to industrial sites at the Astra Enterprise Park.

Microtransit

The nearby Johnson County Transit microtransit zone could be expanded to serve the K-10 corridor, including De Soto and the Astra Enterprise Park. The current zones extend as far west as Renner Boulevard in the north zone and K-7 in the south zone. This could either entail the creation of a new zone in combination with the two existing zones, or an extension of an existing zone.

K-10 Connector Improvements

The existing K-10 Connector, providing bus service between Lawrence and Overland Park, could have a bus stop located in De Soto along its route to provide service to the city and the Astra Enterprise site with minimal modifications to the service plan.

Redesign K-10 Connector into Interregional Route

An extension of the previous alternative, the K-10 Connector could be redesigned to become like the original vision for the route from the *2005 K-10 Transportation Study*, with several stops located between the present stops in Lawrence and Overland Park, becoming an interregional service.

Manhattan – Downtown Kansas City Interregional Line

An East-West interregional bus line could be developed serving communities between the Manhattan area and downtown Kansas City, Missouri that would travel along the K-10 corridor.

Private Shuttle Service

A privately operated and funded dedicated shuttle service could be operated exclusively for employees of the Astra Enterprise site. This shuttle service could transfer individuals from their communities and the industrial park.

Vanpool Service

The RideKC vanpool service could be utilized by the Astra Enterprise Park to provide employees transit service on the Johnson County side of the K-10 corridor. Lawrence Transit could assist on the Douglas County side by implementing a vanpool service of their own.

4.2 Tier 1 Evaluation

After the development of the list of service alternatives, a series of meetings with local transit providers were held to gather more information and to gain their input on the proposed services. Based on these meetings initial evaluation criteria were developed to screen the seven potential alternatives. These initial criteria are:

1. Consistency with local plans and input from local agencies.
2. Does the proposed service connect to other transit services?
3. Would the service be conveniently accessible to employees at the Astra Enterprise Park?
4. Would the service connect to existing and/or future employment and population centers?
5. Cost effectiveness of proposed alternative.
6. Does the service make sense for the context of the corridor?

These criteria were ranked on a scale of 1 to 5 based on the following:

- 1 – Alternative did not meet the objective/criteria
- 2 – Alternative barely met the objective/criteria
- 3 – Alternative somewhat met the objective/criteria
- 4 – Alternative mostly met the objective/criteria
- 5 – Alternative fully meets the objective/criteria

Table 5 shows the results of the Tier 1 evaluation, with following sections explaining the justification for the rankings.

Table 5: Table showing qualitative rankings of initial alternatives.

Updated Criteria	Rail	Microtransit	K-10 Connector Improvements	Interregional Bus Short Line	Interregional Bus Line	Private Shuttle	Vanpool Service
Consistency with local plans and input from local agencies	2	3	2	2	3	4	3
Does the proposed service connect to other transit services?	2	4	4	4	4	2	2
Would the service be accessible to workers at the Astra Enterprise Park?	2	5	4	4	4	5	5
Would the service connect to existing/future employment/population centers?	1	5	3	3	3	5	5
Cost effectiveness of proposed alternative	1	2	4	2	2	5	5
Does the service make sense for the context of the corridor?	2	3	4	2	2	4	4
Composite Ranking:	**1.7**	**3.7**	**3.5**	**2.8**	**3.0**	**4.2**	**4.0**

Based on the Tier 1 evaluation two of the alternatives were screened out due to low composite rankings and the likelihood that they were not a viable solution for the corridor. These alternatives were:

Passenger Rail

While passenger rail was considered due to the nearby Amtrak route and the potential reactivation of the US Army spur line leading into the Astra Enterprise site, it was not considered to be feasible. Passenger rail service is expensive compared to all other options that were investigated. Additionally, the alternative would be inflexible, and likely would not serve the potential employee base of industries based in the Astra Enterprise site. If rail service is to be provided, it would likely be freight rail to the Astra Enterprise site to directly link the industries there to the freight network. The high cost and inability to provide direct service between likely employee concentrations and the industrial site make this alternative infeasible.

Redesign K-10 Connector into Interregional Line

The original vision for the K-10 Connector, as outlined in the *2005 K-10 Corridor Study*, had many more stops along its route. This would be much more costly than adding a stop at De Soto and would require additional planning for the route to succeed. Some of the transit agency staff interviewed said that some form of transportation connection between Lawrence and downtown Kansas City is warranted but were not sure if the K-10 Connector was the place to focus those efforts since the route is an education/student focused route.

Five transit alternatives were found to be potentially viable. These alternatives are:

Microtransit

As a county that already serves much of its area with microtransit service, it would make sense to further expand that service to additional users. However, Johnson County Transit staff felt that this is not an attractive option. The current microtransit system is very expensive for the number of riders served and is directly competing with their fixed-route service. Based on this analysis, microtransit would fit the character of the corridor but would be an expensive approach.

Interregional Bus Line

As an alternative to modifying the K-10 Connector, the implementation of a new interregional line was discussed to connect downtown Kansas City with cities as far west as Manhattan. Such a service would be costly to implement and operate compared to other options, but state-level support is possible, as staff from KDOT expressed an interest in interregional transit service. While an interregional service would make sense for the corridor as a whole, it would have the same drawback as other fixed route systems when servicing the Astra Enterprise Park and would likely require a first-mile last-mile solution extending the coverage of fixed route transit.

K-10 Connector Improvements

Improvements to the current K-10 Connector route may be feasible because the route is already in place and would not require substantial modifications. While this option appears to make sense, modifying the current route is not appealing to Johnson County Transit. Due to Lawrence discontinuing their portion of funding from the route earlier in 2023, the route is struggling financially and service reductions may need to be made in the future. Adding a new stop to the route in this situation may not be advisable. The K-10 Connector is a primarily student and education focused route, connecting the Lawrence KU campus to their KU Edwards campus in Overland Park. A new stop on this route at De Soto or the Astra Enterprise Park would be disruptive to the service. A modification to this route would be unlikely to connect the Astra Enterprise Park to the employment pool with such limited stops.

Private Shuttle Service

Other industrial sites like the Astra Enterprise Park use private shuttles to provide transit services for their employees. These systems are usually funded by the private firm, and either a local agency or contractor operate the service. Stakeholders interviewed agreed that this could be the best option to serve the Astra Enterprise Park, as it would go directly to where the expected employment pool is located instead of being constrained by a route also serving other destinations. It would be flexible enough to be able to change with demographics and other conditions, and it would be less expensive to operate than most other options considered. This service would not be available to the general public, as it would only be available to employees of the sponsoring company in the Astra Enterprise Park.

Vanpool Service

A vanpool service was also looked favorably upon by stakeholders as another inexpensive way to provide transit services to areas along the K-10 corridor. The downside to this system is that a sufficient number of individuals have to express interest in order for the service to be provided (a business must apply for a vanpool for their employees, or a number of people within the same area must register), whereas the private shuttle would be in service regardless. If employees were to utilize the existing RideKC vanpool service, this alternative would be able to serve employees including Douglas County residents because the destination of their trips, at the Astra Enterprise Park, lies within Johnson County.

4.3 Tier 2 Evaluation

Based on the results of the Tier 1 evaluation, five alternatives were identified for further evaluation.

- Microtransit

- Interregional Bus Line
- K-10 Connector Improvements
- Private Shuttle
- Vanpool Program

These alternatives are not mutually exclusive. They can be implemented in conjunction with other solutions to provide a more comprehensive transportation program for the K-10 corridor.

Methodology

The alternatives were developed at a conceptual level using the following methodology:

- Routes and service plans were developed to better define the service area and to provide a basis for cost and ridership potential estimates.
- Operating and capital costs were estimated using costs from other similar services.
- Ridership potential was estimated based on the service plan concept and the experience of other similar services. A detailed ridership assessment was not conducted.

Microtransit

Microtransit is most effective in serving short passenger trips. When microtransit is deployed in a large area allowing for longer trips (more than three to four miles) the cost per passenger increases substantially because vehicles are limited in the number of trips that can be served in a time period. Microtransit productivity is typically low, in the range of 3 to 6 passengers per revenue hour. The attractiveness of microtransit is a result of its high level of customer convenience, providing taxi-like service, with pick ups and drop offs at or near the passenger's destination at times requested by the passenger. For this analysis two approaches were evaluated; 1) a relatively small microtransit zone in De Soto which would serve short trips in the area, and a first-mile-last-mile function to supplement other transit service, such as fixed route service. 2) a larger zone that would operate either as an extension of the north Johnson County microtransit zone, or as a new zone entirely. For the purpose of this evaluation the large microtransit zone option is assumed. The small microtransit zone option does not have the ability to generate ridership and would only be used in conjunction with other alternatives to provide a first-mile-last-mile function.

Route and Stops

As an on-demand service, the microtransit system would be able to pick up and drop off passengers anywhere within the zone(s) of operation. The service could drop off Astra Enterprise Park employees adjacent to Park entrances.

Service Frequency and Span

The microtransit system would operate from 6:00 AM to 8:00 PM seven days a week on a demand basis.

Institutional Structure and Operations

The service would likely be the responsibility of Johnson County or another local jurisdiction. The preferred operating model would be to continue Johnson County's practice of contracting with a private operator.

Potential Ridership

Microtransit would be effective in generating ridership with an estimated 400 weekday passenger trips and 120 employees served.

Cost

Annual operating costs were estimated at $4,216,000. There would be no capital cost because a turnkey contract is assumed whereby the contractor provides the vehicles.

Funding

Currently microtransit in Johnson County is provided by Johnson County as part of their transit program. Funding for additional microtransit service is not available. There are no other existing funding sources for microtransit. Additional funding would have to be authorized by the Johnson County Commission.

Interregional Bus Route

An alternative to modifying the K-10 Connector is the implementation of a new interregional bus route serving the corridor and connecting Kansas City metro area with cities to the west such as Topeka and Manhattan. An interregional service would enhance mobility in the corridor as a whole and fill a gap in the transportation system. However, it would have the same drawback as other fixed route services when servicing the Astra Enterprise Park. For the purpose of this evaluation only the portion of the route between Kansas City and Lawrence would be included. It is assumed that the K-10 Connector would continue to operate in the corridor.

Route and Stops

Figure A-17 shows the route concept. Stops would be located at intervals along the route including Kansas City, Olathe, De Soto and other communities. The stop in De Soto would likely not be located conveniently to the Astra Enterprise Park employee entrance and would require another means to transfer passengers between the interregional bus stop and the employee entrance. Microtransit is assumed for this purpose. As labeled in **Figure A-17**, the potential stops are:

1. Downtown Kansas City Union Station

2. Johnson County Community College
3. Downtown Olathe
4. De Soto
5. Eudora
6. Lawrence Transit Central Station
7. Lawrence Amtrak Station
8. Topeka Amtrak Station, adding a regional destination beyond the corridor.
9. Downtown Manhattan, adding a regional destination beyond the corridor.

It is assumed an interregional service would extend beyond the K-10 corridor.

Service Frequency and Span

The interregional bus would operate weekdays only from 6 AM to 9:30 PM with one-hour headways.

Institutional Structure and Operations

The service would likely be operated by the State of Kansas or a quasi-public agency. The service would be contracted to a private operator.

Potential Ridership

Ridership on the entire 140-mile route was estimated at 120 daily riders. Ridership was estimated at 40 for the Kansas City to Lawrence portion of the route with very limited usage by Astra Enterprise Park employees.

Cost

Annual operating costs on the entire 140-mile route was estimated at $3.5 million. For the Kansas City to Lawrence portion of the route operating costs were estimated at $1,524,000. The cost for a microtransit service within De Soto estimated at $496,000 is an additional cost with this alternative. Capital cost would be $3,750,000 for four buses.

Funding

There are no current funding sources for interregional bus service. Several states have interregional funding programs. The most likely funding source for this type of service would be a new state funding program that would likely require authorization by the Kansas Legislature for an interregional transportation program administered by KDOT.

K-10 Connector Improvements

With this service currently in place an option is to make improvements to the existing service to make it a more effective service for both employees of Astra Enterprise Park

and travelers in the corridor in general. The concept would add a stop in De Soto in the interchange area of K-10 and Edgerton Road. This new stop would be a quick-on, quick-off style to minimize the time required for this additional stop.

Service Area/Routing

This service would retain the same route that the K-10 Connector currently runs, from Lawrence to Overland Park, with the addition of a stop in De Soto. The route would serve the areas around the University of Kansas's Lawrence and Edwards campuses, De Soto, and the Johnson County Community College.

Stops/Pickup Points

Stops would remain the same as the existing K-10 Connector route with the addition of a stop in De Soto to provide access to the Astra Enterprise Park for future employees of the site.

Service frequency and Span

Three service improvement scenarios were developed. For purposes of this evaluation, it was assumed that the current "regular" service plan which is currently operated when classes at KU are in session would be operated seven days per week. Thus, the service would operate from 6 AM to 11 PM with 30-minute peak headways and 60-minute off peak headways.

Institutional Structure and Operations

The route would continue to be the responsibility of Johnson County Transit, with operations contracted to a private firm.

Cost

The addition of a stop in De Soto would require an additional bus to be added to the schedule with an estimated increase in annual operating costs of $658,000. In addition, the capital cost for acquiring a new coach would be approximately $1 million. The additional operating cost of increasing the service level throughout the year would increase annual operating costs to $4,086,000 an increase of $2,292,000 over the current service plan. Capital cost would be $2,000,000 for two buses.

Funding

Currently the K-10 Connector is provided by Johnson County as part of their transit program. Funding for additional service is not available. There are no other existing funding sources for the K-10 Connector. Additional funding would have to be authorized by the Johnson County Commission. Other potential funding sources for this service are state funding through a new program, and funding from other jurisdictions. Because the K-10 Connector serves primarily KU students, funding from the University is another potential source. KU does have a transportation program that funds student transportation services.

Private Shuttle

Experience in other areas with large remote industrial sites shows that private transit service is an effective way of serving the employment market. This is due to the flexibility of the service which allows the routing to be designed specifically for the needs of employees and schedules can be tailored to employee shifts. This type of service can be provided as an employee benefit and can help address objectives such as workforce diversity. This type of service would not provide any mobility benefits to the general public.

Service Area/Routing

For this evaluation the service is assumed to consist of four routes serving distinct areas to the north, west, east, and south, such as Bonner Springs, Lawrence, Olathe, and Kansas City, Kansas. In actuality, the routes would be defined based on the location of employees and specific employment related objectives. These potential routes are shown in **Figure A-18**. The routes would use the fastest route between the pickup points and the Astra Enterprise Park using freeways as much as possible to minimize travel time.

Stops/Pickup Points

Stops in the community would be limited to one or two locations to minimize travel times. The stops could be collocated with stops for other transit services if available. For example, a route serving Kansas City, Kansas could have a stop at the 47th Street Transit Center with connections to six local transit routes. The stop at the Astra Enterprise Site would be as close to the employee entrance as possible to maximize passenger convenience. As a private dedicated shuttle, the vehicles could enter areas that public transit vehicles would not be able to access.

Service frequency and Span

As a dedicated private shuttle, the schedule would be dictated by employee shift times. For example, if the plant is operating on a traditional three-shift schedule, bus trips would be scheduled to arrive 15 minutes before shift times at 6:45 AM, 2:45 PM, and 10:45 PM. The same vehicle would be scheduled to leave the plant 15 minutes after shift ending times.

Institutional Structure and Operations

The shuttle operation would likely be contracted to a private transportation company by businesses within the Astra Enterprise Park.

Cost

Annual operating costs were estimated at $783,000. There would be no capital cost because a turnkey contract is assumed whereby the contractor provides the vehicles.

Funding

Funding for this type of service is typically from the firm or firms that benefit from the service. Panasonic does fund transit services at other plants. This type of private shuttle service is not eligible for federal funding. Local funding, for example from Johnson County, would require a policy decision; funding for private shuttles is not currently in the County's transit program.

Vanpool Service

Vanpools are an effective way to serve employees at a location like the Panasonic plant. Vanpool is a form of ridesharing wherein seven to twelve people with similar residence, locations, and shift times, share the cost of commuting. There are several formalized programs in place in the Kansas City area, the largest of which is the RideKC Vanpool Program operated by KCATA which has about 40 vanpools. The concept would be for businesses within the Astra Enterprise Park to arrange with KCATA to establish a vanpool program for their employees. KCATA contracts with Enterprise for the operation and administration of the program which would facilitate the formation of vanpools for interested employees.

Service Area/Routing

The program would be available to any Panasonic employee regardless of residence location as long as at least seven employees would agree to ride together.

Service frequency and Span

The timing of the vanpools would be dictated by the employees that utilize the service, most likely being used around the shift changes at the Panasonic plant.

Institutional Structure and Operations

The vanpool program could be operated in one of two ways; by utilizing the existing RideKC vanpool program or by Panasonic implementing their own vanpool program. In the later scenario, the program would likely be contracted to a private rideshare company to provide the vehicles and program administration.

Cost

The annual cost of a vanpool program with 20 vans is $309,000 which includes RideKC's subsidy of $348 per van per month. The capital cost of van ownership is included in this figure.

Funding

Funding for this type of service is typically provided by the firm or firms benefitting from the program. KCATA does fund a portion of the cost for eligible vanpools. This funding represents about 20 percent of the cost. This funding is included in the cost estimate. Absent external funding the monthly cost per participant is in the range of $120 to $150.

Summary

The ridership potential and costs are summarized in **Table 6.**

Table 6: Table showing summary of ridership and cost characteristics of Tier 2 alternatives.

Alternative	Average Daily Ridership	Daily Panasonic Employees	Annual O&M Cost	O&M Cost per Passenger Trip	Initial Capital Cost
Microtransit	400	120	$4,216,000	$34.00	$0
Interregional Bus Line	40	10	$2,020,000	$198.04	$3,750,000
K-10 Connector	170	10	$2,788,000	$52.90	$2,000,000
Private Shuttles	220	110	$783,000	$11.48	$0
Vanpool Program	320	160	$309,000	$2.65	$0

The results of the Tier 2 Analysis are summarized in **Table 7**.

Table 7: Table showing results of Tier 2 Analysis.

Updated Criteria	Microtransit	K-10 Connector Improvements	Interregional Bus Line	Private Shuttle	Vanpool Service
Consistency with local plans and input from local agencies	3	2	3	4	3
Does the proposed service connect to other transit services?	4	4	4	2	2
Would the service be accessible to workers at the Astra Enterprise site?	5	4	4	5	5
Would the service connect to existing/future employment/population centers?	5	3	4	5	5
Cost effectiveness of proposed alternative	3	2	1	5	5
Does the service make sense for the context of the corridor?	2	4	3	2	2
Composite Ranking:	**3.7**	**3.2**	**3.2**	**3.8**	**3.7**

4.4 Conclusions and Recommendations

The following conclusions are based on the evaluation.

1. The K-10 corridor does not have compelling unmet transit needs. The densities and demographics indicate moderate needs in this auto oriented corridor. The eastern portion of the corridor is served by several JCT routes as well as JCT's microtransit. The western portion of the corridor is served only by paratransit service for persons with mobility limitations, seniors, and low-income individuals.
2. The K-10 Connector does little for mobility in the corridor outside of the student market. This route is designed to connect educational campuses in Johnson and Douglas counties and serves this function well.
3. As the corridor develops and grows in population and employment the need for transit enhancements will increase. Whether transit enhancements are implemented rests with policy decisions by local and state officials. The corridor will remain auto oriented for the foreseeable future.
4. Funding for transit service in the corridor is very limited and currently continued funding of existing services is a challenge. There is no readily available local funding for new services. Federal grant funding is typically limited to capital projects such as bus purchases or facility development. Additional state funds are not available.
5. Transportation improvements in the corridor will not be realized without a significant increase in transit funding. Consideration should be given to a state funding program that can address multijurisdictional and interregional transportation needs.
6. Employee transportation for Panasonic employees and other businesses in the Astra Enterprise Park can most effectively be met by program specific service like private shuttles and a vanpool program. The nature of the employment, the dispersal of employee origins, employee shift work and the limited density and development in the vicinity of De Soto limits the effectiveness of general-purpose public transit. Shift work spreads out demand over a longer period of time than traditional work schedules thereby effectively reducing employment trip density and requires a full service span (more trips in more time periods) increasing cost.
7. Microtransit has been demonstrated to be effective in serving travel needs in low density markets and it is very popular among the traveling public. However, it is costly on a per passenger basis and requires careful planning and policy making regarding the deployment of microtransit.

Recommendations

1. Civic and business leaders in the De Soto area should consider organizing to address current and future transportation issues. This organization can be formal or an informal agreement among interested parties to coordinate on matters of transportation. A more formal approach is to form a Transportation Management Association (TMA).
    a. TMAs are non-profit, member-controlled organizations that provide transportation services in a particular area, such as an industrial park. They are generally public-private partnerships, consisting primarily of area businesses with local government support.
    b. Through a TMA local leaders can more effectively advocate for transportation improvements and funding, better coordinate transportation services, and address traffic issues.
2. To address employee transportation needs Astra Enterprise Park officials should begin immediately to develop an employee commute program.
    a. The program could start with a vanpool program which is relatively low cost and low risk but would provide an alternative to auto commuting as the Panasonic plant and industrial park initiate operations.
    b. As employment grows the commute program would assess needs and determine whether additional commuting options like private shuttles should be added to the program.
3. To address mobility in the corridor it is recommended that the creation of a new interregional service should be considered. K-10 is one of the most highly trafficked corridors in the state and warrants consideration of a transit connection.
    a. The service could extend beyond the K-10 corridor to Topeka and Manhattan with select stops in other communities.
    b. The state is in the best position to conduct a more detailed assessment of this interregional service and possible implementation. A service could be implemented as a pilot project to test the feasibility of the concept.
    c. The existing K-10 Connector route would continue at the discretion of Johnson County officials. The market served by the K-10 Connector is different from the market that the interregional bus route would serve.
4. Transit service in the northwestern portion of Johnson County, which includes De Soto and the Astra Enterprise Park, is the responsibility of Johnson County Transit. With limited funding, expansion of transit service is not an easy decision. The question of transit service in the northwestern portion of the County should be studied in a comprehensive review of Johnson County transit service. The County anticipates such a study in the next year. The study should assess the

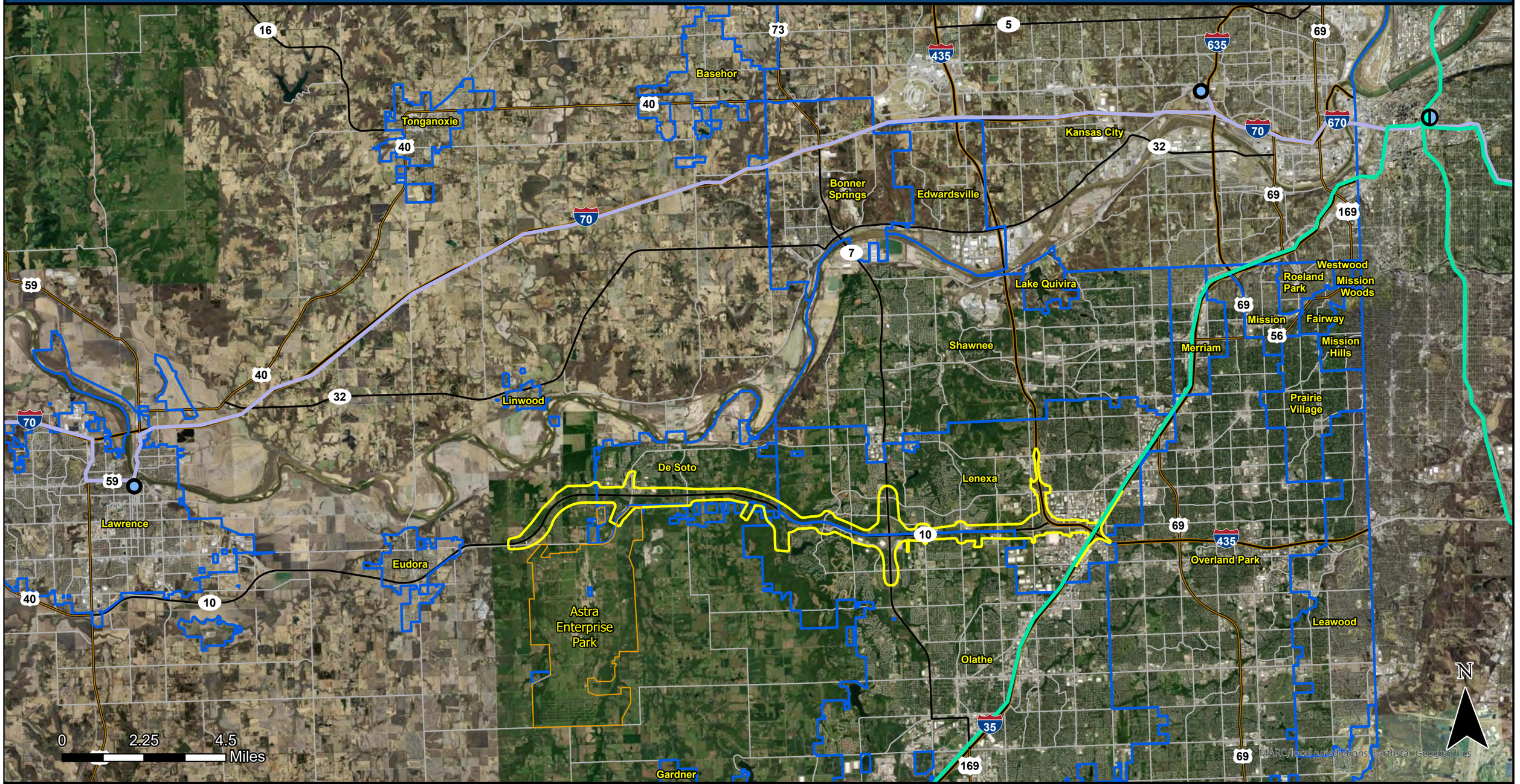
priority of service in the northwest compared to priorities in other parts of the County. The issue of funding levels also should be addressed.

Appendix A

Maps

Existing Intercity Bus Service Map

Figure A-1



Legend

- Astra Enterprise Park
- Study Area
- City Boundary

Bus Stations

- Greyhound
- Greyhound/Jefferson Lines

Routes

- Greyhound
- Jefferson Lines

K-10 Capacity Improvements

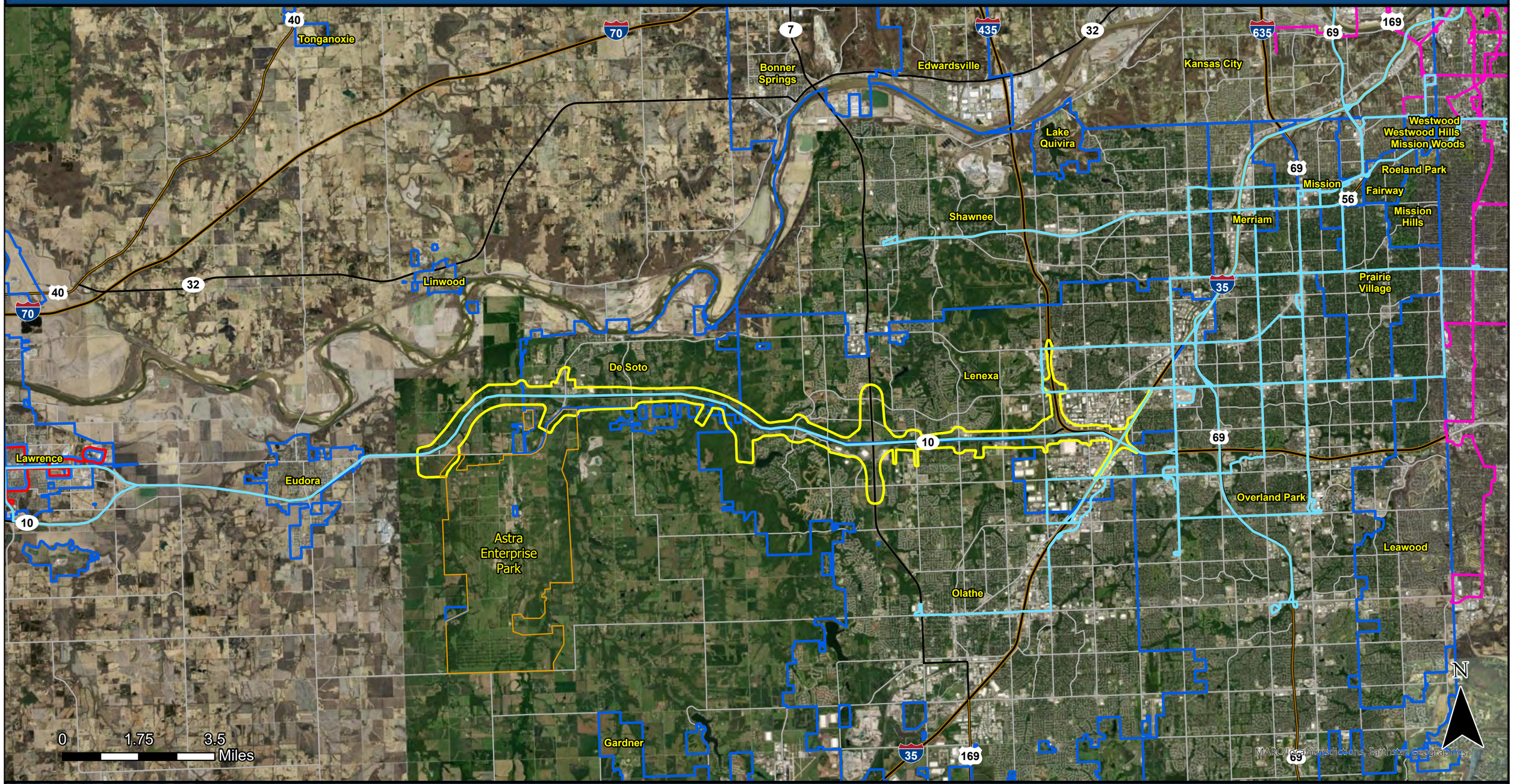
KDOT # 10-46 KA-6549-01

K10 CORRIDOR

Kansas Department of Transportation

Existing Fixed Route Service Map

Figure A-2



Legend

- Astra Enterprise Park
- Study Area
- City Boundary
- Johnson County Transit
- KCATA
- Lawrence Transit

K-10 Capacity Improvements

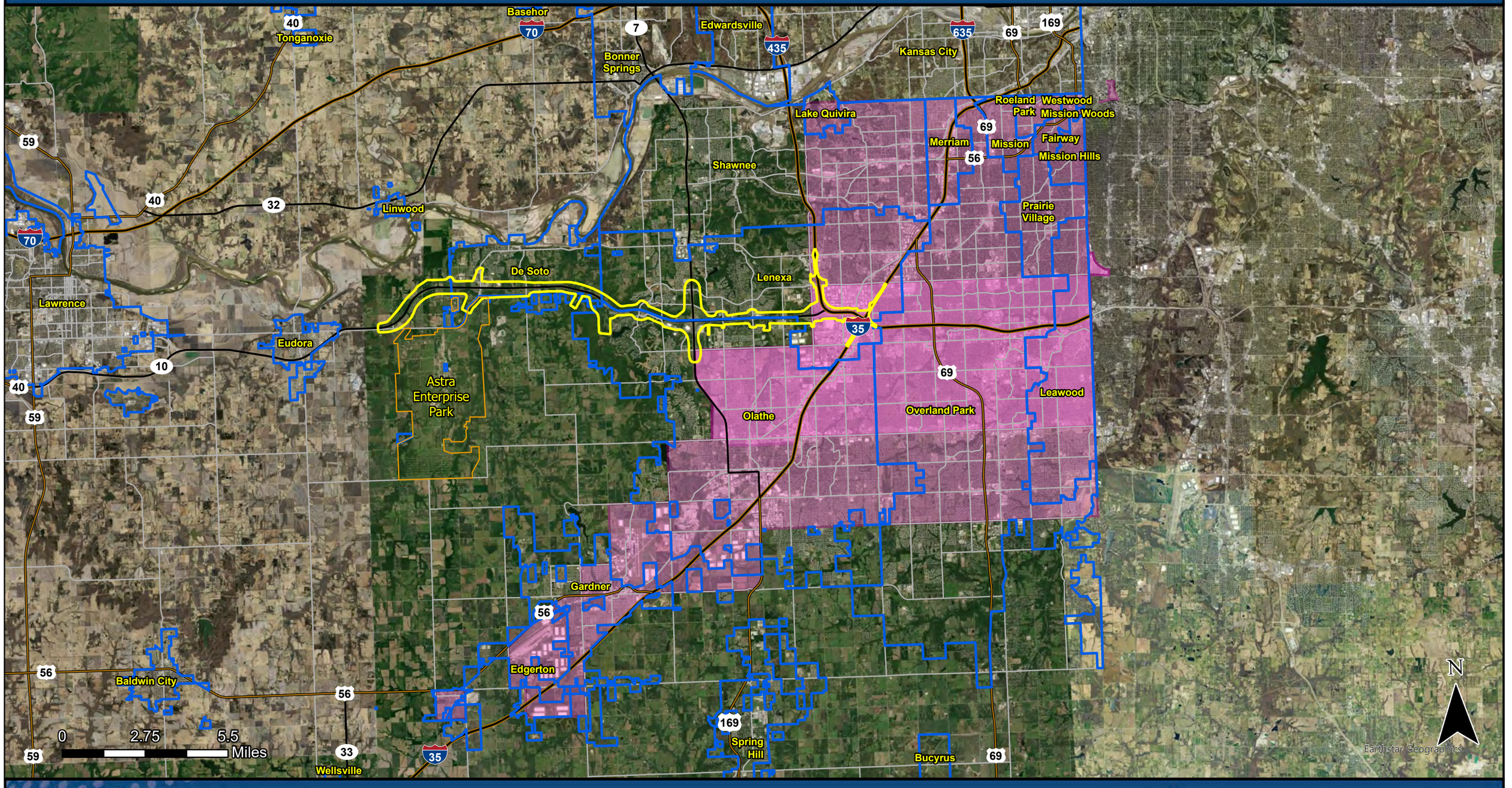
KDOT # 10-46 KA-6549-01

K10 CORRIDOR

Kansas Department of Transportation

Microtransit Service Map

Figure A-3



Legend

- Astra Enterprise Park
- Study Area
- City Boundary
- Johnson County Microtransit

K-10 Capacity Improvements

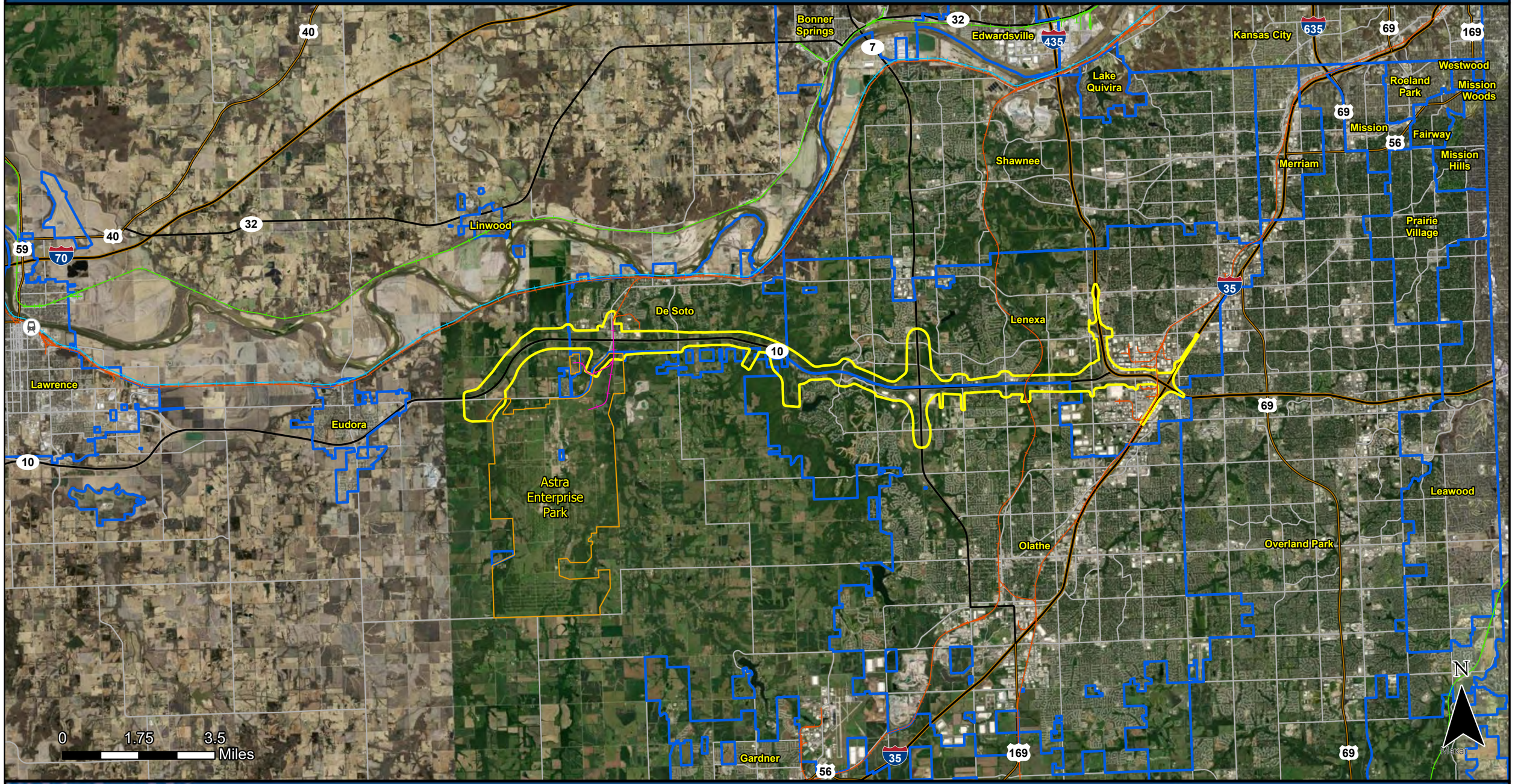
KDOT # 10-46 KA-6549-01

K10 CORRIDOR

Kansas Department of Transportation

Rail Service Map

Figure A-4



Legend

- Astra Enterprise Park
- Study Area
- City Boundary
- Amtrak Stations
- Abandoned US Army Rail Spur
- Amtrak Routes

Rail Owner

- BNSF
- UP

K-10 Capacity Improvements

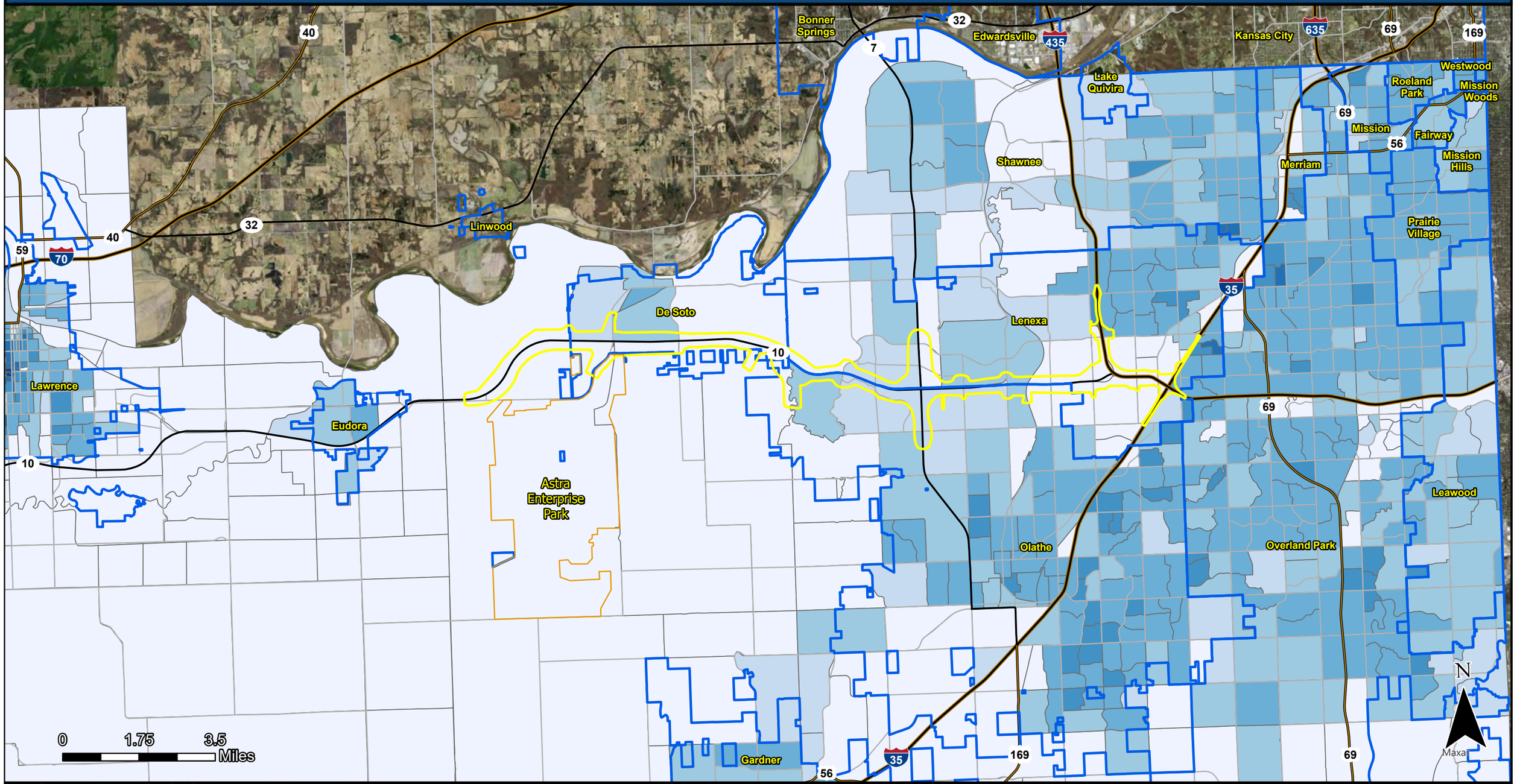
KDOT # 10-46 KA-6549-01

K10 CORRIDOR

Kansas Department of Transportation

2019 Population Density Map

Figure A-5



K-10 Capacity Improvements

KDOT # 10-46 KA-6549-01

Legend

- Astra Enterprise Park
- Study Area
- City Boundary

Population Density (sq.mi.)

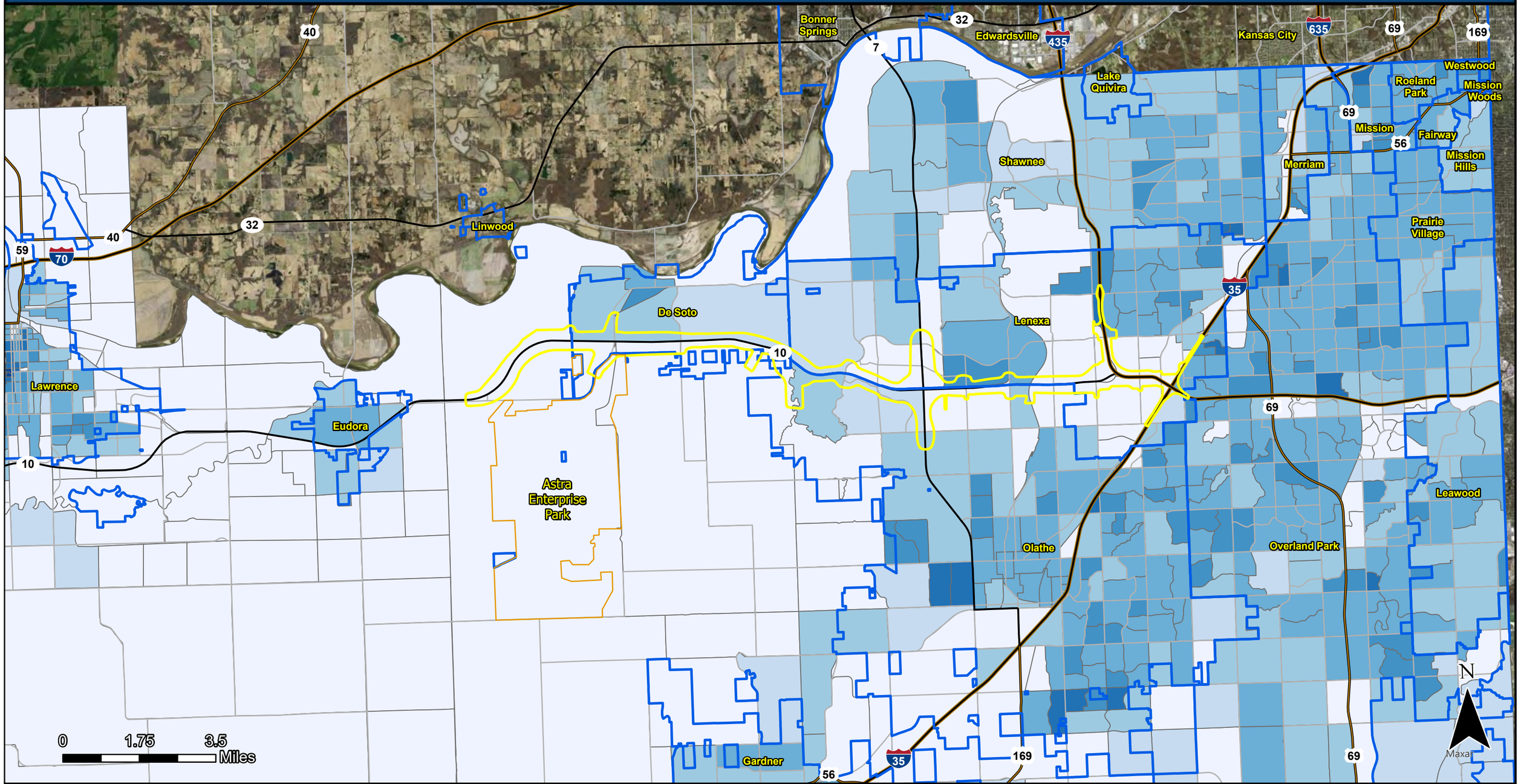
- 0 - 500
- 501 - 1000
- 1001 - 3000
- 3001 - 6000
- 6001 - 11000
- 11001 - 30000
- 30001 - 78000

K10 CORRIDOR

Kansas Department of Transportation

2050 Population Density Map

Figure A-6



K-10 Capacity Improvements

KDOT # 10-46 KA-6549-01

Legend

- Astra Enterprise Park
- Study Area
- City Boundary

Population Density (sq. mi.)

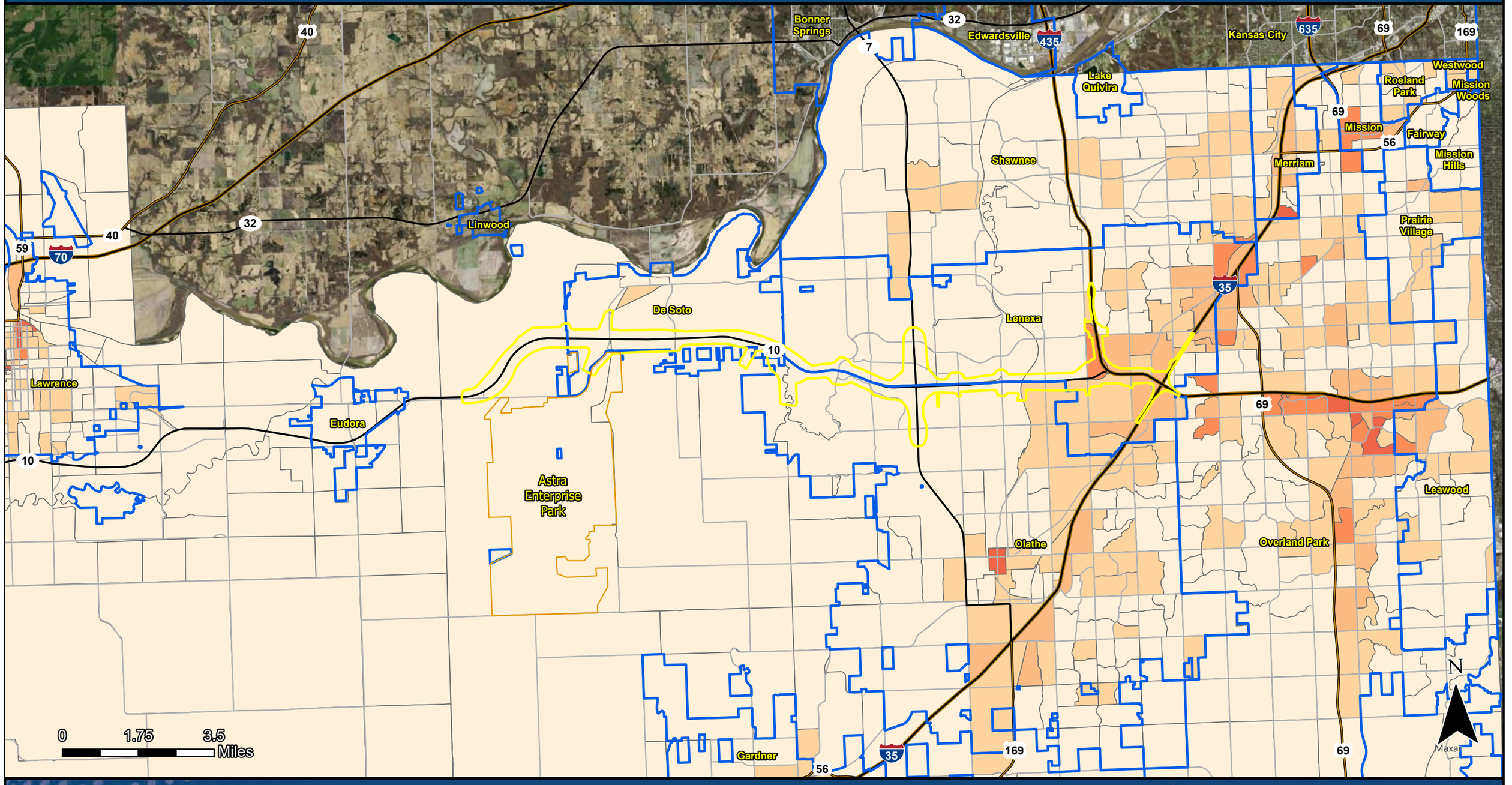
- 0 - 500
- 501 - 1000
- 1001 - 3000
- 3001 - 6000
- 6001 - 11000
- 11001 - 30000
- 30001 - 78000

K10 CORRIDOR

Kansas Department of Transportation

2019 Employment Density Map

Figure A-7



Legend

K-10 Capacity Improvements
KDOT # 10-46 KA-6549-01

- Astra Enterprise Park
- Study Area
- City Boundary

Employment Density (sq. mi.)

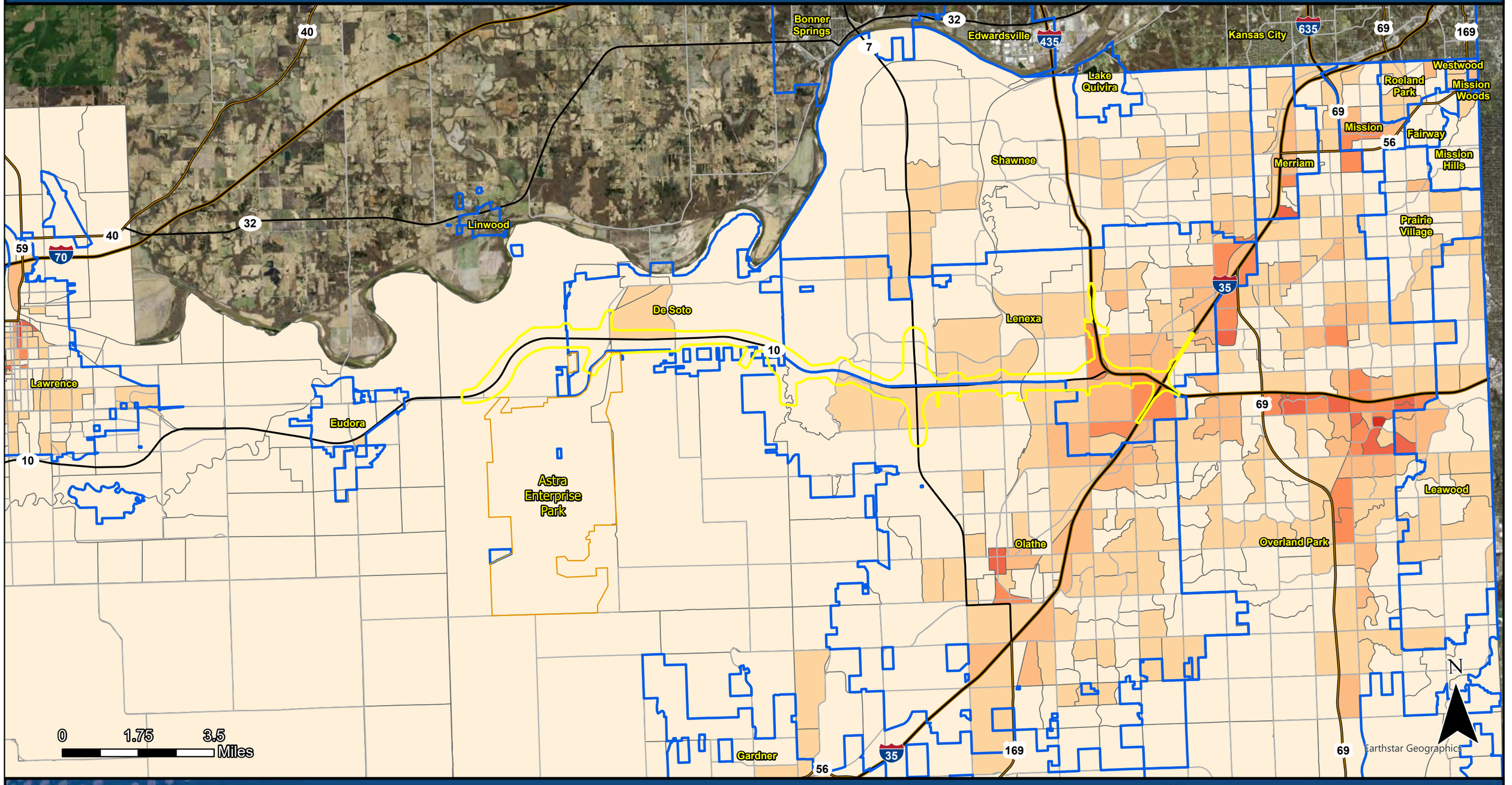
- 0 - 1000
- 1001 - 5000
- 5001 - 10000
- 10001 - 20000
- 20001 - 50000
- 50001 - 100000
- 100001 - 201000

K-10 CORRIDOR

Kansas Department of Transportation

2050 Employment Density Map

Figure A-8



K-10 Capacity Improvements

KDOT # 10-46 KA-6549-01

Astra Enterprise Park
Study Area
City Boundary

Legend

Employment Density (sq. mi.)

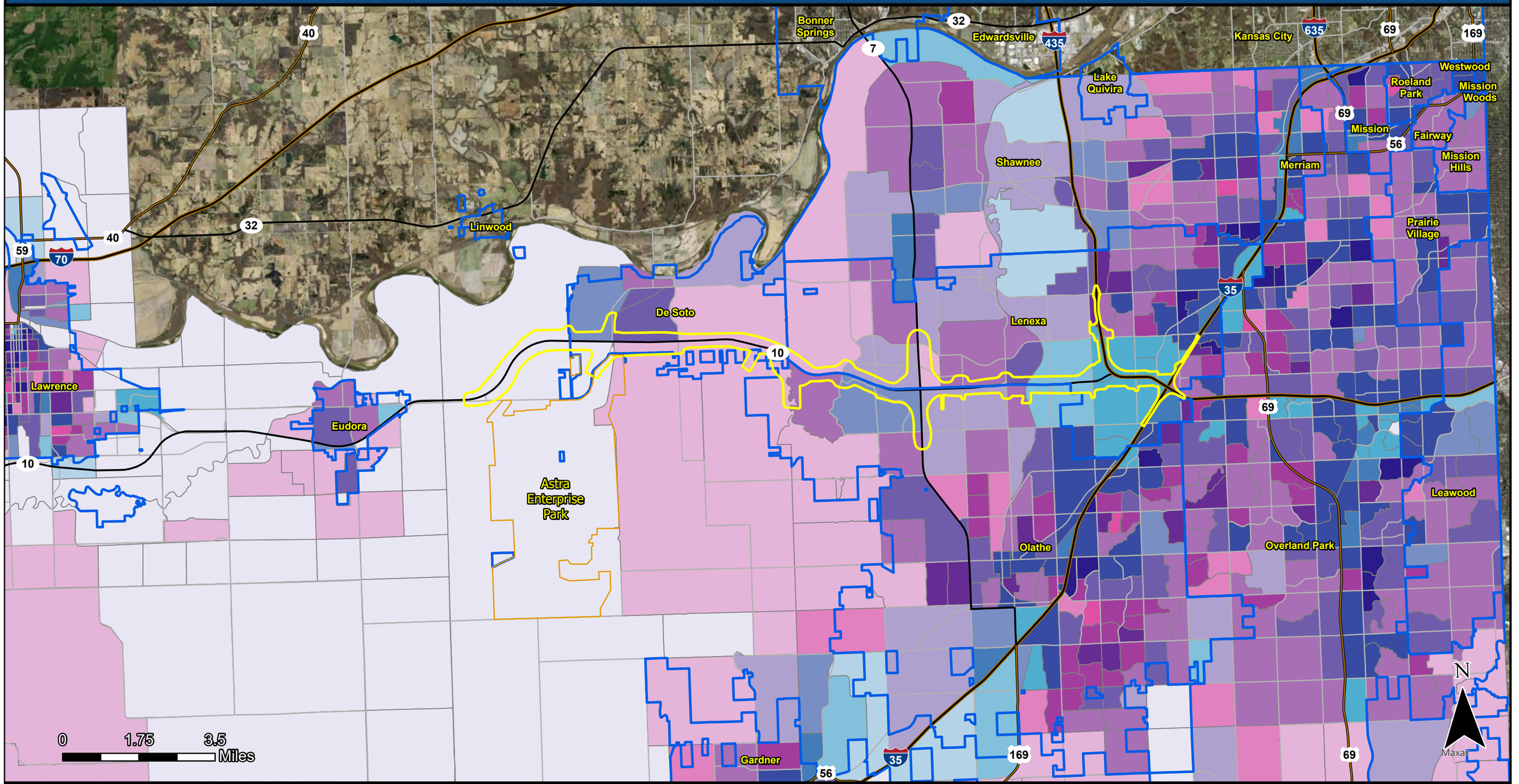
- 0 - 1000
- 1001 - 5000
- 5001 - 10000
- 10001 - 20000
- 20001 - 50000
- 50001 - 100000
- 100001 - 201000

K10 CORRIDOR

Kansas Department of Transportation

2019 Activity Density Map

Figure A-9



Legend

- Astra Enterprise Park
- Study Area
- City Boundary
- Population Density
- Employment Density

High / Low / Low / High

K-10 Capacity Improvements

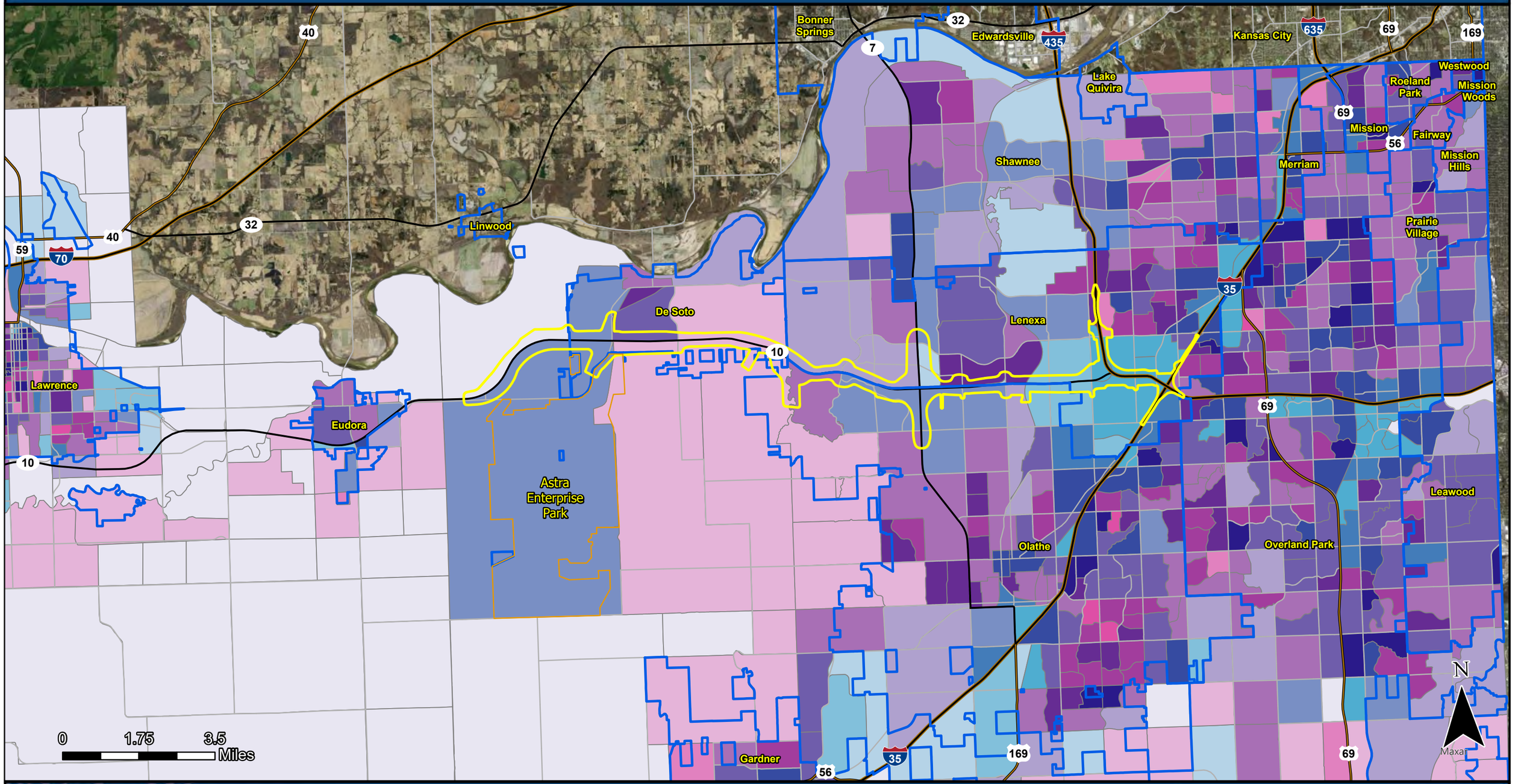
KDOT # 10-46 KA-6549-01

K10 CORRIDOR

Kansas Department of Transportation

2050 Activity Density Map

Figure A-10



K-10 Capacity Improvements

KDOT # 10-46 KA-6549-01

Legend

- Astra Enterprise Park
- Study Area
- City Boundary
- Population Density
- Employment Density

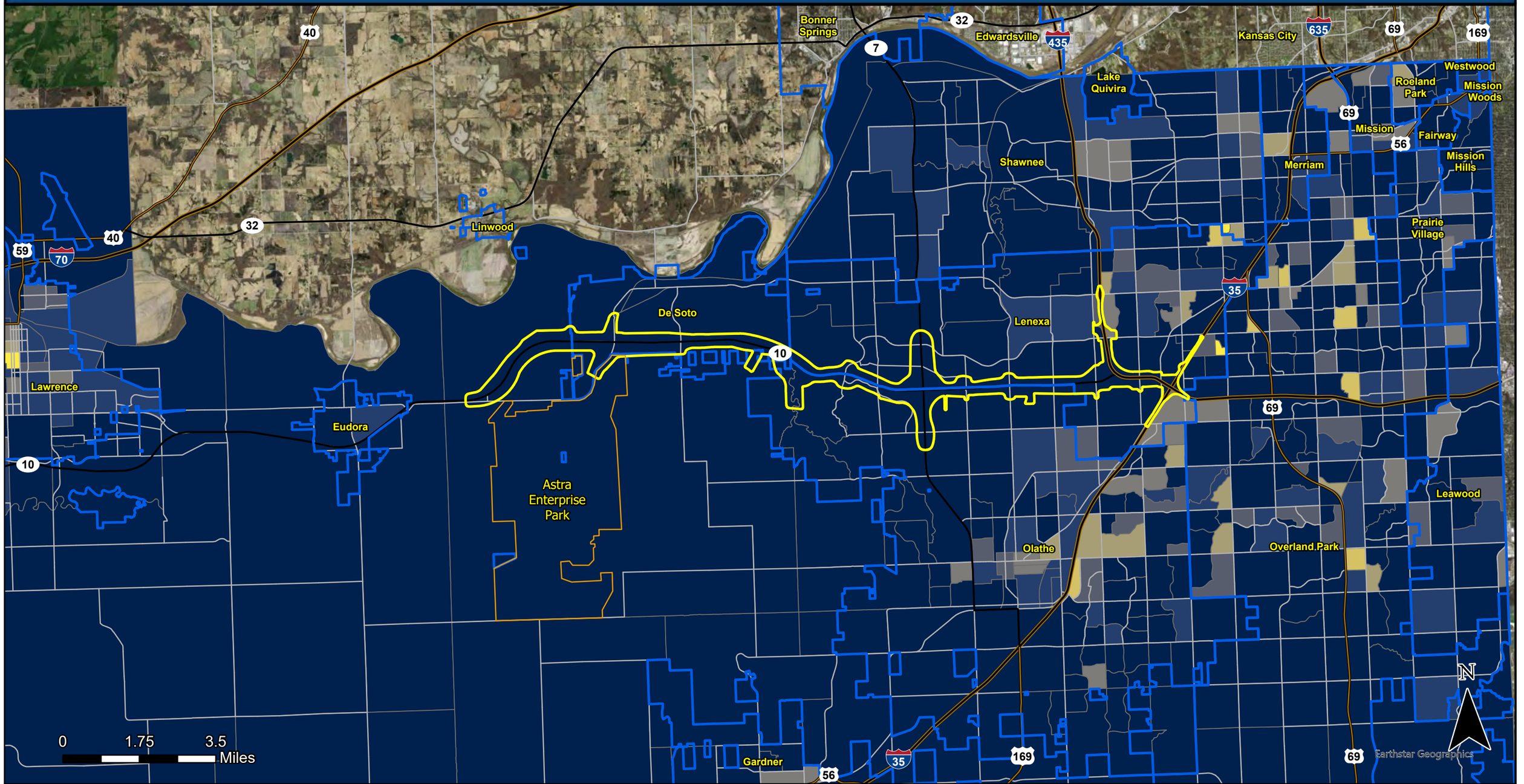
High / Low / Low / High

K-10 CORRIDOR

Kansas Department of Transportation

Zero Vehicle Household Density Map

Figure A-11



Legend

K-10 Capacity Improvements
KDOT # 10-46 KA-6549-01

- Astra Enterprise Park
- Study Area
- City Boundary

Zero Vehicle Household Density (Sq. Mi.)

- 0 - 25
- 26 - 80
- 81 - 150
- 151 - 250
- 251 - 400
- 401 - 700
- 701 - 1700

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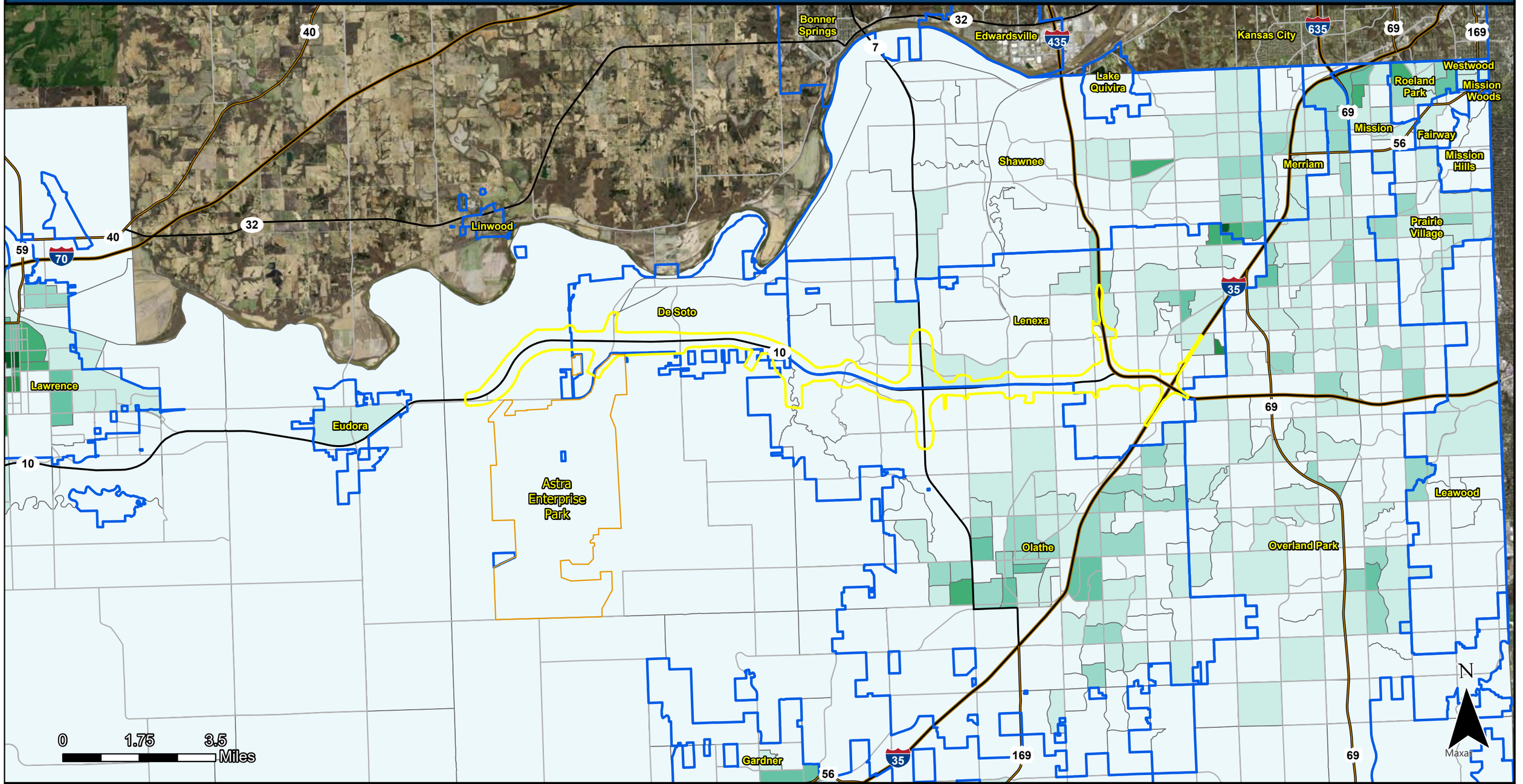
Kansas Department of Transportation

Low-Income Household Density Map

Figure A-12



Legend

K-10 Capacity Improvements
KDOT # 10-46 KA-6549-01

- Astra Enterprise Park
- Study Area
- City Boundary

Poverty Density (Sq. Mi.)

- 0 - 100
- 101 - 400
- 401 - 750
- 751 - 1500
- 1501 - 3000
- 3001 - 6000
- 6001 - 11000

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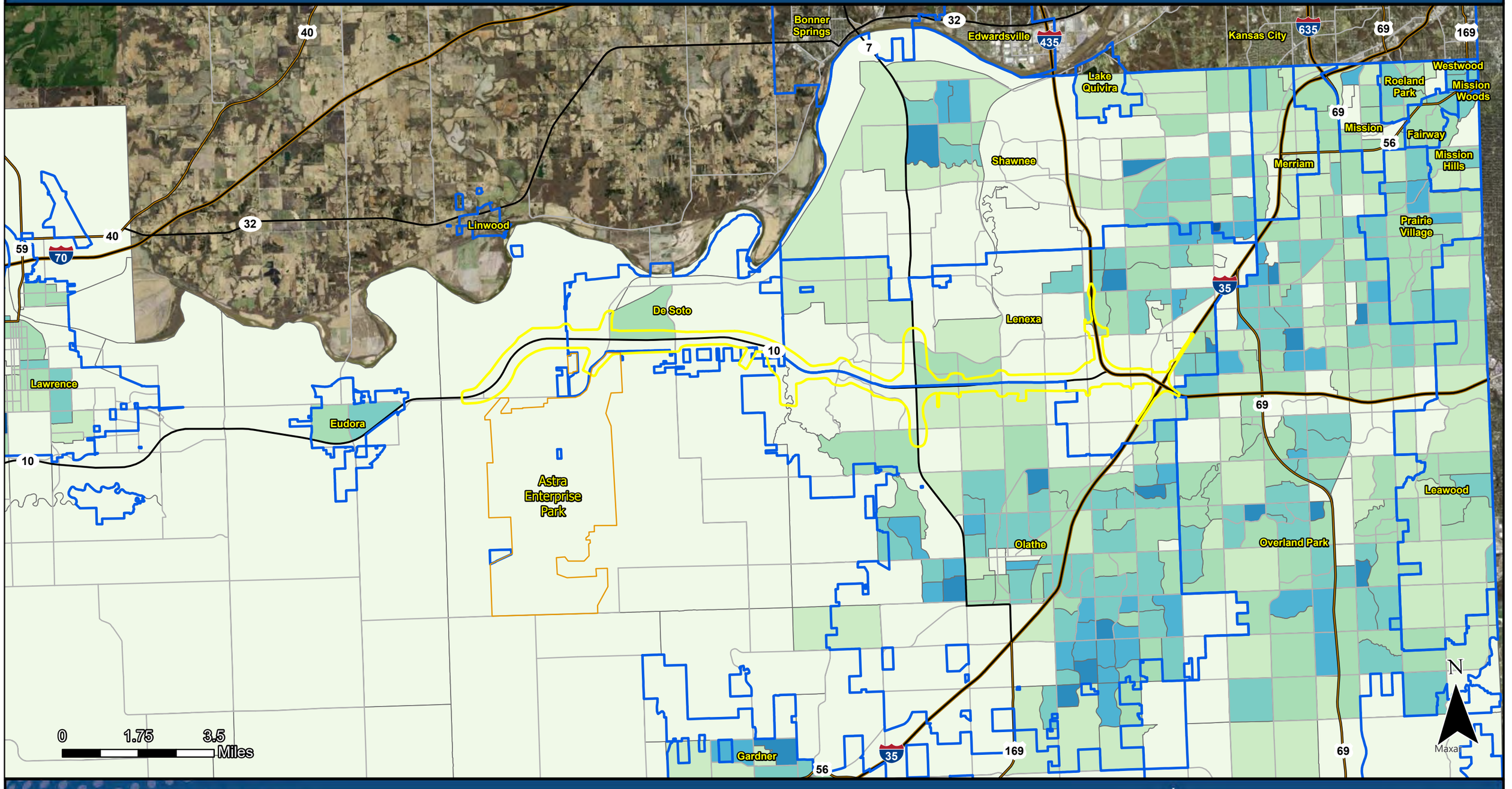
Youth (Under 18) Density Map

Figure A-13



K-10 Capacity Improvements

KDOT # 10-46 KA-6549-01

Legend

- Astra Enterprise Park
- Study Area
- City Boundary

Young Resident Density (Sq. Mi.)

- 0 - 250
- 251 - 500
- 501 - 900
- 901 - 1500
- 1501 - 2000
- 2001 - 4000
- 4001 - 8000

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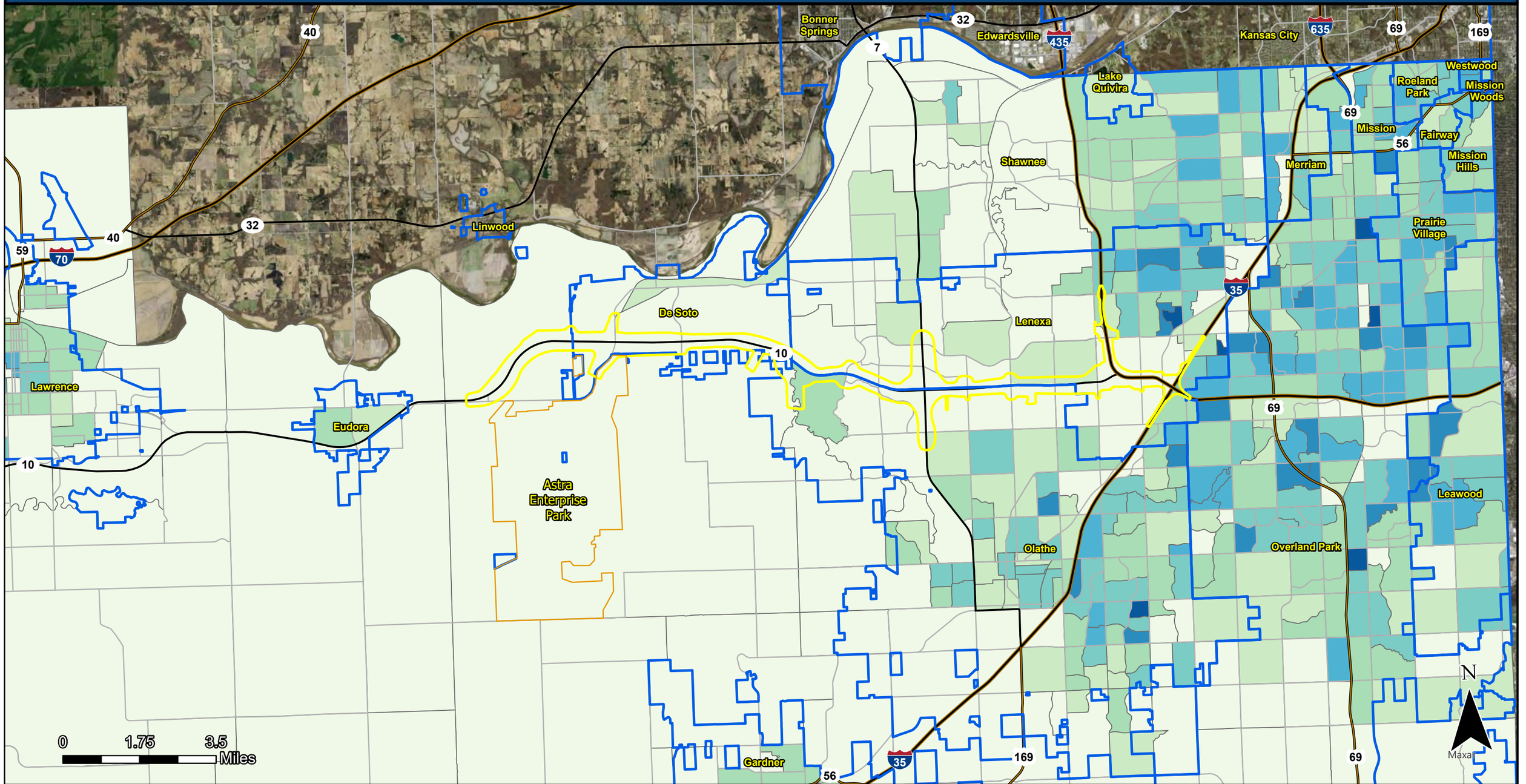
Kansas Department of Transportation

Senior (Over 65) Density Map

Figure A-14



K-10 Capacity Improvements

KDOT # 10-46 KA-6549-01

Legend

- Astra Enterprise Park
- Study Area
- City Boundary

Senior Density (Sq. Mi.)

- 0 - 150
- 151 - 300
- 301 - 500
- 501 - 800
- 801 - 1200
- 1201 - 2200
- 2201 - 5000

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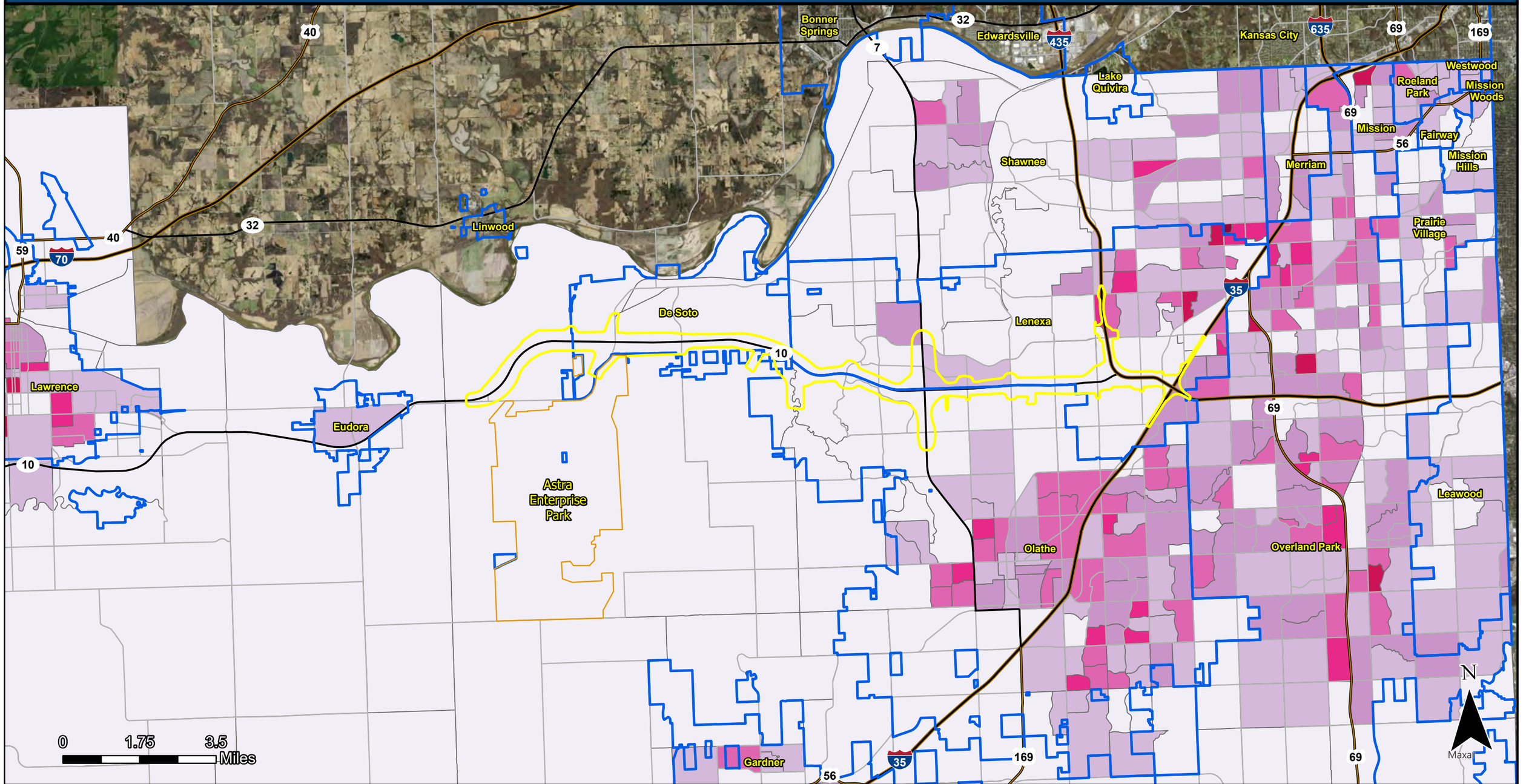
Minority Population Density Map

Figure A-15



Legend

K-10 Capacity Improvements
KDOT # 10-46 KA-6549-01

- Astra Enterprise Park
- Study Area
- City Boundary

Minority Population Density (Sq. Mi.)

- 0 - 200
- 201 - 600
- 601 - 1000
- 1001 - 2000
- 2001 - 4000
- 4001 - 9000
- 9001 - 19000

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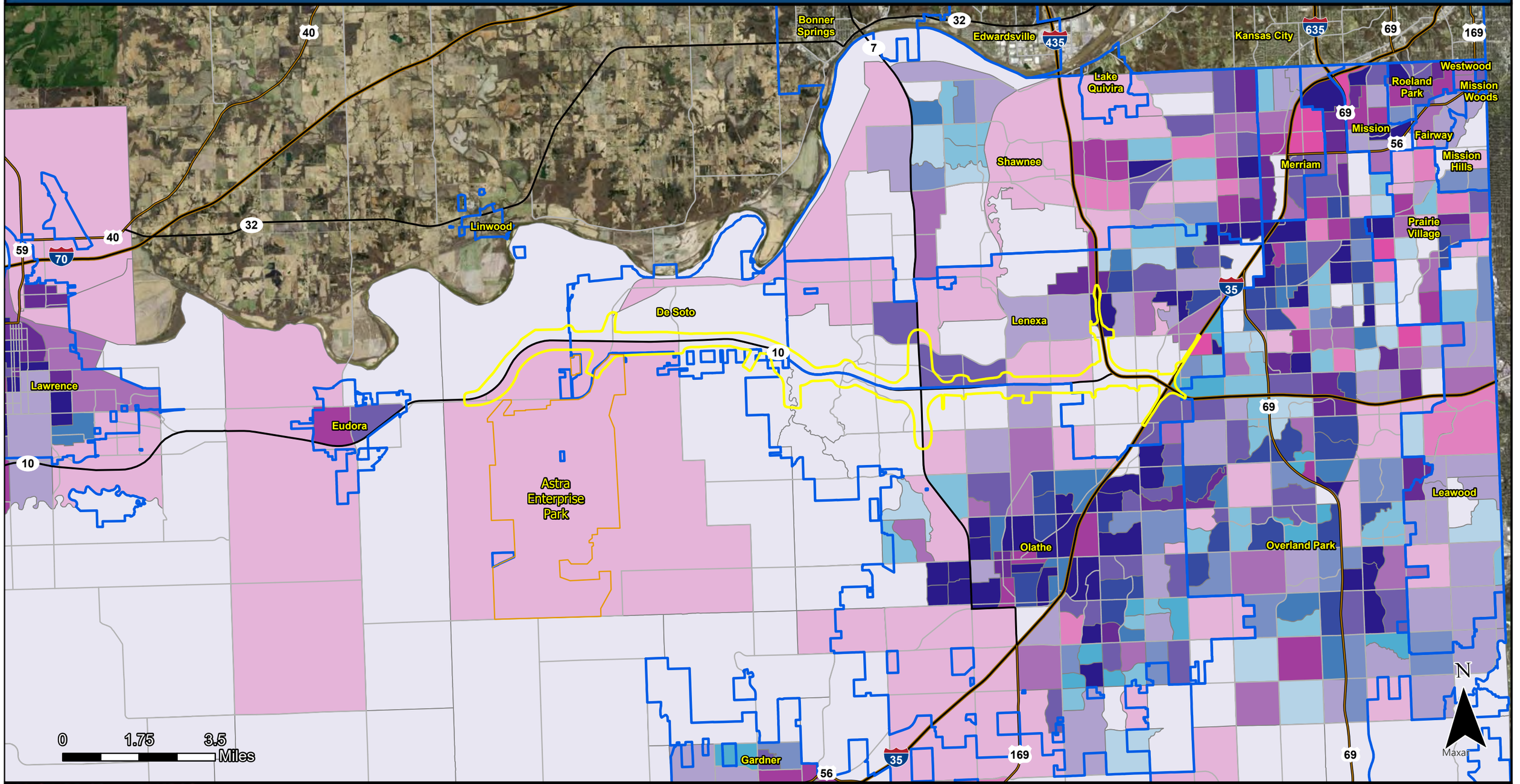
Environmental Justice Population Density Map

Figure A-16



Legend

- Astra Enterprise Park
- Study Area
- City Boundary
- Low-Income Population Density
- Minority Population Density

High / Low / Low / High

K-10 Capacity Improvements

KDOT # 10-46 KA-6549-01

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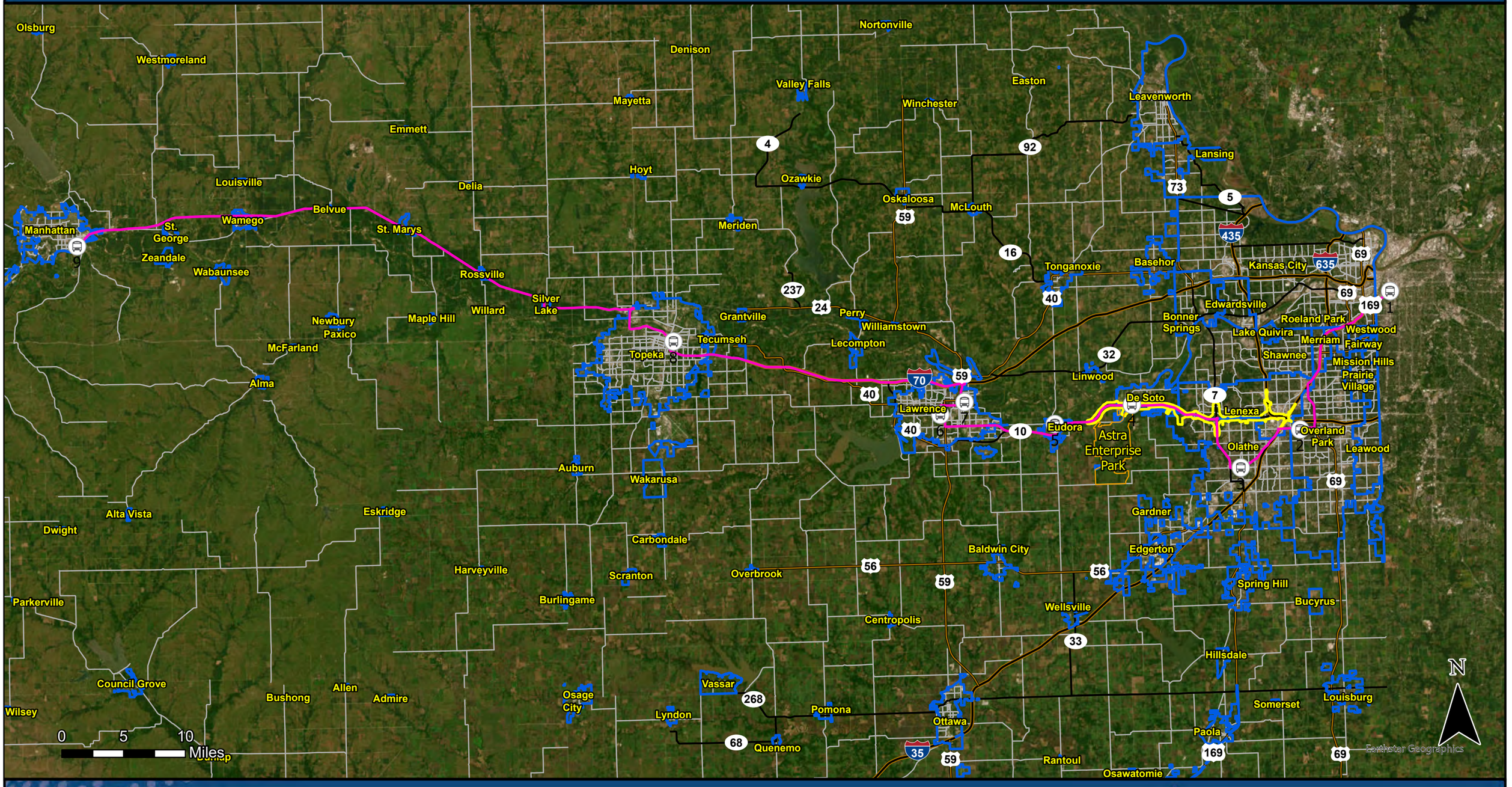
Potential Interregional Bus Route Map

Figure A-17



Legend

- Astra Enterprise Park
- Study Area
- City Boundary
- Potential Stations
- Interregional Line

K-10 Capacity Improvements

KDOT # 10-46 KA-6549-01

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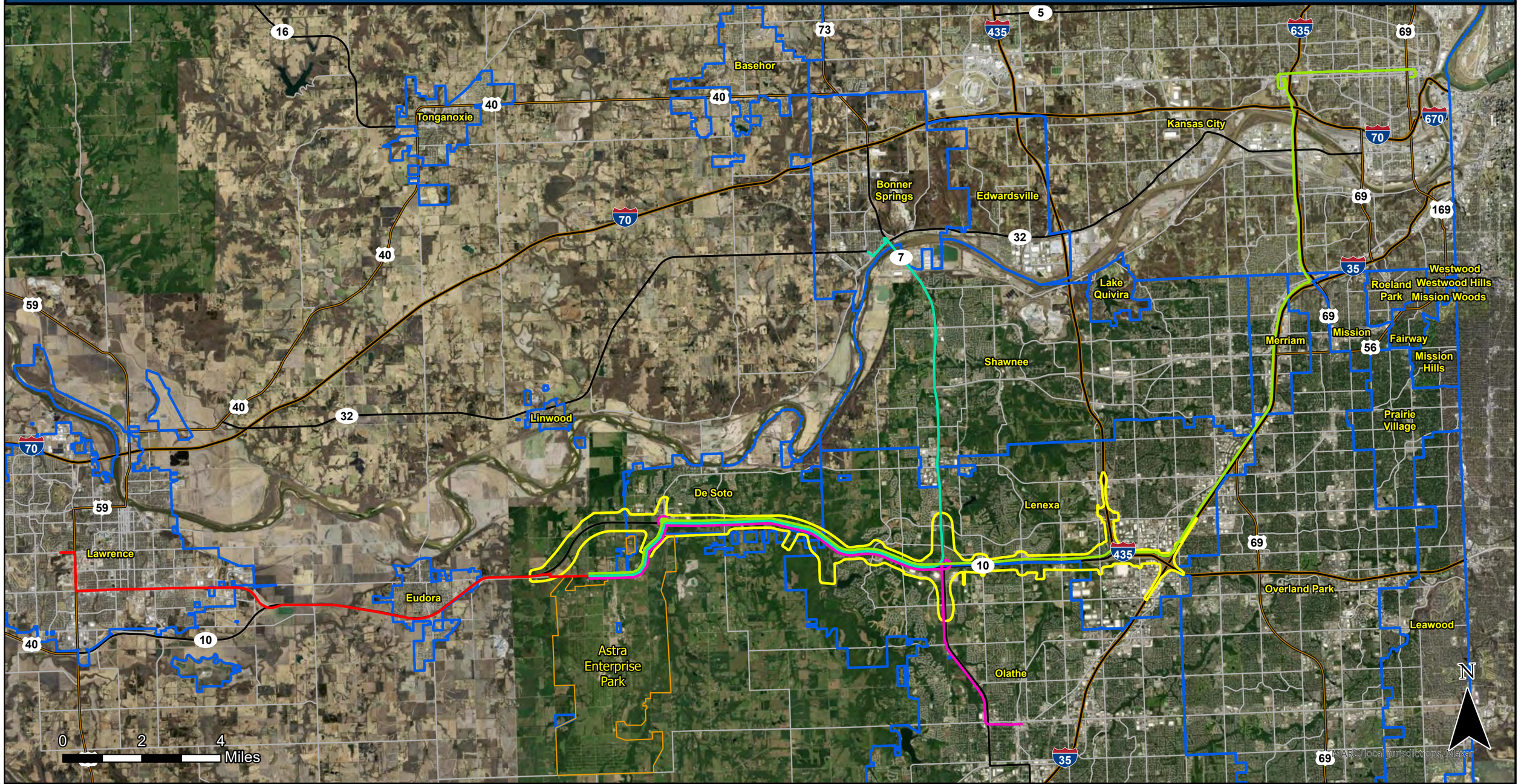
Potential Private Shuttle Map

Figure A-18



K-10 Capacity Improvements

KDOT # 10-46 KA-6549-01

Legend

- Astra Enterprise Park
- Study Area
- City Boundary

Potential Shuttle Routes

- Bonner Springs
- Kansas City, KS
- Lawrence
- Olathe

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Appendix B

Initial Alternatives Screening Matrix

K-10 Capacity Improvements Project

Initial Alternatives Screening

Alternative	Purpose and Need Criteria									
	Enhance Safety Performance		Improve Traffic Operations		Improve Infrastructure Condition		Provide Flexible Choices		Support Local and Regional Growth	
	Reduction in number and severity of Congestion-Related Crashes	Improve Bicycle and Pedestrian Safety at Crossroad Arterials	Change in Travel Level of Service	Change in Travel Speed	Change in Roadway & Bridge Condition	Support Environmental Sustainability	Access and Connectivity to Bicycle & Pedestrian Facilities	Reliability for Transit Riders	Compatibility with Local Planning	Compatibility with Regional Planning
	Achievement	Achievement	Achievement	Achievement	Achievement	Achievement	Achievement	Achievement	Achievement	Achievement
No-Build										
Improvement of Alternate Routes										
Existing Capacity Management										
Multimodal										
Add Capacity - Traditional Widening										
Add Capacity - Express Toll Lanes										

 High Impact/No or Low Achievement

 Substantial Impact/Slight Achievement

 Moderate Impact/Moderate Achievement

 Slight Impact/Substantial Achievement

 No or Low Impact/High Achievement

K10 CORRIDOR

Appendix C

Reasonable Alternatives Screening Matrix

K-10 Capacity Improvements Project

Reasonable Alternatives Screening

Criteria	Impact	No-Build	Traditional Widening	Express Toll Lanes
Purpose and Need Criteria				
Enhance Safety Performance				
Reduction in Number and Severity of Congestion-Related Crashes	Achievement			
Improve Bicycle and Pedestrian Safety at Crossroad Arterials	Achievement			
Improve Traffic Operations				
Change in Travel Level of Service (Percent of Corridor with Substantial Freeflow)	Achievement			
Change in Travel Speed (Average Peak Speed)	Achievement			
Improve Infrastructure Condition				
Change in Roadway & Bridge Condition	Achievement			
Support Environmental Sustainability	Achievement			
Provide Flexible Choices				
Access and Connectivity to Bicycle & Pedestrian Facilities	Achievement			
Reliability for Transit Riders	Achievement			
Support Local and Regional Growth				
Compatibility with Local Planning	Achievement			
Compatibility with Regional Planning	Achievement			
Natural and Human Environment Criteria				
Park and Recreational Area (Acres)	Impact	0	0.18	0.18
Bike Lanes and Trails (Feet)	Impact	0	Bike Lanes: 3,643 Trails: 12,856	Bike Lanes: 3,643 Trails: 12,856
Community Facility Impacts	Impact	0	2 (1 school & 1 church)	2 (1 school & 1 church)
Environmental Justice - Low Income and Minority Population Impacts	Impact	None	8 Low-Income Population Block Groups; 9 Minority Block Groups	8 Low-Income Population Block Groups; 9 Minority Block Groups
Noise Impacts	Impact			
Wetland Impacts (Acres)	Impact	None	8.96	9.26
Floodplains Impacts - Floodway and 100 Yr Floodplain (Acres)	Impact	None	Floodway: 6.72 100-Yr Floodplain: 12.66 Total: 19.38	Floodway: 7.06 100-Yr Floodplain: 13.09 Total: 20.15
Potential T&E Species & Critical Habitat Impacts	Impact	None	Potential TES Impacted: 6 Federal 18 State/County Critical Habitat Impacted: None	Potential TES Impacted: 6 Federal 18 State/County Critical Habitat Impacted: None
Stream Impacts (Feet)	Impact	None	18,195	18,850
Hazardous Material Impacts (Sites)	Impact	None	2	2
Cultural and Historic Sites Impacts	Impact	None	0	0
Air Quality, Emissions and Energy Impacts	Impact			
Indirect and Cumulative Impacts	Impact			
Engineering and Cost Criteria				
Roadway and Interchange Geometrics	Achievement			
Right-of-Way Impacts (Acres)	Impact	None	65.48	65.53
Residential or Business Displacements	Impact	None	Residential: 4	Residential: 4
Ease of Phasing, Maintenance of Traffic, and Constructability	Impact	N/A		
Estimated Construction Costs (2023 dollars)	Impact	None	1.16 Billion	1.20 Billion
Estimated Life-Cycle Costs	Achievement			
Public and Stakeholder Input Criteria	Achievement			

High Impact/No or Low Achievement

Substantial Impact/Slight Achievement

Moderate Impact/Moderate Achievement

Slight Impact/Substantial Achievement

No or Low Impact/High Achievement

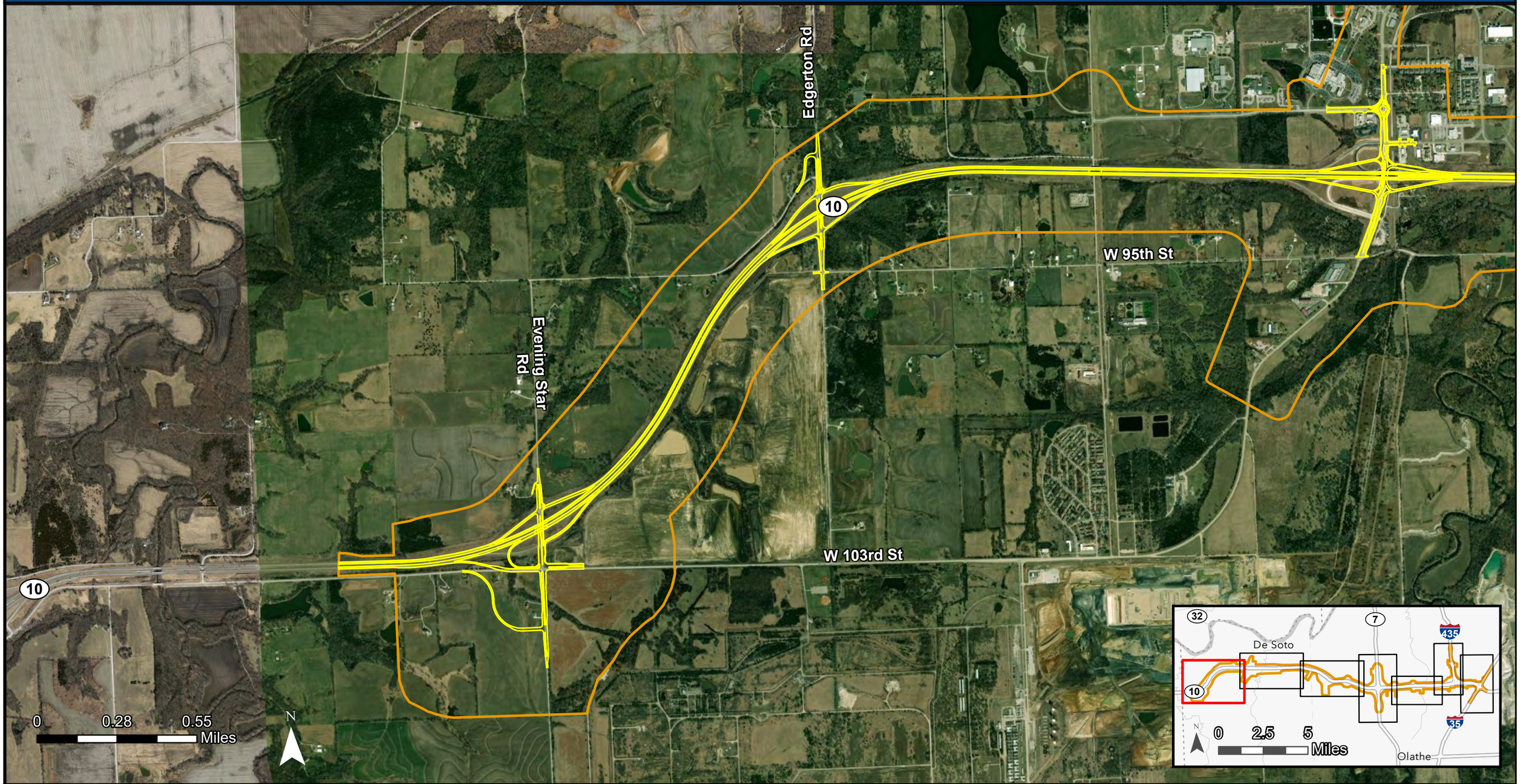
K10 CORRIDOR

Appendix D

Traditional Widening Alternative

Reasonable Alternative - Traditional Widening

Appendix D



Legend

- Study Area
- Proposed Alignment

K-10 Capacity Improvements

KDOT # 10-46 KA-6549-01

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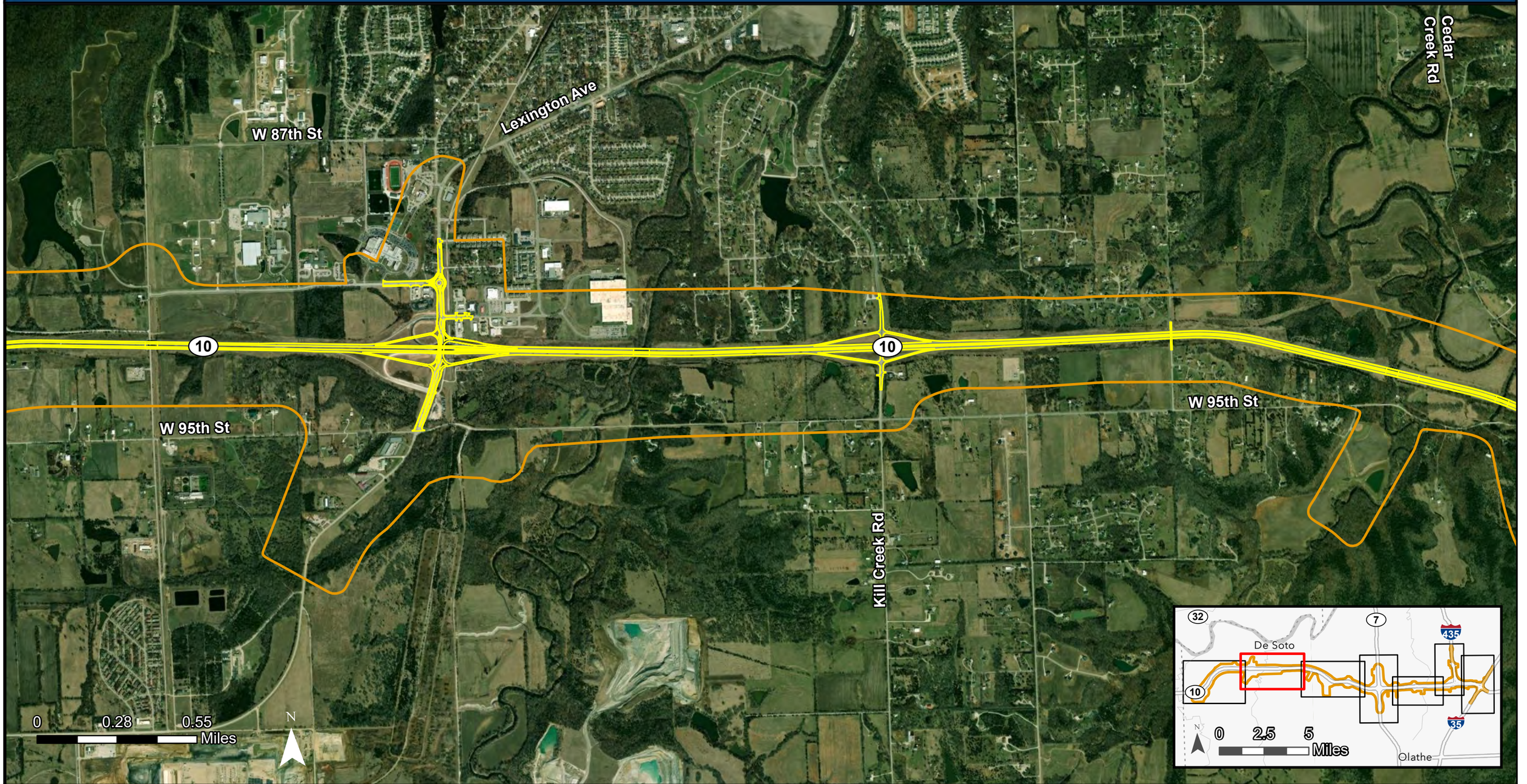
Kansas Department of Transportation

Reasonable Alternative - Traditional Widening

Appendix D



Legend

- Study Area
- Proposed Alignment

K-10 Capacity Improvements

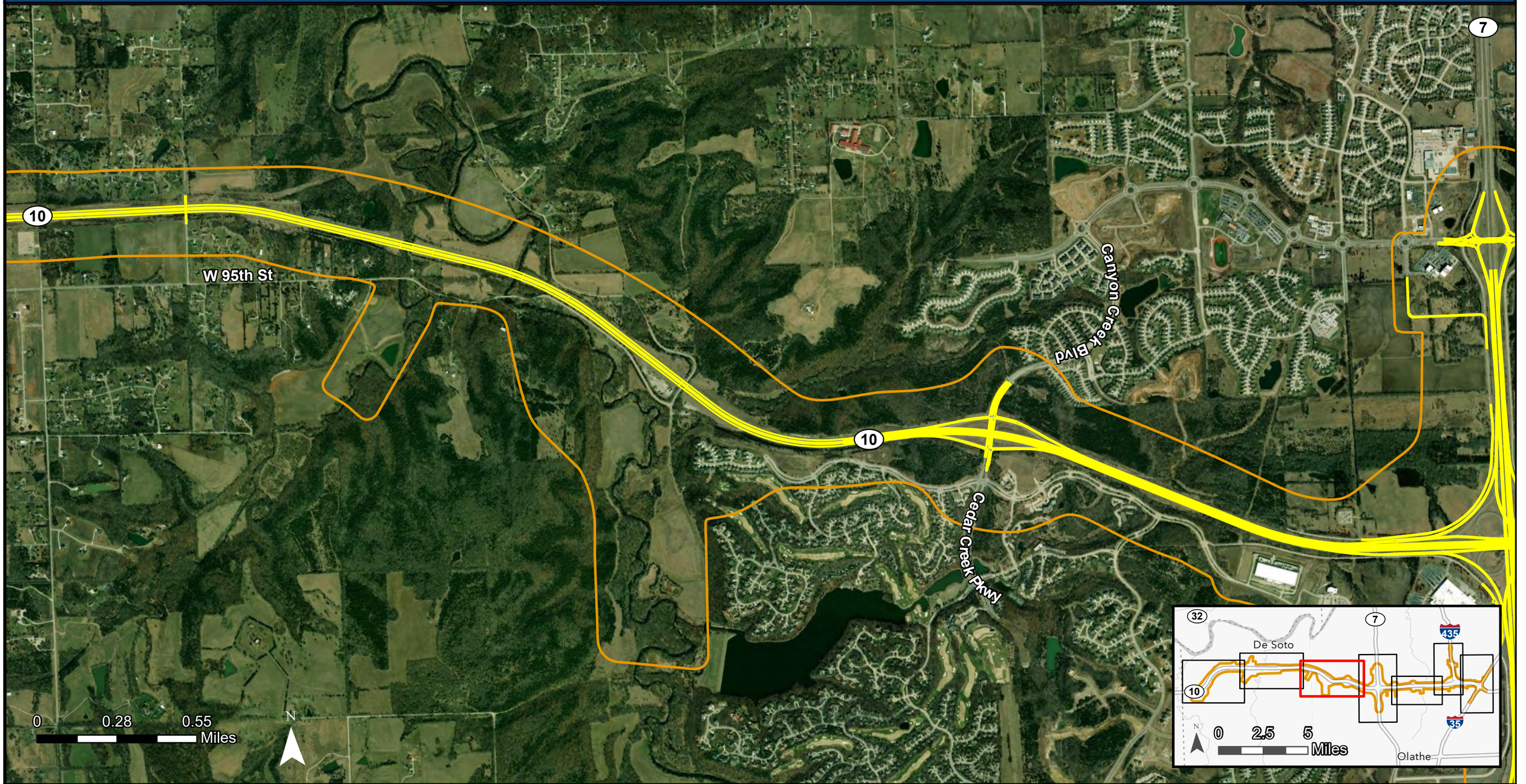
KDOT # 10-46 KA-6549-01

K-10 CORRIDOR

Kansas Department of Transportation

Reasonable Alternative - Traditional Widening

Appendix D



Legend

- Study Area
- Proposed Alignment

K-10 Capacity Improvements

KDOT # 10-46 KA-6549-01

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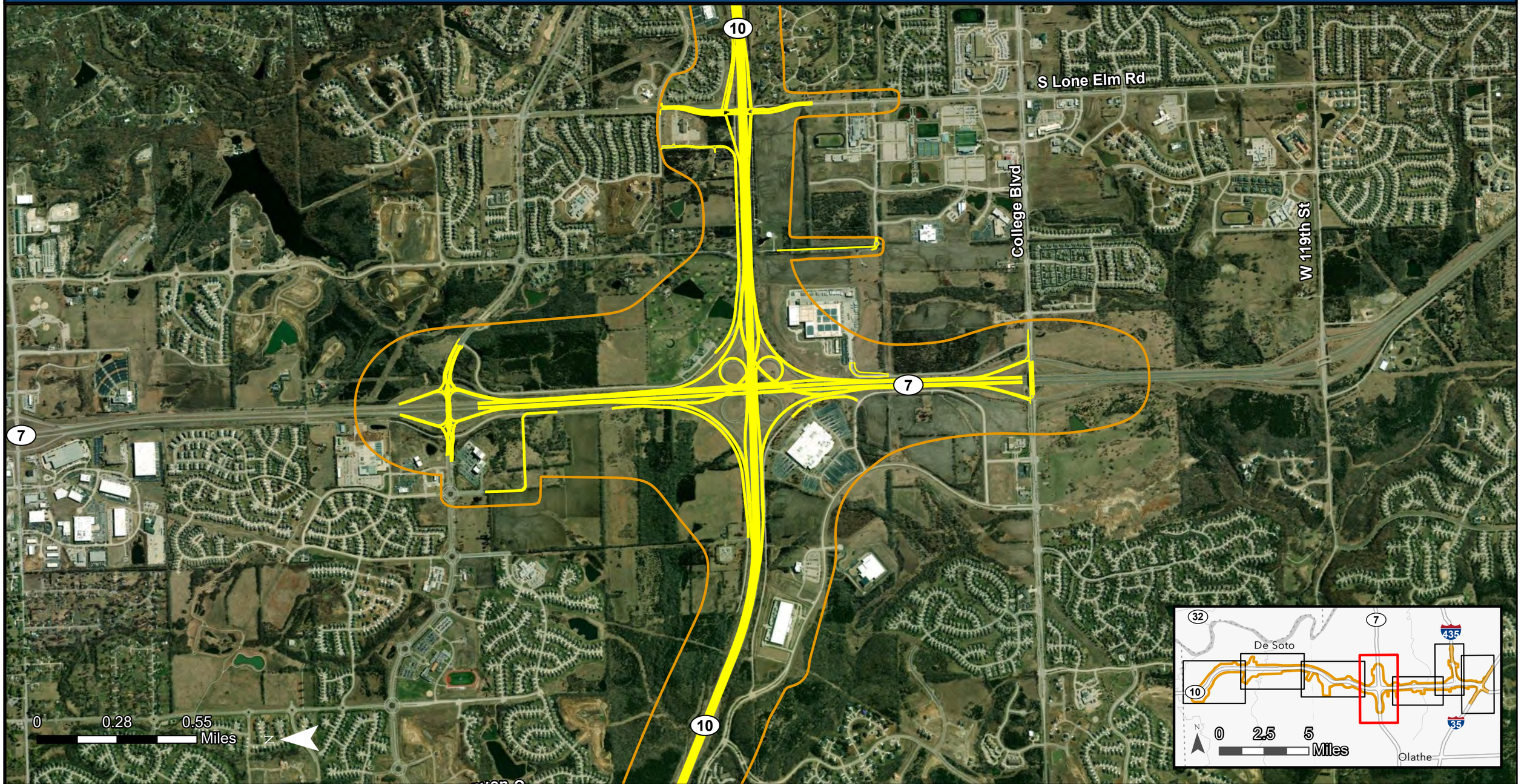
Reasonable Alternative - Traditional Widening



Legend

- Study Area
- Proposed Alignment

K-10 Capacity Improvements

KDOT # 10-46 KA-6549-01

K-10 CORRIDOR

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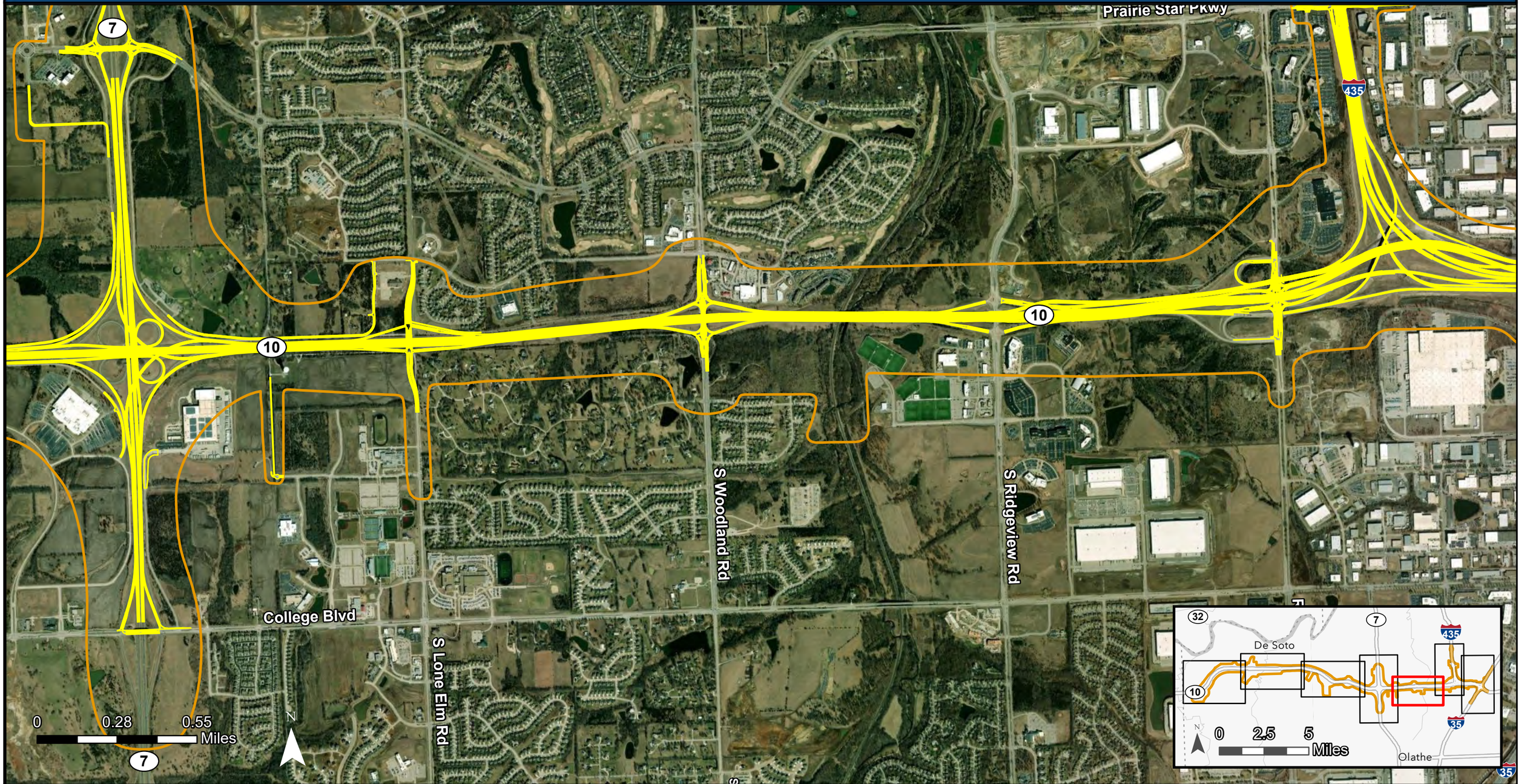
Reasonable Alternative - Traditional Widening

Appendix D



Legend

- Study Area
- Proposed Alignment

K-10 Capacity Improvements

KDOT # 10-46 KA-6549-01

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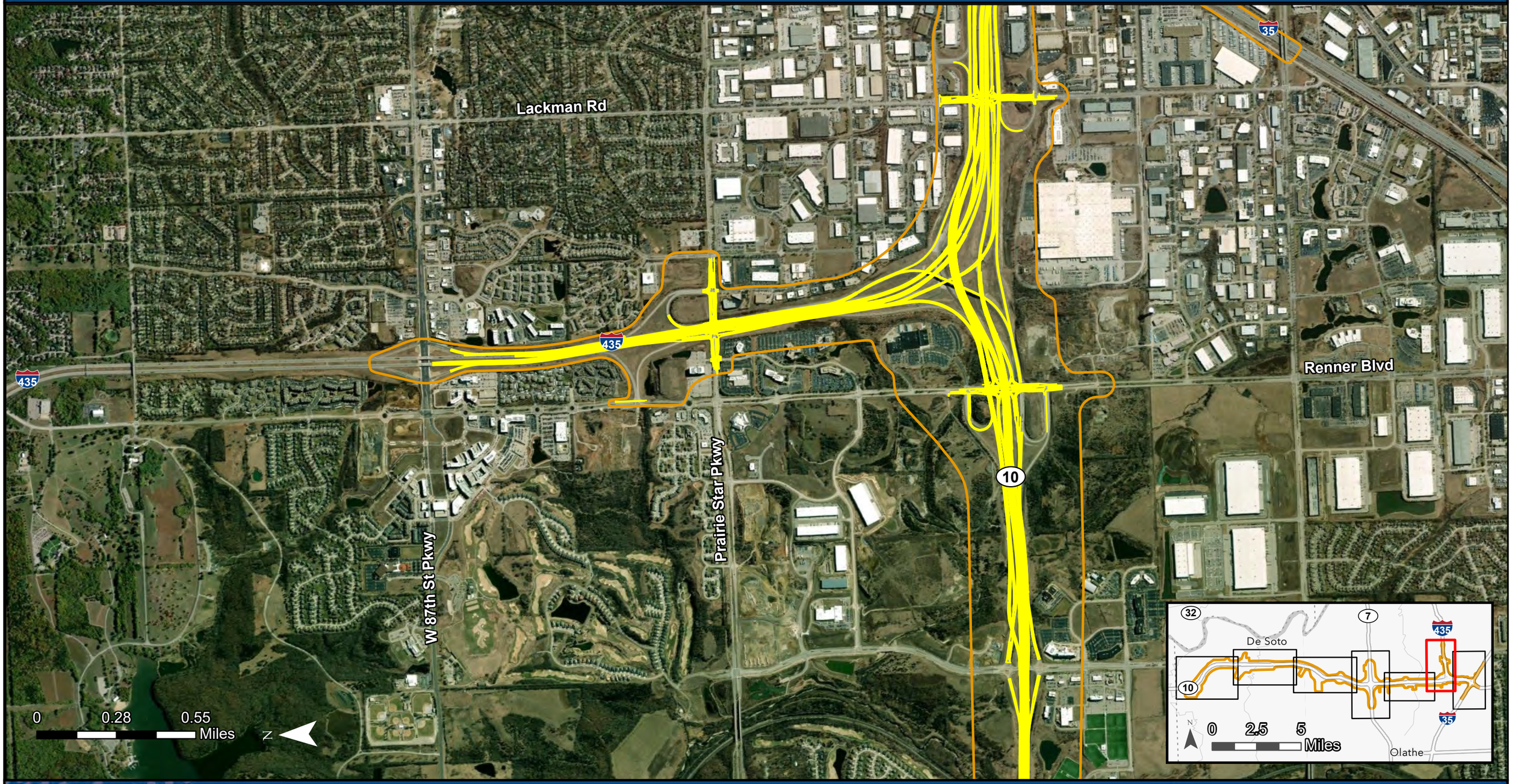
Reasonable Alternative - Traditional Widening



Legend

- Study Area
- Proposed Alignment

K-10 Capacity Improvements

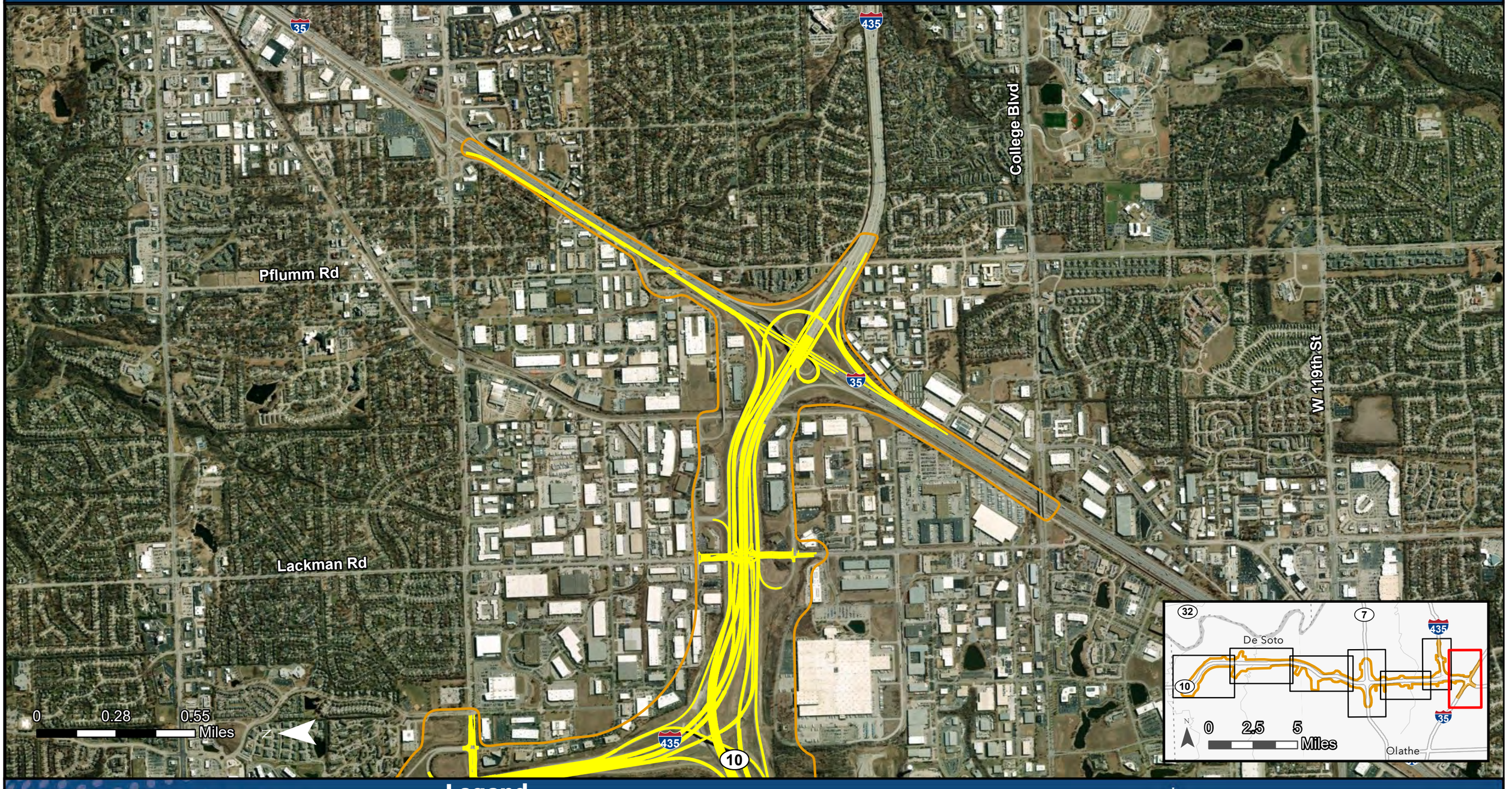
KDOT # 10-46 KA-6549-01

K10 CORRIDOR

Kansas Department of Transportation

Reasonable Alternative - Traditional Widening

Appendix D



Legend

- Study Area
- Proposed Alignment

K-10 Capacity Improvements

KDOT # 10-46 KA-6549-01

K10 CORRIDOR

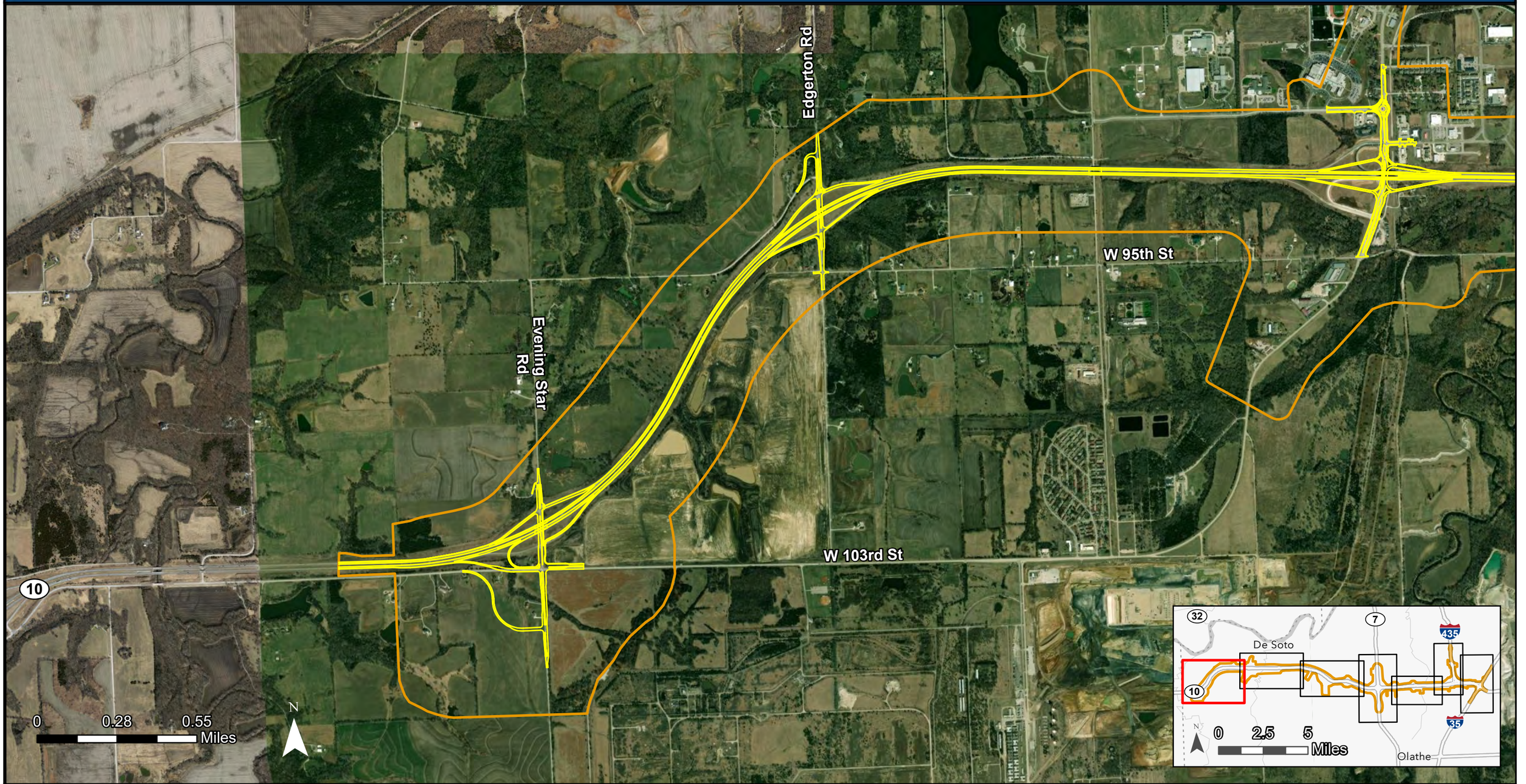
Kansas Department of Transportation

Appendix E

Express Toll Lanes Alternative

Reasonable Alternative - Express Toll Lanes

Appendix E



Legend

- Study Area
- Proposed Alignment

K-10 Capacity Improvements

KDOT # 10-46 KA-6549-01

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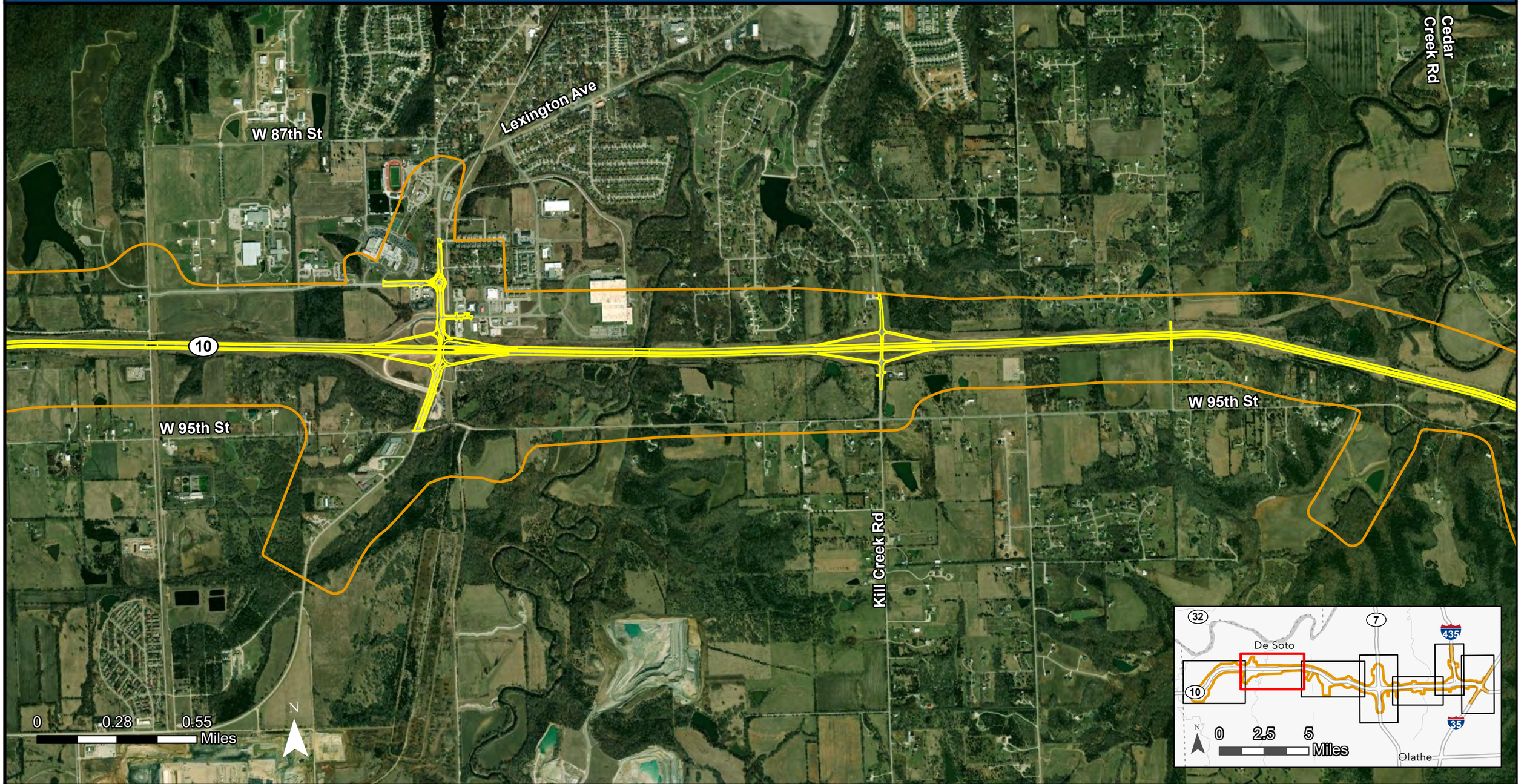
Kansas Department of Transportation

Reasonable Alternative - Express Toll Lanes

Appendix E



Legend

- Study Area
- Proposed Alignment

K-10 Capacity Improvements

KDOT # 10-46 KA-6549-01

K-10 CORRIDOR

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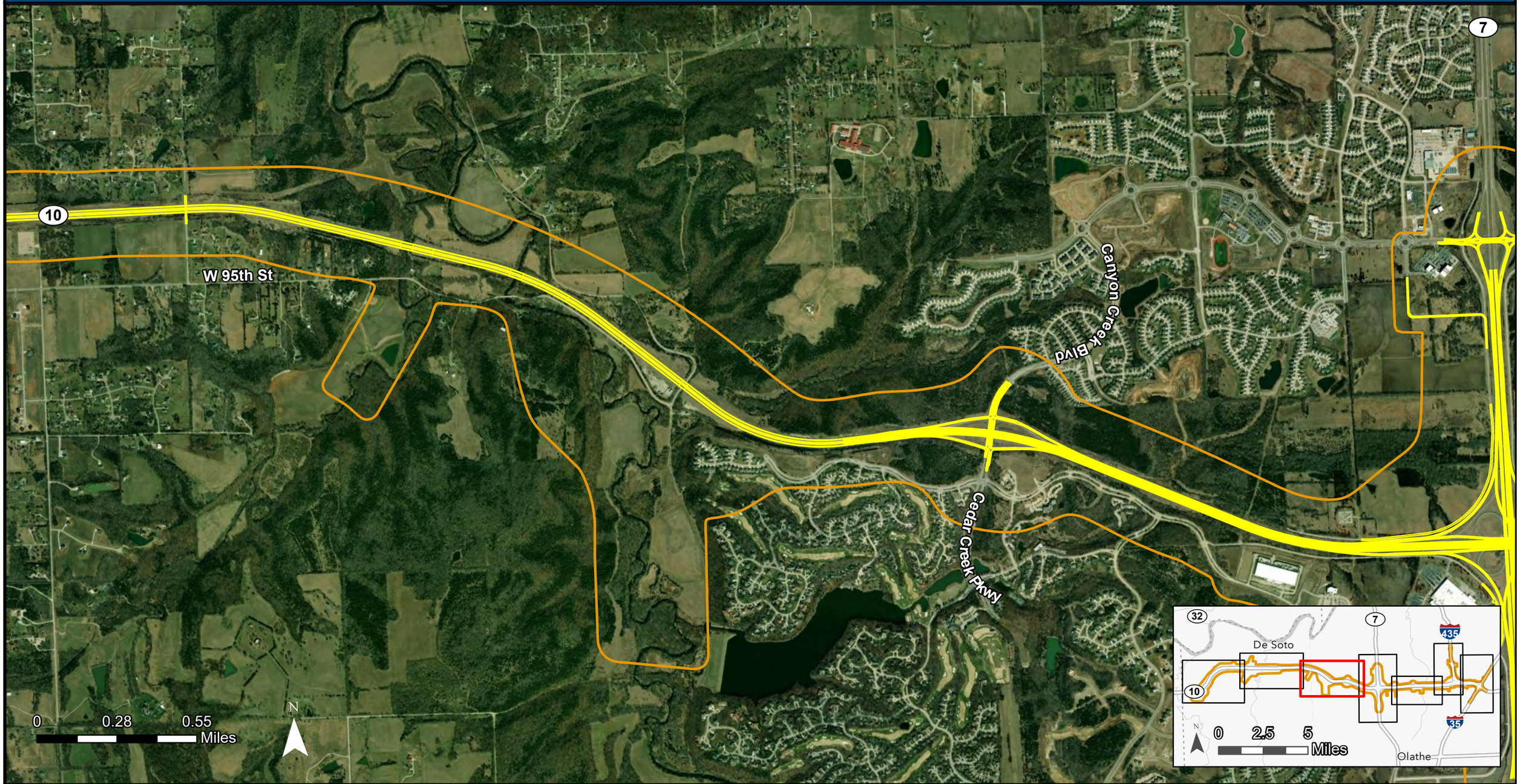
Reasonable Alternative - Express Toll Lanes

Appendix E



Legend

- Study Area
- Proposed Alignment

K-10 Capacity Improvements

KDOT # 10-46 KA-6549-01

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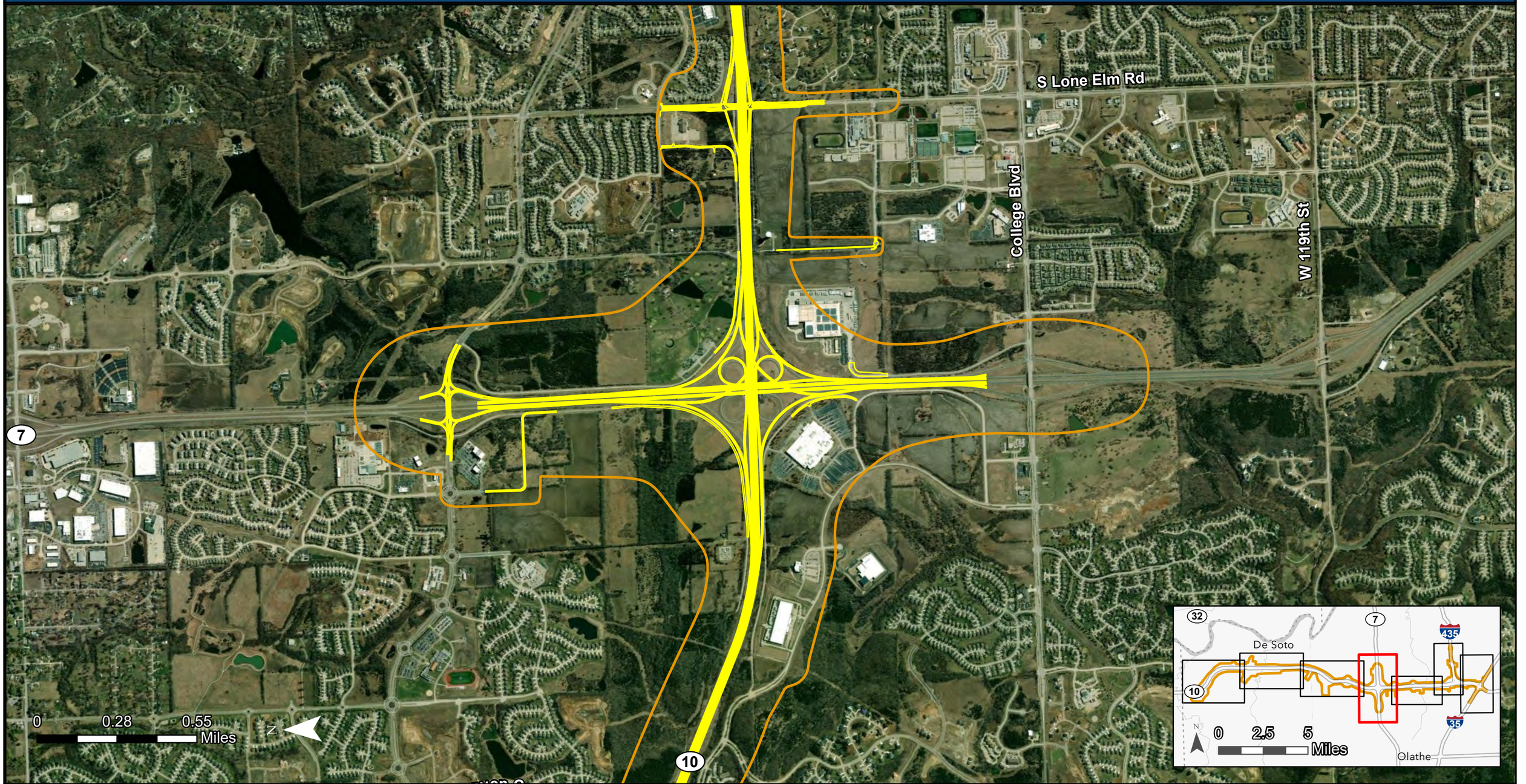
Reasonable Alternative - Express Toll Lanes

Appendix E



Legend

- Study Area
- Proposed Alignment

K-10 Capacity Improvements

KDOT # 10-46 KA-6549-01

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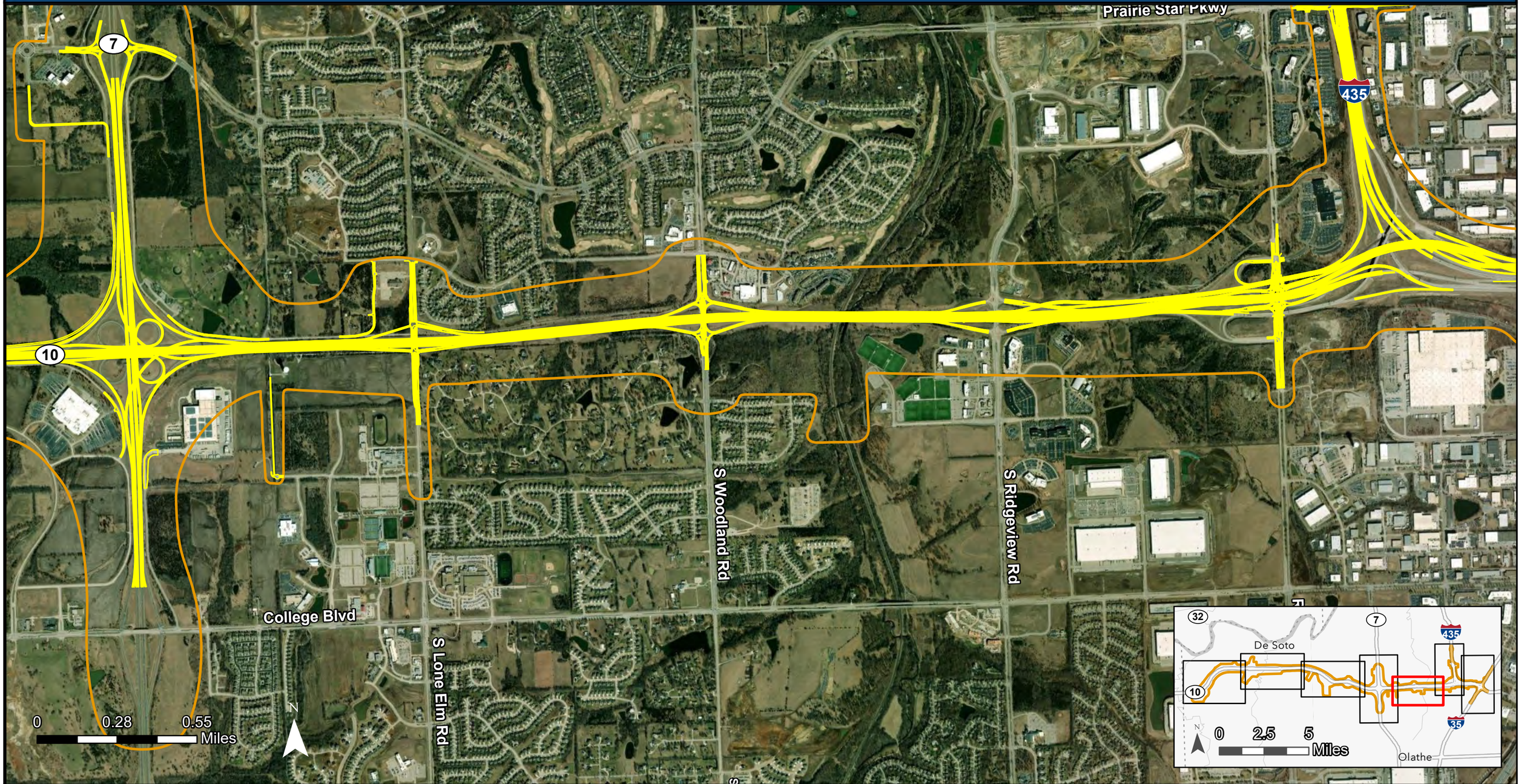
Reasonable Alternative - Express Toll Lanes



Legend

- Study Area
- Proposed Alignment

K-10 Capacity Improvements

KDOT # 10-46 KA-6549-01

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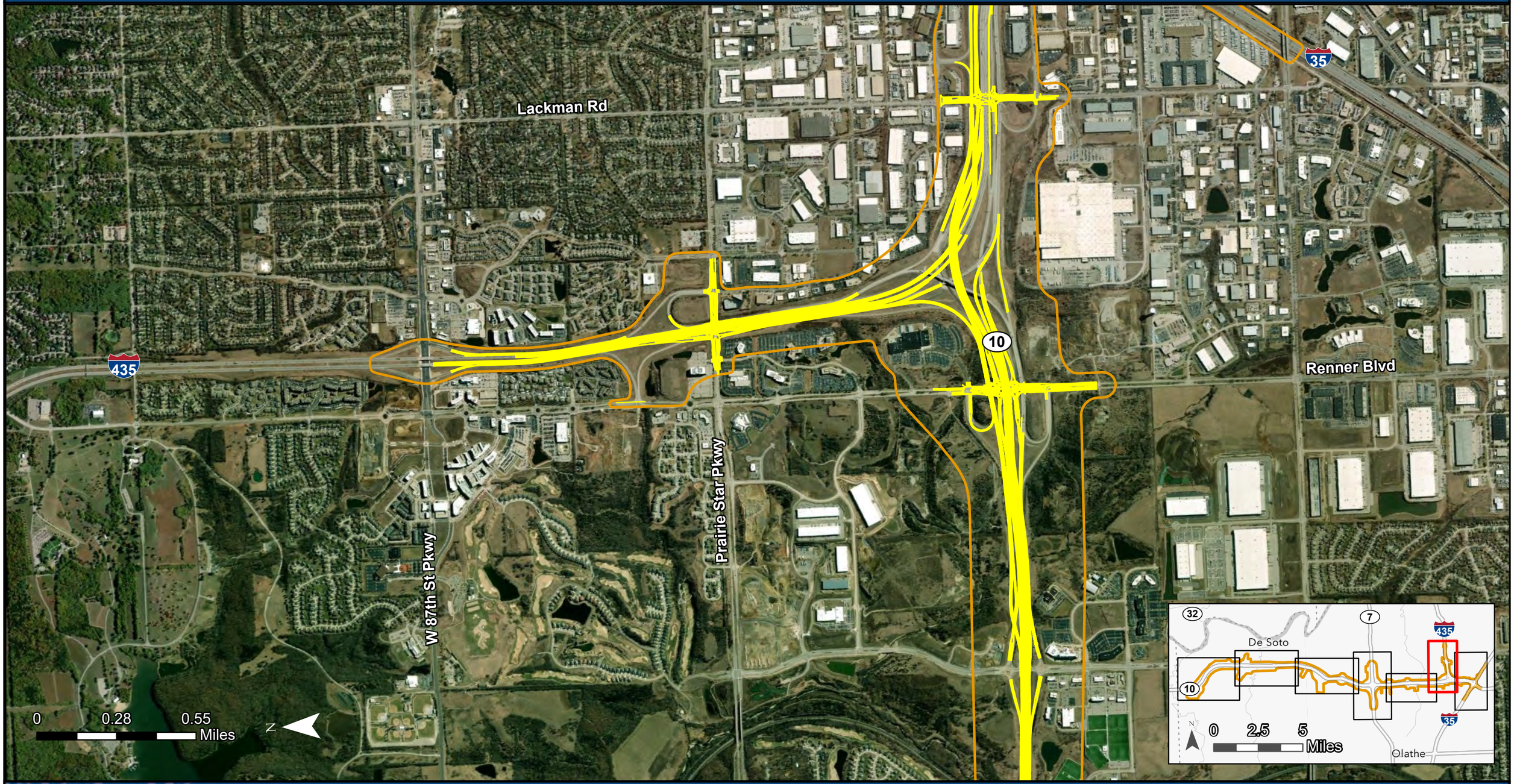
Reasonable Alternative - Express Toll Lanes



Legend

- Study Area
- Proposed Alignment

K-10 Capacity Improvements

KDOT # 10-46 KA-6549-01

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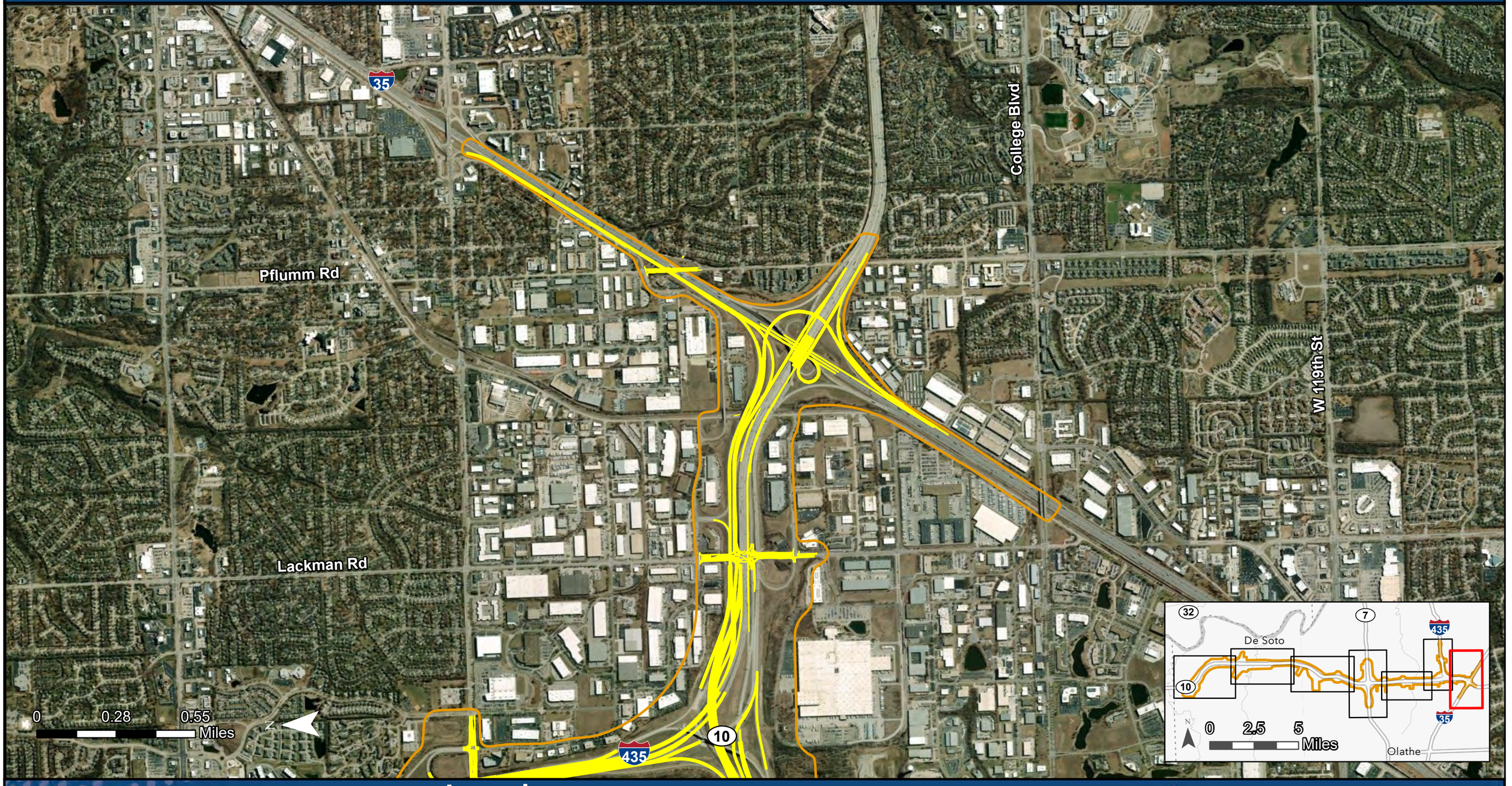
Kansas Department of Transportation

Reasonable Alternative - Express Toll Lanes



Legend

- Study Area
- Proposed Alignment

K-10 Capacity Improvements

KDOT # 10-46 KA-6549-01

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