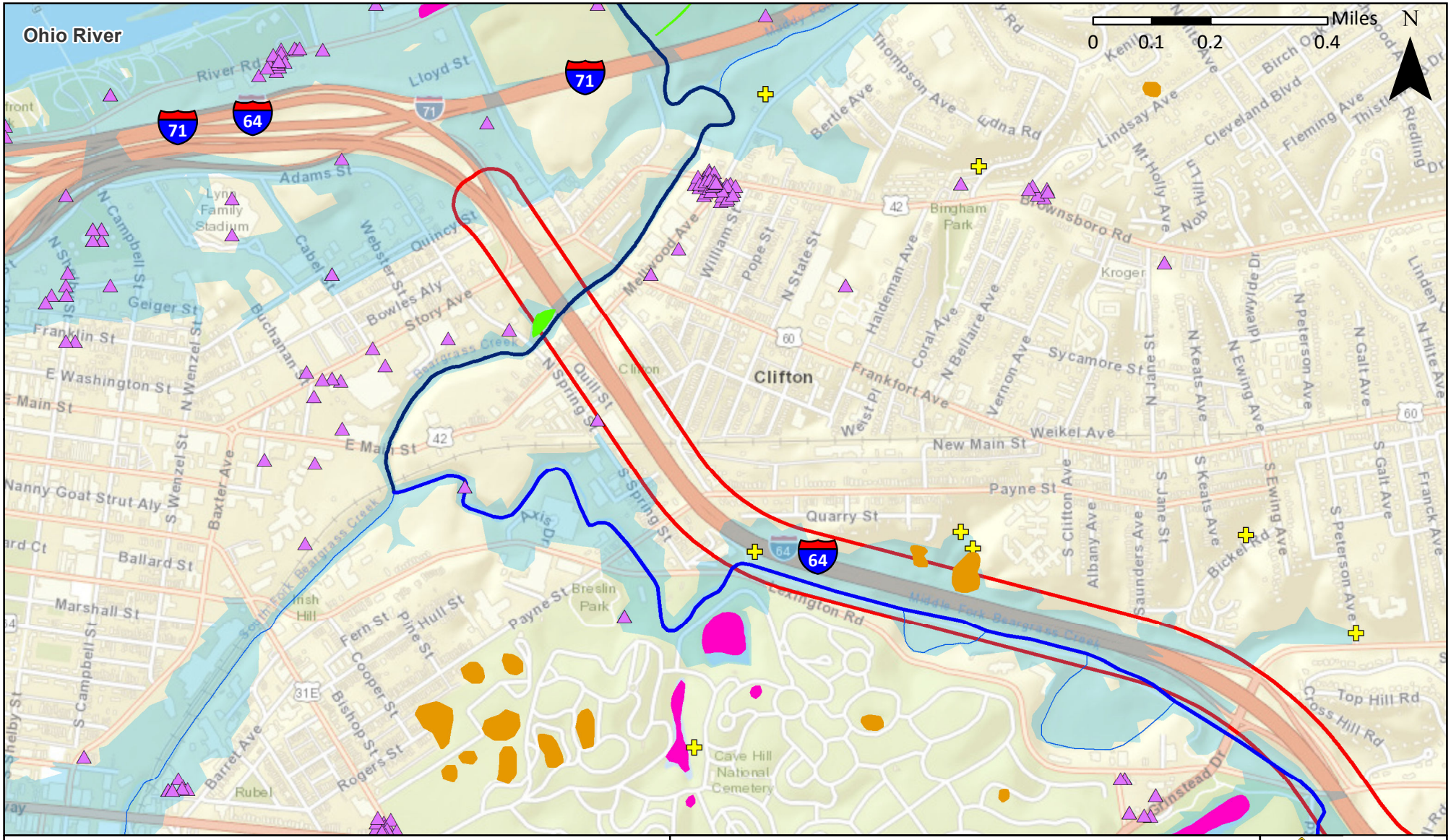
APPENDIX D:

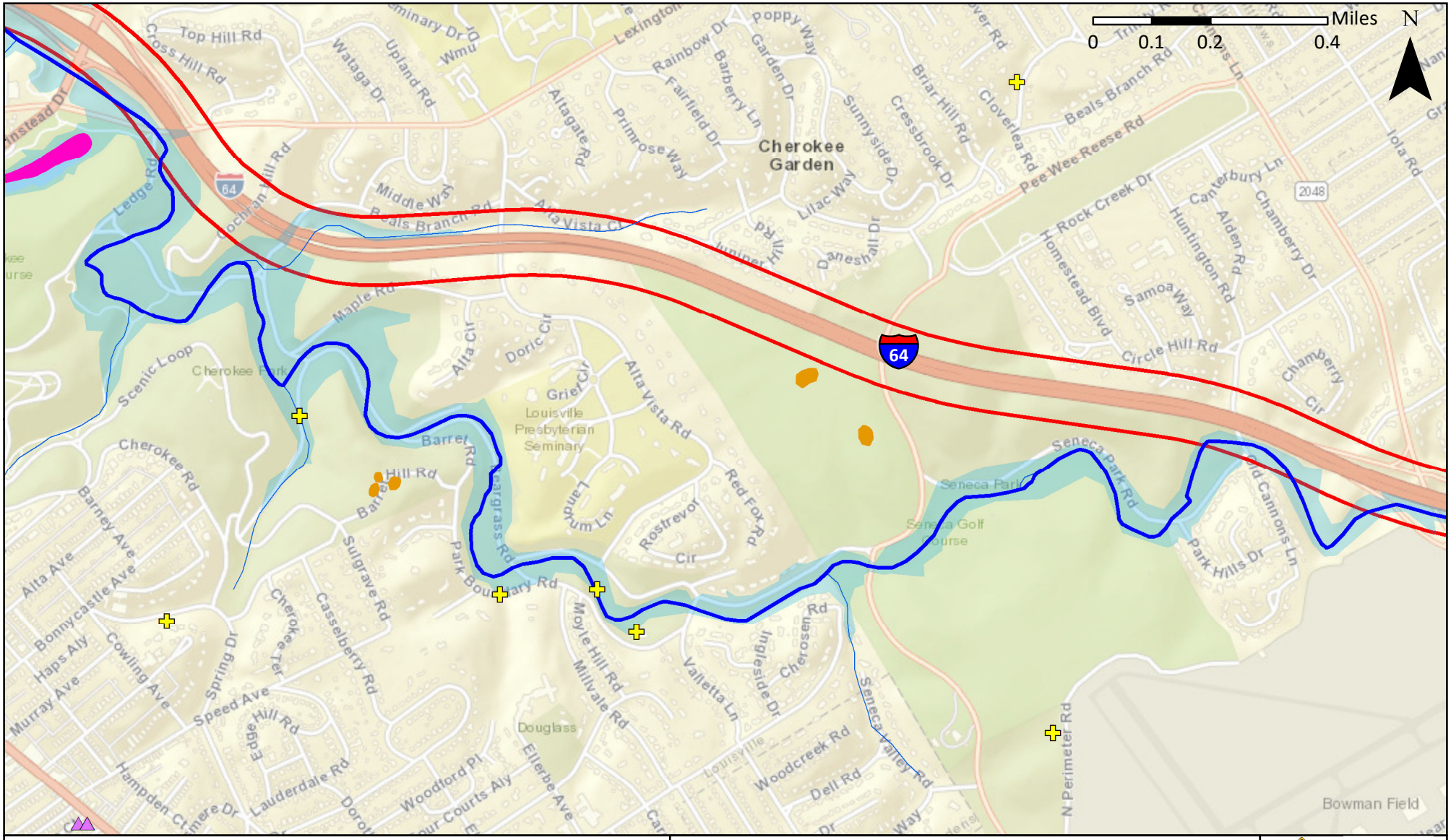
Environmental Resources

- Exhibit 1: Natural Environment
- Exhibit 2: Human Environment
- Geotechnical Overview
- Socioeconomic Study



I-64 Corridor Study; Story Avenue to I-264

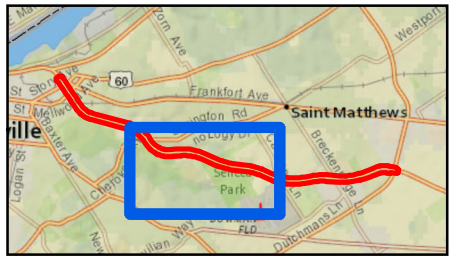
Appendix D, Exhibit 1: Natural Environment (1 of 3)

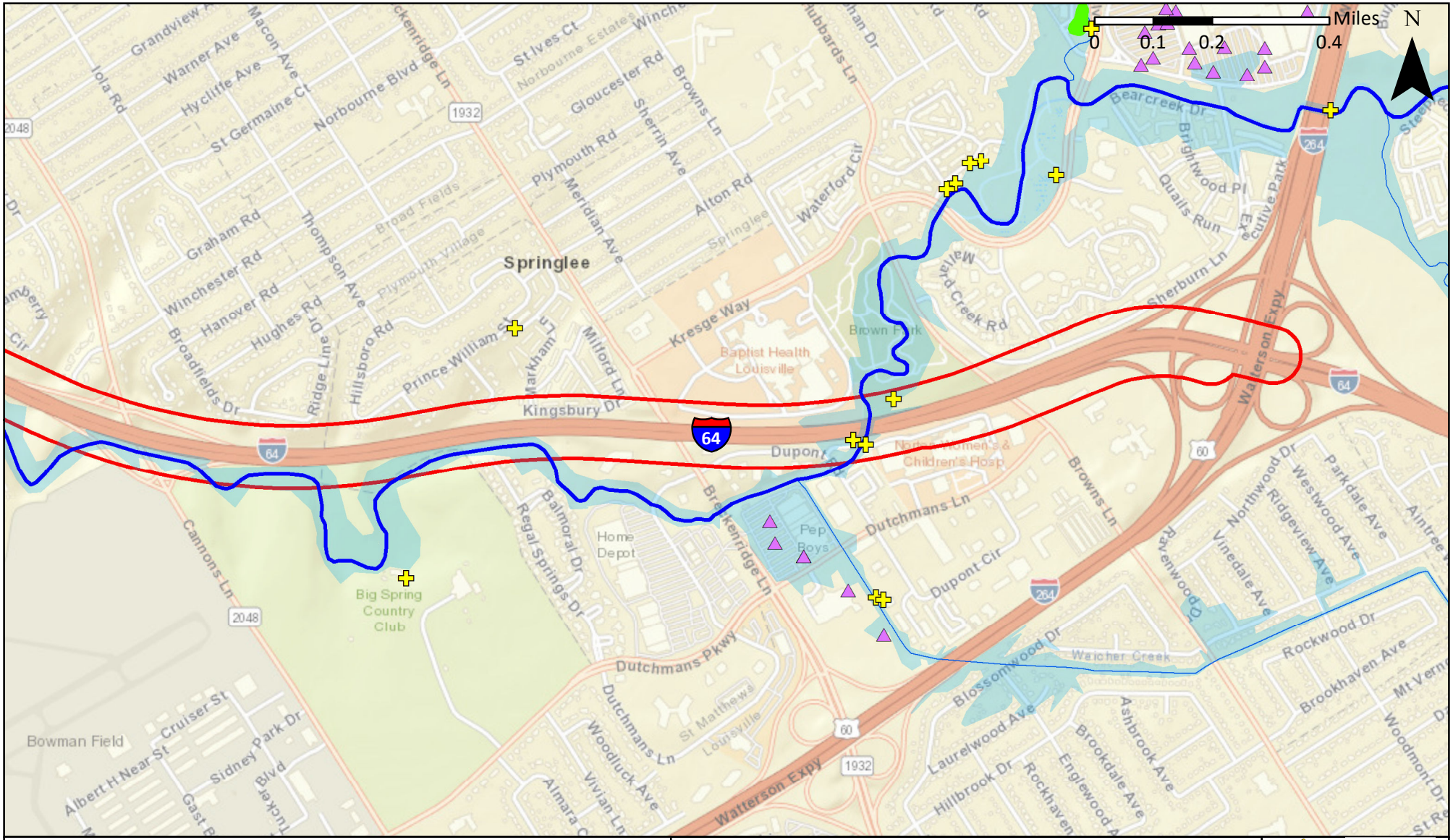


I-64 Corridor Study; Story Avenue to I-264

Appendix D, Exhibit 1: Natural Environment (2 of 3)

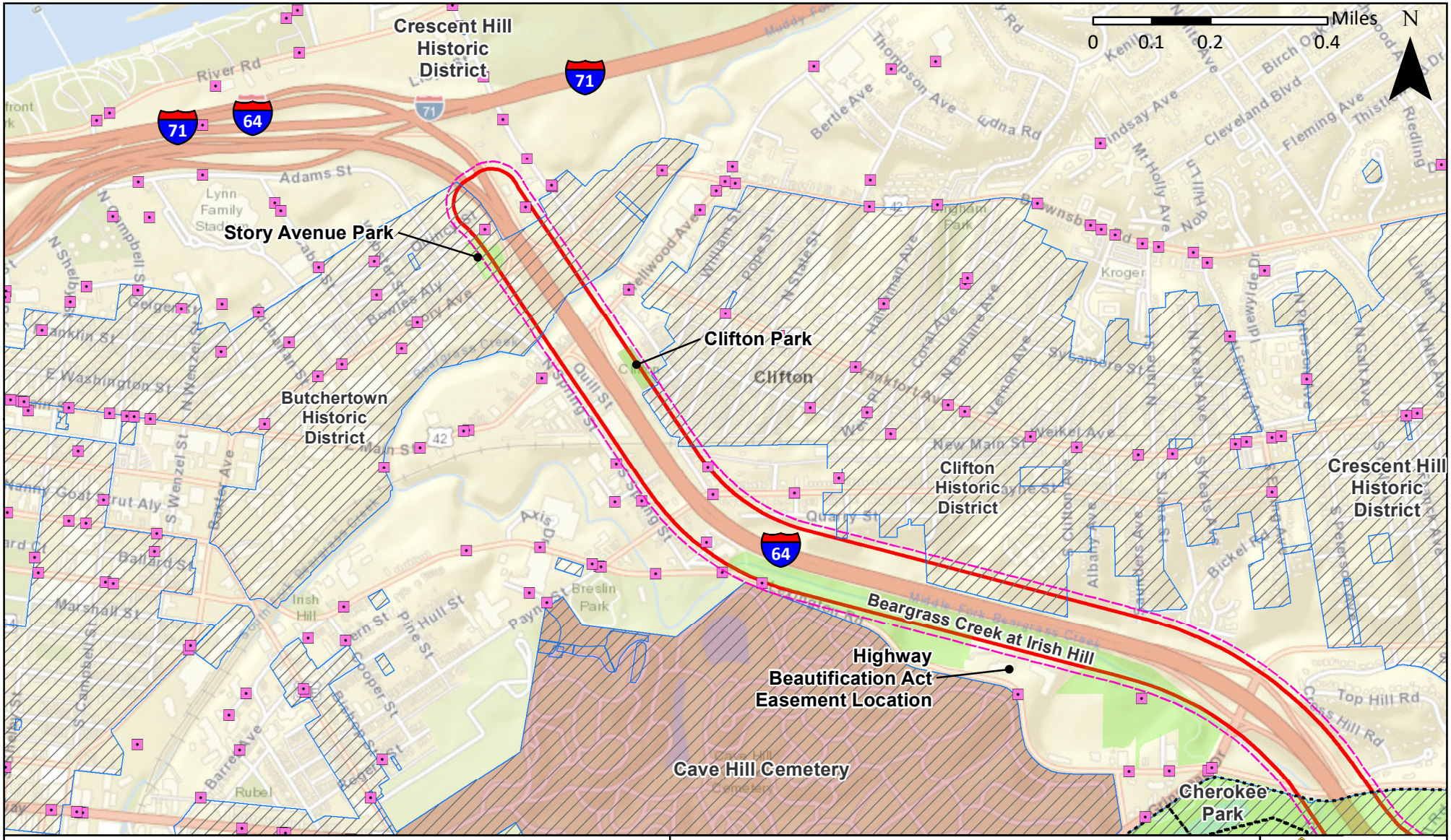
- Middle Fork Beargrass Creek
- Beargrass Creek
- Other Streams
- 100 Year Flood Zones
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Sinkholes
- Springs
- Water Wells
- Environmental Corridor





I-64 Corridor Study; Story Avenue to I-264

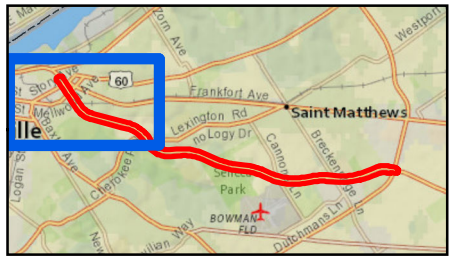
Appendix D, Exhibit 1: Natural Environment (3 of 3)

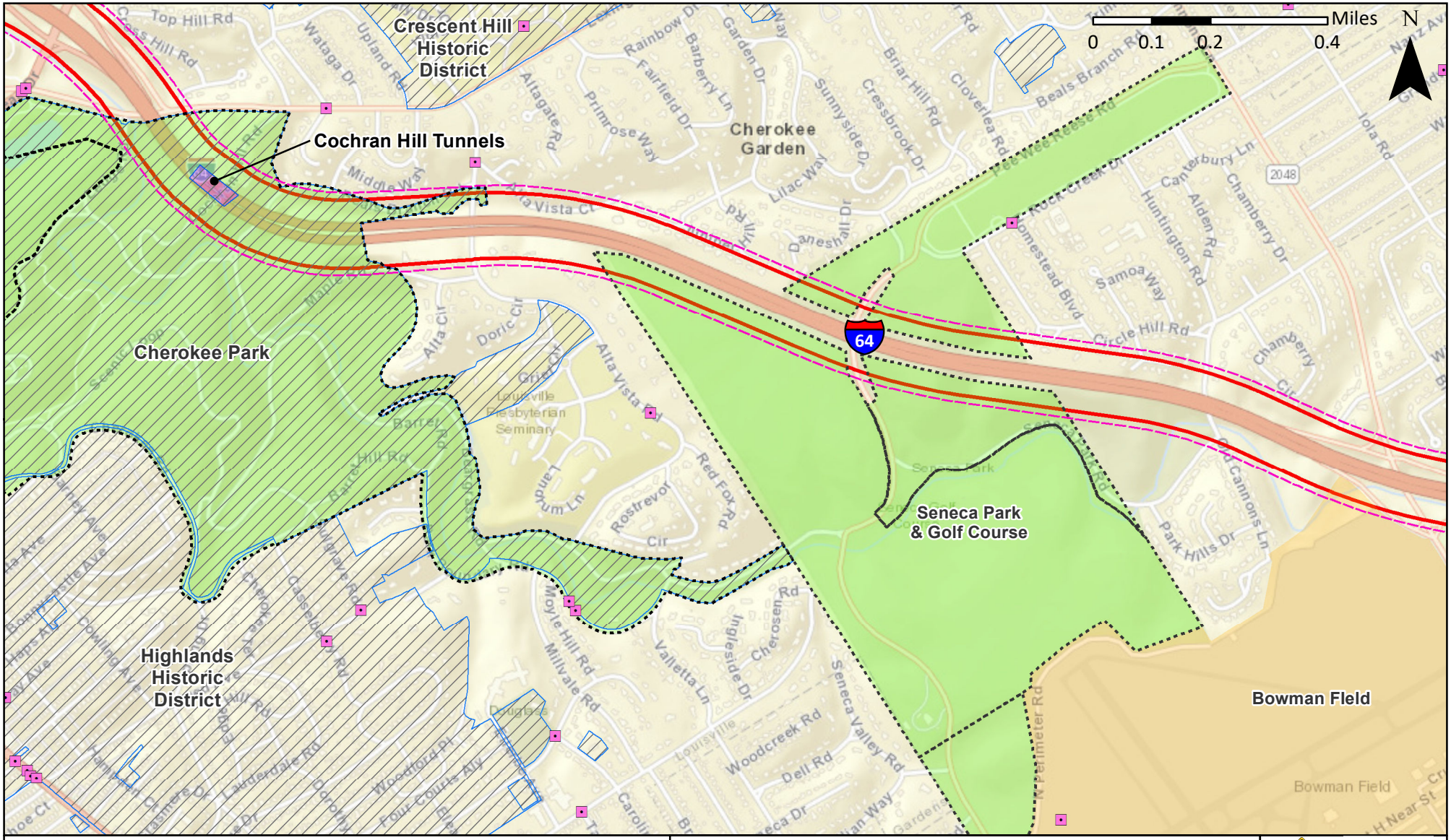


I-64 Corridor Study; Story Avenue to I-264

Appendix D, Exhibit 2: Human Environment (1 of 3)

- Hazmat Facillities
- 6(f) Resource
- NRHP Listed Site/District
- Cochran Hill Tunnels
- Bowman Field Airport
- Medical Facilities
- Cave Hill Cemetery
- Parks
- Potential Noise Impact Area
- Environmental Corridor





I-64 Corridor Study; Story Avenue to I-264

Appendix D, Exhibit 2: Human Environment (2 of 3)

- Hazmat Facillities
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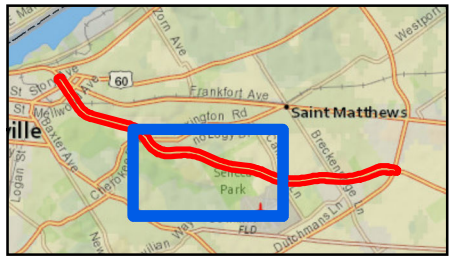

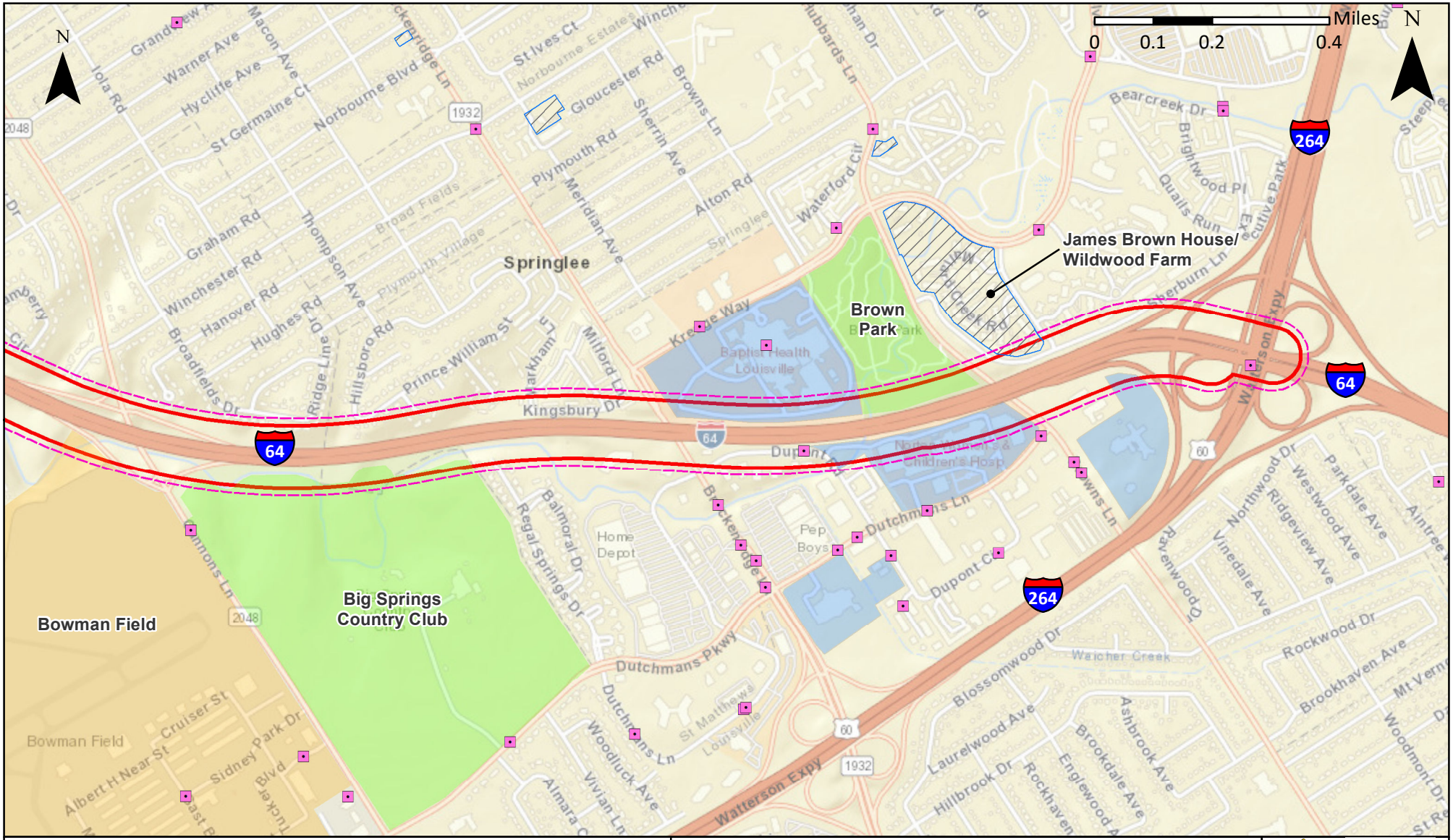

I-64 Corridor Study; Story Avenue to I-264

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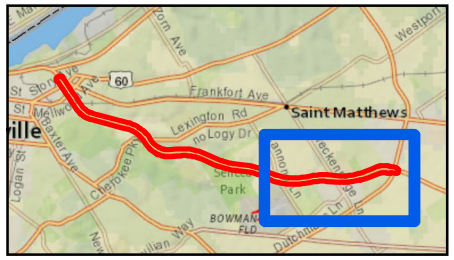

REPORT OF GEOTECHNICAL OVERVIEW

I-64 Corridor Study
Between Story Ave. and I-264
Louisville, Kentucky

Prepared For:
HMB Professional Engineers, Inc.
3 HMB Circle
Frankfort, Kentucky 40601

Prepared By:
K. S. Ware and Associates, L.L.C.
350 Cal Batsel Road
Bowling Green, Kentucky 42101

KSWA Project No. 500-20-0002

November 19, 2020

November 19, 2020

Mr. Brad Johnson, P.E.
HMB Professional Engineers, Inc.
3 HMB Circle
Frankfort, KY 40601

Subject: Report of Geotechnical Overview
I-64 Corridor Study
Between Story Ave. and I-264
Louisville, Kentucky

Dear Mr. Johnson:

K. S. Ware and Associates, L.L.C. (KSWA) is pleased to present to you this this geotechnical overview report for I-64 Corridor Study project in Lexington, Kentucky. The attached report summarizes the project information provided to us, describes the site conditions observed during our site reconnaissance, and summarizes the general site geologic conditions. The Appendices include figures depicting topographic information and mapped geologic formations.

We appreciate the opportunity to be of service to you on this project. Please contact us if you have any questions regarding this report. We look forward to serving as your geotechnical consultant on the remainder of this project.

Respectfully submitted,

K. S. Ware and Associates, L.L.C.

Nathan Long, P.E
Senior Geotechnical Engineer

Derek L. Hodnett, P.E.
VP of Field / Geotechnical Services

Enclosures: Report of Geotechnical Overview

Distribution: File (1)

350 Cal Batsel Rd | Bowling Green, KY 42101
270.842.1070 phone | 615.256.5873 fax | info@kswarellc.com

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APPENDICES

1.0 INTRODUCTION

1.1 PROJECT INFORMATION

The project consists of evaluating potential improvement options for widening I-64 between Story Avenue and I-264 in Louisville, Jefferson County, Kentucky. The existing roadway along this 6.1-mile alignment consists of a four-lane divided highway. Each of the existing driving lanes along the alignment are about 12 feet wide. Paved shoulders are located along the inside (4 feet wide) and outside (10 feet wide) lanes, except for within Cochran Hill Tunnels, which only has 3-foot wide shoulders. The median between the existing shoulders is generally about 28 feet wide, except for about a one mile section where the distance between the shoulders is up to 78 feet. This one mile section includes Cochran Hill Tunnel and the sections of roadway on each end leading up to the tunnel.

Sixteen bridges are located along the study alignment, with seven (7) of the bridges associated with I-64 overpasses and nine (9) of the bridges associated with I-64 underpasses. Additionally, the Cochran Hill Tunnel is located along the alignment between MP 8.2 and MP 8.3. The Cochran Hill Tunnels consist of twin tunnels, one for each traffic direction. The westbound tunnel is about 440 feet long, and the eastbound tunnel is about 406 feet long.

We understand that potential improvement options consist of adding a driving lane for each direction to create a six-lane highway and/or adding lanes to existing exit/entry ramps.

1.2 PURPOSE AND SCOPE OF STUDY

The purpose of the study was to perform a geotechnical overview for the project to address geotechnical issues that may affect the potential improvement options discussed above. To identify potential geotechnical issues, we performed a desktop study of available published geotechnical data/information for the proposed project area. We also performed a site visit to observe the project area, paying particular attention to existing cut and fill embankments within the area. We performed the geotechnical overview in accordance with Section 801 of the KYTC Geotechnical Guidance Manual. Below is a list of KYTC geotechnical reports reviewed as part of this study:

- Proposed bridge and retaining wall structures associated with the Kennedy Interchange project. These structures are located at the Kennedy Interchange ramps and at I-64 over Story Avenue, Mellwood Avenue, and Beargrass Creek. KYTC geotechnical report numbers are S-031-2009, S-032-2009, S-059-2008, S-070-2008, S-163-2007, S-213-2007, S-214-2007, S-295-2007, S-296-2007, S-297-2007, and S-298-2007.
- Existing noise wall along I-264 eastbound between Breckenridge Lane and I-64 (S-051-2013).
- Existing bridge for Browns Lane over I-64 (S-067-1989).
- Existing retaining wall along eastbound lanes of I-64 at I-264 interchange (S-090-1989).
- Existing bridge over I-64 at I-264 ramp (S-168-2015).
- Two roadway reports for widening along I-264 near the I-64 interchange (R-094-2007 and R-059-2015)
- Existing Louisville East End Tunnel (R-029-2008)

2.0 SITE GEOLOGY

2.1 PHYSIOGRAPHIC PROVINCE

Louisville is located in the Outer Bluegrass Physiographic Region, which is characterized by rolling terrain with very little flat land. The bedrock of the Outer Bluegrass typically consists of limestone, dolomite, and shale of the Late Ordovician age. Additionally, limestones of the Mid-Silurian and Mid-Devonian ages are exposed in the Louisville area.

2.2 GEOLOGIC FORMATIONS

The Kentucky Geological Survey's (KGS) online Geologic Map Service indicates the I-64 alignment crosses 6 mapped geologic units. Appendix B includes a Geologic Map depicting each of these units, which are further discussed below.

2.2.1 QAL –ALLUVIUM

Alluvium is mapped within the Ohio River valley near the west end of the corridor and along portions of Beargrass Creek, which intersects I-64 near the east and west ends of the project and flows parallel to the south side of I-64 along the majority of the alignment. The alluvium is typically composed of varying quantities of clay, silt, sand, and gravel. Gravel is primarily composed of chert, dolomite, and limestone. Maximum thickness is approximately 20 feet along Beargrass Creek and approximately 30 feet within the Ohio River valley.

2.2.2 QO – GLACIAL OUTWASH

Glacial outwash is mapped along Beargrass Creek where it intersects I-64 at the west end of the project. The outwash deposits consist of intermixed sand, gravel, silt, and clay. These materials were deposited as alluvium following release of glacial meltwater. The maximum thickness is about 120 feet.

2.2.3 QLA – LACUSTRINE DEPOSITS

This unit is mapped adjacent to alluvium within the western extent of I-64 near the I-71 interchange and was deposited in valleys ponded by glacial outwash that filled the Ohio River valley. The lacustrine deposits are composed of varying quantities of clay, silt, sand, and gravel. The soil is calcareous in unweathered deposits. Maximum thickness is approximately 50 feet.

2.2.4 DSJ – SELLERSBURG AND JEFFERSONVILLE LIMESTONES

The Sellersburg and Jeffersonville Limestones are mapped as a single unit on the referenced geologic map. The majority of the area surrounding the I-64 alignment is mapped within this unit. This unit is also mapped along the rock cuts adjacent to the existing alignment.

The Sellersberg Limestone Formation is characterized by two distinct members; the Beechwood Limestone Member and the Silver Creek Limestone Member. The Beechwood Limestone member is a highly fossiliferous unit that is light-greenish-gray in color. The limestone contains coarse to very coarse white fossil fragments and whole fossils suspended in a very fine-grained brown matrix. Bedding is typically very thin to thin with local crossbedding. Beds of

gray to pink chert reaching maximum thicknesses of 6 inches can be found throughout the member. Additionaly, thin layers of pyrite and quartzose sand and phosphatic nodules are commonly found at the top and base of formation. Thickness of the member ranges from 2 to 15 feet.

The Silver Creek Limestone member is a silty, dolomitic limestone that varies from light-bluish-gray, olive-gray, and light-greenish-gray in color. The member is moderately fossiliferous and contains calcareous stringers throughout. Maximum thickness of the member is 5 feet. The overall distribution of this member is sporadic and is often times missing from the stratigraphy.

The Jeffersonville Limestone is a fossiliferous, pyritic limestone bound in a matrix of sparry calcite or calcareous mudstone. Colors include various shades of gray. Scattered bands of chert found throughout the formation. Thickness ranges from zero feet to 25 feet and tend to increase in thickness to the north. The unit is highly exposed by the road cuts of I-64.

2.2.5 SLV – LOUISVILLE LIMESTONE

This unit is below the Jeffersonville Limestone in areas along Beargrass Creek and its tributaries, where erosion has exposed the unit. The Louisville Limestone is a dolomitic limestone found in various shades of gray, micro-grained to fine-grained, very thin to thick bedded, and fossiliferous. One to 2 feet of shale can be found approximately 6 to 10 feet above the base of the formation. Chert layers found in the upper portion of the formation. Calcite filled joints and vugs found throughout. Thickness ranges from 65 to 85 feet.

The Lyndon Syncline is mapped along the base of this formation near the east end of the project. The syncline traverses the area in a general north-south direction and intersects the alignment near Browns Lane. The Springdale Anticline is also mapped in the project area, and intersects the alignment near Pee Wee Reese Road. The structure contours indicate dips of less than one percent

2.2.6 DNA - NEW ALBANY SHALE

The New Albany Shale is mapped at the high end of the project, around the Browns Lane overpass. This formation consists of olive- to grayish-black, carbonaceous shale. The shale appears massive when fresh, but weathers to produce thin, brittle chips. This formation also includes abundant pyrite, which produces iron oxides and sulfates when weathered.

2.2.7 AF – ARTIFICIAL FILL

Artificial fill is mapped in numerous areas along the existing I-64 alignment where fill materials were likely placed during construction of the roadway. These areas are generally located along over/underpasses and adjacent to low-lying areas along Beargrass Creek and its tributaries.

2.3 KARST POTENTIAL

As mentioned above, significant portions of the I-64 alignment are underlain by limestone formations, which are susceptible to solution weathering and sinkhole development. Therefore, we reviewed the KGS's online Karst Potential Map to evaluate the possibility of karst activity along the project alignment. The areas within the Louisville Limestone were mapped as having a Medium karst potential, and the areas within the Sellersburg and Jeffersonville Limestones were mapped as having a High karst potential. The remaining areas were mapped as Non-Karst karst potential. We have included KGS's Karst Potential Map in Appendix C.

We also reviewed the following maps for additional information about mapped closed depressions.

- Geologic Map of the Louisville East Quadrangle, Jefferson County, Kentucky (GQ-1203) (1974)
- Geologic Map of Parts of the Jeffersonville, New Albany, and Charleston Quadrangles, Kentucky-Indiana (GQ-1211) (1974)
- USGS Topographic Map, Louisville East Quadrangle, Kentucky (2016)
- USGS Topographic Map, Jeffersonville Quadrangle, Indiana-Kentucky (2016)

The referenced maps did not depict any closed depressions along the alignment. However, the maps did indicate 20 closed depressions within ½-mile of the alignment. These closed depressions may be an indicator of sinkhole activity. The majority of the mapped depressions were within or near Cave Hill Cemetery, which has a stream flowing from an on-site cave. The maps also indicate additional springs along unnamed tributaries of Beargrass Creek near the alignment. We note that the scale of reviewed maps often precludes the mapping of smaller features.

2.4 FAULTS

The KGS's online maps and the geologic maps referenced above do not depict any mapped faults along the alignment or in the project area.

2.5 SEISMICITY

The subject area is located within a relatively stable seismographic area that it is influenced by seismic activity associated with the Wabash Valley seismic zone and, to a lesser extent, New Madrid seismic zone. The hazards associated with seismic activity at the site will need to be evaluated during the design phase geotechnical investigation. However, based on our review of AASHTO's LRFD Bridge Design Specifications (8th Edition), we anticipate a Seismic Zone of 1 for the bridges along the alignment. We also anticipate Site Classes will range from B (Rock) to D (Stiff Soil) depending on the structures' location along the alignment. Bridges and/or retaining walls near the west of the alignment where alluvium and glacial deposits are exposed will likely be Class C or D, while other bridges will likely be B or C, depending on depth to bedrock.

3.0 SITE CONDITIONS

On September 16, 2020, KSWA's Nathan Long, PE and Keaton Andrus, EI performed a site reconnaissance to review the site conditions along the existing alignment. The reconnaissance was performed by visually observing features along the interstate while driving multiple times through the area. We also occasionally stopped along the shoulder to take photographs, which are included in Appendix D.

The I-64 alignment generally crosses rolling hill topography that is typical of the Outer Bluegrass Region. The roadway transitions between cut and fill settings throughout the project. The roadway primarily includes a grassed median, except for at Cochran Tunnel and at the east end of the tunnel (Photo Nos. 1 and 2). The median east of the tunnels is wooded and partially elevated for about ½ mile (Photo No. 3).

We estimate cut and fill slopes as tall as 40 feet each were used to construct the highway. However, the slopes are generally less than 20 feet tall. The cut and fill slopes appear to generally be at about 2H:1V or flatter, except for the cut slopes east of the Cochran Tunnel. The majority of the cut slopes between the tunnel and I-264 interchange consist of pre-split rock faces up to about 20 feet (Photo Nos. 4, 5, and 6).

The existing Cochran Hill Tunnels are lined with a tile façade. Additionally, each of the portals are lined with a stone facing (Photo Nos. 7 and 8). So we were unable to observe the bedrock conditions within the tunnel. We estimate up to 30 feet of cover above the tunnel, with the tunnels completely in bedrock.

4.0 GEOTECHNICAL CONSIDERATIONS

Based upon observations from our site reconnaissance, our review of the readily available reports and maps, and KSWA's understanding of the project, KSWA reached the conclusions provided herein. These general conclusions should be preliminary for planning purposes only. A detailed geotechnical investigation with borings, laboratory testing, and geotechnical analyses should be performed for the design phase of the project.

4.1 PAVEMENT SUBGRADE

Based on the reviewed information, we estimate the subgrade soils primarily consist of clay, either native or earthen fill. We believe the potential exists for fill embankments to also consist of rock fill generated from existing rock cuts and a combination of soil and rock.

We anticipate that widening of the existing roadway would require placing new fill within the existing drainage ditches located along the grassed median and outside shoulders. The upper soils in these areas may be wet and require stabilization prior to new fill placement. Additionally, the subgrades beneath the existing pavement could be wet and may require stabilization if the pavements are removed. Stabilization using chemical modifications (i.e., lime or cement) or rock fill is often used in the project area.

Subgrade soils within the project area generally have design CBR values ranging from 2 to 6.

4.2 EMBANKMENT SLOPES

We estimated the existing embankment fills were constructed at 2H:1V or flatter inclinations using excavated soil and rock from the project area. We anticipate similar slope inclinations can be used for new fill slopes, assuming proper fill placement and subgrade evaluations.

We expect both soil and rock cuts will be required if roadway widening extends beyond the existing outside edge of pavement. Cut slopes in soil may be assumed to be 2H:1V. Existing rock cuts along the alignment consist of near vertical, pre-split rock faces (1H:20V). We anticipate 0.5H:1V or steeper rock cuts may be used if these rock faces need to be pushed back.

A detailed geotechnical investigation should be performed during the design phase to analyze slope stability and settlement for embankments over 20 feet tall and cut slopes over 10 feet tall.

4.3 BRIDGES STRUCTURES

As previously mentioned, there are 16 bridges along the study alignment. We expect these bridges would need to be widened or replaced to provide additional traffic lanes. Based on our review of available geotechnical and geologic information, we expect the foundation conditions vary significantly for these bridges.

As mentioned earlier, the west end of the alignment between the I-71 Interchange and Mellwood Avenue is underlain by alluvium and glacial deposits. The depth to bedrock in these areas generally ranges from about 10 feet to over 100 feet, with depth to bedrock increasing towards the Ohio River. We expect new foundations for Mellwood Avenue and Beargrass Creek bridges would consist of H-piles or drilled shafts bearing on the underlying limestone bedrock. We anticipate the bridges at Story Avenue would be supported by foundations bearing on friction piles bearing within the glacial outwash deposits.

We anticipate the limestone bedrock is generally shallower at the bridges east of Mellwood Avenue. We expect the existing foundations for the bridges along this portion of the alignment to consist of H-piles, drilled shafts, and shallow foundations bearing on limestone bedrock.

A detailed geotechnical investigation should be performed during the design phase of the project to determine the appropriate foundation system for bridge widenings and replacements.

4.4 TUNNEL STRUCTURES

We understand that widening of the roadway through Cochran Hill Tunnel would require either expanding each of the twin tunnels or constructing a third tunnel. The reviewed tunnel profiles from a previous rehabilitation project indicate bedrock cover generally between 15 and 25 feet along the tunnel centerline (See Figure 1 below). However, the rock cover at the portals is between about 4 and 7 feet. The profiles also indicate overburden soil thicknesses generally between about 5 and 15 feet. Based on this information, we expect each of improvement options would require excavation of the limestone bedrock along the alignment. Tunnel excavation for shorter tunnels like these would typically utilize either mechanical excavation with a roadheader or drill and blast methods.

Based on the geologic mapping, we anticipate tunnel excavation for a widening project would be within the Louisville Limestone near its contact with the overlying Jeffersonville Limestone. The contact between these formations is marked by a sharp transition from coarse-grained limestone of Jeffersonville to fine-grained dolomitic limestone of Louisville Limestone. As mentioned in Section 2.3, these formations have a medium to high risk of karst potential and are susceptible to solution weathering due to the limestone bedrock. These formations commonly contain sinkholes along with clay seams, weathered joints and bedding planes, and open voids. These features can cause issues for tunnel construction due to the potential for reduced rock support. Additionally, these features can provide a pathway for groundwater flow into the tunnel excavation. The groundwater flow along these discontinuities is typically greater following rainfall events. We note that the limestone outcrops observed in the area appeared to consist of competent rock. However, we did observe zones of weathering and fractures along bedding planes and joints.

Based on our site observations and review of Google Earth elevations, we believe cover thicknesses similar to the existing tunnels are present north of the westbound tunnel. However, the ground surface above the tunnel begins to slope downward to the south above the eastbound tunnel. Therefore, we believe the cover for a new tunnel south of the eastbound tunnel would likely be less than the current tunnels.

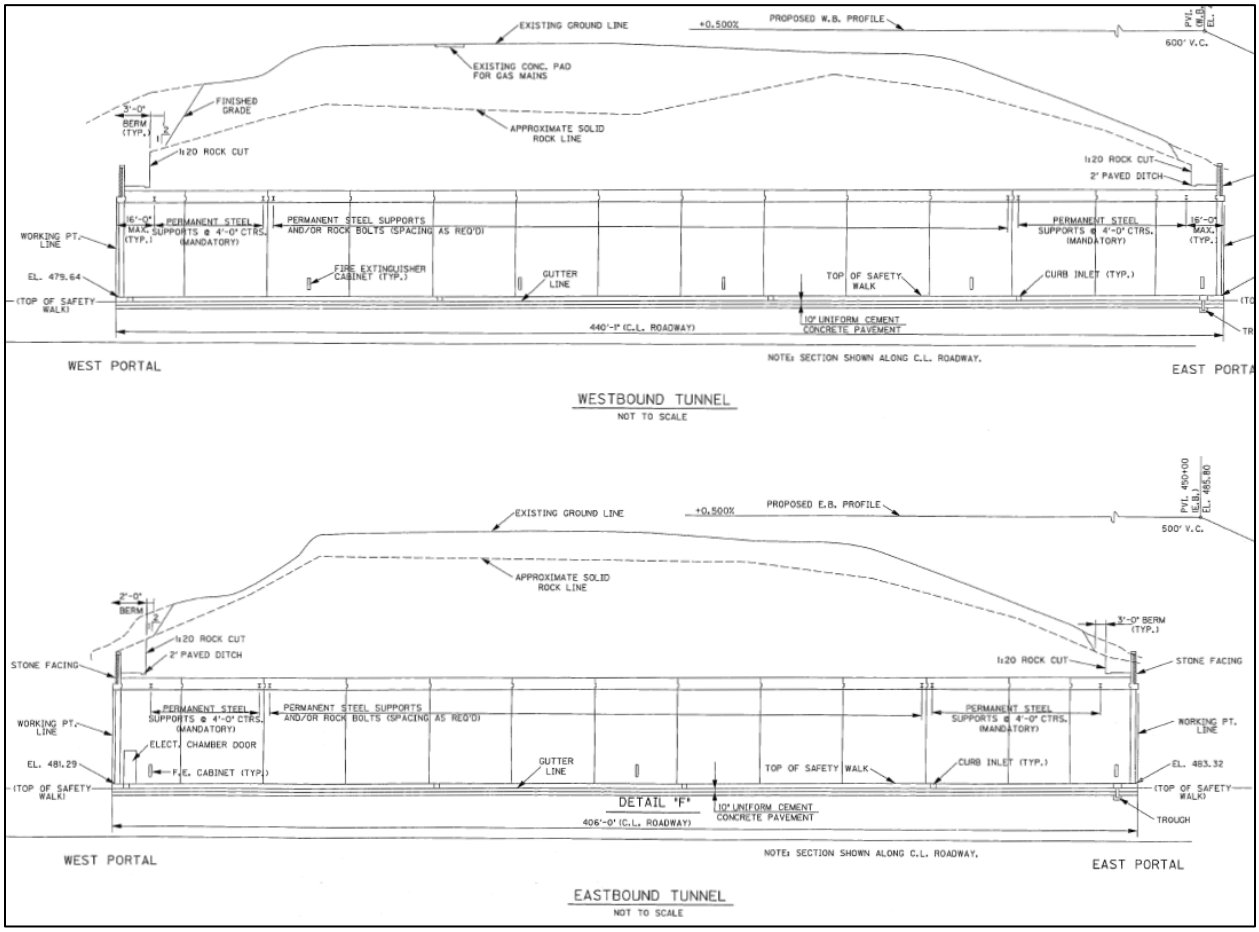

Figure 1 – Exiting Tunnel Profiles

We recommend performing a detailed geotechnical investigation to evaluate the feasibility of a constructing a new tunnel or widening an existing tunnel. We note that specialized geotechnical investigations are critical for tunneling projects and are more detailed than those performed for typical roadway projects.

4.5 SINKHOLES

The majority of the study alignment is located within areas underlain by limestone bedrock having a medium to high risk of karst. We did not observe any indications of sinkhole activity along the project alignment, but these features could be discovered during grading activities. Any sinkholes identified during construction would need to be repaired in accordance with KYTC standards.

4.6 PYRITIC SHALE

The referenced geologic map indicates New Albany Shale underlies portions of the alignment around the Browns Lane overpass. This formation is pyritic and has the potential to produce acidic runoff if exposed in embankment or cut areas. If new excavations are required in this area, then additional testing during the design geotechnical study should be

performed to evaluate the potential for acidic runoff and provide recommendations for mitigation, which may include capping cut slopes, encapsulating fill embankments, and/or treating stormwater runoff.

5.0 QUALIFICATIONS OF RECOMMENDATIONS

KSWA's professional services were performed, findings obtained, and recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. KSWA is not responsible for the conclusions, opinions, or recommendations made by others based upon the data included herein. The scope of this geotechnical exploration did not include assessment or exploration for the presence or absence of hazardous or toxic materials in the soil, rock, groundwater, surface water, or air within or beyond the site.

APPENDIX A

PROJECT LOCATION MAP

10/14/2020

Project Site Map

KSWA
[KS WARE & ASSOCIATES]

Contour Interval: 10 Feet

I-64 Corridor Study

Between Story Ave. & I-264
Louisville, KY
KSWA Project No.: 500-20-0002

0 0.25 0.5 1 1.5 2 Miles

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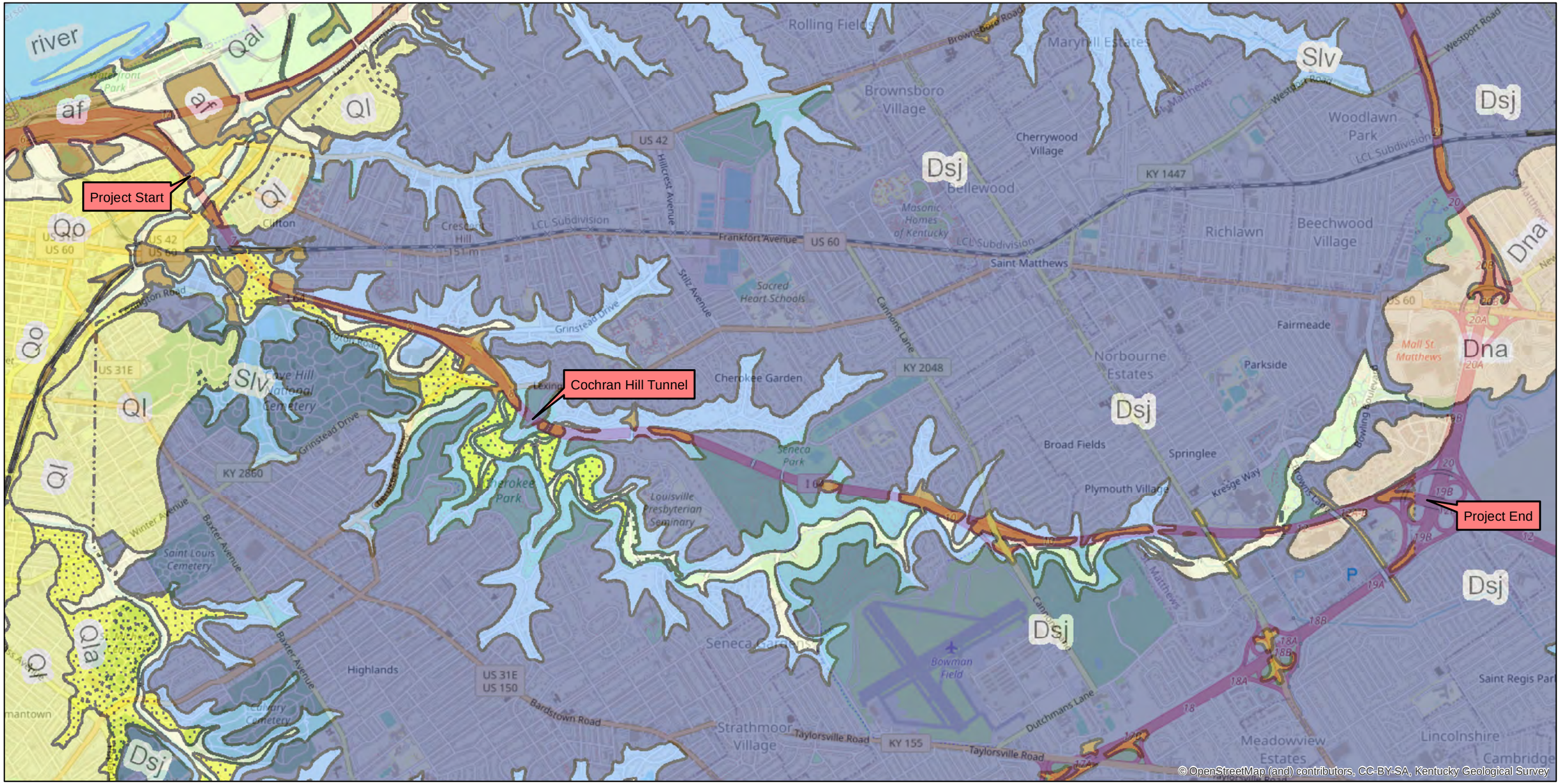
APPENDIX B

USGS GEOLOGIC MAP

10/14/2020

Geologic Map

KSWA
[KS WARE & ASSOCIATES]



Qal (s)	Qla	Qo	Ql
*Alluvium s, *sand*	*Lacustrine deposits	*Outwash	*Loess and eolian sand
Dna	Dsj	Slv	af
New Albany Shale	Sellersburg and Jeffersonville Limestones	Louisville Limestone	Artificial fill

I-64 Corridor Study

Between Story Ave. & I-264
Louisville, KY
KSWA Project No.: 500-20-0002

0 0.25 0.5 1 1.5 2 Miles

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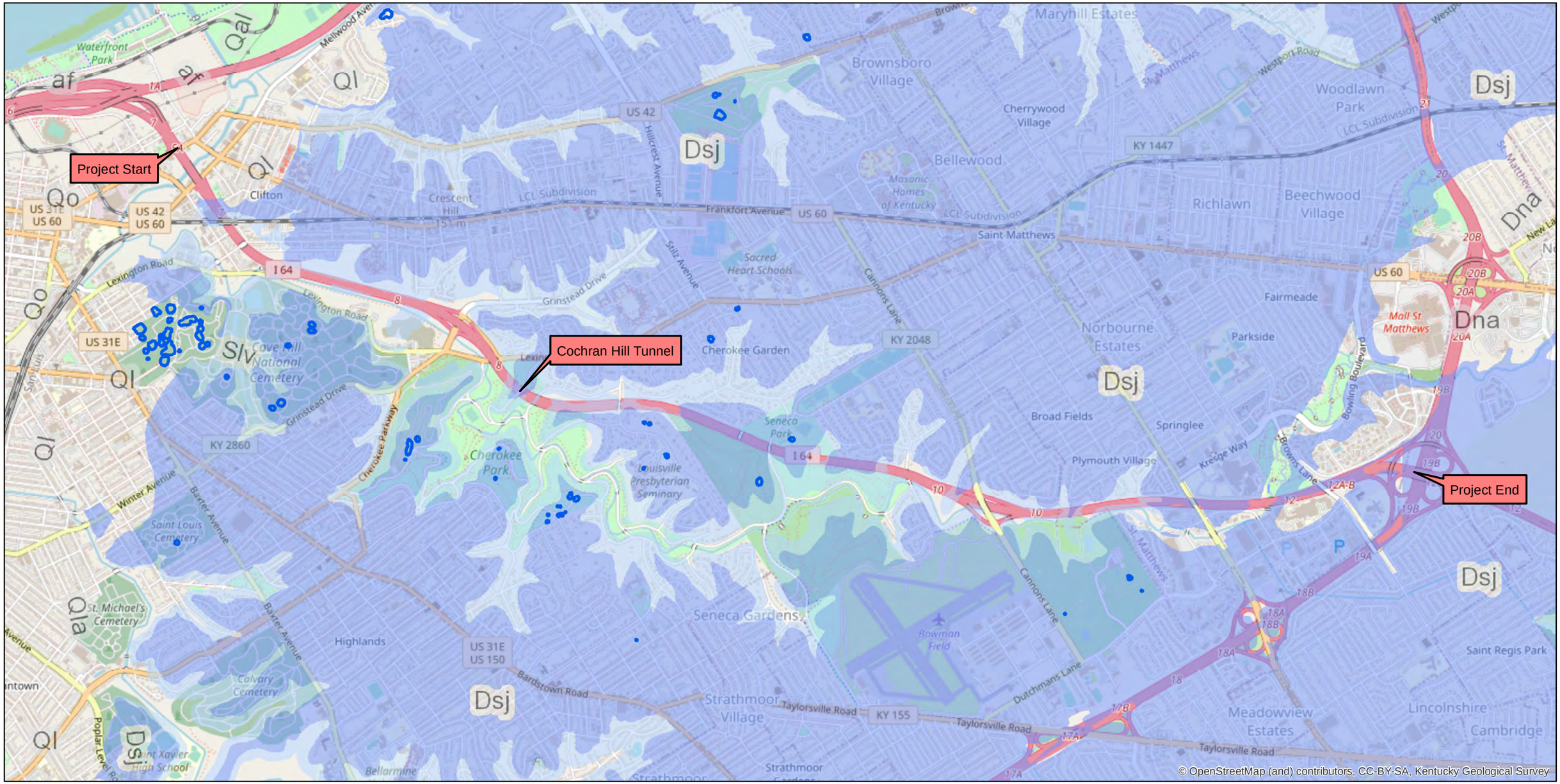
APPENDIX C

KARST POTENTIAL MAP

10/14/2020

Karst Potential Map

KSWA
[KS WARE & ASSOCIATES]



Karst Potential

- Very High
- High
- Medium
- Low Non-Karst
- Mapped Sinkhole

I-64 Corridor Study

Between Story Ave. & I-264
Louisville, KY
KSWA Project No.: 500-20-0002

N

0 0.25 0.5 1 1.5 2 Miles

APPENDIX D

Photographs

Photographs
I-64 Corridor Study
September 16, 2020

Photo No. 1 – View of I-64 looking east from Payne Street overpass

Photo No. 2 – View of I-64 looking east from Pee Wee Reese Road overpass

Photo No. 3 – View of I-64 WB lanes looking east from Alta Vista Road overpass

Photo No. 4 – View of rock cut along WB lanes near Breckenridge Lane overpass

Photo No. 5 – View of rock cut along WB lanes near Pee Wee Reese Road

Photo No. 6 – View of rock cut along EB lanes near Beals Branch Road

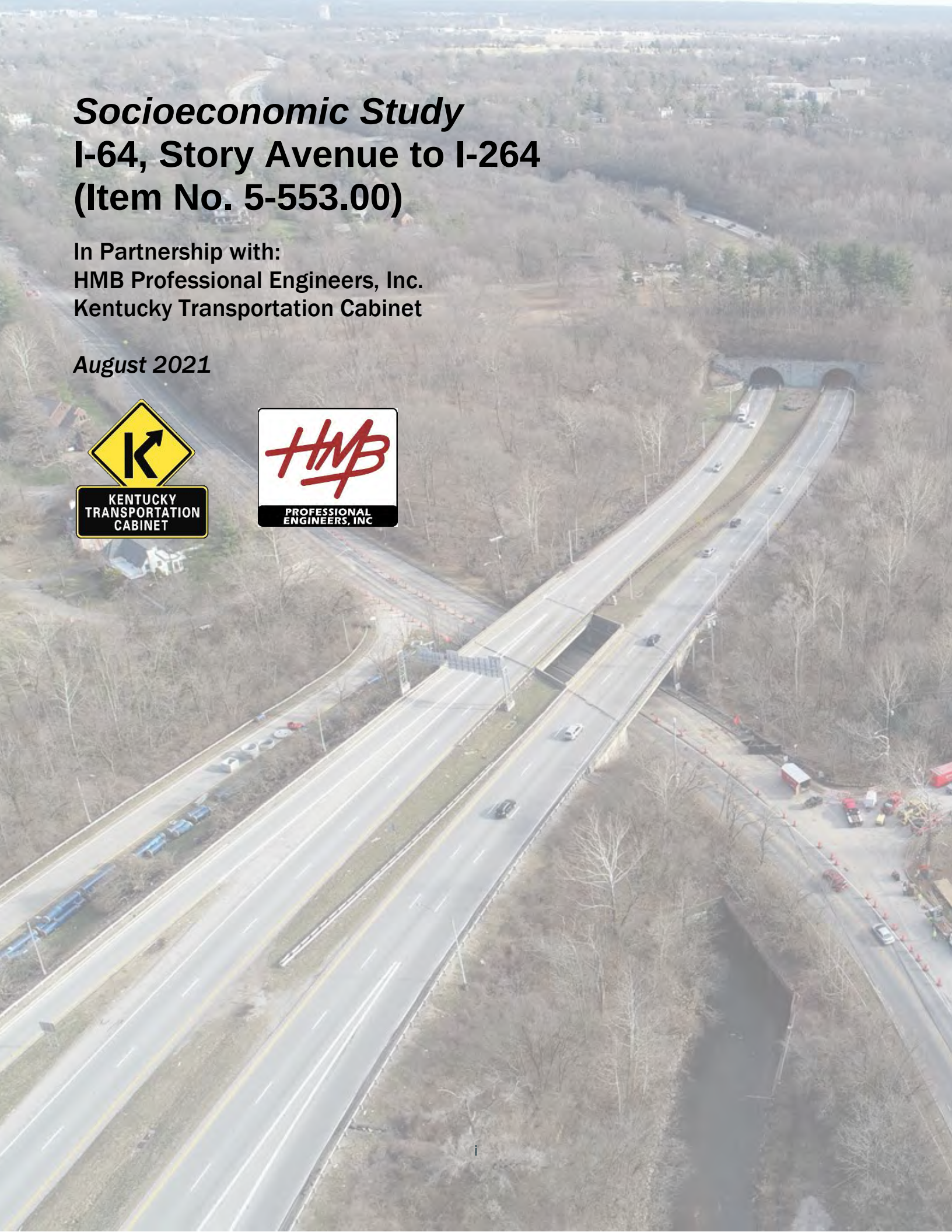
Photo No. 7 – View of west portal of Cochran Hill Tunnel

Photo No. 8 – View of east portal for WB lanes at Cochran Hill Tunnel

Socioeconomic Study
I-64, Story Avenue to I-264 (Item No. 5-553.00)

In Partnership with:
HMB Professional Engineers, Inc.
Kentucky Transportation Cabinet

August 2021



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Chapter 1 – Introduction

The I-64, Story Avenue to I-264 Corridor Study was initiated by the Kentucky Transportation Cabinet (KYTC) in 2019 to evaluate potential improvement options to address safety and operational performance on I-64. Recent improvements to the Kennedy Interchange (beginning of this study area) have improved operations and safety at that interchange but congestion problems still exist in this section of I-64 for both AM and PM peak hours.

The Corridor Study is classified as a Planning and Environmental Linkage (PEL) Study. Along with the congestion and safety concerns of the study area, this corridor is surrounded by numerous environmental considerations. These considerations include multiple parks, historic neighborhoods, Federal Highway Administration (FHWA) exceptional features, and streams and wildlife to consider, including Cherokee Park, Seneca Park, the Clifton neighborhood, the Cochran Hill Tunnels, Beargrass Creek, and many others.

1.1 Purpose of the Socioeconomic Study

This Socioeconomic Study shall be included as a part of the overall Corridor Study's final report. Its purpose is to use available databases, including U.S. Census data, to establish baseline conditions for socioeconomic resources in the study area, including minority, elderly, low-income, and disabled populations. Data from the U.S. Census Bureau's 2015-2019 American Community Survey (ACS) has been utilized for the analysis of the study area. This is a nationwide survey designed to provide communities with reliable and timely estimates of social, economic, and housing data on an annual basis. For additional information on the ACS data, including survey methodology and data limitations, refer to the U.S. Census Bureau's website at data.census.gov.

This Socioeconomic Study was conducted in accordance with the laws, statutes, regulations, executive orders, and directives as outlined in the Environmental Analysis Guidance Manual issued by the Kentucky of Transportation Cabinet (KYTC) Division of Environmental Analysis (DEA).

1.2 Study Area

Illustrated in **Figure 1**, the study area includes I-64 from Story Avenue to I-264. Mainline I-64 is being evaluated for both full widening as well as selective widening of the road. The study includes the interchanges at Story Avenue & Mellwood Avenue (Exit 7), Grinstead Drive (Exit 8) and Cannons Lane (Exit 10). The ramps associated with these interchanges were also evaluated to determine potential improvement options.

For the environmental review, a 250-foot buffer from the edge of the roadway was used to identify the environmental conditions. This area has been designated as the Environmental Corridor (Corridor). It's anticipated that any potential improvement options would be viable within this boundary. The Corridor encompasses approximately 429 acres.

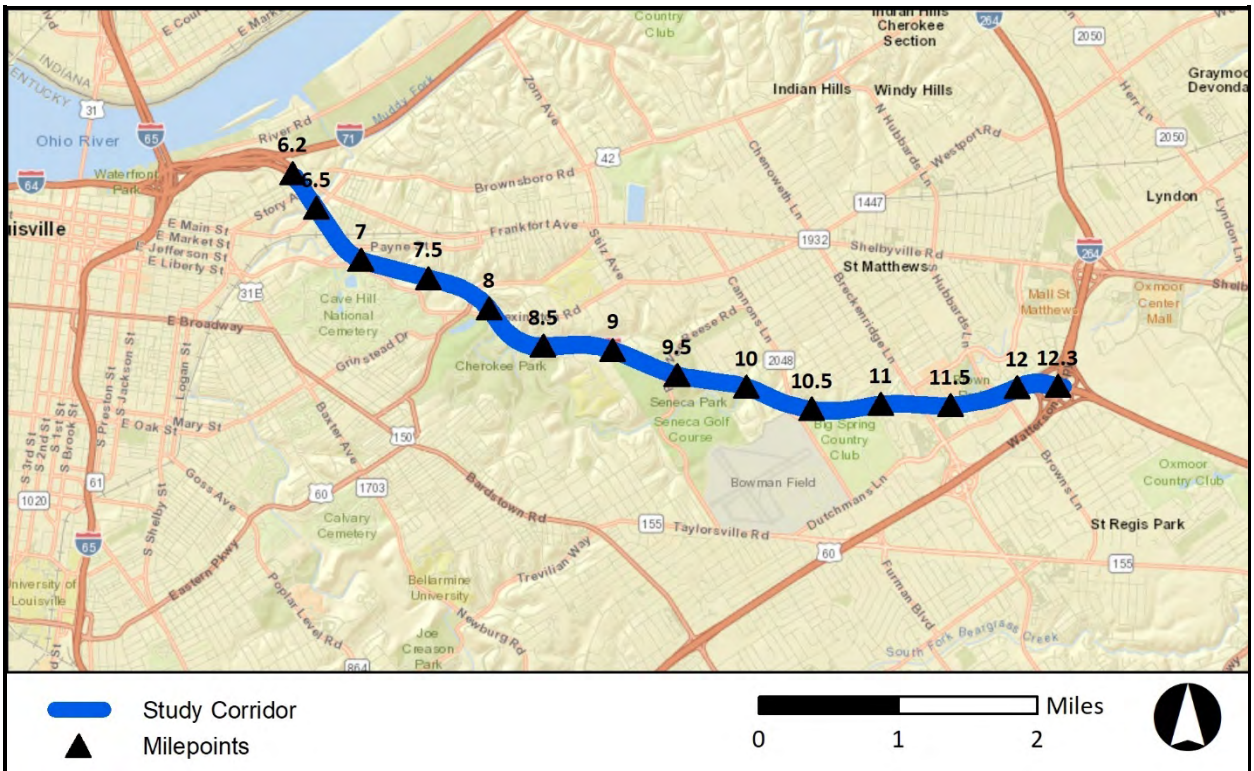

Figure 1. Environmental Corridor

1.3 Environmental Justice

In 1994, the Executive Order (EO) 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, was issued that requires all federal agencies to "[identify] and [address], as appropriate, disproportionately high and adverse human health or environmental effects of [their] programs, policies, and activities on racial minority populations and low-income populations." (EO 1994) Subsequent to the EO, the Federal Highway Administration (FHWA) issued Order 6640.23A in 2012, FHWA Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, that established policies and procedures for FHWA to use in complying with the EO (This canceled FHWA Order 6640.23 on the same subject).

In addition, the Kentucky Transportation Cabinet (KYTC) issued guidance in 2011 and updated in 2014 that provided guidance for "small-scale (CE) projects". This policy, although not applicable for the current project, was used as an aid in the EJ analysis process.

Definitions

The following EJ-related terms are defined by FHWA Order 6640.23A.

Low-Income – A person whose median household income is at or below the Department of Health and Human Services poverty guidelines. The current guidelines are shown in Table 1.

Table 1. 2021 Poverty Guidelines

Persons in Family / Household	Poverty Guidelines
1	$12,880
2	$17,420

Table 1. 2021 Poverty Guidelines (cont.)

Persons in Family / Household	Poverty Guidelines
1	$12,880
2	$17,420
3	$21,960
4	$26,500
5	$31,040
6	$35,580
7	$40,120
8	$44,660
>8	$4,540 for each additional person

Source: U.S. Dept. of Health and Human Services: https://aspe.hhs.gov/2021-poverty-guidelines

Minority – A person who is: (1) Black: a person having origins in any of the black racial groups of Africa; (2) Hispanic or Latino: a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race; (3) Asian American: a person having origins in any of the original peoples of the Far East, Southeast Asia or the Indian subcontinent; (4) American Indian and Alaskan Native: a person having origins in any of the original people of North America, South America (including Central America), and who maintains cultural identification through tribal affiliation or community recognition; or (5) Native Hawaiian and Other Pacific Islander: a person having origins in any of the original peoples of Hawaii, Guam, Samoa or other Pacific Islands.

Adverse Effects – The totality of significant individual or cumulative human health or environmental effects, including interrelated social and economic effects, which may include, but are not limited to: bodily impairment, infirmity, illness or death; air, noise, and water pollution and soil contamination; destruction or disruption of human-made or natural resources; destruction or diminution of aesthetic values; destruction or disruption of community cohesion or a community's economic vitality; destruction or disruption of the availability of public and private facilities and services; vibration; adverse employment effects; displacement of persons, businesses, farms, or nonprofit organizations; increased traffic congestion, isolation, exclusion or separation of minority or low-income individuals within a given community or from the broader community; and the denial of, reduction in, or significant delay in the receipt of, benefits of FHWA programs, policies, or activities.

Disproportionately High and Adverse Effect on Minority and Low-Income Populations – An adverse effect that: (1) is predominately borne by a minority population and/or a low-income population; or (2) will be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the nonminority population and/or non-low-income population.

Chapter 2 – Environmental Setting

2.1 Present Land Use

Designated land use of the Corridor was obtained from the Louisville/Jefferson County Information Consortium (LOJIC) website and is shown in Figure 2. Within the 429 acres of the Corridor, the large majority (56.75%) is existing KYTC right-of-way (see Table 2). Parks and Open Spaces is the next largest land use at 17.82%, followed by Public and Semi-Public land (8.40%) and then Single-Family areas (8.36%). The remaining land use types, including Commercial, Industry, Multi-Family, and Vacant are all less than 4% of the total Corridor. At the western end of the Corridor, between Story Avenue and Mellwood Avenue, the land use is primarily commercial and industrial. A mix of residential properties are then introduced before the land use converts to Parks and Open Space to the south and Public and Semi-Public land use to the north. This includes the Cherokee Park that borders I-64. Also, just outside of the Corridor to the north is the Clifton Historic District, a heavily residential neighborhood of mostly single-family residences.

Table 2. Corridor Land Use (%)

Category	Percent
Right-of-Way	56.75%
Parks and Open Space	17.82%
Public and Semi-Public	8.40%
Single Family	8.36%
Commercial	3.72%
Industry	2.69%
Multi-Family	1.62%
Vacant	0.64%

Source: LOJIC

These land uses continue up to the Grinstead Drive interchange. Following this interchange, Parks and Open Space is the primary land use on both sides of the interstate (related to Cherokee Park and Seneca Park), with a small section of single-family residential residences between the two parks. Then, after a stretch of single-family residential properties, the Parks and Open Space land use is on both side of the Corridor (Seneca Park). Moving east, the areas north of the interstate remains primarily residential, including several locations of multi-family areas. The areas to the south of the interstate include Industrial (Bowman Field), Parks and Open Space, and then commercial up to I-264.

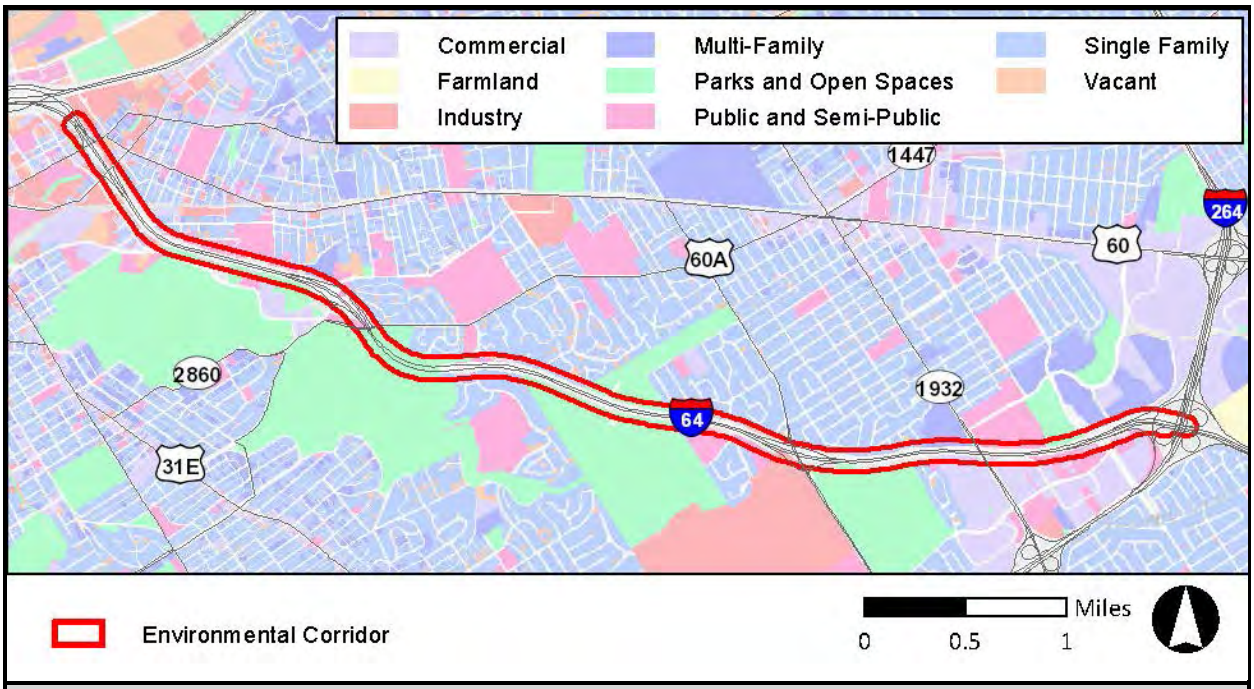

Figure 2. Land Use in the Environmental Corridor

2.2 Zoning

As shown in Figure 3, the vast majority of the Corridor is zoned for Residential use. There are portions, particularly at either end of the Corridor, that are zoned for Commercial-Industrial, Industrial, Office, and Special. This data was obtained from the Louisville/Jefferson County Information Consortium (LOJIC) website.

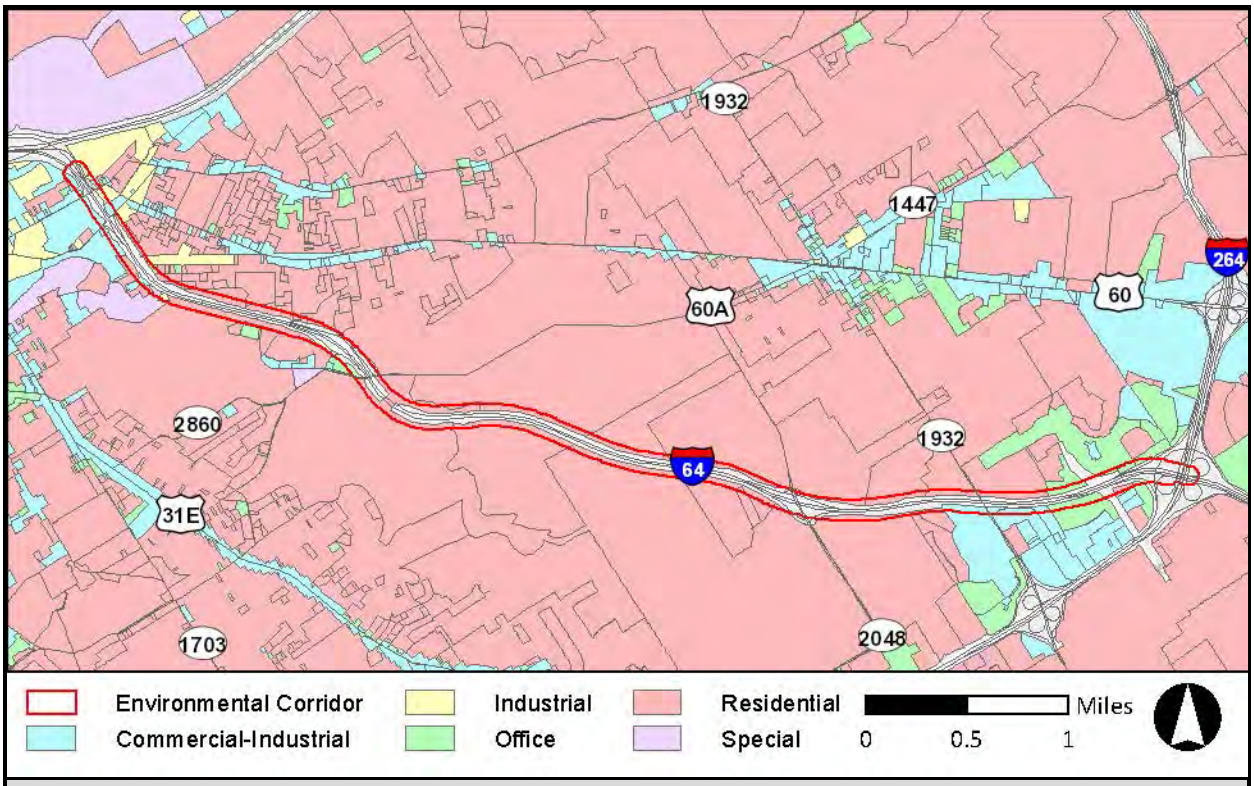

Figure 3. Zoning in the Project Area

2.3 Census Tracts and Block Groups

The Corridor, from Story Avenue to I-264, covers 7 Tracts and 11 Block Groups. They are:

1) Census Tract 74, Block Group 1
2) Census Tract 59, Block Group 1
3) Census Tract 81, Block Groups 1 and 2
4) Census Tract 87, Block Groups 1, 2, 3, and 4
5) Census Tract 105, Block Group 2
6) Census Tract 106.01, Block Group 1
7) Census Tract 106.02, Block Group 1

Refer to Figure 4 for the location of each Tract and Block Group in relation to the Corridor.

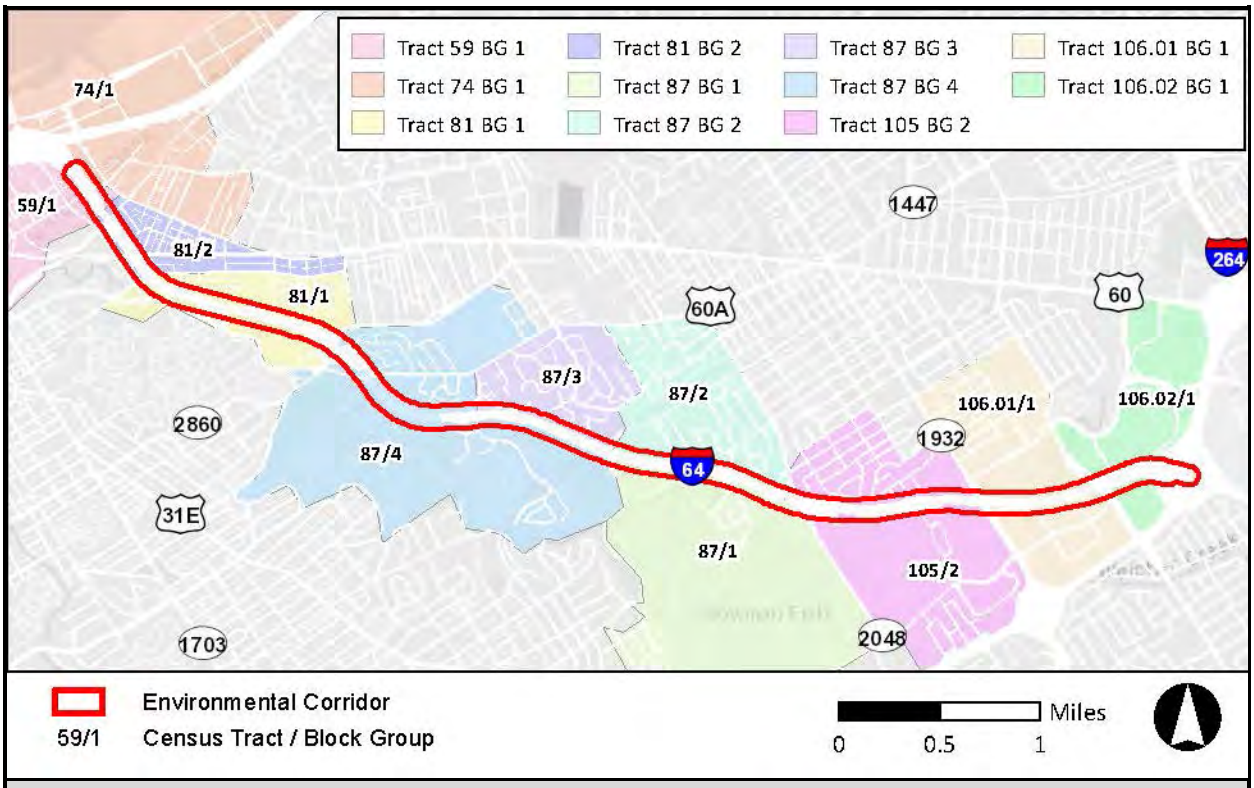

Figure 4. Block Groups and Census Tracts in the Environmental Corridor

Chapter 3 – Population Data

3.1 Jefferson County Population

Population data obtained from the U.S. Census Bureau shows there was small growth in Jefferson County over the past fifty years. The population grew 10% over the fifty years reviewed, with a decrease from 1970 to 1990 followed by small growth up to 2019. Jefferson County grew at a much smaller rate than the state, which saw a 38% increase in population since 1970. Refer to Table 3 for the population data for Jefferson County and Kentucky.

Table 3. Historic Population for Jefferson County and Kentucky

Category	1970	1980	1990	2000	2010	2019 (1)
Jefferson County	695,055	685,004	664,937	693,604	741,096	767,419
Kentucky	3,220,711	3,660,334	3,685,296	4,041,769	4,339,367	4,449,052

Sources: U.S. Census Bureau
Notes: (1) ACS data

Population projections produced by the Kentucky State Data Center at the University of Louisville were also reviewed. As shown in Table 4, these forecasts project a 14% growth in Jefferson County's population by 2040.

Table 4. Projected Population for Jefferson County and Kentucky

Category	2019 (1)	2025	2030	2035	2040
Jefferson County	767,419	815,058	837,477	857,013	875,459
Kentucky	4,449,052	4,634,415	4,726,382	4,808,682	4,886,381

Sources: Kentucky State Data Center
Notes: (1) ACS data

3.2 Corridor Population

Further investigation into the population of the Corridor was performed by analyzing the U.S. Census Tracts and Block Groups. Data for each Block Groups was collected and totaled to serve as a representation of the overall Corridor.

Populations in the eleven Block Groups range from a low of 572 in the area of Bowman Field and Seneca Park to a high of 2,413 near the I-64 and Watterson Expressway (I-264) interchange. In general, the more populated Block Groups were along the eastern end of the Corridor. Population data can be found in Table 5 and Figure 5.

Table 5. Population by Block Groups

Location	Population
Environmental Corridor (Combined Block Groups)	14,262
Tract 59, Block Group 1	827
Tract 74, Block Group 1	1,045
Tract 81, Block Group 1	928
Tract 81, Block Group 2	1,396
Tract 87, Block Group 1	572
Tract 87, Block Group 2	1,133
Tract 87, Block Group 3	885
Tract 87, Block Group 4	1,657
Tract 105, Block Group 2	1,956
Tract 106.01, Block Group 1	1,450
Tract 106.02, Block Group 1	2,413

Sources: U.S. Census Bureau 2019 ACS 5-Year Estimates Subject Table, Table ID B02001

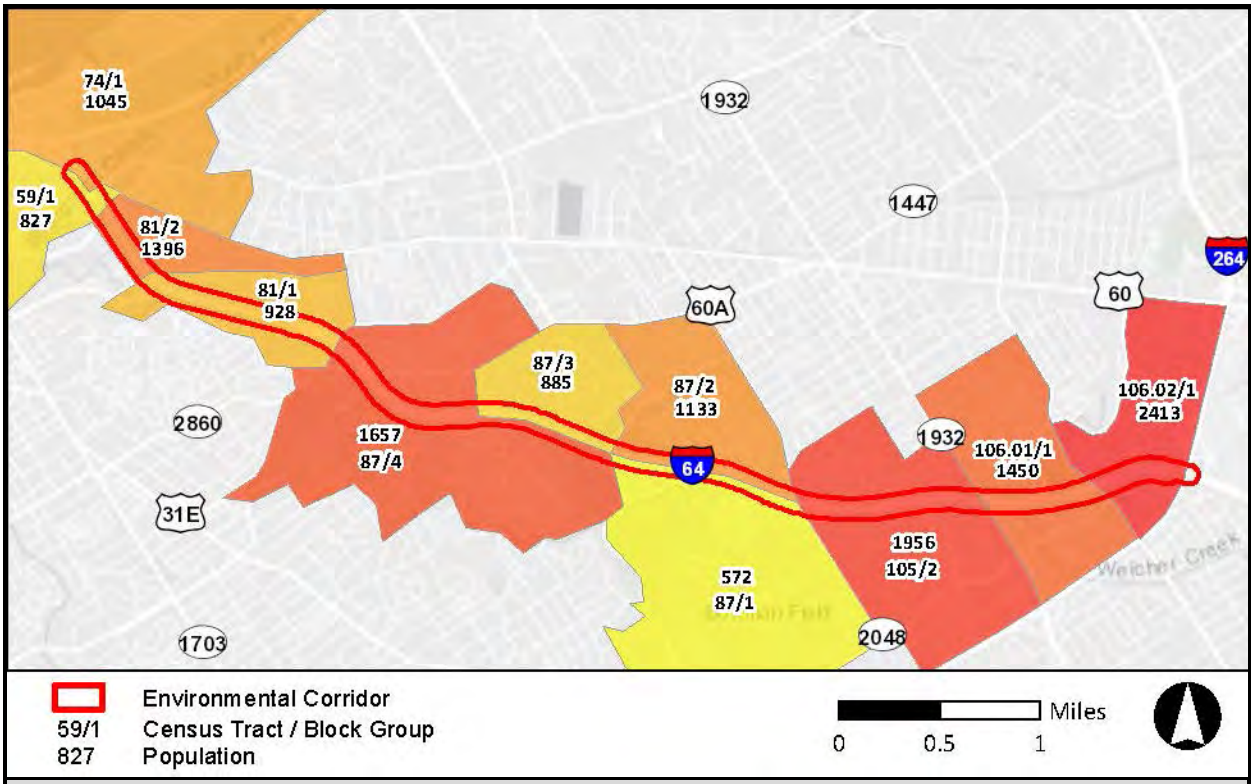

Figure 5. Population by Block Groups

Chapter 4 – Population Demographics

As previously mentioned, demographics of the population within the Corridor were obtained using data from the U.S. Census Bureau, particularly the 2015-2019 ACS 5-Year Estimate. The ACS data was also obtained for the state of Kentucky and Jefferson County to provide a basis of comparison.

4.1 Minority Population

The 2019 ACS 5-Year Estimates were reviewed to determine the racial balance of the communities within the Corridor. The Corridor has a percent minority population that ranges from a low of 0.45% to a high of 26.81%. Overall, the Corridor's minority population is consistent with the state but much lower than Jefferson County, which is used as the reference threshold. None of the Block Groups exceeded the county's percent minority, and only Tract 106.02, Block Group 1 had a minority percentage (26.81%) near the county's (28.40%). Minority population data can be found in Table 6 and Figure 6.

Table 6. Minority Population

Location	Total Population	Minority Population	Minority Percentage
Kentucky	4,449,052	580,573	13.05%
Jefferson County	767,419	217,913	28.40%
Corridor (Combined Block Groups)	14,262	1,947	13.65%
Tract 59, Block Group 1	827	108	13.06%
Tract 74, Block Group 1	1,045	83	7.94%
Tract 81, Block Group 1	928	84	9.05%
Tract 81, Block Group 2	1,396	245	17.55%
Tract 87, Block Group 1	572	49	8.57%
Tract 87, Block Group 2	1,133	11	0.97%
Tract 87, Block Group 3	885	4	0.45%
Tract 87, Block Group 4	1,657	304	18.35%
Tract 105, Block Group 2	1,956	273	13.96%
Tract 106.01, Block Group 1	1,450	139	9.59%
Tract 106.02, Block Group 1	2,413	647	26.81%

Sources: U.S. Census Bureau 2019 ACS 5-Year Estimates Subject Table, Table ID B02001

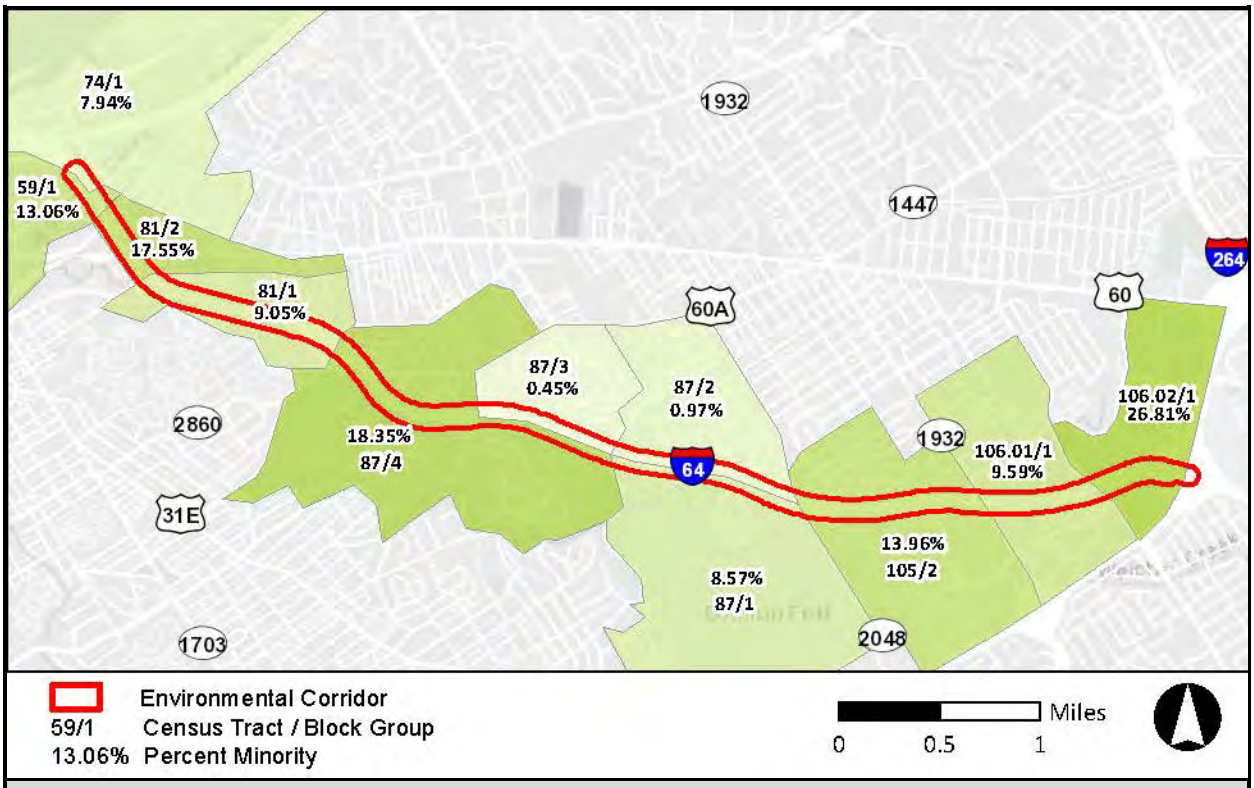

Figure 6. Percent Minority by Block Groups

4.2 Poverty Population

The 2019 ACS 5-Year Estimates were reviewed to determine the percentage of population living in poverty within the Corridor. The Corridor's population living below the poverty levels ranges from a low of 0.00% to a high of 15.44%. While five Block Groups have less than 2% population living in poverty, there were four Block Groups who's percentage exceeds that of Jefferson County's percentage, which served as the reference threshold. Minority population data can be found in Table 7 and Figure 7. The Block Groups that exceed Jefferson County have been colored red in the table.

Table 7. Poverty Status

Location	Population for Whom Poverty Status is Known	Population Below Poverty Levels	Percent Below Poverty Levels
Kentucky	4,309,501	531,073	12.32%
Jefferson County	750,959	72,673	9.68%
Corridor (Combined Block Groups)	13,402	792	5.91%
Tract 59, Block Group 1	743	80	10.77%
Tract 74, Block Group 1	1,011	0	0.00%
Tract 81, Block Group 1	790	122	15.44%

Table 7. Poverty Status (cont.)

Location	Population for Whom Poverty Status is Known	Population Below Poverty Levels	Percent Below Poverty Levels
Tract 81, Block Group 2	1,396	0	0.00%
Tract 87, Block Group 1	572	0	0.00%
Tract 87, Block Group 2	1,133	76	6.71%
Tract 87, Block Group 3	885	43	4.86%
Tract 87, Block Group 4	1,068	149	13.95%
Tract 105, Block Group 2	1,956	25	1.28%
Tract 106.01, Block Group 1	1,450	13	0.90%
Tract 106.02, Block Group 1	2,398	284	11.84%

Sources: U.S. Census Bureau 2019 ACS 5-Year Estimates Subject Table, Table ID B02001

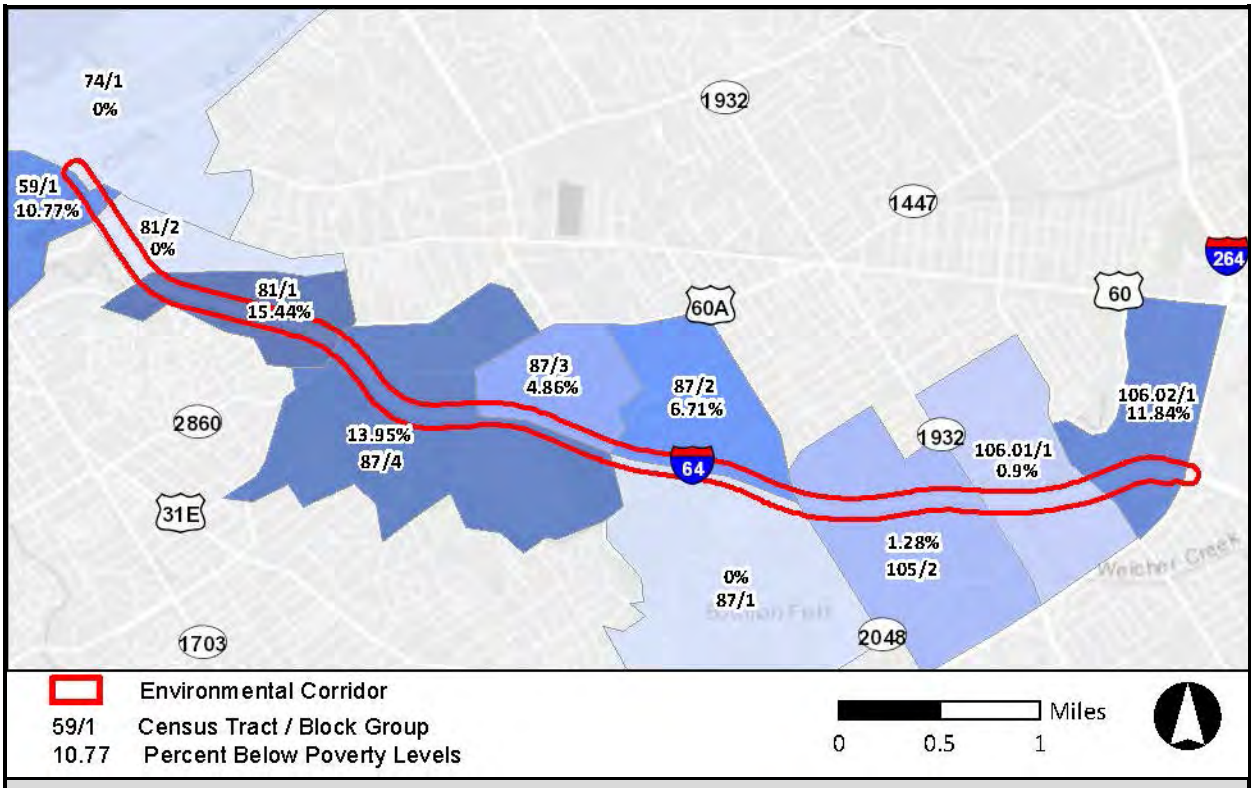

Figure 7. Percent Below Poverty Levels by Block Groups

4.3 Elderly Population

The Corridor has a wide range of elderly population, with the percentages ranging from a low of 5.01% to a high of 30.93%. In addition, the Corridor has a higher percentage of elderly residents than Jefferson County, which served as the reference threshold, with six of the Block Groups exceeding the 15.74% for the county. The elderly population data can be found in Table 8 and Figure 8. The Block Groups that exceed Jefferson County have been colored red in the table.

Table 8. Elderly Population

Location	Total Population	Population of Age 65+	Below Poverty Levels Percentage
Kentucky	4,449,052	710,138	15.96%
Jefferson County	767,419	120,799	15.74%
Corridor (Combined Block Groups)	14,262	2,433	17.06%
Tract 59, Block Group 1	827	140	16.93%
Tract 74, Block Group 1	1,045	81	7.75%
Tract 81, Block Group 1	928	287	30.93%
Tract 81, Block Group 2	1,396	70	5.01%
Tract 87, Block Group 1	572	165	28.85%
Tract 87, Block Group 2	1,133	252	22.24%
Tract 87, Block Group 3	885	124	14.01%
Tract 87, Block Group 4	1,657	202	12.19%
Tract 105, Block Group 2	1,956	562	28.73%
Tract 106.01, Block Group 1	1,450	239	16.48%
Tract 106.02, Block Group 1	2,413	311	12.89%

Sources: U.S. Census Bureau 2019 ACS 5-Year Estimates Subject Table, Table ID B02001

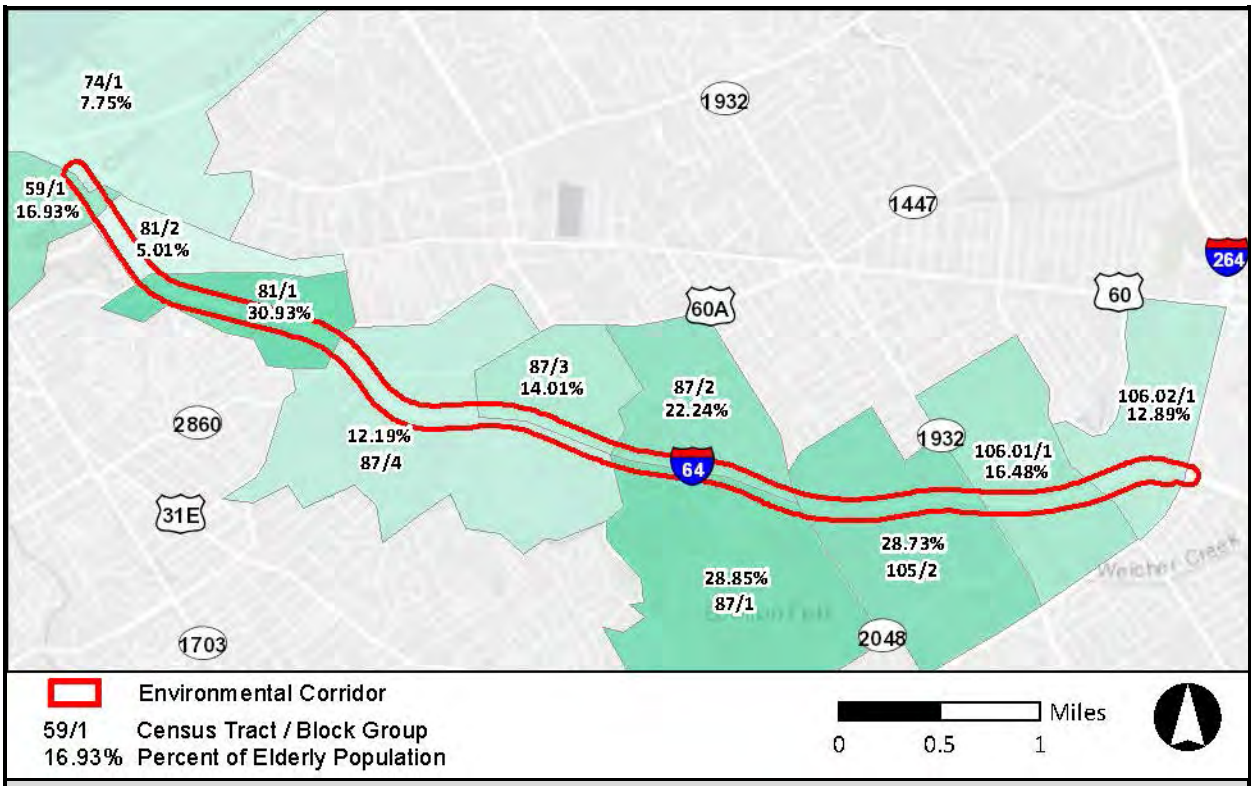

Figure 8. Percent of Elderly Population by Block Groups

4.4 Population with a Disability

Within the Corridor, the population living with a disability range from a low of 6.18% to a high of 24.45%. Only two Block Groups within the Corridor have a higher percentage of population with a disability than Jefferson County, which served as the reference threshold. The data is provided in Table 9 and Figure 9. The Block Groups that exceed Jefferson County have been colored red in the table.

Table 9. Population with a Disability

Location	Total Population of Age 18+	Population with a Disability	Percentage with a Disability
Kentucky	3,316,415	700,834	21.13%
Jefferson County	583,266	98,568	16.90%
Corridor (Combined Block Groups)	11,177	1,634	14.62%
Tract 59, Block Group 1	672	143	21.28%
Tract 74, Block Group 1	899	120	13.35%
Tract 81, Block Group 1	689	77	11.18%
Tract 81, Block Group 2	1,225	190	15.51%
Tract 87, Block Group 1	518	44	8.49%

Table 9. Population with a Disability (cont.)

Location	Total Population of Age 18+	Population with a Disability	Percentage with a Disability
Tract 87, Block Group 2	871	104	11.94%
Tract 87, Block Group 3	634	70	11.04%
Tract 87, Block Group 4	922	57	6.18%
Tract 105, Block Group 2	1,558	381	24.45%
Tract 106.01, Block Group 1	1,289	129	10.01%
Tract 106.02, Block Group 1	1,900	319	16.79%

Sources: U.S. Census Bureau 2019 ACS 5-Year Estimates Subject Table, Table ID C21007

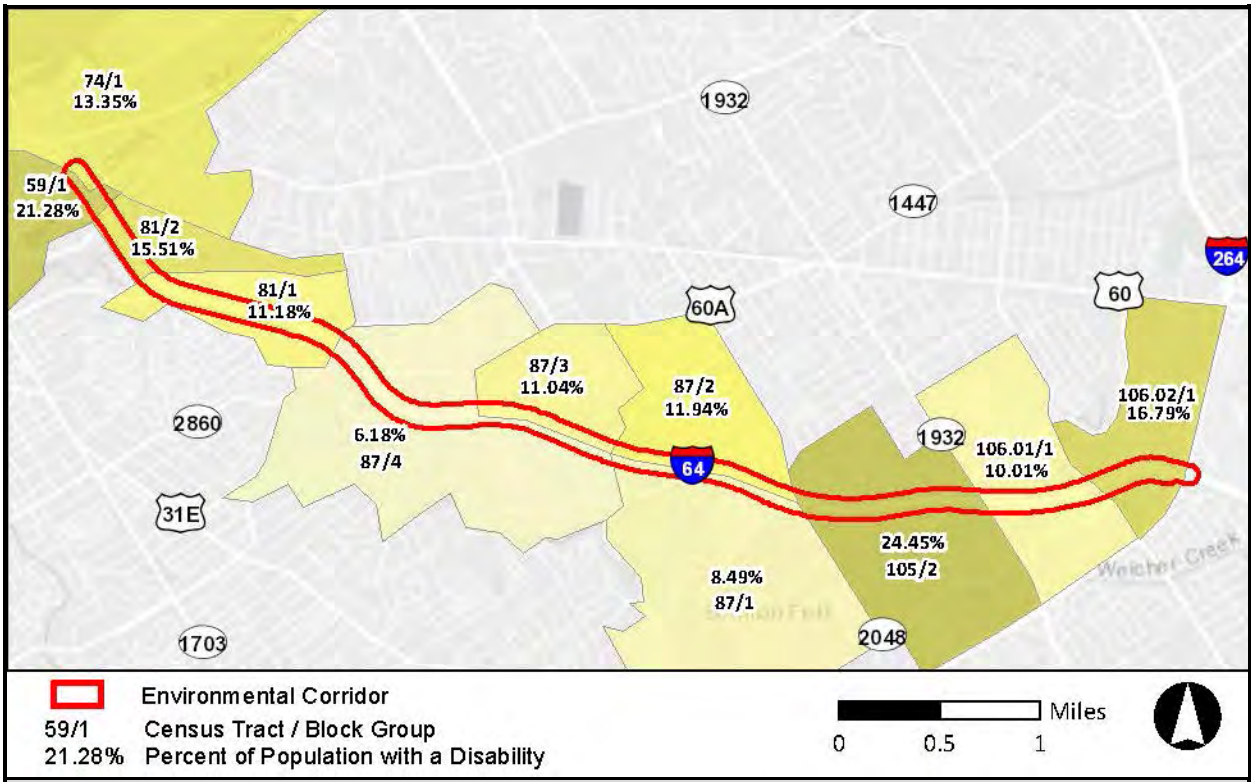

Figure 9. Percent of Population with a Disability by Block Groups

4.5 Population with Limited English Proficiency

The Corridor has a higher percent of population with limited English proficiency (5.22%) than Jefferson County (4.47%), which served as the reference threshold. Four Block Groups within the Corridor exceed the percent for that threshold, especially Tract 106.02, Block Group 1 at 18.71%. The Corridor also has four Block Groups with 0.00% population with limited English proficiency. The data is provided in Table 10 and Figure 10. The Block Groups that exceed Jefferson County have been colored red in the table.

Table 10. Population with Limited English Proficiency

Location	Total Population of Age 5+	Population with Limited English Proficiency	Percentage with Limited English Proficiency
Kentucky	4,174,460	95,983	2.30%
Jefferson County	718,882	32,139	4.47%
Corridor (Combined Block Groups)	13,531	706	**5.22%**
Tract 59, Block Group 1	777	0	0.00%
Tract 74, Block Group 1	1,013	8	0.79%
Tract 81, Block Group 1	881	0	0.00%
Tract 81, Block Group 2	1,344	94	6.99%
Tract 87, Block Group 1	544	0	0.00%
Tract 87, Block Group 2	1,043	0	0.00%
Tract 87, Block Group 3	849	17	2.00%
Tract 87, Block Group 4	1,606	39	2.43%
Tract 105, Block Group 2	1,784	108	6.05%
Tract 106.01, Block Group 1	1,429	17	1.19%
Tract 106.02, Block Group 1	2,261	423	18.71%

Sources: U.S. Census Bureau 2019 ACS 5-Year Estimates Subject Table, Table ID C21007

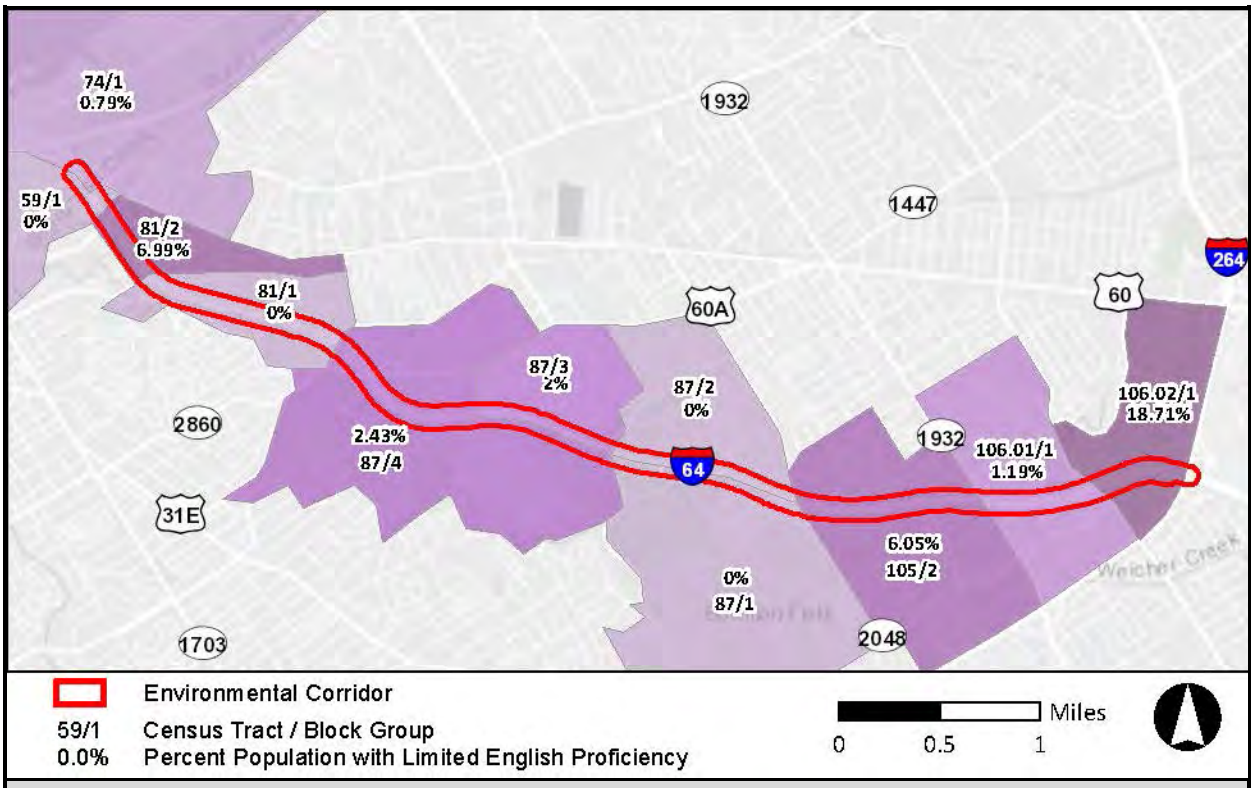

Figure 10. Percent of Population with Limited English Proficiency by Block Groups

Chapter 5 – Summary

Outside of existing right-of-way, the Corridor is made up of primarily parks and open spaces, public and semi-public areas, and single-family homes. The parks and open spaces are comprised of Cherokee Park, Seneca Park, the Big Spring Country Club, and the Bowman Field airport that are adjacent to I-64. The majority of the Corridor is zoned for residential use, and several neighborhoods surround the interstate.

The demographics of the residential population within the Corridor was evaluated by utilizing the US Census Data for the eleven Block Groups it crosses. As shown in Table 11, this evaluation revealed that the demographics of the Corridor were relatively similar to those of Jefferson County, which was used as the reference threshold. The Block Groups that exceed Jefferson County have been colored red in the table. Only the racial minority population was noticeably different than the county, with the Corridor having less than half of a racial minority percentage than the county. The Corridor did have a higher percentage of population over age of 65 and a higher percentage of population with limited English proficiency than the county, but a lower percentage of racial minority residents, population below poverty levels, and population with a disability.

At the Block Group level, Tract 106.02, Block Group 1 exceeded Jefferson County percentages for three of the categories analyzed. This Block Group was approximately double the county percentage for racial minority population, population below poverty levels, and population with limited English proficiency. Three other Block Groups exceeded two categories, and two Block Groups exceeded one category. Five Block Groups did not exceed any of the county percentages.

Table 11. Summary of Population Demographics in the Corridor

Location	Total Population	Percent Minority	Percent Below Poverty Levels	Percent Age of 65+	Percent with a Disability	Percent with Limited English Proficiency
Kentucky	4,449,052	13.05%	12.32%	15.96%	21.13%	2.30%
Jefferson County	767,419	28.40%	9.68%	15.74%	16.90%	4.47%
Corridor (Combined BGs)	**14,262**	**13.65%**	**5.91%**	**17.06%**	**14.62%**	**5.22%**
T 59, BG 1	827	13.06%	10.77%	16.93%	21.28%	0.00%
T 74, BG 1	1,045	7.94%	0.00%	7.75%	13.35%	0.79%
T 81, BG 1	928	9.05%	15.44%	30.93%	11.18%	0.00%
T 81, BG 2	1,396	17.55%	0.00%	5.01%	15.51%	6.99%
T 87, BG 1	572	8.57%	0.00%	28.85%	8.49%	0.00%
T 87, BG 2	1,133	0.97%	6.71%	22.24%	11.94%	0.00%
T 87, BG 3	885	0.45%	4.86%	14.01%	11.04%	2.00%
T 87, BG 4	1,657	18.35%	13.95%	12.19%	6.18%	2.43%
T 105, BG 2	1,956	13.96%	1.28%	28.73%	24.45%	6.05%

Table 11. Summary of Population Demographics in the Corridor (cont.)

Location	Total Population	Percent Minority	Percent Below Poverty Levels	Percent Age of 65+	Percent with a Disability	Percent with Limited English Proficiency
T 106.01, BG 1	1,450	9.59%	0.90%	16.48%	10.01%	1.19%
T 106.02, BG 1	2,413	26.81%	11.84%	12.89%	16.79%	18.71%

Sources: U.S. Census Bureau 2019 ACS 5-Year Estimates

This data is presented to provide a planning level overview of the Corridor and the demographics of the residential population within it. If federal funds are utilized to implement any of the proposed improvement options, a more detailed socioeconomic study would be required as part of the environmental process and documentation required by the National Environmental Policy Act (NEPA). With the understanding that much of the traffic along I-64 is commuter traffic, the detailed study will also evaluate the potential for socioeconomic impacts beyond those that live within the Corridor.