Environmental Overview Report

US 51 Ohio River Bridge Study between Wickliffe, KY, and Cairo, IL
Kentucky Transportation Cabinet
Item No. 1-100.00 and 1-1140.00

April 26, 2013

REVISION HISTORY

The following table summarizes changes which have been made to this White Paper.

Version	Date	Name	Description of Changes

CDM Smith
Document Code

Table of Contents

1. Geology & Soils **1**
2. Water Resources **1**
2.1 Groundwater 5
2.2 Rivers & Streams 5
2.3 Floodplains 6
2.4 Wetlands 6
3. Ecology **6**
3.1 Environmental Setting 6
3.2 Floral & Faunal Communities 7
3.3 Threatened, Endangered, & Special Concern Species 8
4. Socioeconomics **10**
4.1 Land Use 10
4.2 Demographics & Environmental Justice 13
4.3 Community Resources 15
4.4 Local/Regional Economy 17
5. Air Quality **18**
5.1 Mobile Source Air Toxics (MSAT) 18
5.2 Air Quality during Construction 19
6. Noise **20**
7. Cultural & Historic Resources **21**
7.1 Known Archaeological Sites 21
7.2 Previously Identified Historic Structures 21
7.3 US 51 Bridge 23
8. Hazardous Materials **24**
9. Summary of Red Flags **26**
10. References **27**

List of Tables

Table 1: Federally Listed Species within the Study Area 8
Table 2: Existing Land Use in the Study Area 13
Table 3: Historic Population Levels in Study Area Counties 14
Table 4: Population Below Poverty Level 14
Table 5: Population by Race & Ethnicity 14
Table 6: Noise Abatement Criteria 20
Table 7: Summary of Red Flag Environmental Issues 27

List of Figures

Figure 1: Study Area 2
Figure 2: Floodplains 3
Figure 3: Wetlands 4
Figure 4: Land Use 11
Figure 5: Farmlands 12
Figure 6: Community Resources 16
Figure 7: Historic Structures 22
Figure 8: Hazardous Materials Sites & Underground Storage Tanks 25

Appendices

Appendix A: Geotechnical White Paper
Appendix B: Correspondence with Resource Agencies on Listed Species
Appendix C: Socioeconomic White Paper
Appendix D: Cultural Resources White Paper
Appendix E: Hazardous Materials Report

Environmental Overview Report

The US 51 Bridge Replacement Project (KYTC Item Nos. 1-100.00 and 1-1140.00) proposes replacement or rehabilitation of the existing US 51 Bridge that connects Ballard County, Kentucky with Cairo, Illinois. The purpose of the project is to improve or replace the functionally obsolete bridge, to improve or maintain cross river connectivity, and to improve safety.

The Cairo Bridge carries US 51, US 60, and US 62 traffic across the Ohio River. The bridge carries approximately 5,400 vehicles across the Ohio River each day between Wickliffe and Ballard County, KY and Cairo, IL with approximately 35% of that being truck traffic. It also provides a connection to the US 60/US 62 Mississippi River Bridge to Missouri, approximately ½ mile to the south.

This Environmental Overview Report provides a planning level overview of the existing conditions within the natural and human environment of the Study Area, shown in **Figure 1**. Information was collected from readily available sources to identify "red flag" issues and fatal flaws for the alternative development process. The following sections examine geology, water resources, ecology, socioeconomics, air quality, noise, cultural/historic resources, and hazardous materials. **Section 9** summarizes conclusions, including an overview of the red flag issues identified.

1. Geology & Soils

A preliminary geotechnical study was completed for the project and is included as **Appendix A**. The Study Area is located in the Mississippi (Gulf) Embayment physiographic region with typically thick layers of granular and cohesive deposits with deep bedrock. Topography east and west of the Ohio River near the bridge is generally level with ground elevations ranging between 310 and 315 feet.

A number of previous subsurface investigations near the project site were reviewed. Sufficient data to adequately represent existing soil and bedrock conditions were not found; new soil test borings are recommended for future phases of work.

While the project footprint is not located above any known geologic faults, it is within the potentially active New Madrid seismic zone. The level topography of the area and proximity to the rivers create high risks for both severe and seasonal flooding. The Study Area does not contain any known karst hazards. Due to the flat topography, the potential for landslides is low. No evidence of current mining activity or abandoned mines was identified as part of this investigation.

2. Water Resources

A variety of water resources are present within the Study Area, including groundwater wells, streams, floodplains, and wetlands. The following subsections contain an overview of these resources, which are depicted in **Figures 2** and **3**. Coordination with resource agencies and field investigations will occur as part of future phases of work.

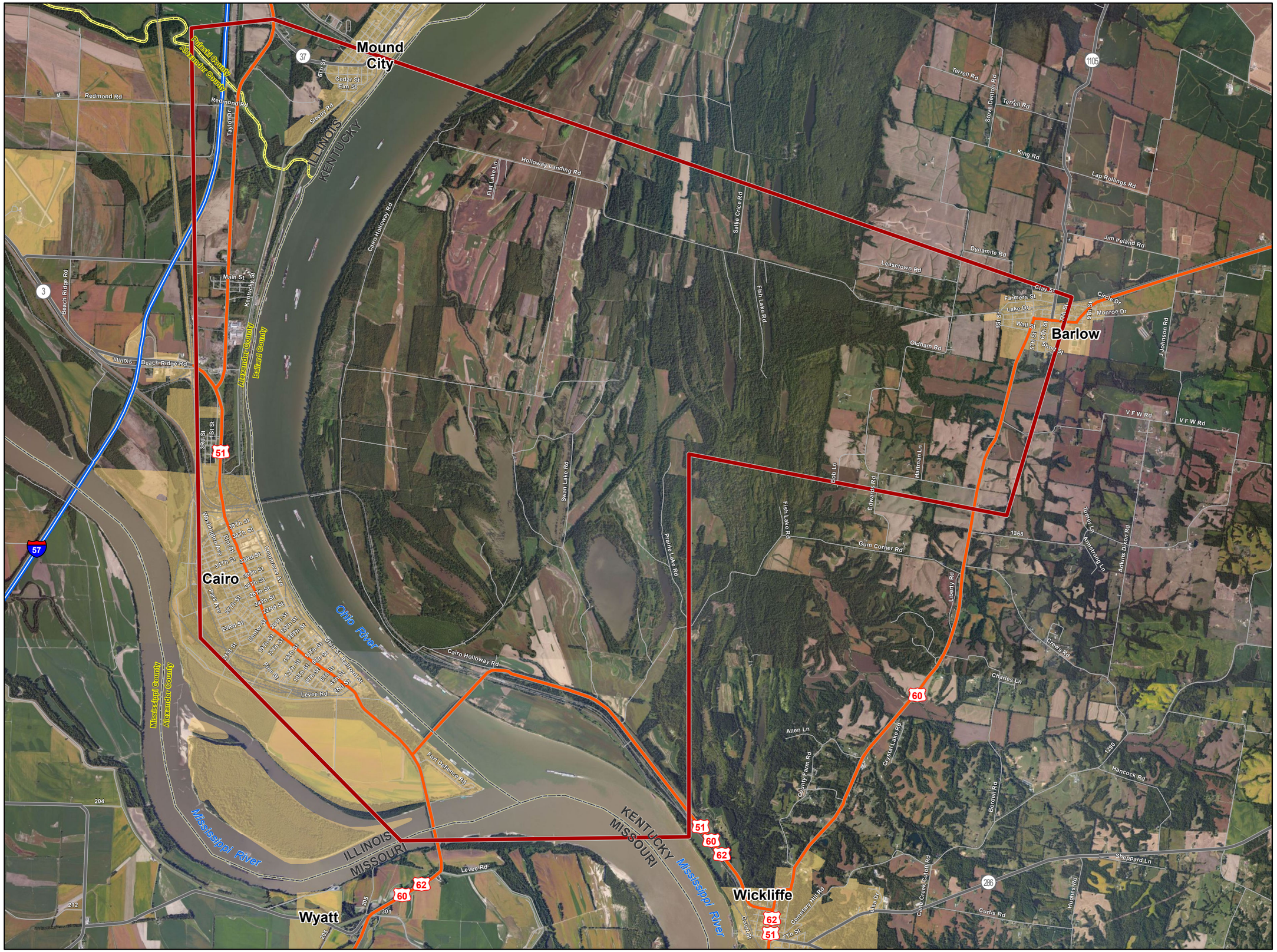
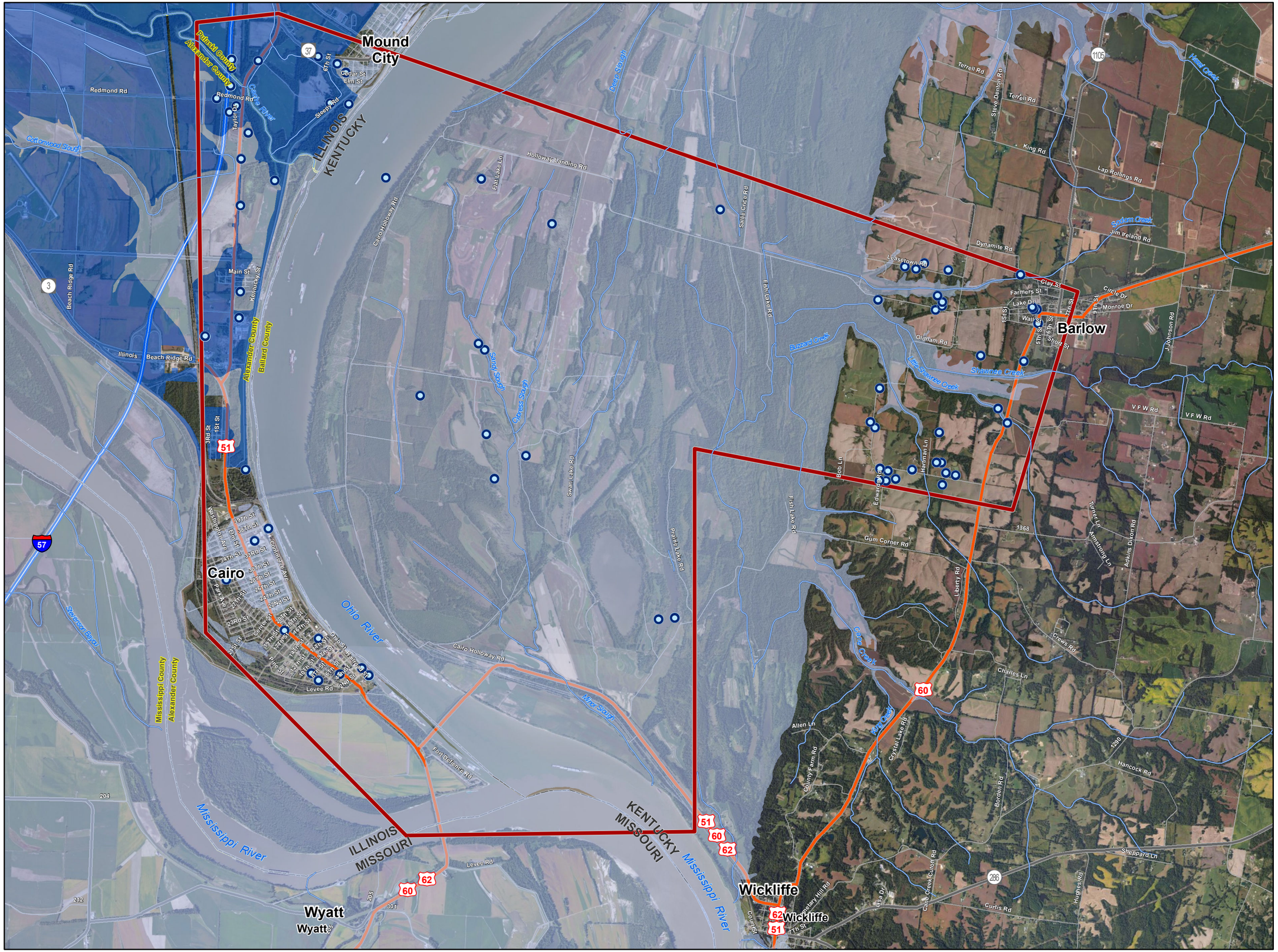


Figure 1

US 51
Ohio River Bridge

Study Area



Interstate
US Highway
State Highway
Local Road
Railroad
State Boundary
County Boundary
Study Area
Streams
100 Year Floodplain
500 Year Floodplain
Water Well

N

0 2,000 4,000 Feet

0 0.5 1 Miles

Figure 2

US 51
Ohio River Bridge

Floodplain

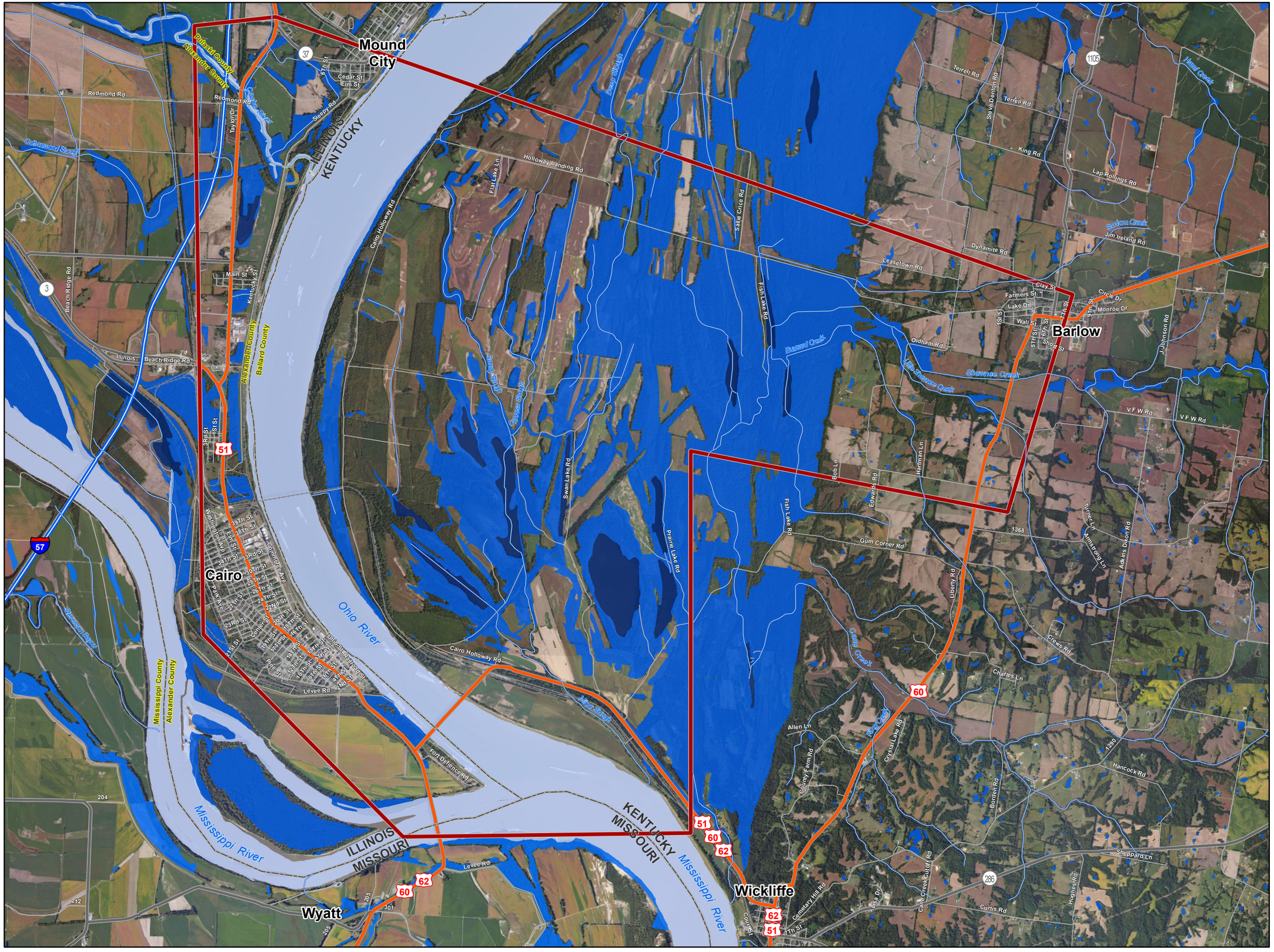


Figure 3

US 51
Ohio River Bridge
Wetlands

2.1. Groundwater

The Study Area is in the western portion of Ballard County, which is primarily comprised of large tracts designated as wildlife protection areas, forests, and agricultural areas. Very few residential areas are within the Ballard County portion of the Study Area, which reduces the need for potable water and groundwater wells for domestic use. Drinking water is provided to Cairo and Mound City residents by a public utility, which also reduces the need for potable water and groundwater wells.

There are, however, several groundwater wells used for agricultural irrigation. Near the river, groundwater levels fluctuate, but drilled wells in the Mississippian alluvium may supply large amounts of water from the deeper gravelly unit for irrigation.[1] Unconsolidated water-bearing sand and gravel deposits underlie most the southern half of Alexander County. Sand and gravel wells in the lowland areas may be as deep as 175 feet.

Information provided by the Kentucky Geological Survey and the Illinois Geological Survey suggests that approximately 136 water wells are potentially located within the Study Area. Known wells within the Study Area are shown in **Figure 2**.

2.2. Rivers & Streams

The Study Area is located within the Ohio River and Mississippi River watersheds, near the confluence of these major rivers. The Study Area boundary consists of Ohio River Miles 973 (North end of Mound City) to 981 (confluence with Mississippi River). The proposed project will include a crossing of the Ohio River, which is included on the Federal List of Navigable Waters. Based on US Army Corps of Engineers records, average pool stage for the Ohio River is 297 feet; the 50-year flood stage is 329 feet. With surrounding ground surface elevations between 310-315 feet, the Study Area has experienced regular local and regional flooding.

Tributaries to the Mississippi River located within the Kentucky portion of the Study Area include Cypress Slough, Sandy Slough, Minor Slough, Deep Slough, and Segments of Cane Creek. There are no mapped named tributaries to the Ohio River within the Kentucky portion of the Study Area. Ohio River tributaries located within the Illinois portion of the Study Area include the Cache River, Cottonwood Slough, and unnamed tributaries. **Figure 2** presents water resources in the Study Area. There may be additional small unnamed intermittent or ephemeral tributaries within the Study Area that are not included on mapping. Field surveys to identify all streams within the impact area of the alternatives will be conducted during a later phase of work.

Correspondence with the Kentucky Division of Water indicated that no Outstanding State Resource Waters or Wild Rivers exist within the Study Area. A Natural Resources EcoCAT review by the Illinois Department of Natural Resources contained no records of Illinois Natural Area Inventory Sites or registered Land and Water Reserves in vicinity of the project location.

The following watersheds based on twelve digit hydrologic unit codes (HUC 12s) occur within the Study Area:

- 051402060704: City of Cairo – Ohio River
- 080102000103: Town of Wickliffe – Mississippi River
- 051402060703: Hess Bayou – Ohio River

[1] http://www.uky.edu/KGS/water/library/gwatlas/Ballard/GWavailability.htm

- 071401050804: Horseshoe Lake – Mississippi River
- 080101000102: Shawnee Creek Slough
- 080101000101: Shawnee Creek

2.3. Floodplains

According to FEMA Flood Hazard Mapping, most of the Study Area is located within the designated 100-Year Floodplain. Boundaries are presented graphically in **Figure 2**. If fill material is placed within this floodplain, No-Rise Certification will be required. As project development continues, impacts will be assessed and permit needs will be determined as part of a future phase of work.

2.4. Wetlands

National Wetland Inventory (NWI) mapping for the Study Area includes extensive wetlands associated with the Boatwright Wildlife Management Area (WMA) in Ballard County, as well as wetland areas north and south of Cairo and southwest of Mound City. The NWI wetlands are shown on **Figure 3**. Field surveys to verify NWI wetlands and to identify wetlands that are not included on NWI mapping have not been conducted at this time but will occur as part of a future phase of work**.** A US Army Corps of Engineers 404 Permit and 401 Water Quality Certification and Floodplain Permits from Kentucky and/or Illinois may be required for stream and wetland impacts.

3. Ecology

Biologists utilized a literature and mapping review to assess the ecology of the Study Area. Coordination with relevant federal and state level resource agencies was also conducted. Copies of this correspondence are located in **Appendix B**.

3.1. Environmental Setting

The Study Area is located at the Ohio River in southwest Ballard County, Kentucky and eastern Alexander County, Illinois. The largest portion of the Study Area is located in Ballard County, bordered by the Ohio River on the west and extending east to the town of Barlow and south near the town of Wickliffe. In Illinois, the Study Area is located along the US 51/IL 37 corridor and includes the entirety of the town of Cairo to the south and a portion of the town of Mound City to the north. The southern boundary of the Study Area is near the confluence of the Ohio River and the Mississippi River at the border between Kentucky, Missouri, and Illinois.

The Illinois portion of the Study Area drains primarily to the Ohio River. The Kentucky portion of the Study Area drains primarily to a complex system of streams and wetlands konwn as “Barlow Bottoms,” which is hydrologically connected to the Ohio and Mississippi Rivers. In this area, the migration of the Ohio and Mississippi River channels across their floodplains has created valley bottom terraces with traces of old meander loops and oxbow lakes. The majority of the Study Area is relatively flat lying with numerous lakes, ponds, sloughs, and swamps.

Ballard County and the surrounding regions are characterized by fairly smooth to fairly rough uplands and valleys. The topographic regions of the Study Area in Alexander County form an area of gently rolling hills and knobs that have been described as broad uplands underlain by limestone, much dissected by streams in most areas, and steep hills of strong to moderate relief.

According to the USDA's *Soil Survey of Ballard and McCracken Counties, Kentucky,* the average daily maximum temperature of Ballard County is 70 degrees Fahrenheit, with the average daily minimum temperature being 47 degrees Fahrenheit. The annual precipitation in Ballard County is approximately 46 inches, with the most precipitation during the months of March, April, and May, and the average depth of snow on days with snow cover is two inches.

According to the NRCS' *Soil Survey of Alexander County, Illinois,* the average daily maximum temperature of Alexander County, Illinois is 67 degrees Fahrenheit, with the average daily minimum temperature being 46 degrees Fahrenheit. The annual precipitation in Alexander County is about 48 inches, with the most precipitation during the months of March, April, and May. The average yearly snowfall is 14.2 inches.

A weather station in Lovelaceville, Kentucky, which is approximately 16 miles east of the Study Area, has recorded daily precipitation and temperature for a 70-year period (1931 through 2001) available through the National Climatic Data Center. This information indicates that the average monthly precipitation in this location is approximately 4.5 inches. The average of the monthly mean temperature readings, for all 70 years of record, is 57.9 degrees Fahrenheit.

3.2. Floral & Faunal Communities

The Study Area includes portions of three major managed natural resources: the Boatwright WMA and the southern portion of Axe Lake Swamp State Nature Preserve in Ballard County and the tip of Cypress Creek National Wildlife Refuge in Illinois.

- The Boatwright WMA covers 8,389 acres of mostly wetland habitat. The Kentucky Department of Fish and Wildlife Resources provides an online checklist of observed and expected animal species for the Boatwright WMA, which includes 24 amphibians, 171 birds, 46 mammals, 42 reptiles, and four fish.[2] Most of the species included on the list are predicted to be present within the WMA, with the exception of fish and mussels, of which only observed species are included. This highly diverse list of animals indicates the diversity of habitats provided by the WMA. Forests and wetland areas adjacent to the WMA boundaries are expected to provide diverse habitats for wildlife as well.

- Axe Lake Swamp State Nature Preserve is located in Ballard County and encompasses approximately 458 acres. This nature preserve includes a portion of Kentucky's best known example of a large, intact bald cypress-tupelo swamp,[3] which is utilized seasonally by large numbers of migratory waterfowl. This preserve is known to have a nesting area for a population of brown creepers (*Certhia americana*), a floodplain songbird species rarely found in Kentucky, and has three rare species of bats.

- The easternmost tip of the Cypress Creek National Wildlife Refuge lies in the Study Area along the Alexander/Pulaski County line. The refuge provides valuable habitat for a diversity of waterfowl and other migratory birds, resident wildlife, and endangered and threatened species. It is also part of a larger 60,000 acre boundary delineated by the Cache River Wetlands Joint Venture Project.

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[2] http://fw.ky.gov/kfwis/arcims/WmaSpecies.asp?strID=222
[3] naturepreserves.ky.gov/naturepreserves/Pages/axelake.aspx

As discussed in **Section 4.1** below, cultivated crops, open water, woody wetlands, and deciduous forest comprise the majority of land uses in the Study Area. Cultivated crops provide limited habitat for flora and fauna; most species that use this type habitat will be common species tolerant to man-altered landscapes. Open water habitats may be occupied by a diversity of aquatic fauna, including many rare species adapted to large rivers such as fresh water mussels.

Forests in the region, which contain many southern and coastal plain species, are often oak-hickory dominated, with the southern red oak the dominant tree. The alluvial valleys have forests of swamp chestnut oak, willow oak, pin oak, overcup oak, swamp cottonwood, pecan, sweet gum, water tupelo, and bald cypress. Woody wetlands and deciduous forests of a continuous nature, such as those found in the Boatwright WMA, can provide habitat for many species that require un-fragmented forest blocks, such as many migratory bird species. Fragmentation of large forest blocks can introduce more common species adapted to edge habitats, which can compete with interior forest species for foraging and nesting habitat.

3.3. Threatened, Endangered, & Special Concern Species

To prepare this Environmental Overview Report, biologists coordinated with the US Fish & Wildlife Service (USFWS), the Illinois Department of Natural Resources (through their EcoCAT website), the Kentucky Department of Fish & Wildlife, and the Kentucky State Nature Preserves Commission (KSNPC). Copies of responses received are included in **Appendix B**.

- The Frankfort USFWS reported 10 federally endangered species and one candidate species with the potential to occur within the Study Area.
- The Marion USFWS reported six endangered species, one proposed threatened species, and one proposed critical habitat with the potential to occur within the Study Area.
- The Kentucky Department of Fish & Wildlife Resources reported three federally endangered species with the potential to occur within the Study Area.
- The KSNPC reports 86 records within one mile of the Study Area, 64 aquatic records within a five miles, 20 records of federally listed species within five miles, and 60 records of mammals and birds within 10 miles of the Study Area. They also noted that within one mile of the Study Area are maternity records for Rafinesque's big-eared bat (*Corynorhinus rafinesquii*), a federal species of management concern; southeastern myotis (*Myotis austroriparius*), a federal species of management concern; Indiana bat, (*Myotis sodalis*), a federally endangered species; and evening bat (*Nycticeius humeralis*), a KSNPC special concern species.
- A Natural Resources EcoCAT review by the Illinois Department of Natural Resources contained no records of state-listed threatened or endangered species in vicinity of the project location.

Table 1 presents the list of federally endangered and threatened species that potentially occur within the Study Area. Records for state listed species are presented in the KSNPC letter in **Appendix B**.

Table 1: Federally Listed Species within Study Area

Group	Species	Common Name	Legal Status*
Mammal	*Myotis sodalis*	Indiana bat	E
	Myotis grisescens	Gray bat	E
Mussels	*Plethobasus cooperianus*	Orangefoot pimpleback	E
	Cyprogenia stegaria	Fanshell	E
	Lampsilis abrupta	Pink mucket	E

Table 1: Federally Listed Species within Study Area

Group	Species	Common Name	Legal Status*
	Obovaria retusa	Ring pink	E
	Plethobasus cuyphyus	Sheepnose	C
	Pleurobema plenum	Rough pigtoe	E
	Potamilus capax	Fat pocketbook	E
	Quadrula cylindrical	Rabbitsfoot	PT**
Fish	*Scaphirhynchus albus*	Pallid sturgeon	E
Birds	*Sterna antillarum*	Interior least tern	E
	Haliaeetus leucocephalus	Bald eagle	Delisted

**E=Endangered, C=Candidate, PT=Proposed Threatened*
***This species is not reported by USFWS, but records of this species are reported by KSNPC within the Study Area*

Indiana Bat

The USFWS Frankfort Field Office does not recommend surveys for Indiana Bat, as the Study Area is within the home range of a known Indiana Bat maternity colony. KSNPC records indicate that this species has been documented within the Boatwright WMA. Indiana Bats hibernate during the winter months in large, cool caves, sinks, and/or mines (hibernacula) where they form tight clusters containing hundreds of individuals. Each spring, the females emerge from these hibernacula and migrate to summer (maternity) habitat consisting of hardwood forests. Maternity colonies are formed in these areas under the exfoliating bark of dead trees or loose bark of living trees.

While no potential winter roost sites are known to occur within the Study Area, potential summer roosting habitat and foraging habitat for Indiana bat is present within forests in the Study Area. The Kentucky Department of Fish & Wildlife Resources reports that a known maternity colony lies within the Study Area. Further consultation with the USFWS will be required as project development continues to comply with Section 7 of the Endangered Species Act.

Gray Bat

The USFWS Marion Field Office indicates that the range of the gray bat includes the Study Area. Gray bats use caves, mines, and cave-like habitats as roosts during both the summer and winter, and forage over water adjacent to forests, including rivers, streams, wetlands, and reservoirs. The USFWS recommends that a search for this species should be made prior to any cave impacting activity.

Mussel Species

Within the Study Area, the Ohio River represents potential habitat for eight federally listed mussel species that could occur within the Study Area. KSNPC records indicate that sheepnose, ring pink, organgefoot pimpleback, and rabbitsfoot are federally listed mussels which have been recorded from the Ohio River within the Study Area. The Marion USFWS also indicates the presence of proposed critical habitat for the rabbitsfoot mussel in the Ohio River within the Study Area. The Frankfort USFWS recommends surveys to determine if listed species are present and analysis of the potential direct, indirect, and cumulative project effects for mussels unless site-specific factors demonstrate there is no potentially suitable habitat within the Study Area.

Pallid Sturgeon

The Ohio River, downstream of Dam 53, which is near Grand Chain, Illinois and upstream of the Study Area, represents habitat for the federally endangered pallid sturgeon, which is a large fish that inhabits large, turbid rivers. The USFWS requests that the proposed project consider the effects of disturbance to the habitat for this species.

Interior Least Tern

The interior least tern is federally endangered bird species that spends the spring and summer months around the lower Ohio River and Mississippi River. This bird nests in sparsely vegetated sand and gravel substrates, often on bars and islands within the river. USFWS records indicate that several interior least tern nests have been documented from agricultural fields in the vicinity of the proposed project area. KSNPC records indicate that this species has been documented from sandbars in the Ohio River near Cairo and Mound City, Illinois. The USFWS recommends that the project be designed to eliminate impacts to potential nesting areas during the breeding season, which is April 15 through August 31; or, if project construction must occur during this time, surveys should be conducted to determine the presence of the species within the vicinity.

Bald Eagle

The bald eagle was officially removed from the List of Endangered and Threatened Species but continues to be protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The Kentucky Department of Fish & Wildlife Resources reports that one known nest site lies in the southern portion of the Study Area. USFWS records identify a known nest site in the northern portion of the Study Area. Bald eagles typically nest in large mature trees near major rivers and large open bodies of water where fish, waterfowl, and other prey are abundant. Bald eagle habitat is present in Boatwright WMA and eagles have been sighted there. As project development continues, an evaluation should be performed to determine whether the project is likely to disturb nesting bald eagles.

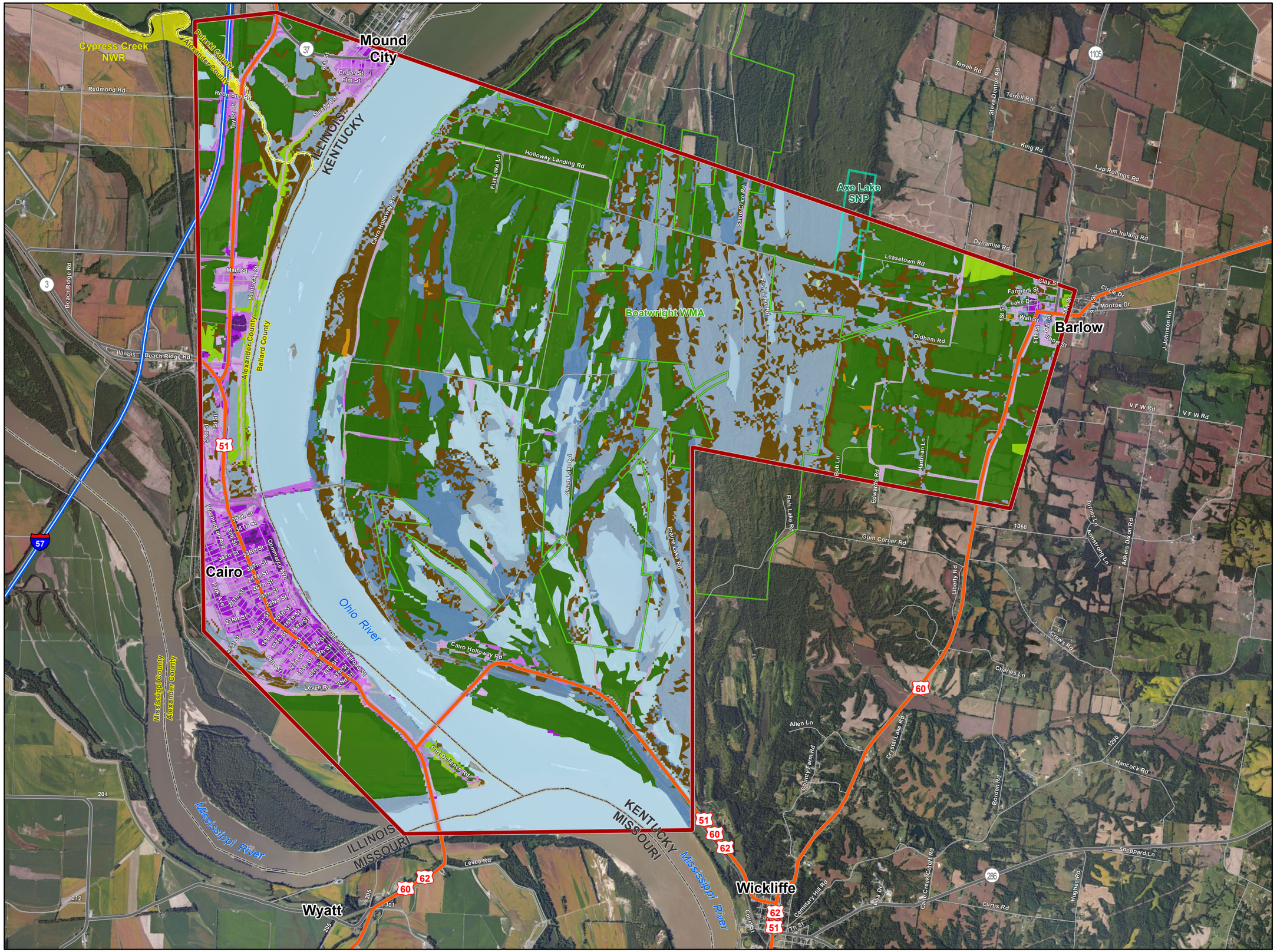
4. Socioeconomic

The following subsections discuss land use, demographics, community resources, and the local/regional economy. The Socioeconomic White Paper is included as **Appendix C**.

4.1. Land Use

The Study Area includes nearly all of the City of Cairo plus portions of the smaller cities of Barlow and Mound City; the City of Wickliffe falls just south of the Study Area limits.

Existing land uses, obtained from the National Land Cover Database 2006, are shown in **Figure 4** and **Table 2**. Formal land use plans are not available for the Study Area, but a review of aerial mapping indicates that the majority of land use in the Kentucky portion of the Study Area is agricultural or undeveloped. Boatwright WMA comprises approximately 20% of the Study Area in Kentucky. Kentucky land beyond the WMA is primarily used for lower density rural residential and agricultural purposes. Approximately 55% of the Study Area is designated as prime farmlands based on soil type, as shown in **Figure 5**. Aerial mapping also indicates that the Illinois portion of the Study Area contains more residential, commercial, and industrial development than the Kentucky portion, particularly in the City of Cairo.



- Interstate
- US Highway
- State Highway
- Local Road
- Railroad
- State Boundary
- County Boundary
- Study Area

Landuse

- Barren Land (Rock/Sand/Clay)
- Cultivated Crops
- Pasture/Hay
- Shrub/Scrub
- Developed, High Intensity
- Developed, Medium Intensity
- Developed, Low Intensity
- Developed, Open Space
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Grassland/Herbaceous
- Emergent Herbaceous Wetlands
- Woody Wetlands
- Open Water
- Nature Preserve
- Wildlife Management Area
- National Wildlife Refuge

N

0 2,000 4,000 Feet

0 0.5 1 Miles

Figure 4

US 51 Ohio River Bridge

Landuse

Figure 5

US 51 Ohio River Bridge

Farmlands

Table 2: Existing Land Use in Study Area

Land Use	Acres	%
Barren Land (Rock/Sand/Clay)	13.63	0.1
Cultivated Crops	8,279.50	31.9
Grassland/Herbaceous	18.18	0.1
Pasture/Hay	254.70	1.0
Developed, Low Intensity	941.87	3.6
Developed, Medium Intensity	499.82	1.9
Developed, High Intensity	107.69	0.4
Developed, Open Space	890.95	3.4
Deciduous Forest	3,171.47	12.2
Evergreen Forest	26.24	0.1
Mixed Forest	1.33	0.0
Shrub/Scrub	13.48	0.1
Emergent Herbaceous Wetlands	1,736.36	6.7
Woody Wetlands	3,825.05	14.7
Open Water	6,173.46	23.8
Total	**25,953.73**	**100**

The Study Area's existing land use is not expected to change a result of the proposed project. The project is being designed to address the area's need for a safe, reliable facility to replace the existing functionally obsolete structure. Rehabilitation or reconstruction of the US 51 Bridge is not anticipated to directly increase growth and development in the Study Area.

4.2. Demographics & Environmental Justice

The population of the Study Area has generally decreased over the past seventy years. Cairo's population has decreased with each decennial census conducted since 1940, when the municipality contained approximately 14,000 residents. Historic population levels for Alexander and Ballard Counties are shown in **Table 3**.

Table 4 presents poverty data from the 2011 American Community Survey for the Study Area counties and tracts. As shown, the Illinois portions of the study area have a considerably higher concentration of persons below the federal poverty level than the Kentucky portion of the Study Area or than Alexander County as a whole.

Table 5 presents minority data from the 2011 American Community Survey for the Study Area counties and tracts. As shown, the Illinois portions of the study area have a considerably higher concentration of minorities than the Kentucky portion of the Study Area or than Alexander County as a whole. Overall, there are very few persons of Hispanic ethnicity in the Study Area; limited English proficiency is not a concern for this project.

Table 3: Historic Population Levels for Study Area Counties

Census Year	Alexander Co, IL	Ballard Co, KY
1900	19,384	10,761
1910	22,741	12,690
1920	23,980	12,045
1930	22,542	9,910
1940	25,496	9,480
1950	20,316	8,545
1960	16,061	8,291
1970	12,015	8,276
1980	12,264	8,798
1990	10,626	7,902
2000	9,590	8,286
2010	8,238	8,249

Table 4: Population Below Poverty Level

Geography	Total Population for whom poverty status is determined	Below Poverty Level	
		Total	%
Alexander County, IL	7,788	2,009	25.8%
Tract 9578	1,592	532	33.4%
Tract 9579	1,316	721	53.0%
Ballard County, KY	8,004	1,164	14.5%
Tract 9502	1,380	263	19.1%
Tract 9503	2,647	293	11.1%

Table 5: Population by Race & Ethnicity

Geography	Total Population	Minority Population		Hispanic Population	
		Total	%	Total	%
Alexander County, IL	8,314	3,178	38.2%	101	1.2%
Tract 9578	1,650	1,167	70.7%	4	0.2%
Tract 9579	1,423	1,038	72.9%	0	0.0%
Ballard County, KY	8,235	411	5.0%	93	1.1%
Tract 9502	1,454	80	5.5%	6	0.4%
Tract 9503	2,670	151	5.7%	18	0.7%

Based on the demographics information presented above, there is a high potential to encounter Environmental Justice populations within the Study Area, particularly within Cairo and the Illinois portions. As alternatives are developed, additional analysis will be required to assess effects on these communities.

If the existing US 51 Bridge continues to deteriorate and it is closed without a replacement, Environmental Justice populations will likely be negatively impacted. The next closest bridge connecting Cairo and Wickliffe is approximately 34 miles from the existing bridge location. Changing

travel patterns to accommodate an additional 70-mile trip each direction to travel between Cairo and Wickliffe would be a hardship for many members of the Environmental Justice population.

If a replacement bridge is constructed away from the existing crossing location, a more detailed Environmental Justice analysis should be conducted to ensure that these communities do not bear a disproportionate share of adverse project impacts.

4.3. Community Resources

Community resources within the Study Area are shown in **Figure 6**. In addition to the churches, cemeteries, schools, local government offices, homes, and small businesses found throughout rural Kentucky and Illinois, there are several resources that are unique within the Study Area:

- Fort Defiance Park, a former Civil War military fort, is located to the south of Cairo, at the confluence of the Ohio and Mississippi Rivers. Previously a state park, the park is now owned and maintained by the City of Cairo. Amenities include an observation tower, a Civil War museum/visitor center, interpretative signage, scattered picnic tables, and greenspace for passive recreation.

- Two smaller community parks, Halliday Park and Saint Mary's Park, are also located in Cairo. Halliday Park is a small pocket park located between US 51 and Poplar Street between 9th and 10th Streets. Saint Mary's Park, located between 33rd Street, Magnolia Drive, 28th Street, and Park Place, contains tennis courts, a baseball field, playground equipment, a covered shelter, picnic tables, and greenspace.

- The easternmost tip of the Cypress Creek National Wildlife Refuge lies in the Study Area along the Alexander/Pulaski County line. The refuge provides valuable habitat for a diversity of waterfowl and other migratory birds, resident wildlife, and endangered and threatened species. A public boat ramp provides access to the Cache River adjacent to IL 37.

- In Kentucky, the state-owned Boatwright WMA contains trails and is open to the public for wildlife viewing, hunting, and fishing.

- The southern end of Axe Lake Swamp Nature Preserve, a 458-acre bald cypress-tupelo swamp, also falls within northern limits of the Study Area.

- Located just south of the Study Area, Wickliffe Mounds State Historic Site offers a variety of recreational and educational amenities on the site of a prehistoric Native American village.

Each of these locations is a protected resource under Section 4(f) of the Department of Transportation Act. This law protects parks, wildlife refuges, and historic sites from conversion to transportation use unless specific conditions are met. No sites developed with Section 6(f) funding were identified in the Study Area.

There are limited medical facilities located in the Study Area. The nearest major hospitals are located in Paducah, Kentucky; Cape Girardeau, Missouri; and Sikeston, Missouri. The Ballard County Medical Clinic is a walk-in clinic located in Barlow. Southern Seven Health Department, which provides non-emergency health services to the seven southernmost counties of Illinois, is located in Cairo.

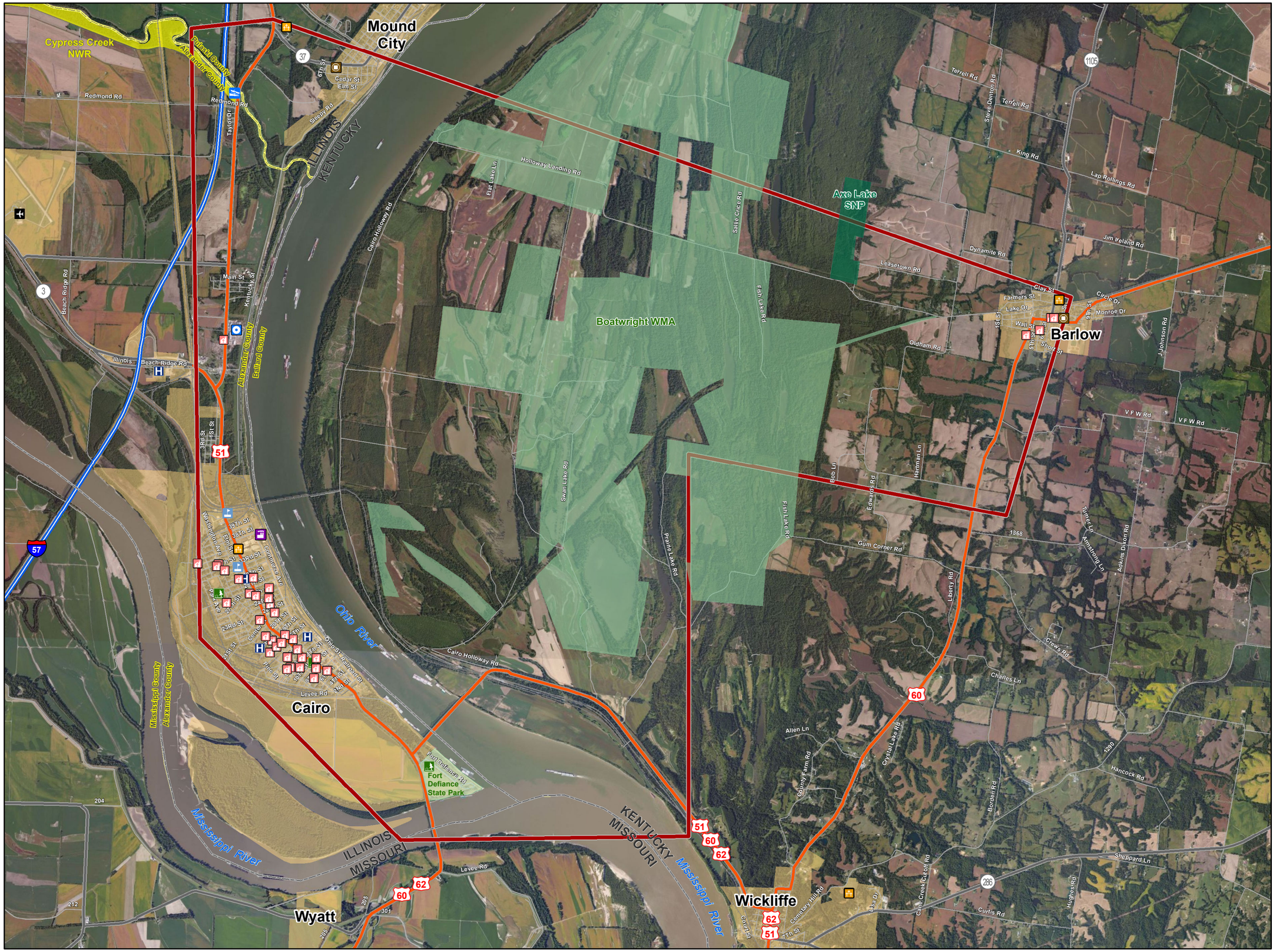


Figure 6

US 51
Ohio River Bridge

Community Resources

Visually, there are several sensitive resources in the area. The town of Cairo, founded in 1837, has a rich history that is reflected in its surviving architecture. A large portion of the city is listed on the National Register of Historic Places (NRHP) as a historic district and represents a potentially sensitive viewshed issue. Portions of several routes, including US 51 and its Ohio River Bridge, are designated as part of the Great River Road and Ohio River National Scenic Byways. As a nature-oriented recreational facility, the WMA may also be considered a visually sensitive feature. Fort Defiance Park is located to the south of the existing US 51 Bridge and may also be considered visually sensitive.

4.4. Local/Regional Economy

Major employers in Cairo and surrounding Alexander County include Community Health and Emergency (freestanding emergency medical centers employing approximately 150 people), American Commercial Lines (inland water freight transportation employing approximately 150 people), Delta Center (social service and welfare organization employing approximately 100 people), and Daystar Care Center (nursing and convalescent homes employing approximately 100 people). Major non-agricultural employers in Ballard County include the NewPage Paper Mill at Wickliffe, which employs approximately 500 individuals, James Marine (a service center/barge repair business that employs approximately 100 individuals), and Harris Engineering (a manufacturer of gun and rifle components that employs approximately 60 people). The largest sectors of the Study Area economy are composed of Manufacturing, Education/Health/Social Services, Trade/Transportation/Utilities, Services, and Agriculture.

Economic Importance of the US 51 Bridge

Approximately 5,400 vehicles per day use the existing river crossing between Wickliffe, KY and Cairo, IL. About 35% of the daily traffic is made up of commercial vehicles. If the US 51 Bridge were not available for local traffic, the detour trip between Wickliffe and Cairo increases from 7 miles to 70+ miles per direction. This increase in travel times, distances, and costs would have a major impact on the economies of the region.

A good transportation network is vital for Study Area residents, including Environmental Justice populations, to reach destinations in other communities, including jobs and major medical facilities. According to county data from the 2006-2010 American Community Survey collected by the US Census Bureau, 109 residents of Ballard County commute into nearby Alexander County, Illinois or to nearby Missouri counties (Cape Girardeau, Mississippi, or Scott Counties). Additionally, an estimated 145 residents in nearby Illinois (Alexander or Pulaski Counties) and Missouri (Mississippi, New Madrid, or Scott Counties) commute into Ballard County, Kentucky. The US 51 bridge provides the most direct link for these commuters.

The US 51 Bridge is also essential for farmers. Agriculture is a major component of Ballard County's economy and the bridge facilitates transport of crops from the county's farms to market. The bridge provides access to the nation's interstate highway system via I-57 in Illinois and Missouri. The bridge also provides access to inland freight transportation services at Cairo and Mound City ports.

If continuing deterioration were to result in the closure of the existing bridge, Study Area residents and businesses would be negatively impacted. The bridge is a vital component in the transportation network as it facilitates transportation of people and goods between Illinois, Kentucky, and nearby Missouri. There are alternative river crossings in the region, but the travel distances do not make these crossings viable choices for local traffic. Other major river crossings include the following:

Ohio River (upstream)

- US 45 Bridge at Paducah, KY (37 miles northeast of US 51 Bridge)
- I-24 Ohio River Bridge at Paducah, KY (34 miles northeast of US 51 Bridge)

Mississippi River (upstream from confluence with Ohio River)

- I-57 Bridge northwest of Cairo, IL (7 miles northwest of US 51 Bridge)
- US 60/US 62 Bridge south of Cairo, IL (1/2 mile south of US 51 Bridge)

Mississippi River (downstream)

- Dorena-Hickman Ferry (40 miles south of US 51 Bridge)
- I-155 Bridge near Caruthersville, MO (84 miles south of US 51 Bridge)

Adding approximately 70 miles per direction to trips between Illinois and Kentucky would be a hardship to area residents and businesses. Residents would have to travel much farther to access jobs, hospitals, retail, and commercial destinations. If residents have to travel further, they may reduce trips to area businesses, which would negatively impact the local economy. In the absence of the bridge, businesses would also suffer from the loss of employees who are unable to access their jobs, and would have to reconfigure transportation routes for shipping/receiving goods, which could result in higher costs.

5. Air Quality

The proposed bridge replacement project is in the Paducah (KY) – Cairo (IL) Interstate Air Quality Control Region. This project is listed in Administrative Modification 2010.115 of the FY 2011-2014 *KYTC Statewide Transportation Implementation Program* (STIP). The area is in attainment for all criteria pollutants established by the United States Environmental Protection Agency (EPA). Implementation of the project is not anticipated to have an adverse impact on Carbon Monoxide, Lead, Ozone, Sulfur Dioxide, or Particulate Matter.

Indirect air quality impacts on areas along the project corridor are expected to be minor as future traffic volumes increase. Rehabilitating or replacing the bridge is not expected to create any cumulative air quality impacts. The proposed project is not anticipated to significantly alter the rural nature of the area or the ambient CO levels.

5.1. Mobile Source Air Toxics (MSATs)

Based on the low number of vehicles per day crossing the bridge today and relatively low growth rate, the proposed project has low potential MSAT effects as defined by FHWA's 2012 *Interim Guidance Update on Air Toxic Analysis in NEPA Documents*. Projects with low potential MSAT effects have design year traffic projections that are less than 140,000 to 150,000 vehicles per day; 2040 projected traffic levels on the bridge are estimated at 6,200 vehicles per day. The proposed project will not increase capacity or result in significant traffic volume increases.

For each alternative under consideration, the amount of MSAT emitted would be proportional to the vehicle miles traveled (VMT) assuming that other variables, such as fleet mix, are the same for each alternative. Generally, alternatives that propose new lengths of roadway will result in greater VMT compared to the existing condition, thus the potential for additional MSAT emissions would be greater for those alternatives. Regardless of the alternative chosen, emissions will likely be lower than present levels in the design year as a result of EPA's national control programs that are projected to reduce

annual MSAT emissions by over 80 percent between 2010 and 2050. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the Study Area are likely to be lower in the future in nearly all cases.

Depending on the alternatives selected, there may be localized areas where VMT would increase or decrease compared to existing conditions. Therefore, it is possible that localized increases and decreases in MSAT emissions may occur. However, the magnitude and the duration of these potential increases compared to the No Build Alternative cannot be reliably quantified due to incomplete or unavailable information in forecasting project-specific MSAT health impacts. On a regional basis, EPA's vehicle and fuel regulations coupled with fleet turnover, will over time cause substantial reductions that will cause region-wide MSAT levels to be significantly lower than present levels.

Construction activities, discussed in the following subsection, may generate a temporary increase in MSAT emissions; however, any increase would be temporary and would not impact the health of residents.

Technical shortcomings of emissions/dispersion models and uncertain science with respect to health effects prevent meaningful or reliable estimates of MSAT emissions and effects from individual projects. However, even though reliable methods do not exist to accurately estimate the health impacts of MSATs at the project level, it is possible to qualitatively assess the levels of future MSAT emissions associated with the project, as noted above. Although a qualitative analysis cannot identify and measure health impacts from MSATs, it can provide a basis for identifying and comparing the potential differences among MSAT emissions, if any, between various alternatives.

For all alternative scenarios, the amount of MSAT emissions in the design year is expected to be significantly lower than existing conditions on a regional basis. No cumulative or indirect air quality impacts are expected to result from construction activities or implementation of the project.

5.2. Air Quality during Construction

Construction activity may generate a temporary increase in emissions. Any increase in air pollution from construction would be temporary in duration and not impact the health of residents.

A number of mitigation strategies and solutions for minimizing the effects of construction-related emissions are available. Construction mitigation includes strategies that reduce engine activity or reduce emissions per unit of operating time. Operational agreements that reduce or redirect work or shift times to avoid community exposures can have positive benefits when sites are near vulnerable populations. For example, agreements that stress work activity outside normal hours of an adjacent school campus would be operations-oriented mitigation. Also, technological adjustments to equipment (such as off-road dump trucks and bulldozers) could be appropriate strategies; these could include particulate matter traps, oxidation catalysts, and other devices that provide an after-treatment of exhaust emissions. The use of clean fuels, such as ultra-low sulfur diesel, also can be a very cost-beneficial strategy.

6. Noise

The FHWA Noise Standard requires that noise abatement measures be considered when traffic noise impacts are identified. Vehicle tires, engines, and exhaust propagate noise at levels dependent upon traffic volumes, speeds, percentage of trucks, and the slope of the roadway. These traffic noises are measured in decibels in the A-scale (dBA). The A-scale is designed to best approximate the way noise is heard by the human ear. Due to the logarithmic nature of noise measurements, a 3 dBA increase in the noise level represents a doubling in the noise level; however, an increase at this scale is barely detectible by the human ear. A 10 dBA increase is perceived as a doubling of the noise level. Noise levels decrease rapidly as distances increase; a 4.5 dBA decrease is usually achieved when the distance from the roadway is doubled.

According to FHWA, traffic noise impacts occur when the predicted traffic noise levels approach (are within one dBA) or exceed the noise abatement criteria (NAC) or when the predicted traffic noise levels substantially exceed the existing noise level. The noise abatement criteria are established to address traffic noise levels that interfere with speech communication. **Table 6** summarizes the NAC for each Activity Category.

Table 6: Noise Abatement Criteria

Activity Category	Decibels (dBA)	Evaluation Location	Activity Description
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B*	67	Exterior	Residential
C*	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structure, radio stations, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structure, radio studios, recording studios, schools, and television studios
E*	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D, or F
F	---	---	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	---	---	Undeveloped lands that are not permitted.

* Includes undeveloped lands permitted for this activity category proposed for future development.
Source: 23 CFR 772, July 2010

Based on a cursory examination of topographical and aerial maps, most noise sensitive receptors in the Study Area are categorized as Activity Category B, which includes exterior areas of single or multi-family homes and mobile home parks where traffic noise would interfere with normal conversation (for

example, on balconies, patios or in backyards). Residences in Mound City, Barlow, and Cairo represent Activity Category B receptors as do scattered rural residences. Other non-residential areas--such as schools, parks, cemeteries, recreational areas, and churches--are also present in the area, which are noise sensitive; this includes resources such as Fort Defiance Park, schools in Cairo, and local churches.

Based on the low number of vehicles per day crossing the bridge today and the relatively low growth rate, the proposed project is unlikely to result in substantial noise impacts if the river crossing stays at or near its current location. The proposed project will not increase capacity or result in significant traffic volume increases. If a new location alternative is selected, additional analysis should be performed to assess specific impacts.

7. Cultural & Historic Resources

A records check was conducted to identify known archaeological sites and historic architectural resources in the Study Area. The results of this effort are presented in **Appendix D**. Data was obtained through a review of archaeological and historic architectural site files held by the Kentucky Heritage Council in Frankfort, Kentucky and through a review of the Historic Architectural and Archaeology Resources Geographic Information System website hosted by the Illinois Historic Preservation Agency.

As alternatives are developed, an archaeological survey will be necessary to locate and identify any archaeological sites along the preferred alternative. Deep testing will be necessary for areas in the floodplain that are within the area of potential effect. Testing of the archaeological sites may be necessary to determine eligibility for listing on the NRHP. If any of the sites are determined to be eligible, mitigation of the effects may be required.

A historic architectural assessment will also be required to identify historic architectural properties in the proposed alternatives and to determine if the sites are eligible for listing on the NRHP. If any of the sites are determined to be eligible, mitigation of adverse effects may be required.

7.1. Known Archaeological Sites

There are 35 known archeological sites within the Study Area: 12 sites are located in Illinois and 23 are in Kentucky.

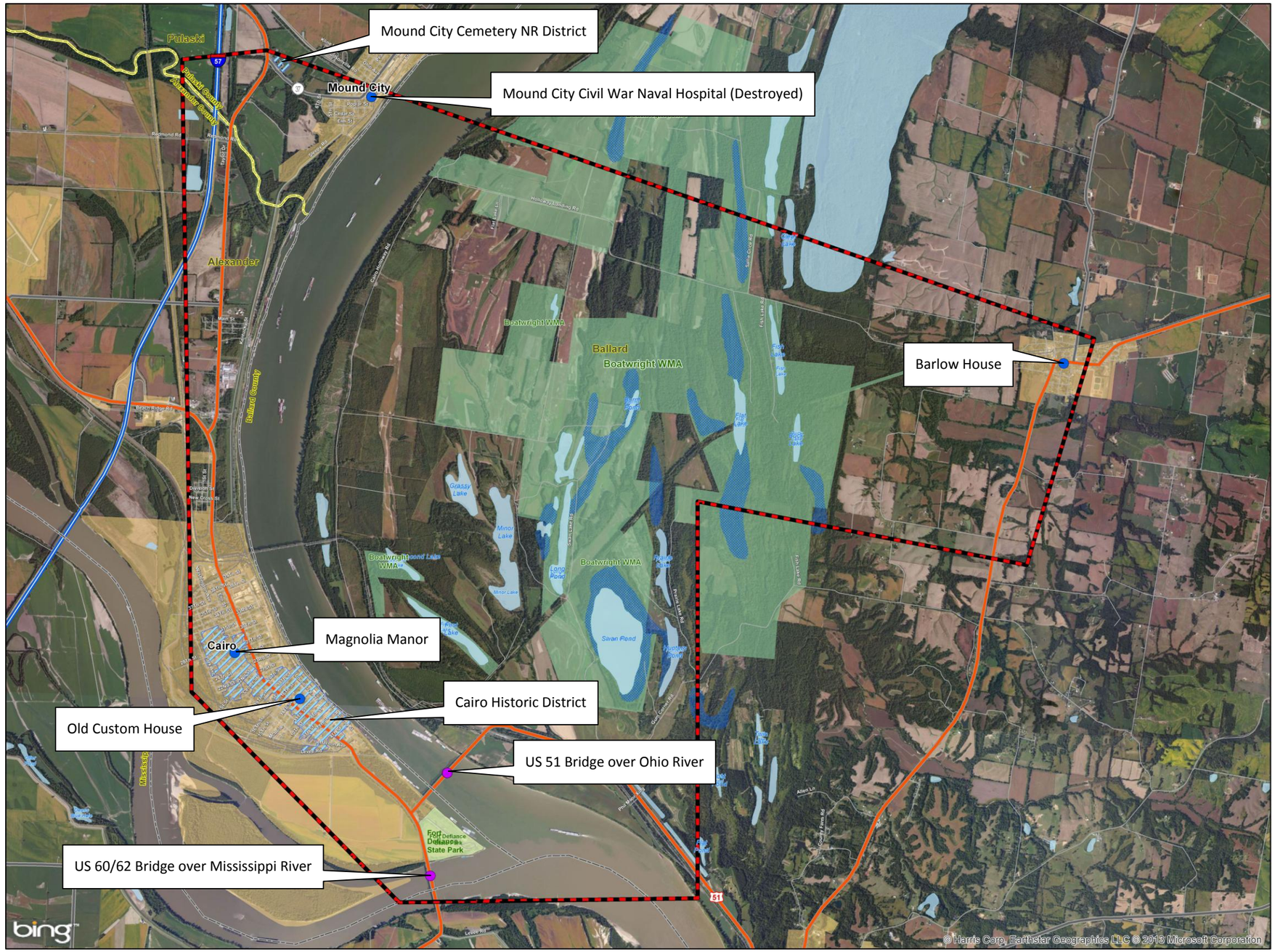
- One site, 15Ba2, is listed on the NRHP. The site is an open habitation with mounds prehistoric occupation affiliated with Late Woodland and Mississippian cultural groups. The site, located on a levy in Barlow Bottoms, consists of two large mounds, a plaza, and food waste piles. The site may have functioned as a large administrative mound center during circa 1100-1700 A.D.

- One site, 11Pu140, has been previously determined eligible for NRHP listing. It encompasses the Mound City Marine Ways, which constructed three ironclad ships during the Civil War and was the first heavy industry in the region.

Of the other known sites within the Study Area, nine have been determined not eligible for NRHP listing and the remaining 24 have not been assessed to determine their eligibility.

7.2. Previously Identified Historic Structures

Aboveground, there are six NRHP listed resources within the Study Area, shown in Figure 7:



Interstate
US Highway
State Highway
Local Road
Railroad
State Boundary
County Boundary
Park
City
Lake/Pond
Swamp/Marsh
Wildlife Management Area
Study Area Boundary
NR Districts
Listed on the NR
Eligible for Listing on the NR

N

0 2,000 4,000 Feet

0 0.5 1 Miles

Figure 7

US 51
Ohio River Bridge
Historic Resources

- The Cairo Historic District demonstrates the architectural styles popular in Illinois between 1850 and World War I. Its homes range from Italianate quasi-palazzi to the working man's shack; commercial establishments, although now vacant and dilapidated, demonstrate the city's once great importance as shipping port. The public buildings showcase the faded glory that once was bestowed on this forgotten city. The district includes hundreds of homes within its boundary, 47 of which are identified in the NRHP nomination form as architecturally and/or historically significant.

- The Mound City National Cemetery Historic District, located at the junction of IL 37 and US 51, is significant due to its association with the Civil War and its 1880 lodge designed by Quartermaster General Meigs. In addition to the Civil War era interments, the cemetery is the final resting place for veterans associated with every war and branch of service since it opened in 1864. It has been chosen by Congress as a primary memorial for the country's military history.

- The Old Custom House at 1400 Washington Avenue in Cairo was constructed during 1869-1872. Over its history, it has served a variety of civic uses including post office, customs house, court, and police station. It is one of only a few remaining federal custom houses and its Italianate style is rare among government buildings. It is also an important link with the history of the era of river commerce.

- Magnolia Manor, located at 2700 Washington Avenue in Cairo, was built during 1869-1872. It is an Italianate Victorian style house that exemplifies the prosperity of the boomtown era. General Ulysses S. Grant made several visits to the house, which is now open for public viewing year round.

- The Mound City Civil War Naval Hospital, which was one of the largest military hospitals in the west during the Civil War, has been demolished since its listing.

- The Barlow House is a two story Queen Anne style residence that was built in 1903. Generally, it retains a distinct small-town setting with its surroundings of late 19th and early 20th century houses. The agricultural nature of the area is underscored by the location of a large tobacco field to the rear. Its self-sufficiency is reflected in the brick outbuilding that was used by the family as a smokehouse, laundry, and storage building. The property also contains an original cast-iron fence that runs across the front.

Two resources within the Study Area have been identified as eligible for NRHP listing: the US 51 Ohio River Bridge and the US 60/US 62 Mississippi River Bridge. Additionally, 111 resources in the Illinois portion of the Study Area are listed in the HAARGIS database but their status is undetermined.

7.3. US 51 Bridge

The US 51 Bridge is a continuous span cantilever Warren truss bridge with anchor arm spans at each end. It opened to traffic in 1938; the engineering company responsible for bridge design and construction was Modjeski, Masters and Case. The Missouri Valley Bridge and Iron Company constructed the substructure. The Mount Vernon Bridge Company was responsible for construction of the superstructure. In 1951, after repayment of the bonds sold for construction, ownership of the bridge transferred to the Commonwealth of Kentucky. Major rehabilitation was completed in 1977 to address serious deterioration of the deck. Another rehabilitation project was completed in 1999.

The Cairo Bridge is nearly identical to the 1929 George Rogers Clark Memorial Bridge spanning the Ohio River in Louisville, Kentucky, which was designed by Ralph Modjeski. The main spans of the Cairo Bridge are four steel Cantilever Warren trusses that total 2,830 feet in length. It is the longest cantilever truss in Kentucky. The main spans are flanked by Warren deck truss approaches at each end; the approach spans on the Illinois side are 570 feet in length, while the Kentucky approach spans are 2,684 feet in length.

The US 51/Cairo Bridge was determined potentially NRHP eligible in KYTC's 1996 bridge evaluation. It is one of two extant cantilever bridges constructed during the period of the Great Depression and World War II (1935-1945) in the Purchase Region of Kentucky.

8. Hazardous Materials

A database search and cursory field reconnaissance was performed to identify recognized environmental conditions within the Study Area. A limited mapping review was conducted using Google Earth and US Geological Survey mapping. Historic aerial images and topographic maps were reviewed; no recognized environmental conditions were discovered as a result of the limited mapping review.

The investigation resulted in the identification of 92 mapped facilities located within the Study Area concentrated within Barlow, Mound City, and Cairo. Additionally, 163 orphan sites (exact location unknown) were identified as being potentially located within the Study Area. The orphan sites are located near Barlow, Mound City, and Cairo; however the exact locations are not known. **Appendix E** contains additional information about this research effort; **Figure 8** shows the location of EPA-monitored sites within the Study Area. Additional research is recommended regarding the exact location of the orphan sites as project development continues.

Lead Contamination

The potential exists to encounter lead contamination in the soil under the approaches of the existing US 51 Bridge. The existing bridge was built in 1937, rehabilitated in 1979, and assumed to have been painted a number of times prior to the 1978 ban on paint containing greater than 0.06 percent lead. Any bridge painting and cleaning conducted prior to 1978 could have resulted in potential lead contamination in the soil under the bridge approaches.

Oil & Gas Wells

No oil or gas wells are mapped within the Study Area; however, abandoned oil and gas wells that are unmapped and not easily identifiable in the field could potentially be present within the Study Area.

Waste Disposal Sites

Two solid waste disposal facilities are located within the Study Area. One facility is listed as a transfer station near Barlow and the other facility is listed as an un-permitted landfill near Mound City. Both locations are shown on **Figure 6**. Although not mapped or disclosed, there is also a possibility of additional historic waste disposal sites or landfills located in the vicinity. As project development continues, additional review should be conducted to identify any historic landfills.

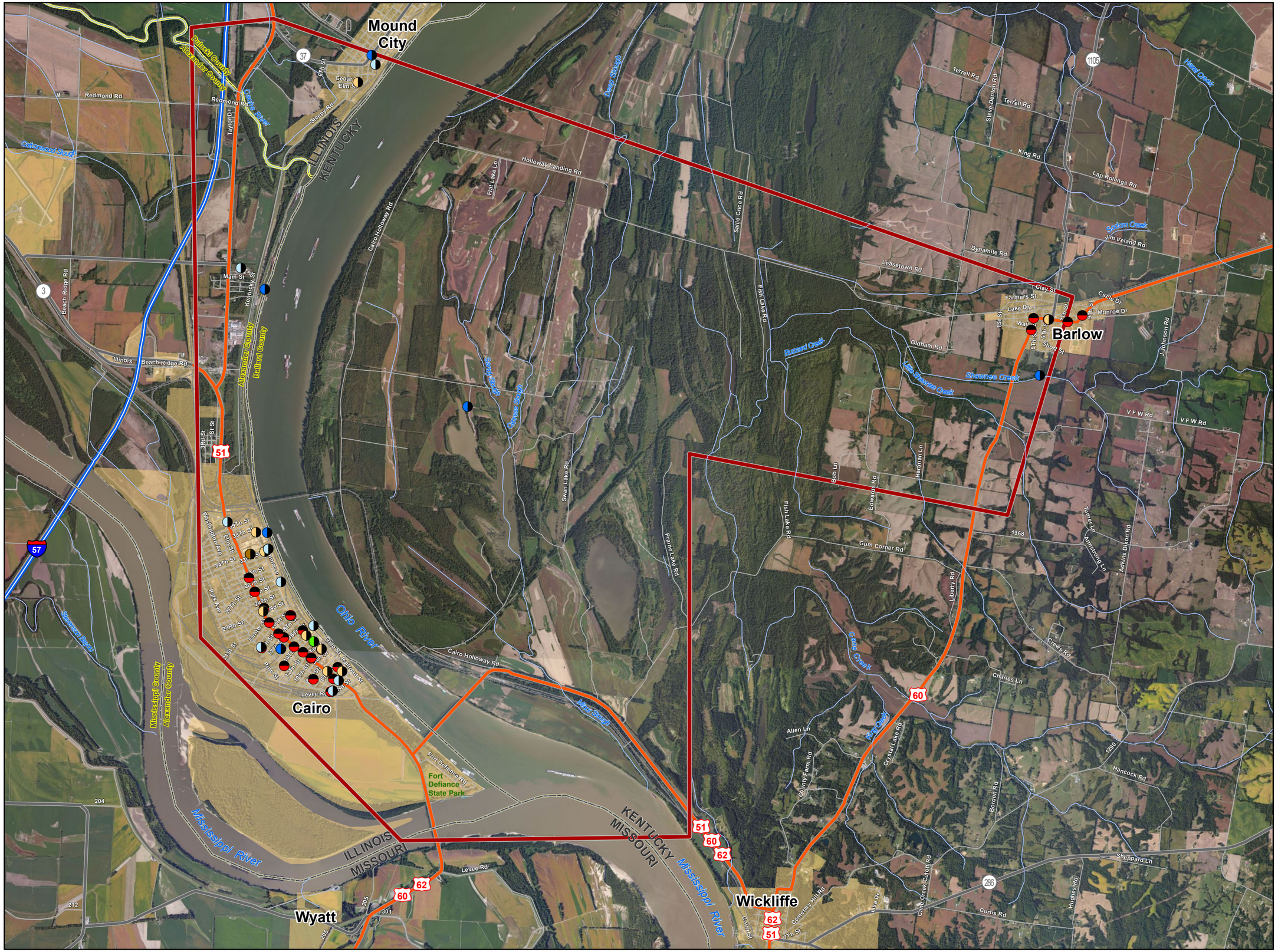


Figure 8

US 51
Ohio River Bridge

Hazardous Materials

Industrial Sites

Hazardous material and waste activities associated with current and historic industrial facilities can be expected in the Study Area. Scattered industrial development is present in the Study Area, primarily near the city of Cairo. Barlow does not represent a strong industrial concern due to land use being predominantly agricultural.

Underground Storage Tanks

Underground storage tank (UST) and hazardous material concerns for this project are similar to that of any other proposed highway development. Active and abandoned UST sites can be expected along major roadways within the Study Area. It can be assumed that convenience stores and gas stations with UST potential are located along Study Area roadways, particularly near Cairo, Mound City, Wickliffe and Barlow. Research identified 36 active and former UST sites located within the Study Area. Furthermore, it is possible that country stores and automotive repair facilities not previously identified are present along roadways in the Study Area that could also represent UST potential. Further investigation into the location of USTs is recommended as part of a future phase of work.

9. Summary of Red Flags

Potential red flag issues are those identified resources within the Study Area that should be carefully considered as the project moves forward. Those issues, summarized in **Table 7**, include:

- Section 4(f) resources – Several large wildlife refuges/preserves lie within the Study Area, plus a number of smaller parks and known historic resources. To the extent possible, these resources should be avoided as alternatives are developed.
- Environmental Justice communities – The community of Cairo exhibits elevated concentrations of minority and low income populations. As the bridge provides an important link between communities and access to jobs, alternatives should be developed to avoid disproportionately affecting these groups.
- Threatened/Endangered species habitat – A number of known federally listed species occur in the Study Area. This includes known nest sites for Interior Least Tern and Bald Eagles. There is also a known maternity colony and potential summer habitat for Indiana bat. Surveys and additional coordination with USFWS will be required.
- Streams, floodplains, and wetlands
- Prime and statewide importance farmlands
- Hazardous materials sites and UST locations

Table 7: Summary of Red Flag Environmental Issues

Category	Identified Issues in Study Area
Geology & Soils	- New Madrid seismic zone - Potentially severe and seasonal flooding
Water Resources	- Groundwater Wells (Figure 2) - Rivers & Streams (Figure 2) - Floodplains (Figure 2) - Wetlands (Figure 3)
Ecological Resources	- Boatwright Wildlife Management Area (Figure 4) - Axe Lake Swamp State Nature Preserve (Figure 4) - Cypress Creek National Wildlife Refuge (Figure 4) - Other natural habitats for threatened & endangered species
Community Resources	- Prime & Statewide Importance Farmlands (Figure 5) - Potential Environmental Justice Populations in Illinois - Cairo Parks: Fort Defiance, Halliday Park, & Saint Mary's Park - Scenic Byways along US 51 - 70+ mile detour per direction
Air Quality	- No key issues identified
Noise	- Sensitive receptors concentrated in Cairo, Wickliffe, Barlow, & Mound City
Cultural & Historic Resources	- Two NRHP Archaeological Sites: Levee in Barlow Bottoms & Mound City Marine Ways - Two NRHP Historic Districts: Cairo & Mound City National Cemetery (Figure 7) - Three NRHP Listed Properties: Barlow House, Magnolia Manor, & Old Customs House (Figure 7) Two NRHP Eligible Structures: US 51 Bridge, US 60/US 62 Bridge (Figure 7)
Hazardous Materials	- Lead contamination under Bridge - Two waste disposal sites: Barlow transfer station, Mound City landfill (Figure 6) - Environmental concern sites (Figure 8) - Industrial sites along Illinois riverfront - Known UST locations (Figure 8)

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Appendix A

Geotechnical White Paper

White Paper Geotechnical Study

US 51 Ohio River Bridge Scoping Study
Wickliffe, Ballard County, KY

March 18, 2013

Terracon Project Number: N1135002

Prepared for:

CDM Smith
Lexington, KY

Prepared by:

Terracon Consultants
Cincinnati, Ohio

Offices Nationwide
Employee-Owned
Established in 1965
terracon.com

Terracon

Geotechnical ■ Environmental ■ Construction Materials ■ Facilities

March 18, 2013

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Attn: Samantha Jones Wright, PE
Project Manager
P: [859] 254-5759 ext. 109
C: [859] 333-0138
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E: wrightsj@cdmsmith.com

Re: White Paper Geotechnical Study
US 51 Ohio River Bridge Scoping Study
Wickliffe, Ballard County, KY
Terracon Project Number: N1135002

Dear Ms. Wright:

Terracon Consultants, Inc (Terracon) has completed the white paper geotechnical study for the US 51 Ohio River Bridge Scoping Study. This study was performed in general accordance with the agreement dated December 18, 2012. This report presents the findings from screening existing archive boring logs, geological survey maps and geological survey publications. Recommendations for a geotechnical subsurface investigation are also provided.

Sincerely,
Terracon Consultants, Inc.

Nancy Dendramis, E.I.T
Staff Geotechnical Engineer

RadhaKrishna M. Daita, P.E.
Project Geotechnical Engineer

Ronald J. Ebelhar, P.E.
Senior Principal

TABLE OF CONTENTS

EXECUTIVE SUMMARY ..... **i**

1.0 INTRODUCTION **1**

2.0 PROJECT DESCRIPTION **1**

2.1 Project Location 1
2.2 Purpose 1
2.3 Bridge Historical Background and Recent Inspection 2

3.0 GEOTECHNICAL DATA SUMMARY **2**

3.1 Geologic History 3
3.2 Regional Geologic Formation Descriptions 3
3.3 Archive Boring Records 5
3.4 Groundwater 7
3.5 Bridge History and Foundations 7

4.0 POTENTIAL GEOLOGICAL HAZARDS **10**

4.1 Seismic Risk 10
4.2 Other Geological Hazards 13

5.0 RECOMMMENDATIONS FOR GEOTECHNICAL STUDY **14**

5.1 Subsurface Investigation 14
5.2 Laboratory Investigation 14
5.3 Engineering Analyses 15

6.0 EXISTING BRIDGE INVESTIGATION **15**

6.1 Destructive and Non-destructive Field Testing 15
6.2 Laboratory Testing 15

7.0 GENERAL COMMENTS **16**

8.0 REFERENCES **16**

APPENDIX A - SITE MAPS, GEOLOGY QUDRANGLES, CONSTRUCTION PLANS

Exhibit A-1 Site Location Map
Exhibit A-2 Site Topographic Map (West)
Exhibit A-3 Site Topographic Map (East)
Exhibit A-4 Geologic Quadrangles
Exhibit A-5 1936 Bridge Plan Drawings

APPENDIX B - BORING LOCATION MAP, ARCHIVE BORINGS, SUMMARY TABLE

Exhibit B-1 Historical Subsurface Study & Well Vicinity Map
Exhibit B-2 Handwritten Logs from 1997 Inspection Report
Exhibit B-3 Cairo Bridge Commission Survey and Boring Data
Exhibit B-4 to B-7 IDOT Logs interactive ISGS Database
Exhibit B-8 USACE Boring Summary Table

APPENDIX C – GEOLOGIC FAULT MAP, SEISMIC STUDY RESULTS

Exhibit C-1 Geologic Fault Map
Exhibit C-2 Seismic Study Results

APPENDIX D – LEVEE WALL, WETLAND AND KARST POTENTIAL MAPS

Exhibit D-1	USACE Levee Wall Location Map
Exhibit D-2	KGS Generalized Land Use Map with Wetland Location
Exhibit D-3	KGS Known Karst Risk Potential

EXECUTIVE SUMMARY

A white paper geotechnical study has been performed as part of a comprehensive US 51 Bridge Scoping Study. The existing bridge is under consideration for remediation and/or reconstruction. Preliminary geotechnical data has been assembled for the bridge study; findings and considerations are as follows:

- The US 51 Bridge conveys traffic over the Ohio River between Wickliffe, Ballard County, Kentucky and Cairo, Alexander County, Illinois. The topography both east and west of the River is generally level with ground elevations ranging between 310 and 315 feet.
- The site is located within the Mississippi (Gulf) Embayment physiographic region with typically thick layers of granular and cohesive deposits with deep bedrock. The study site subsurface stratigraphy has been extrapolated from surficial and bedrock geologic quadrangle maps and other documentation published by USGS, KGS and ISGS.
- Archive records from subsurface investigations near the project site were found from a variety of sources including an old bridge inspection report, quadrangle maps (USGS and ISGS), and ISGS and KGS archive databases for borings performed in Alexander County, IL and Ballard County, KY respectively. Approximate locations for borings with available records are shown in the Historical Subsurface Study and Well Vicinity Map.
- Based on the original 1936 bridge construction drawings of the bridge provided by Modjeski and Masters and by Baker, the bridge has 31 interior piers and two abutments. With the exception of the piers in the channel, the interior piers and both abutments are supported by pile caps on driven reinforced concrete piles. The construction drawing dimensions and soil stratigraphic profiles interpolated from archive records indicate that the piles extend into inter-layered granular and cohesive overburden. The interior piers within the channel are supported on caisson foundations embedded and bearing in alluvial soils.
- Data to adequately represent existing soil and bedrock conditions and to furnish information for engineering recommendations were not found for the subject site during this white paper geotechnical study. It is recommended that new soil test borings (SPT and CPT soundings) be performed per the KYTC Geotechnical Manual specifications.
- Based on Missouri Department of Natural Resources maps and USGS publications, the project footprint is not located above any known geologic faults; however the site is within the potentially active New Madrid seismic zone. A preliminary seismic analysis has been performed for the scoping study.
- Based on USACE records, the average Ohio River pool stage elevation is at 297 feet and the 50-year flood stage is 329 feet. Surrounding ground surface elevations are between 310 and 315 feet. Historically, the site has experienced local and regional flooding. With the exception of the 4 interior piers in the channel, the interior piers of the existing bridge are within flood plains east and west of the Ohio River.

- Other local geotechnical hazards including karst, landslide potential and mining activity were evaluated. Based on topographical maps and other published data for KGS, ISGS, and USGS, the project site does not contain any known karst hazard. Due to the generally level ground surface topography, landslide risk is expected to be low. Geomorphic evidence of surficial movement could be obtained by on-site field inspection. Mining history investigations for Alexander County, IL and Ballard County, KY have produced no evidence of current mining activity or evidence of abandoned mines at or near the project site.

File and archive data are the primary focus of this report and are for screening purposes only. Present and historical observations at the site may not reflect long-term conditions. This summary should be used in conjunction with the entire report. It should be recognized that details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled **GENERAL COMMENTS** should be read for an understanding of the report limitations.

US 51 OHIO RIVER BRIDGE SCOPING STUDY
WICKLIFFE, BALLARD COUNTY, KENTUCKY

Terracon Project No. N1135002

March 18, 2013

1.0 INTRODUCTION

The purpose of this project (KYTC 6YP Numbers 1-100.00 and 1-1140.0) is to study the salient aspects for the replacement or rehabilitation of the US 51 Bridge between Cairo, Alexander County, Illinois and Wickliffe, Ballard County, Kentucky.

A project team under CDM Smith, Inc. has been assembled to provide a scoping study report for the existing 75-year old Composite Span Bridge (004B00021N) with provision for a safe, reliable roadway giving due consideration to future transportation needs and appropriate corridor alternatives. The project team with their respective disciplines includes the following:

CDM Smith, Inc.	Planning/Environmental
Michael Baker Jr, Inc.	Bridges
Palmer Engineers	Roadway
Third Rock	Environmental Overview
EHI Consultants	Environmental Justice and DBE Coordinator
Terracon Consultants	Geotechnical Engineering
Daryl Armstrong	Media Relations and Public Involvement
Tim Hagerty	NEPA Legal Sufficiency

2.0 PROJECT DESCRIPTION

2.1 Project Location

The project site consists of the US 51 Bridge over the Ohio River just upstream from the confluence between the Ohio River and the Mississippi River in Ballard County, Kentucky and Alexander County, Illinois (see Exhibit A-1, Appendix A).

2.2 Purpose

The purpose of the geotechnical white paper study for the US 51 bridge replacement/rehabilitation was to review available geologic information and archive data to conceptually characterize the subsurface conditions and summarize the geotechnical considerations within the proposed study area. This report summarizes our findings and provides an overview of the general geotechnical findings relevant to the bridge replacement/rehabilitation.

2.3 Bridge Historical Background and Recent Inspection

The existing US 51 Bridge consists of a two-lane, composite span, cantilevered Warren-type through-truss bridge completed in 1936 to span the Ohio River and connect Ballard County, Kentucky with Alexander County, Illinois (see bridge plans Exhibit A-4, Appendix A). The existing steel truss bridge on 31 reinforced concrete interior piers and abutments was designed by Modjeski, Masters, & Case Engineers and constructed by the Mt. Vernon Bridge Company with oversight from the Cairo Bridge Commission in conjunction with the Federal Emergency Administration of Public Works and the respective highway departments of Illinois and Kentucky. The bridge was opened to vehicle traffic on November 11, 1936.

The bridge was rehabilitated in 1979 and has undergone regular safety inspections. The most recent inspection revealed that the existing bridge is rated functionally obsolete with a sufficiency rating of 35.4. The structure width is narrow at 22.6 feet curb to curb with an approaching roadway width of 24 feet including shoulders. The deck geometry and approach alignment are “intolerable.” Presently the bridge carries more than 5,000 vehicles daily from US 51, US 60, and US 62 connecting the US 60/US 62 Mississippi River Bridge to Bird’s Point, Missouri at the southern tip of Illinois.

3.0 GEOTECHNICAL DATA SUMMARY

Given the findings from the recent inspection concluding that the US 51 bridge is in need of replacement or rehabilitation, a white paper geotechnical study was begun in order to conceptually characterize the subsurface conditions and summarize the geotechnical considerations within the proposed study area. The geotechnical study summary included in this report is based on available United States Geological Society (USGS), Kentucky Geological Society (KGS), and Illinois State Geological Society (ISGS) topographic maps, surficial geologic maps, bedrock geologic maps, archive boring logs, boring log summaries, and other published data.

The study site (Exhibit A-1 in Appendix A) for this report is focused on the area along US 51 at the roadway, abutments and interior spans of the US 51 Bridge. The existing topography east and west of the existing bridge is mostly level flood plain with ground surface elevations between 310 feet and 315 feet. The surficial soils within the study area consist of Holocene alluvial silt and sand (see Exhibits A-2, A-3, and A-4 in Appendix A). Based on US Army Corp of Engineers (USACE) records, the pool stage of the Ohio River at the US 51 bridge is 295 feet elevation and the 50-year flood stage is at Elevation 329.0 feet.

3.1 Geologic History

The existing US 51 bridge is near the northern end of the Mississippian (Gulf) Embayment, a physiographic feature of the South Central United States. Sedimentation from the Cretaceous to present has filled the continental rift generating significant water-bearing layers in between occluding layers within the Mississippi Valley (USGS publications). A broad, generalized cross section diagram of the Mississippi Embayment Aquifer illustrating the sedimentary deposits at the southern end of the present day Embayment stratigraphy is shown below.

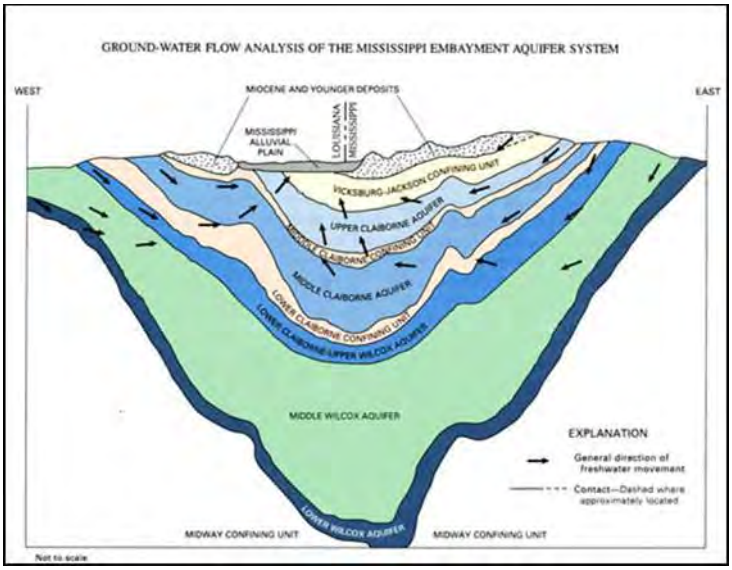


Figure 1. Mississippi Embayment Stratigraphy

3.2 Regional Geologic Formation Descriptions

Generalized stratigraphic layers expected at the subject site are listed in the table at the end of this section and summarized in the text below. These layers are based primarily on the subsurface data provided on the ISGS Cairo/Wyatt geology quadrangle map.

The west bank of the Ohio River upstream of the bridge location (see ISGS Cairo Quadrangle Map, Appendix A) contains surface layers of unconsolidated Holocene layers defined as the *Cahokia Formation ($Qc_{(C)}$)*. Historic meandering of the Mississippi and Ohio Rivers has generated these layers and sand bars which are overlain by a flood veneer of silt and silty clay. The thickness of these layers varies widely due to erosion and flooding. (See figure below). Varying thicknesses of quaternary deposits (Q_{al}) are present in some locations underlying the Cahokia formation (not shown in the diagram, see table below). These deposits generally include silt (derived mainly from loess) underlain by Metropolis Formation (Q_m) silty sand and sandy silt with chert gravel followed by a layer of angular to rounded chert pebbles up to several inches in diameter.

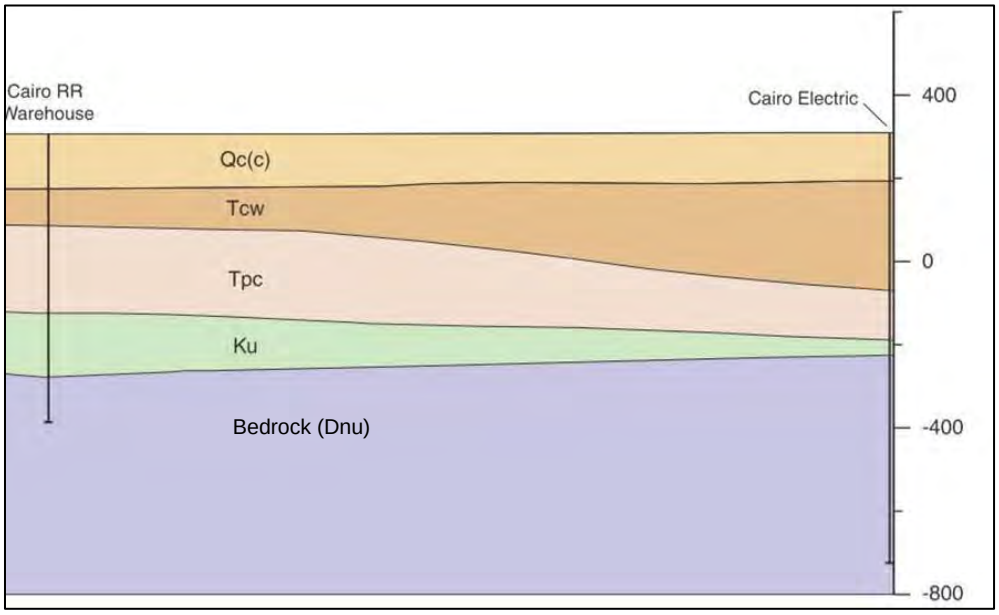


Figure 2. General Stratigraphy North of the Subject Site (Reproduced from ISGS Cairo Geologic Quadrangle)

Below the quaternary surface layers is a geographically-widespread, well-defined thick layer in the Mississippian Embayment, *Claiborne-Wilcox Formation* (T_{cw}), with sand, silt and clay deposits containing well-rounded and polished sand-sized chert particles, mica, and clay balls up to 2" in diameter. The Claiborne-Wilcox is underlain by a stiff, massive clay bed, *Porters Creek Clay Formation* (T_{pc}). The clay mineral is dominantly *montmorillonite*. Four additional unconsolidated layers (K_U) underlie the clay above the bedrock. Top of rock, the *New Harmony Group* (D_{nu}), consists mainly of chert 350 to 650 feet thick above cherty limestone and argillaceous limestone.

Table 1, Regional Geologic Formation Stratigraphy

Stratum	Formation	Approximate thickness[1] (feet)	Material Encountered[2]	
			Illinois (Alexander county)	Kentucky (Ballard county)
Stratum 1	Lower Cahokia Formation ($Qc_{(c)}$)	0-50	clay overlain by a veneer of silt and silty clay flood deposition	Not present
Stratum 2	Quaternary Alluvium (Q_{al})	0-175	Sand, silt and gravel	Sand, silt and gravel
Stratum 3	Peoria Silt, Roxana Silt and Loveland Silt	Thin to not present	Silt derived from loess	

Stratum	Formation	Approximate thickness[1] (feet)	Material Encountered[2]	
			Illinois (Alexander county)	Kentucky (Ballard county)
Stratum 4	Metropolis Formation (Q_m) underlain by Mounds Gravel	Thin to not present	Silty sand and sandy silt with chert pebbles underlain by sub-angular to rounded fine to coarse chert gravel	
Stratum 5	Claiborne-Wilcox Formations (T_{cw})	90-150	Sand, silt and clay with well rounded sand sized chert particles, mica, and clay balls up to 2" in diameter	
Stratum 6	Porters Creek Clay Formation (T_{pc}),	0-50	Clay, dark gray to dark olive gray, predominantly montmorillonite	
Stratum 7a	Clayton Formation & Owl Creek Formation (K_u)	Unknown	Sand and clay	
Stratum 7b	McNairy Formation and Post Creek Formation (K_u)	Unknown	Sand silt and clay underlain by cherty gravel with pyritic sand and clay filling depressions in the bedrock	
Bedrock[3,4]	New Harmony Group (D_{nu})	350-650	Chert grading to cherty limestone and argillaceous limestone.	

[1]Thickness varies with location
[2]Interpolated from Cairo, Barlow, Wyatt, and Wickliffe geologic quadrangles (USGS, ISGS)
[3]Depth to bedrock expected at >200 feet below ground surface at the project site
[4]Lower Devonian to upper Silurian

3.3 Archive Boring Records

Archive records for subsurface investigations performed near the project site were found from multiple sources including archive records provided by Modjeski and Masters Engineering, an old bridge inspection report, quadrangle maps (USGS and ISGS), and ISGS and KGS archive databases. Soil depths and soil descriptions (rock descriptions where encountered in Ballard County wells) are provided below:

1. The 1997 US 51 Bridge Inspection Report contained four handwritten boring logs (Exhibit B-2, Appendix B) included on the original plan and profile page of the 1931 Bridge proposal submitted by Modjeski, Masters & Case Engineers. The borings were noted as "typical" and were performed 3000 feet upstream from the project during the proposal period prior to construction of the original bridge. Soil type and thicknesses were recorded but blow count, density or consistency remarks were not noted. The borings with depths varying between 90 feet and 200 feet deep encountered inter-layered granular and cohesive overburden soils.

2. The archive records provided by Modjeski and Masters Engineering contained 15 logs of borings performed along the US 51 Bridge alignment included on the Cairo Bridge

Commission Ohio River Bridge Survey and Boring Data 1936 Supplemental Drawing No. 1; Modjeski, Masters & Case Engineers (Exhibit B-3, Appendix B). Soil type and thicknesses were recorded but blow count, density or consistency remarks were not noted. The borings encountered inter-layered granular and cohesive overburden soils.

Fourteen of these logs are represented on the USGS Wickliffe Quadrangle map as Cross-Section A-A' (see quadrangle map, Appendix A). The diagram shown below illustrates the soil stratigraphic profile interpolated from borings along the existing bridge alignment. These borings are between 100 feet to 150 feet deep and extend through alluvial deposits (Q_{al}) and all but two terminate in the Caliborne (T_c) Formation. Bedrock was not encountered in these borings.

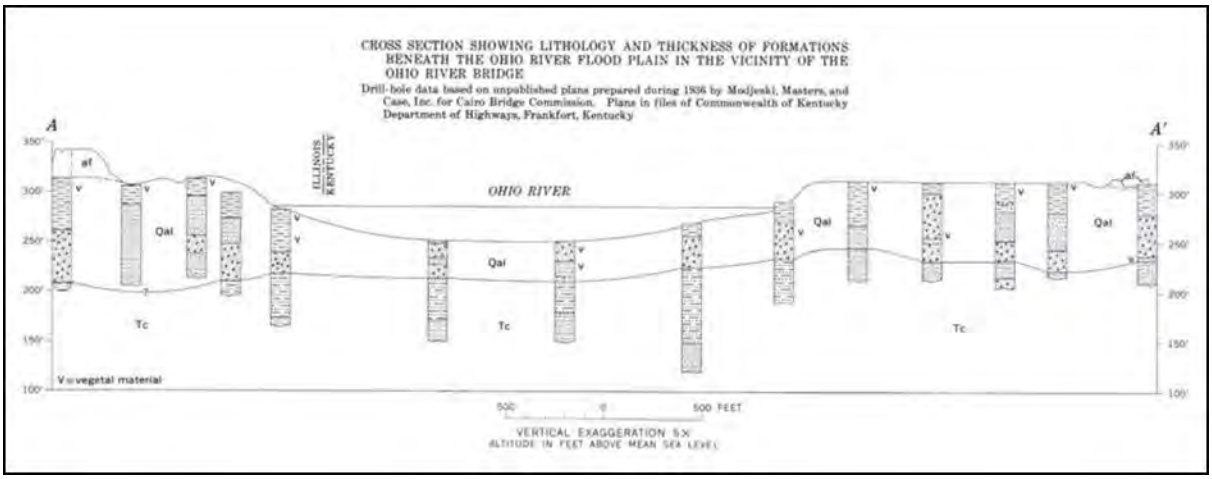


Figure 3. Stratigraphy Profile at US 51 Bridge
(Reproduced from USGS Wickliffe Quadrangle Map)

3. Four archive boring logs contained in the ISGS archive boring log database are from the test borings performed along Interstate 57 in Alexander County, IL between 1965-1969 and in 2000. The site is shown on the Boring Location Plan Map (Exhibit B-1) and the boring logs identified as Exhibits B-4 to B-7 are attached in Appendix B. These borings with depths varying between approximately 65 feet to 152 feet encountered soft to stiff cohesive soil and very loose to very dense granular deposits. Blow count data was not recorded.

4. The KGS Well Sample Database contained six Ballard County, KY archive (1921-1988) boring logs for wells drilled to depths between 1020 feet to 3415 feet. Please refer to the Boring Location Plan (Exhibit B-1) in Appendix B for the general location of these wells. The well logs describe the encountered overburden as inter-layered cohesive and granular. No blow count, density, or consistency data was noted. In five of the borings located north and east of the project site, bedrock was encountered between depths of

340 and 450 feet. The sixth boring located south of the project site encountered bedrock at 1000 feet deep.

5. Fifty-five USACE borings were performed upstream from the study site at the Cairo railroad bridge and at Mound City, IL. The Boring Location Plan Map (Exhibit B-1) in Appendix B shows the general location of these test borings. Boring logs were not available; however, elevation data for the top of Claiborne, Wilcox, and Porters Creek Clay Formations are tabulated on the USGS East Cairo and Barlow Quadrangle map. The tables have been reproduced and are attached in Exhibit B-14 in Appendix B.

3.4 Groundwater

Groundwater is expected to be within the granular layers overlying the Porters Creek Formation and confined to the water-bearing granular layers between well-defined occluding cohesive layers. Groundwater levels are also dependent on seasonal variations and the pool elevation of Ohio River. The region is dotted with wells penetrating the Mississippian Embayment Aquifer for public, domestic, industrial, irrigation, observation, and livestock use.

3.5 Bridge History and Foundations

Based on the original 1936 construction drawings of the bridge provided by Modjeski and Masters and by Baker, there are 31 interior piers and two abutments (Bridge Plans - Exhibit A-4, Appendix A). Interior piers I-5 to I-1 and A, listed from west to east, are on the Illinois side of the river channel. Interior piers B, C, D, and E (west to east) are within the river channel. Interior piers F and K-1 to K-20 are on the Kentucky side of the river channel. With the exception of the piers in the channel, the interior piers and both abutments are supported by pile caps on driven reinforced concrete piles. The interior piers within the channel are supported by caisson foundations bearing in inter-layered granular and cohesive alluvial soils. At some locations, the piles may be tipped into the mostly-granular Claiborne Formation. Relevant dimensions and elevations are contained in the following table.

Table 2. Summary of Existing Bridge Foundation Support Details

Pier ID[1]	Ground Surface Elevation (feet) (Mud Line at B-F)	Elevation at Top of Pile Cap (feet)	Bottom of Caisson Footing Elevation[3]	Embedment Depth (feet)	Pile Length (feet)	Number of Piles[2]	Dimensions
I-5	309.5	306.0		3.5	35.5	17	16” x 16” driven, jetted piles grouped under pile cap
I-4	310.0	306.0		4.0	35.5	21	
I-3	306.4	303.0		3.4	35.5	21	
I-2	314.4	311.0		3.4	35.5	21	
I-1	329.3	309.0			35.5	26	
A	314.0	309.0		5.0	40.5	58	
B	283.8		215.0	68.8			71’ x 33‘ (caisson base)
C	251.2		200.0	51.2			
D	250.8		205.0	45.8			
E	268.8		220.0	48.8			
F	280.0		234.0	46.0			50’ x 20’ (caisson base)
K-1	304.0	298.0		6.0	35.5	38	16” x 16” driven, jetted piles grouped under pile cap
K-2		307.0			35.5	32	
K-3		307.0			35.5	32	
K-4		307.0			35.5	30	
K-5	312.0	307.0			35.5	30	
K-6	312.0	307.0			35.5	28	
K-7	312.0	307.0			35.5	28	
K-8	312.0	307.0			35.5	28	
K-9		298.0			35.5	26	
K-10	312.0	308.0		4.0	35.5	21	
K-11	311.0	308.0		3.0	35.5	21	
K-12	310.0	307.0		3.0	35.5	21	
K-13	310.3	307.0		3.3	35.5	21	

Pier ID[1]	Ground Surface Elevation (feet) (Mud Line at B-F)	Elevation at Top of Pile Cap (feet)	Bottom of Caisson Footing Elevation[3]	Embedment Depth (feet)	Pile Length (feet)	Number of Piles[2]	Dimensions
K-14	308.0	305.0		3.0	35.5	17	
K-15	310.5	307.0		3.5	35.5	17	
K-16	309.7	306.0		3.7	35.5	17	16” x 16” driven, jetted piles grouped under pile cap
K-17	309.5	306.0		3.5	35.5	15	
K-18	305.0	302.0		3.0	35.5	15	
K-19	309.5	306.0		3.5	35.5	14	
K-20	314.5	309.0		5.5	35.5	13	

[1]Piers are listed in order from west to east (Illinois to Kentucky)
[2]See Construction Drawings for Pile Group Layout for Piers I-5 to I-1, Pier A, and Piers K-1 to K-20 (Exhibit A-4, Appendix A)
[3]Bridge Piers B-F are supported on embedded caisson foundations

4.0 POTENTIAL GEOLOGICAL HAZARDS

Various geological conditions were investigated for potential risk to the existing structure and for potential impact on future improvements. These include:

- Seismic risk and known geologic faults
- Flooding, levees and wetlands
- Karst
- Landslide history
- Mining history
- Scour

4.1 Seismic Risk

Based on Missouri Department of Natural Resources maps and USGS publications, the project footprint is not located above any known geologic faults (Exhibit C-1 - KGS Faults Map, Appendix C); however, the existing bridge is at risk for seismic activity due to its location within the New Madrid Seismic Zone.

The following paragraphs summarize relevant information related to the seismic hazard. The selection of the design seismic event will have a significant impact on the seismic loads used for evaluation and design of a renovated or a replacement bridge.

The New Madrid Seismic Zone is a major seismic zone and a prolific source of intraplate earthquakes (earthquakes within a tectonic plate) in the southern and midwestern United States, located near New Madrid, Missouri. The New Madrid fault system was responsible for the 1811–1812 New Madrid earthquakes and may have the potential to produce large earthquakes in the future. Since 1812, frequent smaller earthquakes have been recorded in the area.

Earthquakes that occur in the New Madrid Seismic Zone potentially threaten parts of seven American states: Illinois, Indiana, Missouri, Arkansas, Kentucky, Tennessee and Mississippi.

The 150-mile (240 km) long fault system, which extends into five states, stretches southward from Cairo, Illinois; through Hayti, Caruthersville and New Madrid in Missouri; through Blytheville into Marked Tree in Arkansas. It also covers a part of West Tennessee, near Reelfoot Lake, extending southeast into Dyersburg. Most of the seismicity is located between 3 and 15 miles (4.8 and 24 km) beneath the Earth's surface.

The zone had four of the largest North American earthquakes in recorded history, with moment magnitudes estimated to be as large as 8.0, all occurring within a three-month period between December 1811 and February 1812. Many of the published accounts describe the cumulative effects of all the earthquakes (known as the New Madrid Sequence); thus finding the individual effects of each quake can be difficult. Magnitude estimates and epicenters are based on interpretations of historical accounts and may vary.

The biggest quake since 1811–1812 was a 6.6-magnitude quake on October 31, 1895, with an epicenter at Charleston, Missouri. The quake damaged virtually all buildings in Charleston, creating sand volcanoes by the city, cracked a pier on the Cairo Rail Bridge and toppled chimneys in St. Louis, Missouri, Memphis, Tennessee, Gadsden, Alabama and Evansville, Indiana.

The next biggest quake was a 5.4-magnitude quake (although it was reported as a 5.5 at the time) on November 9, 1968, near Dale, Illinois. The quake damaged the civic building at Henderson, Kentucky and was felt in 23 states. It is the biggest recorded quake with an epicenter in Illinois in that state's recorded history.

Instruments were installed in and around the area in 1974 to closely monitor seismic activity. Since then, more than 4,000 earthquakes have been recorded, most of which were too small to be felt. On average, one earthquake per year is large enough to be felt in the area. A preliminary seismic analysis is included in Appendix C.

The map below shows earthquakes (circles) of the New Madrid and Wabash Valley seismic zones (orange patches). Red circles indicate earthquakes that occurred from 1974 to 2002 with magnitudes larger than 2.5 located using modern instruments (University of Memphis). Green circles denote earthquakes that occurred prior to 1974 (USGS Professional Paper 1527). Larger earthquakes are represented by larger circles.

KTC Research Report KTC-00-1 describes a general assessment of the seismic stability of highway embankments in Kentucky. This included an evaluation of the approach embankments for the subject US 51 Ohio River Bridge. There were no soil borings or engineering data obtained for this study and the same borings identified earlier in our report for the existing bridge were used for this general assessment. This report also describes the alluvial nature of the soil profile, consisting of the interlayered gravel, sand, silt and clay mentioned previously. The report concluded that liquefaction is highly likely in the alluvial soils near the bridge for a 500-year recurrence interval seismic event, resulting in loss of embankment stability and potential loss of abutments and bridge spans. Site-specific geotechnical exploration and testing is required to obtain parameters to further define the expected seismic performance of the soil profiles and their impact on existing or proposed bridges at this location.

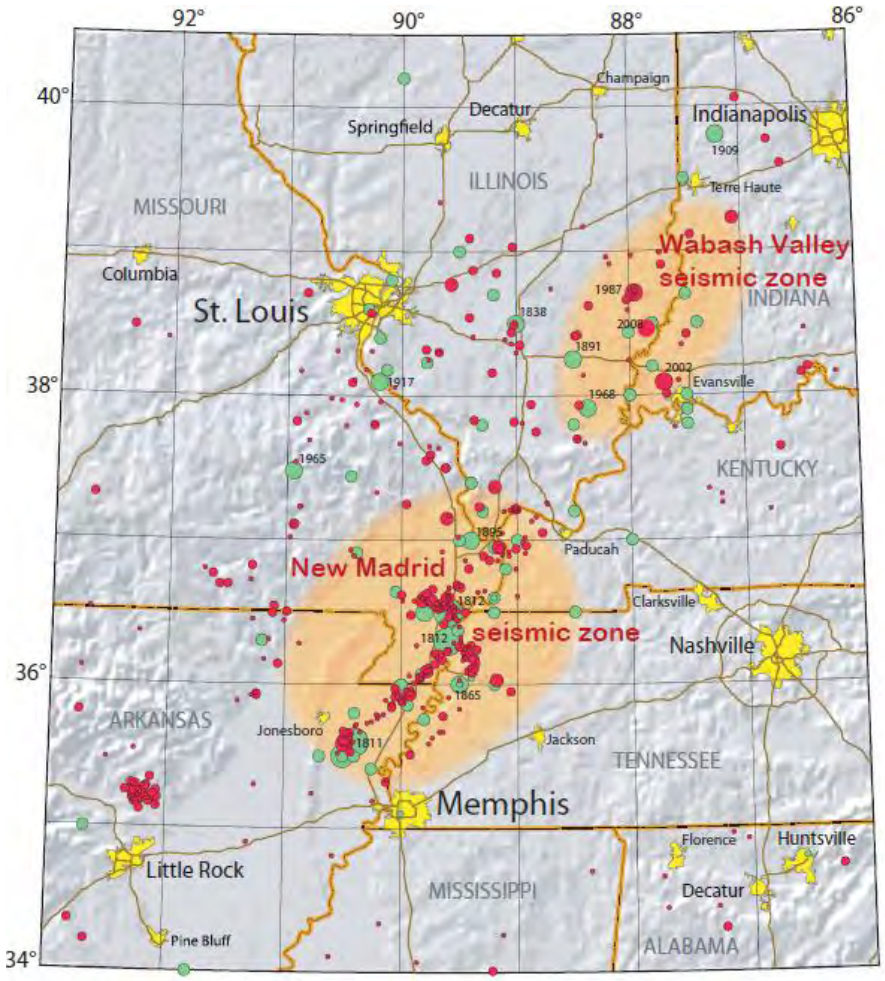


Figure 3. Recent Seismicity on New Madrid Seismic Zone (USGS)

The following tables summarize the findings of our preliminary seismic analysis.

Table 3. Seismic Site Classification

Code or Standard Used	Site Classification
2009 AASHTO [1]	E [2]

1. In general accordance with the 2009 AASHTO Guide Specifications for LRFD Seismic Bridge Design (seismic design event is 7% probability of exceedance in 75 years (recurrence interval of 1000 years).
2. The 2009 AASHTO Guide requires a site soil profile determination extending a depth of 100 feet for seismic site classification. Borings with engineering data adequate to determine the Site Class have not been performed. Since the possibility exists that soft or loose soils subject to cyclic softening or liquefaction due to seismic loading are present, site specific response analyses are required to fully characterize the ground response and Site Class and to obtain accurate ground motion parameters for design.

Table 4. Preliminary Ground Motion Parameters (USGS Website)

Ground Motion Parameter	Value (g)1,2
A_s	0.956
S_{DS}	1.701
S_{D1}	1.280

1. Latitude 36.993 and Longitude -87.472 degrees, for the assumed Site Class.
2. These parameters are preliminary and should be confirmed by site-specific response analyses

4.2 Other Geological Hazards

Historically, the tri-state region at the confluence of the Ohio River and the Mississippi River has experienced regular local and regional flooding; risk at the existing bridge for both severe and seasonal flooding is high. The channel normal pool stage elevation at Cairo is at 297 feet and natural surrounding ground surface elevations are at 310 to 315 feet. The project site has a tornado risk higher than the national average.

Flood risk has been mitigated locally in Alexander County, IL by the construction of levees to protect the residents of Cairo, IL (see Exhibit D-1, USACE map of levee wall locations, Appendix D). However, the bridge west abutment and interior piers on the Illinois side are outside the area protected by the levee wall.

Natural wetlands at major water ways have been used to allow for relief during seasonal pressure from flooding and are protected against development. In Ballard County along the Ohio River, the Kentucky Department of Fish and Wildlife (KDFW) Service manages over 8,000 acres of natural wetlands which provide both flood protection and wildlife protection (see Exhibit D-2, Wetland Location Map, Appendix D). The bridge east abutment and interior piers on the Kentucky side are within a flood plain and near the KDFW wetland preservation area.

Karst features are the result of limestone bedrock dissolution and are common in central western Kentucky. Based on topographical maps and other published data for KGS, ISGS and USGS, the project site does not contain any known karst hazards (see Exhibit D-3, Karst Risk Potential). A field survey should be performed to confirm absence of karst terrain.

Due to the generally level ground surface topography, landslide risk is expected to be low. Geomorphic evidence of surficial movement should be confirmed by on-site field inspection.

Mining history investigations for Alexander County, IL and Ballard County, KY have produced no evidence of current mine activity or evidence of abandoned mines at or near the project site. Interactive data-based maps show that Ballard County is located outside of the mined areas in Kentucky. Similar results were found for Alexander County. It is recommended that prior to any

subsurface investigation that recent applications for mining permits be investigated for potential activity near the project site.

Scour analysis is outside the scope of our investigation and scour studies for the existing bridge have not been reviewed. We recommend scour analysis as part of a comprehensive program to improve the US 51 bridge foundation performance at interior piers within the channel.

5.0 RECOMMMENDATIONS FOR GEOTECHNICAL STUDY

Data to adequately represent existing soil and bedrock conditions and to furnish information for engineering recommendations were not found for the subject site during this white paper geotechnical study. It is recommended that a subsurface geotechnical investigation be performed per KYTC and IDOT specifications.

5.1 Subsurface Investigation

The overburden investigation should include CPT soundings and SPT borings with split-spoon and Shelby tube sampling at abutments and interior pier locations. A barge-mounted drill rig may be used to access interior pier locations within the channel. Shear wave velocity measurements using applicable downhole tools (downhole seismic or P-S suspension logging) are recommended at representative locations.

Based on our study of the subject site, bedrock is expected to be deep (> 200 feet). We recommend extending at least two test borings into bedrock to determine top-of-rock depths to better define the site geology. Considering the site being within an existing flood zone, challenges in scheduling field exploration and subsequent construction may include planning around seasonal weather changes.

5.2 Laboratory Investigation

Upon completion of the field exploration, the recovered soil samples be visually examined by a geotechnical engineer. In addition, select recovered samples should be tested for index properties including grain-size distribution and Atterberg Limits. Specialized tests such as unconfined strength, triaxial, and consolidation should be performed on Shelby tube samples. Grain-size distribution results will enable future scour analyses and seismic analyses. Resonant column and cyclic simple shear tests on representative samples will be required to obtain accurate site-specific parameters for input into seismic analyses. Per KYTC subsurface investigation specifications, soil testing and Standard Proctor Tests should be performed on bag samples taken from potential borrow pits.

5.3 Engineering Analyses

The data obtained from the recommended subsurface exploration supplemented with the data gathered during this white paper study can be used to develop geotechnical engineering recommendations for proposed bridge rehabilitation/replacement. Engineering analyses to develop bridge foundation recommendations should also include evaluation of axial and lateral capacity of the support members, slope stability at the bridge abutments, abutment retaining wall analyses, settlement and downdrag on support members at bridge abutments, settlement of approach embankment, and seismic studies including site response analyses, liquefaction, seismic settlement and lateral displacement analyses.

6.0 EXISTING BRIDGE INVESTIGATION

The existing bridge, constructed more than 75 years ago, has aging members including the interior piers and their foundations. An investigation should be performed at select interior piers to confirm the structural integrity, composition and state of deterioration in order to predict longevity and to determine factors affecting future performance under expected loads.

6.1 Destructive and Non-destructive Field Testing

It is recommended that coring into pier concrete be performed at select interior pier locations. Multiple holes drilled into the pier concrete at specified depths will allow access for cross-hole sonic testing to better define the structural integrity and composition of the pier. A barge-supported drill rig mobilized to the site for soil test borings will facilitate access to the piers for concrete coring above and below the waterline.

Consideration should be given to certified diving inspectors to perform pier coring and a thorough visual inspection above and below the waterline. Due to the local availability of chert gravel, we expect aggregate composition in the concrete to include a significant portion of chert. The bridge inspection team should be equipped with the experience and proper drilling tools to core through tough chert aggregate.

6.2 Laboratory Testing

The obtained concrete core samples at the interior piers should be examined by petrographic analysis for characterization of the cementation and aggregate composition. Core samples should be examined visually and microscopically per ASTM 856 to determine the present condition of the concrete including the air void ratio, presence of fractures and evidence of decomposition due to chemical reactions. Air voids present in the concrete increase material durability and resistance to degradation due to freeze-thaw cycles.

7.0 GENERAL COMMENTS

The conclusions, analyses and recommendations presented in this report are based upon the available file data obtained from archive boring logs and from other information discussed in this report. File and archive data are the primary focus of this report and are for screening purposes only. Present and historical observations at the site may not reflect long-term conditions.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, and bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

8.0 REFERENCES

Geologic Quadrangle Maps

Wilson, W.J., 2008, Geology of Cairo Quadrangle, Alexander and Pulaski Counties, Illinois: Illinois State Geological Survey, Illinois Geologic Quadrangle Map, IGQ Cairo-G, 2 sheets, 1:24,000.

Olive, Wilds W., 1974, Geologic Map of the Wickliffe Quadrangle, Kentucky-Missouri, and the part of the Wyatt Quadrangle in Kentucky, GQ 1161, 1:24,000.

Olive, Wilds W., 1971, Geologic Map of parts of the Cairo and Barlow Quadrangles, Ballard County, Kentucky, GQ 885, 1:24,000.

Internet Interactive Sites

Kentucky Geologic Survey (KGS) interactive data base:
http://minemaps.ky.gov/
http://www.uky.edu/KGS/
http://kgs.uky.edu/kgsweb/DataSearching/OilGas/

USGS

http://waterdata.usgs.gov/nwis/gw
http://pubs.er.usgs.gov/

Illinois State Geologic Society (ISGS) interactive data base
http://www.isgs.uiuc.edu/maps-data-pub/wwdb/wwdb.shtml

USACE Nashville District
http://www.lrn.usace.army.mil/

Google Earth with USDA Soil Survey overlays:
Ballard County, Kentucky and Alexander County, Illinois

Google and Google Maps
https://www.google.com/

Sutterer, K.G., Harik, I.E., Allen, D.L., and Street, R., (2000), "Ranking and Assessment of Seismic Stability of Highway Embankments in Kentucky (KYSPR 96-173)", KTC-00-1 Research Report, Kentucky Transportation Research Center, College of Engineering, University of Kentucky, July 2000

APPENDIX A

APPENDIX A - TABLE OF CONTENTS

Exhibit A-1	**Site Location Map**
Exhibit A-2	**Site Topographic Map (West)**
Exhibit A-3	**Site Topographic Map (East)**
Exhibit A-4	**Geologic Quadrangles (4)**
Exhibit A-5	**1936 Bridge Plan Drawing**

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

SOURCE: GOOGLE MAPS

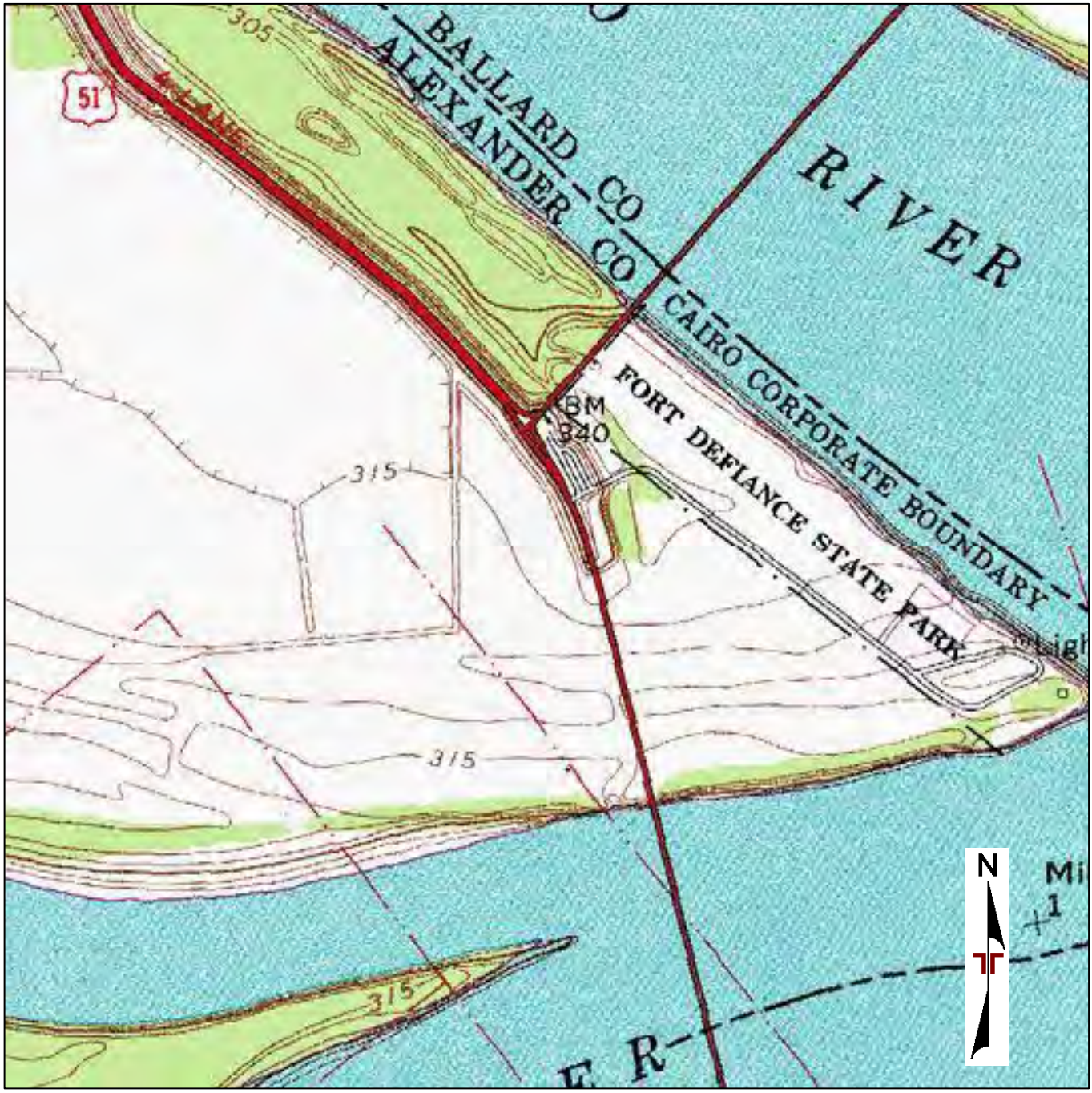
Project Manager:	NCD
Drawn by:	NCD
Checked by:	DRK
Approved by:	DRK
Project No.	N1135002
Scale:	As Shown
File Name:	A1
Date:	03-01-2013

Terracon
Consulting Engineers & Scientists
611 Lunken Park Drive Cincinnati, Ohio 45226
PH. (513) 321-5816 FAX. (513) 321-0294

SITE LOCATION MAP

US51 OHIO RIVER BRIDGE SCOPING STUDY
CDM SMITH
WICKLIFFE BALLARD COUNTY KENTUCKY

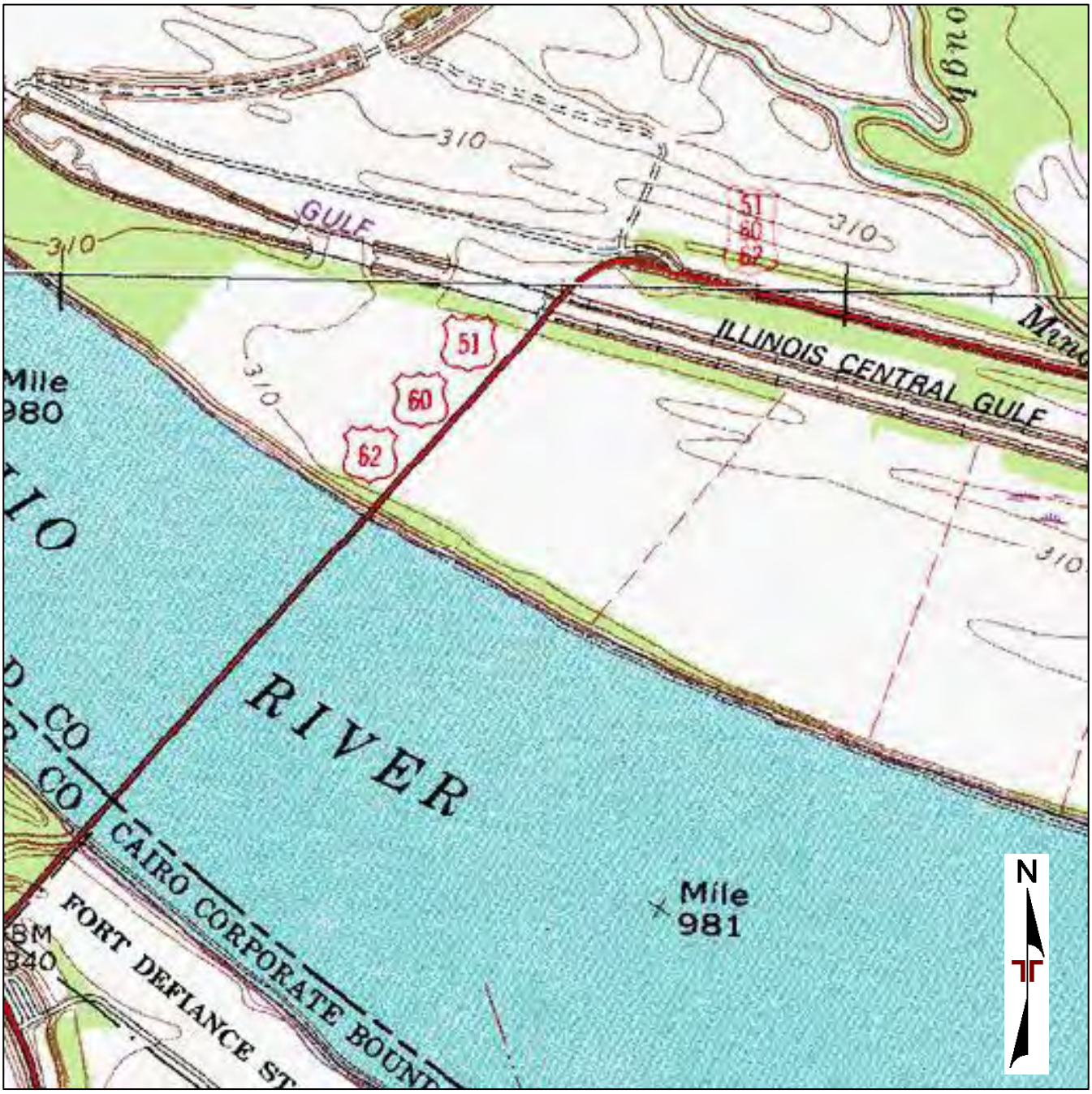
Exhibit
A-1



Source: Topoquest

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Manager: NCD	Project No. N1135002	Terracon Consulting Engineers & Scientists	SITE TOPOGRAPHIC MAP (WEST)	Exhibit
Drawn by: NCD	Scale: N.T.S	611 Lunken Park Drive Cincinnati, Ohio 45226	US51 OHIO RIVER BRIDGE SCOPING STUDY	A-2
Checked by: DRK	File Name: A-2	PH. (513) 321-5816 FAX. (513) 321-0294	CDM SMITH	
Approved by: DRK	Date: 03-01-2013		CAIRO ALEXANDER COUNTY ILLINOIS	



Source: TopoQuest

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

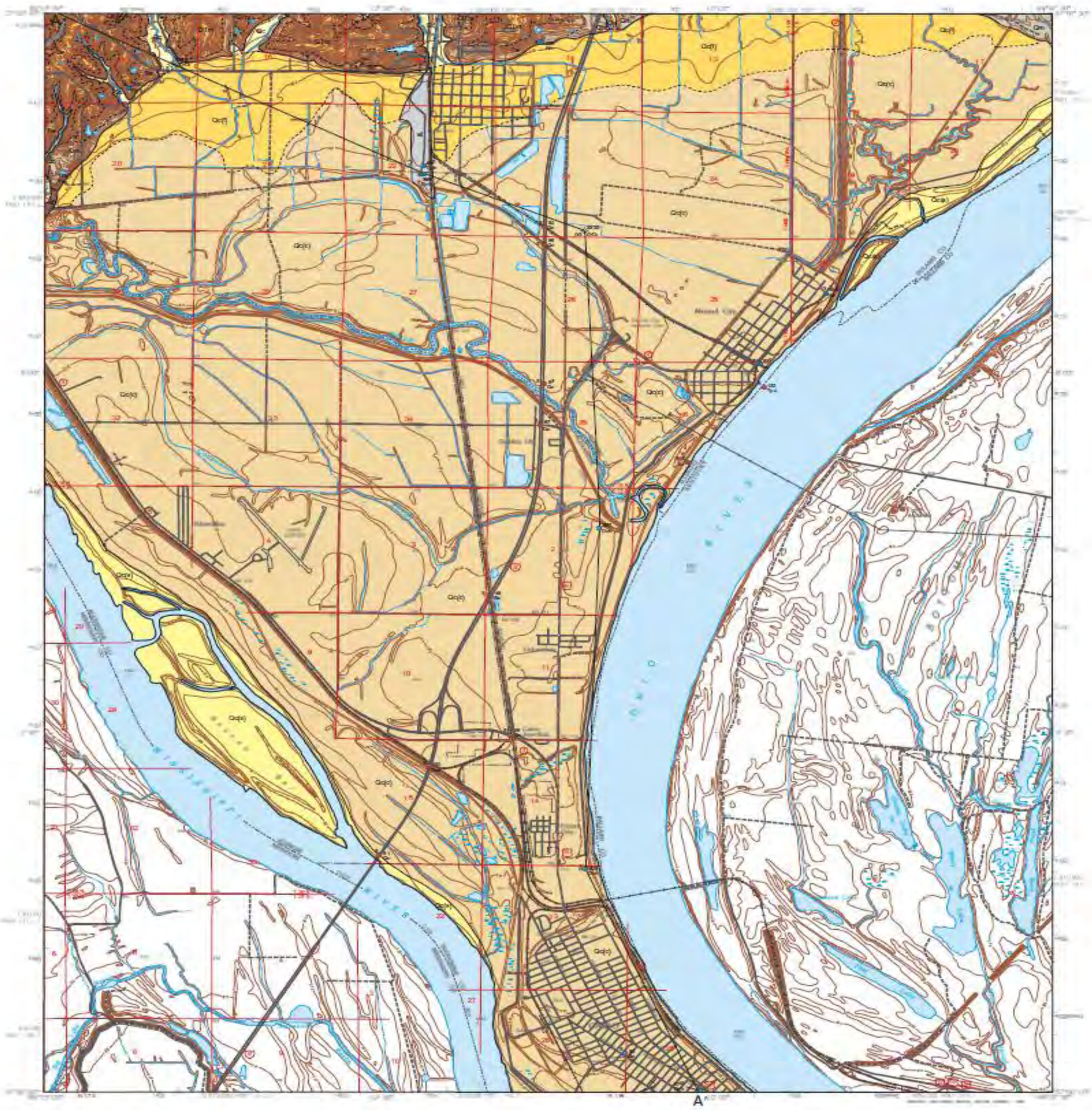
Project Manager: NCD	Project No. nN1135002	Terracon Consulting Engineers & Scientists	SITE TOPOGRAPHIC MAP (EAST)	Exhibit
Drawn by: NCD	Scale: N.T.S	611 Lunken Park Drive Cincinnati, Ohio 45226	US51 OHIO RIVER BRIDGE SCOPING STUDY	A-3
Checked by: DRK	File Name: S A-3	PH. (513) 321-5816 FAX. (513) 321-0294	CDM SMITH	
Approved by: DRK	Date: 03-01-2013		WICKLIFFE BALLARD COUNTY KENTUCKY	

Illinois Department of Natural Resources
ILLINOIS STATE GEOLOGICAL SURVEY
William W. Shilts, Chief

GEOLOGY OF CAIRO QUADRANGLE
ALEXANDER AND PULASKI COUNTIES, ILLINOIS

W. John Nelson
2008

Illinois Geologic Quadrangle Map
IGQ Cairo-G



EXPLANATION

	af	Artificial fill	
Quaternary	Qc(s)	Cahokia Formation (sandy deposits)	Holocene
	Qc(f)	(alluvial fans)	
	Qc(c)	(clayey deposits)	
	Unconformity		
	Qm	Metropolis Formation (loess cover not shown)	Pleistocene
	Unconformity		
Tertiary	Tmm	Mounds Gravel (loess cover not shown)	Pliocene
	Unconformity		
	Tw	Wilcox Formation (loess cover not shown)	Eocene

Note: Loess deposits, comprising the Peoria, Roxana, and Loveland silts, cover uplands near the northern edge of the map. Loess is not shown on this map.

Drill Holes
from which subsurface data were obtained

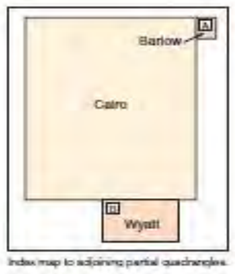
- Stratigraphic boring (ISGS)
- Water well
- Engineering boring
- Dry oil test hole

Numeric label indicates total depth of boring in feet. Borings with samples (s), geophysical log (G), or core (c). Unit label denotes formation at bottom (Tcw, Claiborne/Wilcox; Tpc, Porters Creek Clay/Clayton; Ock, Knox Group; Koc, Owl Creek; Km, McNairy; Dhh, New Harmony; br, bedrock). Dot indicates location accurate within 100 feet.

Line Symbols
Dashed where inferred; dotted where concealed

- Contact
- A—A' Line of cross section

Note: Well and boring records are on file at the ISGS Geological Records Unit and are available online from the ISGS Web site.



Index map to adjoining partial quadrangles

Partial Barlow Quadrangle

Scale 1:24,000

Partial Wyatt Quadrangle

Scale 1:24,000

Base map compiled by Illinois State Geological Survey from digital data provided by the United States Geological Survey. Planimetry of Illinois compiled by photogrammetric methods from imagery dated 1985. Topography partly by planetable surveys 1967. Revised from imagery dated 1993. PLSS and survey control current as of 1997. Map edited 1998. Contours not revised. Contours that conflict with revised planimetry are dashed.

North American Datum of 1983 (NAD 83)
Projection: Transverse Mercator
10,000-foot ticks: Illinois Illinois State Plane Coordinate system, east zone (Transverse Mercator)
1,000-meter ticks: Universal Transverse Mercator grid system, zone 16

Recommended citation:
Nelson, W.J., 2008, Geology of Cairo Quadrangle, Alexander and Pulaski Counties, Illinois: Illinois State Geological Survey, Illinois Geologic Quadrangle Map, IGQ Cairo-G, 2 sheets, 1:24,000

SCALE 1:24,000

BASE MAP CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Released by the authority of the State of Illinois: 2008

Geology based on field work and well-log analysis by W. John Nelson, 1999–2002.

Digital cartography by J. Domier, M. Widener, and J. Palmer, Illinois State Geological Survey.

The Illinois State Geological Survey, the Illinois Department of Natural Resources, and the State of Illinois make no guarantee, expressed or implied, regarding the correctness of the interpretations presented in this document and accept no liability for the consequences of decisions made by others on the basis of the information presented here. The geologic interpretations are based on data that may vary with respect to accuracy of geographic location, the type and quantity of data available at each location, and the scientific and technical qualifications of the data sources. Maps or cross sections in this document are not meant to be enlarged.

For more information contact:
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Champaign, Illinois 61820-6964
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http://www.isgs.uiuc.edu

ADJOINING QUADRANGLES
1 Tamms
2 Pulaski
3 Olmsted
4 Cache
5 Belknap
6 Charleston
7 Wyatt
8 Wickliffe

APPROXIMATE MEAN DECLINATION, 2008

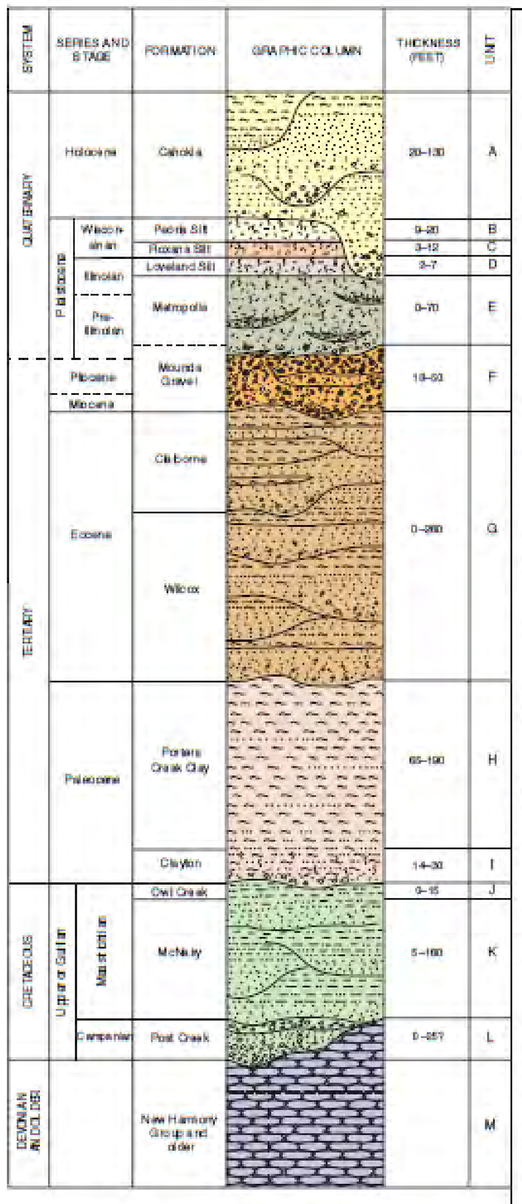
ROAD CLASSIFICATION
Primary highway, hard surface
Secondary highway, hard surface
Light-duty road, hard or improved surface
Unimproved road
Interstate Route
U.S. Route
State Route

N

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Manager: RJE	Project No. N1135002	Terracon Consulting Engineers & Scientists	ISGS CAIRO QUADRANGLE MAP
Drawn by: DRK	Scale: N.T.S	3601 Mojave Court, Suite A Columbia, Missouri 65202	US 51 OHIO RIVER BRIDGE SCOPING STUDY
Checked by: RJE	File Name: EXHIBIT A-4A	PH. (573) 214-2677 FAX. (573) 214-2714	CDM SMITH
Approved by: RJE	Date: 2/22/2013		CAIRO ALEXANDER COUNTY ILLINOIS

FIG No. A-4A



A Cahokia Formation Sand, gravel, silt, and clay Four surficial facies have been mapped.

1. Sand bars (map unit Qcs(i)) occur along the banks of the Ohio and Mississippi Rivers and as islands in the rivers. These landforms likely developed within historic time and are dynamically changing. In places, the sand is overlain by a veneer of silt and silty clay derived from overbank flooding. This unit interfingers with Qc(c) and overlies coarser sand and gravel.

2. Clayey deposits (map unit Qc(c)) encompass most of the map area. Surficial sediments are 13 feet to more than 25 feet thick and consist of mottled medium to dark gray and brownish gray clay, silty clay, and silt containing lenses of sand, mica flakes, iron-manganese and calcite nodules, and plentiful organic matter. These deposits grade downward to sand and gravel, which is not exposed at the surface. The sand is very fine to very coarse, composed of quartz and chert along with diverse sedimentary, igneous, and metamorphic rock fragments derived from glacial outwash. Gravel composition is similar to that of sand.

A small area of surficial sand was mapped by Parks and Fehrenbacher within this facies adjacent to the Cache River in Secs. 20 and 29, T16S, R1W (Parks and Fehrenbacher 1968). This area could represent one or more "sand blows" resulting from earthquake-induced liquefaction; given the location, however, a more likely explanation is washover of sand during a flood of the Mississippi River.

Arcuate ridge-and-swale topography that reflects buried meanders can be discerned on the topographic map and is clearly evident on aerial photographs. Prior to construction of natural levees, the area was regularly inundated during spring floods. Typical soils are the Darwin and Jacobs clays and the Cape, Karnak, and Pigeonville silty clays (Parks and Fehrenbacher 1968). Fisk (1944) mapped 20 stages of meander cutoffs in the Mississippi floodplain in Alexander County. Saucier (1994) also mapped the meander belt in less detail in this area.

3. Alluvial fans (map unit Qc(f)) border uplands along the northern edge of the map area. The gently sloping fans are composed of light-colored, poorly drained silt and silty loam of the Sorrento, Belknap, and Birds soils (Parks and Fehrenbacher 1968). These soils are derived from thick loess eroded from the uplands and deposited by streams flowing onto the floodplain.

4. Undifferentiated Cahokia (map unit Qc) is mapped on the floodplains of streams draining uplands at the northern edge of the map. This alluvial sediment is dominantly silt derived from loess and mixed with sand and gravel from Tertiary strata.

Alluvial deposits of the Mississippi River in the map area are up to at least 130 feet thick. Alluvium of the Ohio River is 50 to 100 feet thick onshore and as thin as 20 feet in the river (Olive 1971). The Cahokia Formation, as defined by Willman and Frye (1970), comprises alluvial sediments of Holocene age. Distinguishing Holocene from older alluvium within the map area is problematic. Pleistocene sand and gravel (e.g., Henry and Pearl Formations) have been thoroughly reworked into Holocene deposits. However, wood from sand at a depth of 120 feet in an Illinois Department of Transportation bridge boring in Sec. 15, T17S, R1W yielded a Holocene radiocarbon age of 3,350 ± 70 years.

B Peoria Silt Silt is yellowish gray to yellowish brown and light brownish gray, partly mottled, and massive to faintly laminated. Iron-manganese stains and pellets are common. The lower part is calcareous and contains small calcite nodules. The Peoria is loess, or wind-borne silt, deposited during the late Wisconsinan time on uplands near the northern edge of the map area. The modern soil is developed within this unit.

C Roxana Silt Silt is medium brown to reddish brown, massive, and more clayey than the Peoria (especially in the lower part). Portions of this unit may be slightly calcareous and may contain a few small calcite nodules. The Roxana is loess deposited during the middle Wisconsinan time on uplands near the northern edge of the map area. The Farrisdale Geosol is weakly developed in the upper part of this unit.

D Loveland Silt Silt is strongly mottled, yellowish and reddish brown, clay-rich, and massive with a hackly fracture. Clay skins are common, as are scattered sand grains and granules, especially in the lower part. The Loveland is loess deposited during the Illinoian time. The Sangamon Geosol is strongly developed in this unit.

E Metropolis Formation Silty sand and sandy silt with gravel. Sediments are strongly mottled gray, brown, yellowish gray, and yellowish orange and are massive to weakly stratified. Scattered pebbles and small lenses and layers of gravel are composed largely of chert pebbles derived from Mounds Gravel. These pebbles are worn and bleached, and the brown patina has been partially removed. Sediments generally form upward-fining sequences, but are thoroughly burrowed and contain multiple buried soils. The Sangamon Geosol is developed in the upper part. The Metropolis underlies narrow loess-covered terraces bordering uplands near the northern edge of the map area. This unit is interpreted as a fluvial sediment of small meandering streams of Illinoian and older age. The lower contact to the Mounds Gravel is gradational.

F Mounds Gravel Gravel, sand, minor silt and clay. Gravel is composed dominantly of subangular to rounded chert pebbles up to several inches across, along with a small fraction of quartz granules and small pebbles. Chert pebbles bear a characteristic yellowish to reddish brown, glossy patina. Gravel has a matrix of sand and is crudely stratified, is locally cross-bedded, and shows scour-and-fill structures. Iron oxide cement and Liesegang banding are common, particularly at the base. Sand of the Mounds is red to brown, coarse, poorly sorted, and composed mostly of quartz with a smaller portion of chert. Grains are coated with clay. Small lenses of light gray to reddish brown silt and clay occur within the Mounds. The Mounds caps upland ridges (mantled with loess) and underlies the Metropolis Formation beneath terraces. The lower contact is erosional and unconformable.

G Claiborne and Wilcox Formations Sand, silt, and clay. Sand of the Wilcox is white to yellow, orange, and reddish brown; fine to coarse; and poorly sorted, and contains numerous granules of quartz and gray to black chert. The chert granules are well rounded and polished (without patina) and commonly are ovoid or ellipsoidal. Sand also contains a little mica and clay balls up to 2 inches in diameter. The unit can be cross-bedded and commonly contains laminae of white clay. Silt and clay of the Wilcox vary from white to pink and pale orange. Sand laminae are present, along with small iron-oxide tubes that likely are burrows.

The Claiborne Formation probably overlies the Wilcox in the subsurface in the southern part of the map area. Olive (1971) reports the Claiborne to be as thick as 90 feet in the Barlow and Cairo Quadrangles in Kentucky. A cross section by Olive (1971) based on data from the U.S. Army Corps of Engineers at Mound City depicts a strongly erosional contact at the base of the Claiborne, scoured entirely through the Wilcox Formation in places. Olive's identification of the Claiborne was confirmed by microfossils. No wells in the Illinois part of the Cairo Quadrangle have samples or descriptions sufficiently detailed to differentiate Claiborne from Wilcox. According to Olive (1971), the diagnostic feature of the Wilcox is "sa ndstone and," which is "silty, clayey, white-speckled sand composed of quartz, clay and chert grains and aparas to moderately abundant fragile, curved, striated, kaolinitic vermicules. . . ."

Subsurface Only

H Porters Creek Clay Clay is dark gray to dark olive-gray, stiff and massive, breaking with conchoidal fracture. The clay is dominantly montmorillonite. Mica, glauconite, and occasional silt and sand laminae are present; sand increases toward the base. The lower contact is gradational.

I Clayton Formation Sand and clay. Sandy clay to clayey sand is greenish black, micaceous, and highly glauconitic. It is thoroughly burrowed. Pebbles of opaque, honey-colored, and dark gray-green chert are common in the lower part.

J Owl Creek Formation Clay and sand. Dark gray clay and light gray sand are interbedded and laminated. These sediments are micaceous and contain glauconite pellets. Kolata et al. (1981) reported 14 feet of Owl Creek, without reaching the base, in a drill hole at the Mounds gravel pit west of Mounds. This thickness is near the maximum for this unit in Illinois.

K McNairy Formation Sand, silt, and clay. Very little information on the McNairy is available within the Cairo Quadrangle. Driller's logs generally record it as "sand." In adjacent areas, the McNairy consists of interbedded and interlaminated light gray, very fine- to medium-grained quartz-rich sand and medium to dark gray silt and clay, all containing abundant mica.

L Post Creek Formation Gravel. This formation probably is present, although there are no reliable records of this unit within the map area. The Post Creek is dominantly gravel composed of dull-textured, opaque, light-colored chert pebbles up to several inches in diameter. The matrix is pyritic sand and clay. This unit is lenticular, filling depressions on the bedrock surface. The lower contact is unconformable on Paleozoic bedrock.

M Paleozoic Bedrock These units are not exposed on the map but information is from well samples and is described below.

Introduction

This map shows the geologic formations or materials that lie at or close to the surface in the Cairo Quadrangle in Illinois. The geologic units at the surface are mapped on the floodplains, which cover more than 90% of the map area. In the uplands at the northern edge of the quadrangle, the map shows the formations that underlie the surficial loess, or wind-blown silt. Loess is commonly 20 to 25 feet thick on the crests of ridges and is thinner on steep slopes because of erosion.

The minor upland areas were mapped through the combination of outcrop study and well records. Because of thick loess cover, outcrops of older units are confined to the Mounds gravel pit just west of Mounds and a few small exposures in stream banks. Topography is of some help in mapping erosional contacts. There is commonly a break in slope at the base of the Mounds Gravel (steeper contours above the contact) and the Metropolis formation underlies a terrace. Fluvial deposits of the floodplains were divided into three mapping units on the basis of topography, aerial photography, and soil mapping (Parks and Fehrenbacher 1968).

Paleozoic Bedrock Stratigraphy

The following descriptions of Paleozoic bedrock are not shown on the map or column. They are based on sample studies from two dry oil tests: the Cache Oil Co. No. 1 Moses in Sec. 17, T16S, R1W, drilled in 1951 to a depth of 2,956 feet, and the Vance Oil Co. No. 1 Hudson in Sec. 23, T16S, R1W, drilled in 1953 to a depth of 3,320 feet. Both wells bottomed in dolomite of the Lower Ordovician Knox Group. Sample studies by USGS geologists are on file for both holes; a gamma-ray neutron log is also available for the Hudson well.

New Harmony Group The group comprises, from top downward, the Clear Creek, Backbone, Grassy Knob, and Bailey formations, which range in age from Lower Devonian to upper middle Silurian. Thickness is 757 feet in the Hudson well and 475 feet in the Moses well. Formations cannot be differentiated from available records in the Cairo Quadrangle. Samples are logged as a white to light bluish gray chert, opaque, dull-textured, and vesicular, rather vitreous nor tripolitic. Samples are entirely chert to a depth of 330 feet below the bedrock surface in the Moses well and 650 feet in the Hudson well. Below this depth, the samples consist of limestone that is medium to dark gray, microgranular to very finely granular, argillaceous and silty, and cherty. The limestone probably belongs to the Bailey Formation.

Moccasin Springs Formation This formation of Niagaran (Silurian) age is 152 to 195 feet thick and composed of limestone that is mottled light gray, greenish gray, and reddish gray. The rock is microgranular to very finely granular and nearly or very silty and argillaceous and containing thin interbeds of shale and locking chert.

St. Clair Limestone The Silurian unit is 15 to 22 feet of microgranular limestone that is light brownish to pinkish gray, containing distinctive red grains and spots. The fossil *Atrypa reticularis*, common in the St. Clair, is reported in samples.

Sexton Creek Limestone This Silurian unit is 53 to 65 feet of light to medium brownish gray limestone that is microgranular and contains abundant chert nodules and a little glauconite.

Maquoketa Shale The Maquoketa, of Late Ordovician age, is 196 to 211 feet thick and is largely siliceous and silty shale that varies in color from greenish and brownish gray to nearly black. Some limestone (Giardeau Member) is reported in the upper part, and a very fine sandstone (Thebes Member) is near the middle. The shale is partly calcareous, becoming more so near the base.

Kimmswick Limestone The Kimmswick, or "Trenton," of Late Middle Ordovician age, is fine to coarsely crystalline limestone that varies from white to light gray and pinkish gray and contains small amounts of chert. Although sample logs do not describe it as such, the Kimmswick typically is crinoidal grainstone. Brownish gray microgranular limestone, a few feet thick at the top of the interval, may represent the Cape Limestone.

Decorah Formation This unit is 15 to 20 feet of limestone that is yellowish brown to dark brownish gray limestone, containing many fossils (not identified in logs). A little greenish gray shale is present.

Plattin Limestone Of Middle Ordovician age, the Plattin is 516 to 616 feet of lithographic to very fine-grained limestone and some dolomite that is mottled medium to dark brownish gray and yellowish brown. Cherts and corals were noted. An interval of argillaceous limestone having thin brown shale layers in the lower Plattin probably is the Moffitt Member. The basal Pecatonica Member is less argillaceous.

Joachim Limestone The Middle Ordovician unit is 307 to 358 feet of limestone and dolomite that is largely dark brown and grayish brown and argillaceous to finely sandy. The Joachim contains more dolomite than the Plattin, and the lower part becomes increasingly sandy with little sandstone present.

Dutchtown Limestone The Dutchtown is 133 to 164 feet thick and resembles the Joachim, but the limestone and dolomite are nearly black and very sandy throughout. Sand grains are rounded and frosted. Dark shale laminae and cutbacks are reported.

St. Peter Sandstone This distinctive unit, of early Middle Ordovician age, is composed of fine to coarse quartz grains that are frosted and well-rounded. Color varies from white to light yellowish and orange. The sandstone is largely incoherent or weakly cemented. Thickness is 131 to 140 feet.

Everton Formation The Everton, the basal Middle Ordovician unit in Illinois, is about 75 to 107 feet of dolomite that is light to dark brownish gray. The dolomite has a sugary texture and contains plentiful sand along with interbeds of sandstone, similar to the St. Peter Sandstone.

Knox Group The Moses well penetrated 415 feet in the Lower Ordovician and Cambrian Knox Group, which is difficult to divide into formations. The rock is dominantly dolomite in various shades of gray and brown, is very fine to fine grained, and commonly has a sucrosic texture. Portions are argillaceous, sandy, and cherty.

Structure

The Cairo Quadrangle lies within the Mississippi Embayment, a northern extension of the Gulf Coastal Plain. During the Late Cretaceous and early Tertiary Periods, about 35 to 80 million years ago, the Embayment was an arm of the Gulf of Mexico. Clay, silt, sand, and gravel were deposited in a variety of shallow marine, deltaic, and coastal settings in southern Illinois. These materials became more thoroughly compacted than modern sediments but did not become rock. Regionally, the Embayment deepened toward the south so that individual units become thicker and deeper from north to south.

Underlying Embayment sediments, at depths of 150 to 600 feet below the surface, is Paleozoic bedrock of limestone, dolomite, chert, sandstone, and shale. The youngest bedrock in the Cairo Quadrangle is Early Devonian age, about 400 million years before present.

The structure of the bedrock and Embayment sediments is poorly known because of a lack of reliable well records. Only the two deep oil test holes mentioned have good sample logs made by geologists. Other borings either did not reach bedrock or have only drillers' logs, or in one case, a primitive geophysical log. Identifying formations from these logs is tentative at best. Wells outside the map area, including an oil test in Kentucky 3.5 miles east of Mound City, provide a measure of additional control. The cross sections included with this map contain one of the best deep well records.

Two geologic anomalies in the Cairo Quadrangle are well established:

1. Cretaceous strata are thin or absent in the northwestern part of the map area, where Paleozoic sediments rest directly or almost directly on Paleozoic bedrock.

2. Paleozoic bedrock is extensively silicified throughout the quadrangle.

The first anomaly is shown by samples that I personally logged from the R.J. Miller No. 1 Moses water well (Sec. 17, T16S, R1W) and the City of Mounds No. 2 water well in Sec. 22, same township. In the Miller well there are only about 10 feet of micaceous, quartz-rich Cretaceous sand between the Clayton Formation and Devonian chert. The Clayton contains large green-stained chert fragments that are probably transported from bedrock. In the City of Mounds No. 2 well, Porters Creek Clay apparently rests directly on bedrock. A third hole just outside the map area, R.M. Gould No. 1 Bouldard water well, also has no Cretaceous strata; bedrock is directly overlain by either Clayton or Porters Creek. Thus, an island of Devonian chert apparently stood west of Mounds during Late Cretaceous time. Such an island explains the common occurrence in southern Illinois of chert pebbles within the lower part of the basal Paleocene Clayton Formation. Presence of this island is more remarkable in view of the fact that drilling and seismic reflection survey indicate Cretaceous strata are more than 500 feet thick at Cairo, only 8 miles northeast of Mounds. Thick Cretaceous strata at Cairo occupy a fault block that dropped downward during Cretaceous sedimentation (Bickford et al. 2005). The Mounds "island," therefore, may represent an uplifted fault block; however, data needed to map such a fault are not available.

Every borehole in the Cairo Quadrangle that sampled Paleozoic bedrock found the upper part of bedrock to be chert. Logs of deeper holes indicate that chert or silicon rock extends 350 to 650 feet below the bedrock surface. The identity of silicon rock as Lower Devonian New Harmony Group is verified by sample logs from the Moses and Hudson oil test holes, both of which penetrated Lower Ordovician rocks. The basal part of the New Harmony Group, along with older formations, is not silicified. Three deep water wells, drilled in the southern half of the quadrangle during the 1890s, also penetrated silicified bedrock. Although drillers logged this material as "gravel," Olmen (1906) stated that it is not water-worn gravel but "mechanically disturbed chert still in place." Olmen identified the material with the "Mississippian" chert at the old quarry on the west bluff of the Cache Valley between Tamms and Elco. The chert at this quarry (NW corner of Sec. 3 6, T14S, R2W, Mill Creek Quadrangle) is not Mississippian but rather the lower Clear Creek and upper Grassy Knob Formations of the New Harmony Group, Lower Devonian (Nelson et al. 1995).

Paleozoic bedrock, especially the New Harmony Group, is extensively silicified in Alexander and Union Counties. This microcrystalline silica forms the basis for the southern Illinois tripoli industry. Berg and Masters (1994) interpreted the siliceous rock as fractured, cherty limestone and dolomite that was altered by hydrothermal fluids derived from deep-seated igneous intrusions.

Earthquakes

Cairo is situated at the northeastern end of the New Madrid Seismic Zone, a linear belt of concentrated seismic activity that extends from northeastern Arkansas through the "bootheel" of Missouri and adjacent parts of Kentucky and Tennessee. Most of the tremors that take place in the zone are detected by instruments only, being too slight to be felt. However, during the winter of 1811–1812, the central Mississippi Valley was the scene of some of the most powerful historic earthquakes in North America. Among the effects in the epicentral zone, the ground was thrown into waves and great fissures opened, thousands of sand volcanoes erupted, hundreds of landslides occurred along the river banks and bluffs, temporary waterfalls formed in the Mississippi River, and a fault scarp downstream, creating Reelfoot Lake (Fuller 1912, Penick 1981). Because most of the Cairo Quadrangle lies on water-saturated, sandy alluvium, such sediment can liquefy and greatly amplify the shaking during a major earthquake (magnitude 6.5 or larger).

Although no faults have been mapped within the study area, there is little doubt that seismically active faults are present. In 1968, a swarm of small earthquakes was centered near Lock & Dam 53 on the Ohio River, north of Olmsted. These tremors appear to be associated with a system of faults trending north-south to northeast-southwest through the Olmsted area (Bexfield et al. 2005). Projected southward (toward New Madrid, Missouri) these faults would pass through the eastern part of the Cairo Quadrangle, possibly under the city of Cairo. Whether these faults will be reactivated and generate major earthquakes cannot be predicted.

Economic Geology

Sand and Gravel

Extensive sand supplies are available from bars and channels of the Ohio and Mississippi Rivers and from ancient sand bars on the present floodplain below clayey Cahokia Formation sediment. Arcuate ridges on the floodplain, where sand is stored near the surface below overbank deposits, would be most convenient to quarry.

Gravel can be obtained from river deposits at greater depth and also from the Mounds Gravel in the uplands at the northern edge of the map area. Mounds Gravel has been quarried intermittently for several decades from the Moses Pit, just west of Mounds. Primary use of the gravel is for surfacing light-duty roads, but when screened and washed, the Mounds Gravel makes attractive ornamental gravel for landscaping.

Clay

The Porters Creek Clay of Paleocene age has been mined extensively for use as absorbent in the bordering Pulaski and Alexander Quadrangles to the north and northeast. Porters Creek Clay is present throughout the Cairo Quadrangle, but it is all or below the level of the floodplain. Mining the clay would entail removing overburden, much of which is likely to be water-bearing sand.

Oil and Gas

As already mentioned, two oil test holes were drilled in the northern Cairo quadrangle in the early 1950s. Both the Cache Oil No. 1 Moses in Sec. 17 and the Vance Oil No. 1 Hudson in Sec. 23, T16S, R1W reached the Early Ordovician Knox Group without encountering shows of hydrocarbons and were plugged and abandoned. The Middle Ordovician Kimmswick (Trenton) Limestone, encountered in both holes, is the oldest formation to date that has yielded oil or gas in Illinois.

Novel or gas production has been established within 5 miles north and east of the Cairo Quadrangle. The possibility of production at greater depths, within or below the Knox Group, is speculative.

Groundwater

Most water wells in the Cairo Quadrangle are completed in Quaternary alluvium on the Mississippi and Ohio River floodplains. In most areas, coarse sand and gravel that is highly permeable and saturated with water can be found at depths of 100 feet or less. Several water wells in the northern part of the map area were drilled into Paleozoic bedrock.

Three deep wells were drilled prior to 1900 in the southern part of the map area by R.W. Halliday, a wealthy resident of Cairo. All three wells produced artesian water from fractured chert. But it is thought to be Paleozoic bedrock at depths of 700 to 750 feet. Water rose to 6 to 12 feet above the ground surface in all three wells at flow ranging from 70 to 400 gallons per minute (Olmen 1906).

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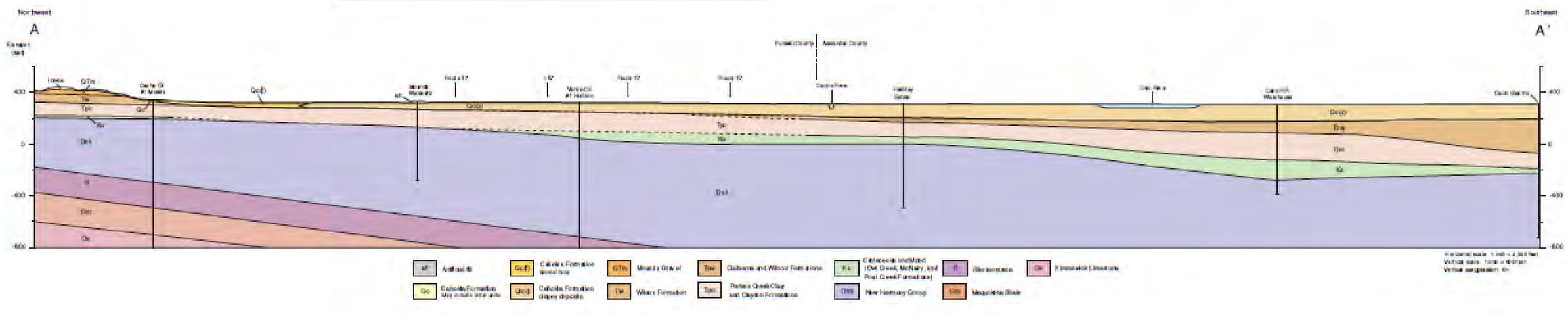

Project Manager:	RJE
Drawn by:	DRK
Checked by:	RJE
Approved by:	RJE
Project No.	N1135002
Scale:	N.T.S.
File Name:	EXHIBIT A-4A
Date:	2/22/2013

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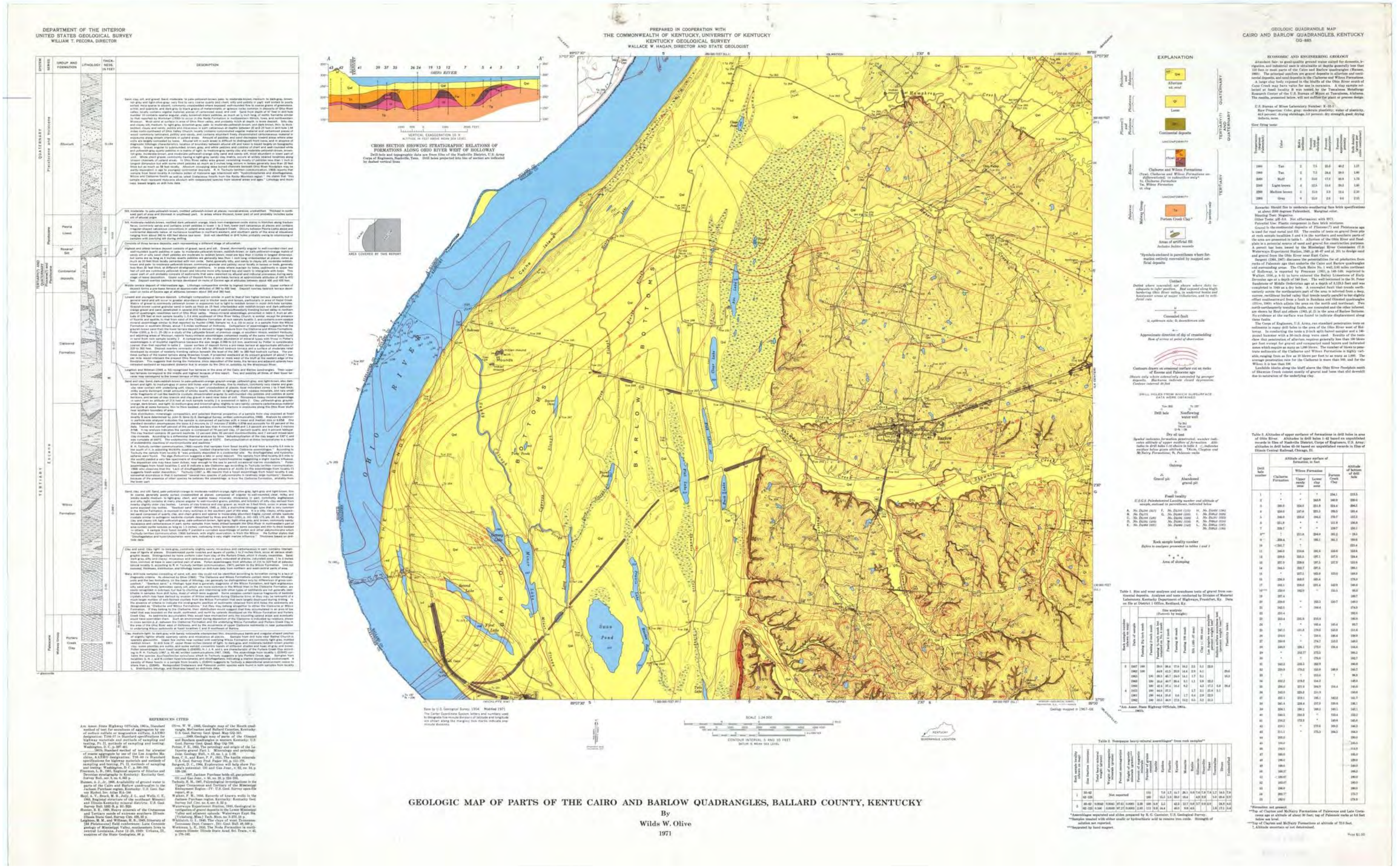
ISGS CAIRO QUADRANGLE MAP
US 51 OHIO RIVER BRIDGE SCOPING STUDY
CDM SMITH
CAIRO ALEXANDER COUNTY ILLINOIS

FIG No.
A-4A

IGC Cairo-BG Sheet 2 of 2



Project Manager: RJE	Project No. N1135002	Terracon Consulting Engineers & Scientists	USGS CAIRO QUADRANGLE MAP	Exhibit
Drawn by: DRK	Scale: NTS	611 Lunken Park Drive Cincinnati, Ohio 45226	US 51 OHIO RIVER BRIDGE SCOPING STUDY	A-4B
Checked by: RJE	File Name: A4B	PH. (513) 321-5816 FAX. (513) 321-0294	CDM SMITH	
Approved by: RJE	Date: 2/22/2013		CAIRO, ALEXANDER COUNTY, ILLINOIS	

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
V. E. McKELVEY, DIRECTOR

PREPARED IN COOPERATION WITH
THE COMMONWEALTH OF KENTUCKY, UNIVERSITY OF KENTUCKY
KENTUCKY GEOLOGICAL SURVEY
WALLACE W. HAGAN, DIRECTOR AND STATE GEOLOGIST

SYSTEM	SERIES	FORMATION	LITHOLOGY	THICKNESS, IN FEET	DESCRIPTION
QUATERNARY	Pleistocene and Holocene	Alluvium		0–102	Sand, silt, and gravel: Sand, light-olive-gray and pale- to dark-yellowish-orange, very fine to very coarse, angular to very well rounded, commonly contains granules and pebbles, silty in part; composed dominantly of clear and milky quartz and chert, but beneath Mississippi River flood plain, includes grains of dark-gray to black igneous and metamorphic rocks, glauconitic, and shiny black coal; and in locally calcareous. Occurs as cross-bedded lenses and sheets, and as massive, poorly sorted, poorly bedded deposits. Thickest beneath Cairo, No. 1 Chute, as much as 72 feet thick beneath Mississippi River flood plain; thin to absent beneath other flood plains. Silt, pale- to moderate-yellowish-brown, greenish-gray, light-olive-gray, and medium- to brown-gray, clayey, sandy, locally calcareous, micaceous, and fossiliferous; at places, at surface in most floodplain areas; generally 5 to 40 feet thick but 72 feet thick in drill hole under a mile west of Wickliffe. Gravel composed mostly of chert, quartzite, and quartz pebbles in sand and silty clay matrix; locally cemented by calcite; at places contains minor to moderate amounts of granules and small pebbles of greenstone and dark-gray to black igneous and metamorphic rocks. Lithologic description based largely on drill-hole data.
	Pleistocene	Peoria Loess		0–30	Silt, pale- to moderate-yellowish-brown, grayish-brown, and moderate-brown, mottled moderate yellowish orange and stained black by ferro-magnesian minerals in some outcrops; unstratified, fossiliferous and calcareous in part, but leached and noncalcareous in upper 3 to 5 feet; contains abundant small black specks and mass iolate concretions, known as loess "dolls" or loess "hindlers," common in upper part of calcareous zones. Contains numerous fossil small shells at outcrops 0.2 mile south and 0.6 mile southeast of site of Fort Jefferson.
		Roxana Silt		0–7	Silt, moderate- to dark-yellowish-brown, locally sandy, calcareous at places, discontinuous; exposed beneath sub-stantial Peoria Loess only in small isolated areas near bluffs bordering Mississippi River valley; not recognized in drill holes, possibly due in part to intermixing of material recovered from hole.
TERTIARY(?) AND QUATERNARY	Pleistocene and Pliocene(?)	Continental deposits		0–55	Consists of two terrace deposits, separated by unconformity. Gravel, sand, and silt: Gravel, composed dominantly of angular to well-rounded chert and well-rounded quartzite and quartz pebbles in matrix of light- to moderate-reddish-brown, mottled moderate to dark yellowish orange, silty sand and sandy silt. Chert pebbles are moderate-brown to moderate yellowish brown and, less commonly, light to dark gray and black; most brown chert pebbles have thin white rind. Quartzite pebbles are pale red, pale red purple, and white. Silt and sand seams occur at a few localities north of Mayfield Creek. Sparse gray to black chert pebbles as much as 2½ inches long occur at many localities, most of which are within two miles of the bluffs of the Mississippi River. Quartzite and quartz pebbles are generally ellipsoidal, ovoidal, or discoidal, less than 1½ inches in longest dimension. Angular to subangular clay pebbles, cobbles, and boulders as much as 2 feet long are present at many localities; most are moderate-reddish-brown and have been derived from the Claiborne Formation of the Jackson or Claiborne Formations. Crossbedded and poorly stratified in part; zones as much as 4 feet thick locally cemented with iron oxide. Sand, moderate-reddish-brown, pale- to moderate-yellowish-brown, moderate-orange-pink, and moderate-orange-pink; fine to very coarse, commonly contains granules and pebbles; silty and clayey for the most part but clean at places; locally crossbedded. In southwestern part of area lenses or beds as much as 20 feet thick of light-olive-gray to olive-gray sand and sandy silt occur; these contain small sparse scattered medium-gray to black and brown chert pebbles and widely spaced 10cm lenses of brown chert pebbles. Size analyses from gravel pits at rock sample localities 1 to 5 are shown in table 1. Silt, moderate-yellowish-brown, moderate-reddish-brown, and moderate-brown; clayey, sandy, locally calcareous. In areas where overlain by loess, sediments in upper five feet are commonly yellowish brown and become more silty upward and seem to intergrade with loess. Upper surface of deposit forms terrace beneath Peoria Loess and Roxana Silt between approximate altitudes of 420 and 430 feet. Deposit overlies bedrock surface developed on rocks of Eocene age at altitudes between 390 and 420 feet. Thickness and lithology based in part on drill-hole data.
				0–34	Lower and younger terrace deposit consists of gravel and sand: Gravel, angular to well-rounded chert and well-rounded quartzite and quartz pebbles in sand matrix. Chert pebbles are light gray and light olive gray to submoulded to well-rounded brown, light-yellowish-orange, white, light- to dark-gray, and black chert; quartz and quartzite pebbles in matrix of moderate-reddish-brown, fine to coarse clayey sand; chert pebbles generally have thin white rind. Sparse gray to black chert pebbles as much as 2 feet thick cemented with iron oxide. Sand, moderate-reddish-brown and medium-gray, fine to coarse, silty, commonly pebbly; upper surface of deposit forms a terrace beneath Peoria Loess and Roxana Silt at altitudes between about 380 and 390 feet. Deposit overlies a bedrock surface developed on rocks of Eocene age at altitudes between about 280 and 340 feet.
		Jackson Formation		150±	Sand, silty clay, and gravel: Sand, light- to yellowish-gray, pale- to dark-yellowish-orange, light- to moderate-reddish-brown and grayish-red; fine to very coarse, dominantly clayey, milky, and smoky quartz; clay and chert grains common but not abundant; poorly sorted; commonly contains granules and small pebbles; angular to very well rounded quartz; subangular to submoulded shiny light-gray to black chert, and angular to rounded pebbles, cobbles, and boulders of clay; sparse heavy minerals; non-opaque heavy minerals at rock sample locality 9 are similar to those reported from the Claiborne Formation; micaceous, carbonaceous, and fossiliferous; bedded to massive, crossbedded and exhibits cut-and-fill structure in some outcrops. Clayey to partly indurated zones as much as four feet thick and mostly composed of pebbly coarse sand cemented with iron oxide form knickpoints and prominent ledges at places, particularly in valleys of high-gradient streams in southwestern part of area. Clayey silt and silty clay, very light to light-gray, yellowish-gray, light-olive-gray, and moderate-yellowish-brown; commonly contains abundant small specks of brown lignite; micaceous; very sandy; in lenses containing sand laminae and are interbedded with sand at places; thin to thick bedded; coal bed impinges at fossil locality A near southwest corner of area. Clay breccia, composed of locally calcareous light-gray clay in matrix of boulders of clay in zones; some lies in very coarse, granular sand matrix, at places fills channels. R. M. Tschudy (written communication, 1970) states reservedly that a palynomorph assemblage from clay at fossil locality A is similar to that from the Jackson Formation and that it may be further stated: "The presence of the algal genera *Botryococcus* and *Bitryococcus* indicates deposition in a fresh-water site. The light color of the rock and the very slight amount of organic matter extracted from the sediment suggest that the site was a fresh-water lake or pond. The palynomorph assemblage identified was derived from trees rather than herbaceous plants. I envisage the deposition site as a fresh-water lake or pond surrounded by a mixed deciduous forest with no open spaces or savannas. Pollen from the trees was carried by wind into a rapidly filling basin." Lithologic description in part based on drill-hole data. The Jackson Formation of the mapped area is equivalent in part to rocks mapped as the Claiborne Formation in adjacent areas (Olive and Finch, 1969, p. 8). Tschudy (written communication, 1970) states that palynomorphs from localities in adjacent areas (Olive and Finch, 1969, p. 8) suggests that the exposed Eocene rocks south of Mayfield Creek are Jackson Formation. However, a palynomorph assemblage from an outcrop in the Kennedy Heights (Olive, 1971), 5 miles east of Bardwell, and an assemblage (R. H. Tschudy, 1972, written communication) from an outcrop in the Arlington quadrangle 3 miles south of Bardwell, indicate Claiborne Formation. Tschudy (written communication, 1970) states that the palynomorphs from the clay at fossil locality A and the exposed Eocene rocks may be Claiborne Formation representing isolated lots that were partially or completely buried beneath Jackson sediments.
TERTIARY	Eocene	Claiborne Formation		550±	Sand, silt, clay, lignite, and clay breccia: Sand, light- to yellowish-gray and light-olive-gray, pale- to dark-yellowish-orange, moderate-yellow to moderate-brown, and moderate-reddish-brown; composed of very fine to very coarse grains, granules and pebbles of clear, milky, and smoky quartz and sparse medium-gray to black chert, angular to very well rounded; surfaces of rounded quartz and chert particles are commonly very highly polished; coarser grains and pebbles are commonly stained dark brown; contains sparse clay balls and rounded pebbles, cobbles, and boulders of clay in some areas; poorly to well sorted, slightly to very angulosus and silty; commonly massive but very thin to thick bedded at places; locally crossbedded; generally poorly indurated but locally cemented by calcite; at places, contains abundant small specks of lignite; at a few places composed mostly of coarse pebbly non-pebble-cemented sand. Medium-gray to black chert is a trace fossil composed mostly of coarse pebbly sand near base of formation in north-central part of area and at depths between coal beds in drill holes. Sand as much as 40 feet south of gauging station at Wickliffe. Chert was not found in the Claiborne elsewhere in the quadrangle. In areas to the east coarse pebbly sand is common near the base of the Claiborne and rare at higher strata-graphic levels. Sand in the Claiborne is light gray to white, fine to medium grained, and silty. Its absence to the east suggests that it had a western or northern source. Clayey silt and silty clay, light-olive-gray, very light gray to black, yellowish-gray to grayish-yellow, pale- to moderate-brown, dark yellowish-brown; commonly mottled pale to dark yellowish orange in weathered outcrops; slightly to very sandy; locally carbonaceous; contains marcasite nodules and minute gypsum crystals at places; commonly thick bedded but thin bedded at places; locally crossbedded; contains abundant small specks of lignite and at places, many well-preserved leaf impints, and clay adjacent to coal beds commonly contains abundant lignitized pieces of wood; some resembling tree roots. According to the driller, a water well 1.2 miles west of Bethlehem Church contains a 3-foot-thick lignite bed at a depth of 50 feet of alluvium and underlain by very coarse sand. X-ray analysis by G. S. Ericson (U.S. Geological Survey) of clay sample from rock sample locality 9 shows illite-rich composition (a sample from locality 9 is similar to that of a sample from the Jackson Formation; composition is 85 percent kaolinite, 10 percent illite, 5 percent mixed-layer clay plus traces of chlorite and montmorillonite. Lignite, brownish-black to black, structureless to shaly, and at places composed partly to almost entirely of well-preserved lignitized wood fragments including tree trunks as much as 14 inches in diameter and stumps as much as 6 feet across and 2 feet high; freshly exposed surfaces of some of the larger pieces are dark-reddish-brown; but due to oxidation the surface becomes black within several minutes; beds generally less than 3 feet, but as much as 6½ feet thick in upland area between Wickliffe and Mayfield Creek. All exposures of lignite are within 3½ miles of Wickliffe. Clay breccia, composed of light-gray and light-olive-gray clay in matrix of boulders of clay in zones; some lies in very coarse, granular sand matrix; small pebbles to boulders as much as 18 inches across. In some outcrops clay breccia occupies small V-shaped channels eroded into sand. Palynomorph assemblages from samples collected at fossil localities B to F indicate a Claiborne age (see Explanation). According to Tschudy (1969, p. 2) the occurrence of a few specimens of dinoflagellates and acritarchs in samples from localities B and F suggests a slight marine influence. In reference to the sample from locality B he (p. 2) states: "The deposition site may have been distal, near enough to the sea to permit occasional marine incursions, but not near enough to the sea to be in the zone of predominant pollen forms which C. E. Leopold and H. W. Pakiser (written communication, 1961) observed "are members of the family Sapotaceae which live today in the Caribbean area and along the Gulf Coast towards." Lithologic description in part based on drill-hole data.
		Wilcox Formation		174+	Sand, very light, light-yellowish-, and pinkish-gray, and moderate-reddish-brown, fine to coarse-milky, clear, and smoky quartz, silty and clayey; foreset and bottomset crossbedding common; contains abundant minute white, curved, striate, cog-like kaolinite crystals similar to those described by Ross and Kerr (1931); resembles sawdust in appearance and has been termed "sawdust sand" by Whitlatch (1940, p. 233). Sims (1970, p. 833) states that the sand in the Wilcox Formation in Tennessee is "a fluviatile deposit of a meandering stream" "was probably characterized by large volumes of fresh water flushing through porous sandstones." On the other hand, Pryor and Ysnese (1971, p. 747) on the basis of a study of "sawdust sand" from Tennessee, note that nearly half the sand is composed of aggregate grains "of clay particles enclosing silt and sand sized detrital particles or they are simply masses of clay particles." They (p. 759) conclude that the sand "is a relict fluviatile sediment." Lithologic description in part based on drill-hole data.

ECONOMIC GEOLOGY

Mineral resources in the mapped area include ground water, gravel, clay, sand, and lignite. Paleozoic rocks which occur at altitudes ranging from about 100 feet below sea level in the northern part of the area to 900 feet below sea level in the southern part are potential sources of oil and gas (Schwalb, 1969, p. 19).

Abundant quantities of water are available from rocks of Eocene age and from the continental deposits and alluvium at depths ranging from a few feet to more than 500 feet beneath the surface (Lambert, 1968). In general, the chemical quality of the water is good, but water from some aquifers contains objectionable amounts of iron and manganese; water from alluvium is hard to very hard. Numerous springs in the area of Claiborne outcrop north of Mayfield Creek are fed by general water probably perched on top of clay deposits.

Gravel used for road metal and fill has been mined from several pits all but one of which are in terrace deposits between altitudes of 380 and 430 feet. Sand and gravel for concrete and ground water seepage pores hazards in quarrying in the lower terrace deposit. Size and Los Angeles wear analyses of gravel deposits from several pits, all of which were inactive at the time of mapping, are presented in table 1.

Clay deposits of the Claiborne Formation having potential value for use in ceramics occur in the area north of Mayfield Creek. Drill-hole records and measurements of stratigraphic sections indicate that near-surface clay deposits occur in lenses some of which have an areal extent of more than 100 acres.

According to Gildersleeve (1940, p. 113-114), ball and stoneware clay were mined by the LaClede-Christy Products Co. from a pit at the south edge of Wickliffe, and by the American Clay Co. from a pit half a mile northeast of Wickliffe. A long-time resident of Wickliffe reports that the LaClede-Christy pit operated during a period of about 20 years before closing in 1935. Analysis of clay from a locality 0.4 mile east of east city limits of Wickliffe indicated that the clay has potential use for fine lining and possible use for medium-weathering-grade face brick (Olive and Finch, 1969, p. 27). Firing characteristics of a sample from the same locality, as reported by McGrain and Kendall (1957, p. 63), indicate that it is a good raw material for the manufacture of terracotta face brick at cone 1 and tile at cone 4. The pyrometric cone equivalent of this material, cones 29-31, indicates it also might be suitable for low-grade refractories. Clay from the Claiborne, at a locality from rock sample locality 9 is similar to that of a sample from the Scott Mine in Henry County, Tenn., as reported by Olive and Finch (1969, p. 18). Easton (1913, p. 758-762 and 772-773) describes ceramic properties of clay from localities in the Wickliffe quadrangle. He reports qualities for clay which vary within a wide range according to locality and stratigraphic position. Clay from one locality is described as excellent and white burning and from another as having limited usefulness because of high shrinkage and warping. Evidence presented by Olive and Finch (1969, p. 18) indicates that clay in the Jackson and Wilcox Formations has greater economic potential than clay of the Jackson Formation. Clay in "sawdust sand" of the Wilcox Formation is composed dominantly of kaolinite and is a potential source of high-grade ceramic clay and molding sand. Most of the sand in the Claiborne and Jackson Formations is probably suitable for making mortar and cement.

Lignite reserves in the Claiborne Formation are probably on the order of 22,000 short tons. Analyses of two lignite samples, probably weathered, from the bluff at the site of Fort Jefferson indicate about 40 percent fixed carbon, 50 percent total volatile matter, 7 to 11 percent ash, and moisture contents of 13.2 and 30.06 percent (Laughridge, 1968, p. 122). Lignite in the Claiborne Formation is described by Olive and Finch (1969, p. 18) in the Wickliffe quadrangle (Olive, 1971) where about 16 percent fixed carbon, 35 percent volatile matter, 6 to 9 percent ash, and 0.7 to 2.5 percent sulfur with a moisture content of about 30 percent; the heating value is about 5,000 Btu.

The geology of the Paleozoic rocks and their petroleum-bearing possibilities are discussed by Schwalb (1969). The petroleum potential of the northern part of the Mississippi embayment, which includes the Wickliffe and Wyatt quadrangles, is discussed in publications by Bond, Cole, and others (1971), and by Illinois State Geological Survey (1971). Only one test for oil and gas has been drilled in the Kentucky part of the Wickliffe and Wyatt quadrangles. The test hole, which showed no oil or gas, was drilled at the turn of the century in the southern part of the city of Wickliffe. A log presented by Glenn (1906, p. 126) and interpreted by the author shows that the hole entered rocks of Paleozoic age at a depth of 1,000 feet (980 feet below sea level) and bottomed at a depth of 1,020 feet. The top of the Fortern Creek Clay (Paleocene) was penetrated at an altitude of 122 feet below sea level; the top of the Clayton Formation (Paleocene), or possibly the McNairy Formation (Upper Cretaceous), was penetrated at 280 feet below sea level.

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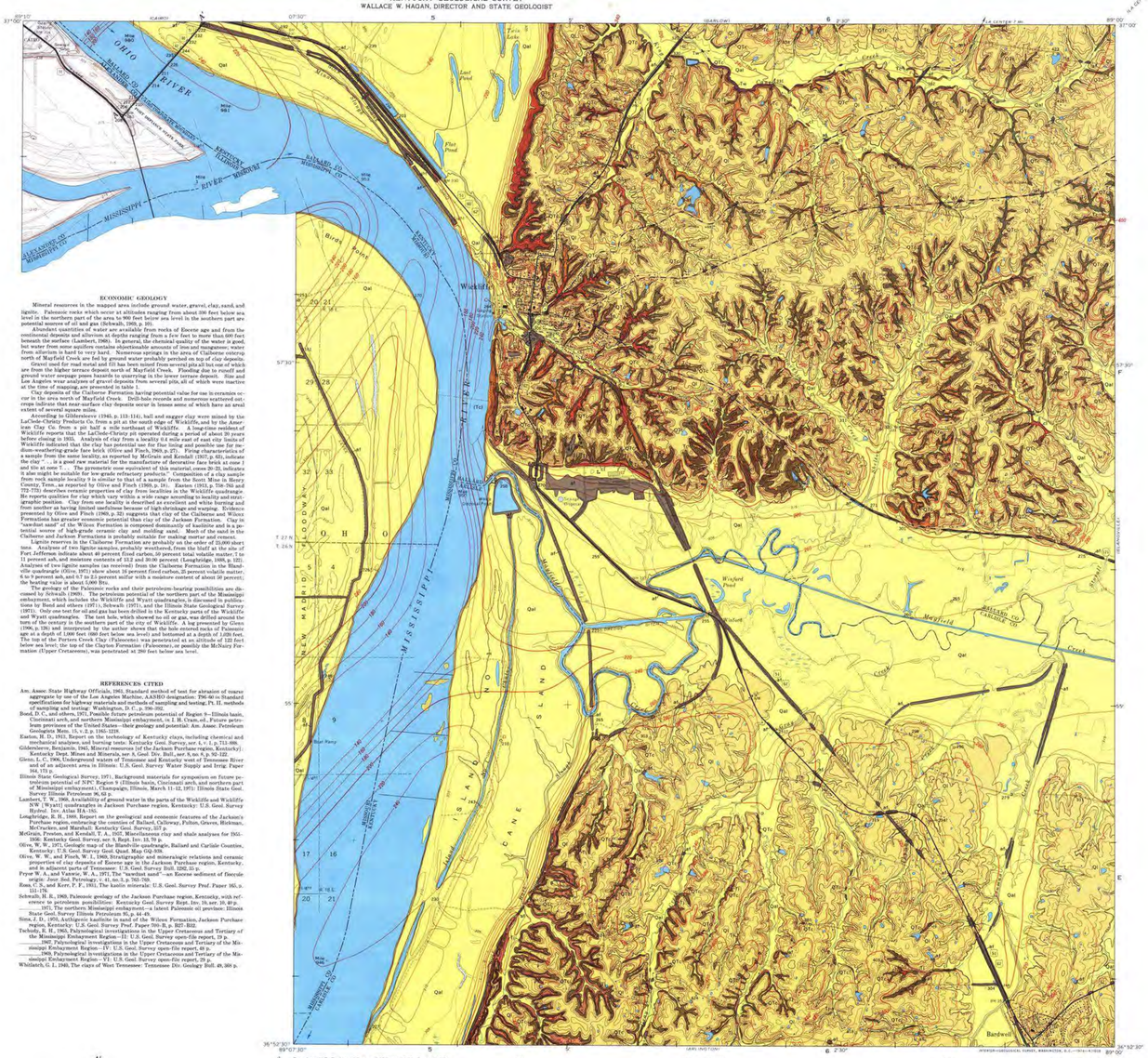
CROSS SECTION SHOWING LITHOLOGY AND THICKNESS OF FORMATIONS BENEATH THE OHIO RIVER FLOOD PLAIN IN THE VICINITY OF THE OHIO RIVER BRIDGE

Drill-hole data based on unpublished glass prepared during 1966 by Modjeski, Masters, and Case, Inc. for Cairo Bridge Commission. Plans in files of Commonwealth of Kentucky Department of Highways, Frankfort, Kentucky



GEOLOGIC MAP OF THE WICKLIFFE QUADRANGLE, KENTUCKY–MISSOURI, AND THE PART OF THE WYATT QUADRANGLE IN KENTUCKY

By
Wilds W. Olive
1974

GEOLOGIC QUADRANGLE MAP
WICKLIFFE AND WYATT QUADRANGLES
KENTUCKY—MISSOURI
GQ-1161

EXPLANATION

Pleistocene and Holocene — Qal — Alluvium

Pleistocene — Qp — Peoria Loess and Roxana Silt — QUATERNARY

Pleistocene(?) and Pliocene(?) — QTc — Continental deposits — TERTIARY(?) AND QUATERNARY

UNCONFORMITY

Eocene — Tj — Jackson Formation

Tc — Claiborne Formation (Tcl, clay)

UNCONFORMITY

Tw — Wilcox Formation — TERTIARY

af — Areas of artificial fill
Includes Indian mounds

Contact
Dotted and formation symbol enclosed in parentheses where concealed by water of Mississippi River. Bar symbol is boundary of alluvial-protected stream, undercut banks, and artificial cuts

Approximate direction of dip of crossbedding
Base of arrow at point of observation

Contours drawn on erosional surface cut on rocks of Eocene age
Shown only where extensively concealed by younger deposits. Contour interval 20 feet

DRILL HOLES FROM WHICH SUBSURFACE DATA WERE OBTAINED

206 Drill hole — 424 Nonflowing water well — 308 Dry oil test

Number indicates altitude of erosional surface cut on Eocene rocks. ◁ indicates surface below given altitude

x 47 Outcrop — Tcl, clay; L, lignite

Abandoned gravel pit

Abandoned clay pit — Abandoned sand pit

B Outcrop — B Drill hole — Fossil locality
Letter designates U.S.G.S. Paleobotanical Locality number; altitude of sample from drill hole shown in parentheses
A, D1570, upper Eocene or Oligocene (Tschudy, 1969, written communication)
B, D1576, lower Claiborne (Tschudy, 1969, p. 2)
C, D1564, (181-172), Claiborne (Tschudy, 1967, p. 36)
D1570, (151-161), Claiborne (Tschudy, 1967, p. 36)
D1571, (141-151), Claiborne (Tschudy, 1967, p. 36)
D1572, (130), possibly lower Claiborne (Tschudy, 1967, p. 36)
D1573, (100-112), upper Claiborne (Tschudy, 1967, p. 36)
E, D1567A, upper Claiborne (Tschudy, 1969, p. 7)
F, D1567, lower or middle Claiborne (Tschudy, 1969, p. 2)
G, D1568, Claiborne (Tschudy, 1969, p. 19)

2 Rock sample locality number
Refers to analyses presented in tables 1 and 2 and in description of columnar section

Table 1. Size and wear analyses of gravel from continental deposits. Analyses and tests conducted by Division of Material Laboratory, Kentucky Department of Highways, Frankfort, Ky. Data on file at District 1 Office, Redland, Ky.

Rock sample locality number	Size analysis (Percent by weight)										Los Angeles wear analysis percent weight lost
	Passing 2½-inch mesh	Passing 2-inch mesh	Passing ¾-inch mesh	Passing 4 mesh	Passing 40 mesh	Passing 100 mesh	Passing 200 mesh	Silt (.005-.07 mm)	Clay (<.005 mm)		
1		100	95.0	86.4	3.8	0.1					23.3
2	100			63.4	27.6		4.5				22.6
3		100		41.2	12.1		1.4				22.4
3	100			31.2	5.4		0.7				25.6
4	100		83.4	56.1	24.4	4.9		1.0	3.7		
5		100		49.4	9.7		0.9				23.6
	100		75.7	20.1	11.9	9.6		1.0	4.9		

*Am. Assoc. State Highway Officials, 1961

Table 2. Non-opaque heavy-mineral assemblages from rock samples*

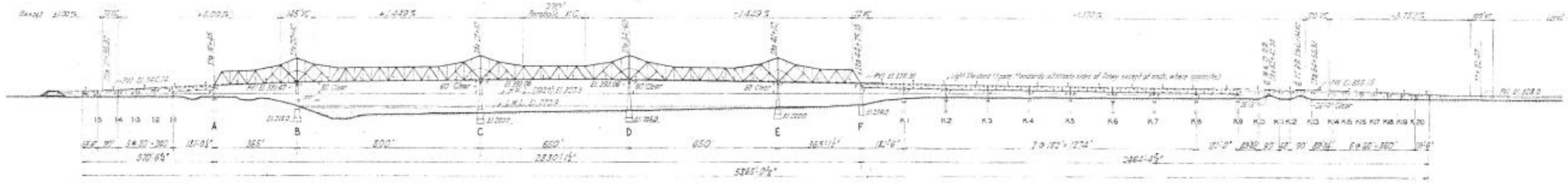
Rock sample locality no.	Lithology of sample	Size fractions (microns)	Number of grains counted	Biotite	Chlorite	Fluorite	Garnet	Kyanite	Monazite	Rutile	Staurolite	Tourmaline	Zircon
6	Very coarse pebbly sand	44-62	100	5		1	1	1	6	4	30	1	4
		62-125	100					2	6	7		3	82
7	Fine to medium sand	44-62	100						5	1		5	89
		62-125	100	1				2	8	11		10	68
8	Very coarse pebbly sand	44-62	100	1	2	1		5	10	8		6	67
		62-125	100					4	2	14		10	70

*Assemblages separated in bromoform; magnetic minerals removed by hand magnet.

Price $3.00

Project Manager: RJE	Project No. N1135002	Terracon Consulting Engineers & Scientists	USGS WICKLIFFE-WYATT QUADRANGLE MAP
Drawn by: DRK	Scale: NTS	611 Lunken Park Drive Cincinnati, Ohio 45226	US 51 OHIO RIVER BRIDGE SCOPING STUDY
Checked by: RJE	File Name: A4B	PH. (513) 321-5816 FAX. (513) 321-0294	CDM SMITH
Approved by: RJE	Date: 2/22/2013		CAIRO, ALEXANDER COUNTY, ILLINOIS

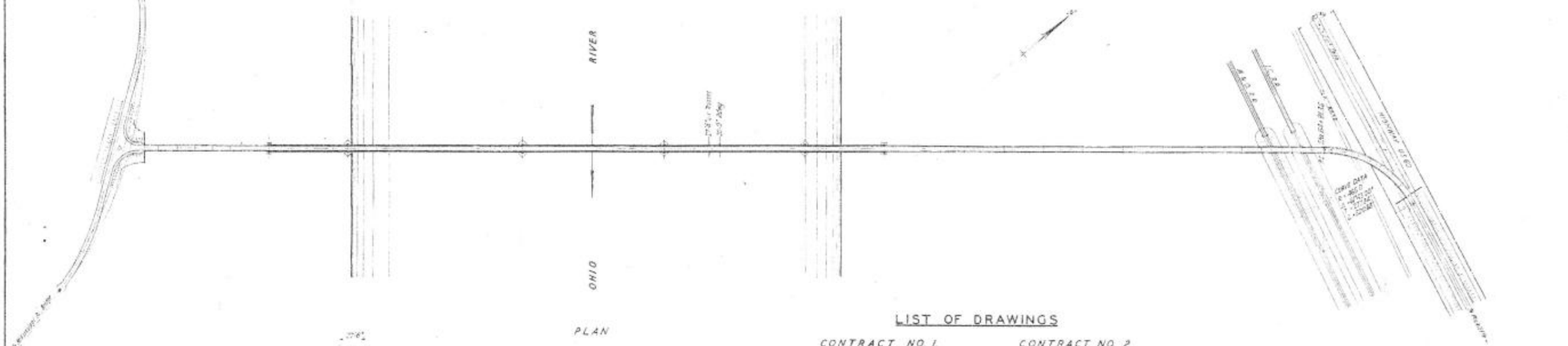
Exhibit
A-4C



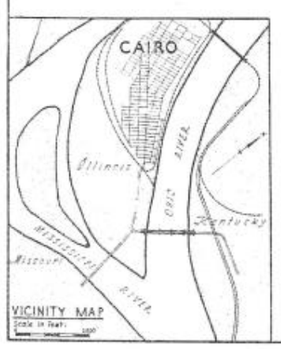
ELEVATION

ALEXANDER CO. ILLINOIS

BALLARD CO. KENTUCKY

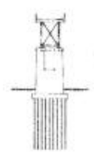


PLAN



VICINITY MAP

SECTION AT PIER C



SECTION AT PIER K2

SECTION AT PIER K15

LIST OF DRAWINGS

CONTRACT NO. 1

1. General Plan & Elevation
2. Main River Piers
3. Pier A and Approach Piers
4. Approach Piers & Abutments

Suppl. Drwg No. 1. Survey & Boring Data
" " " 2. Hydrograph of Ohio River

CONTRACT NO. 2.

1. General Plan & Elevation
2. Stress Sheet - Anchor Arm "A" & Cantilever Arm "D"
3. " " Cantilever Arms B & C and Suspended Span
4. " " Anchor Arm "C"
5. " " Anchor Arm "D"
6. " " Cantilever E & Anchor Arm "E"
7. " " Approach Spans
8. Typical Details - Anchor Arm A-B
9. " " " " Cont'd.
10. " " Cantilever Arms B & C
11. " " Suspended Span
12. Typical Details & Sections - Main Bridge
13. Details of Deck Truss Spans
14. Details of Girder Spans
15. Roadway & Miscellaneous Details

Supplementary Drwg No. 1. Survey & Boring Data
" " " 2. Hydrograph of Ohio River

CAIRO BRIDGE COMMISSION
OHIO RIVER BRIDGE
AT
CAIRO, ILLINOIS

GENERAL PLAN & ELEVATION

Approved:
Ralph Modjeski
F. M. Masters
M. R. Case,
Modjeski, Masters & Case.

CONTRACTS NO. 1 & 2
SUPPL. CONTRACT DRAWING NO. 1
MODJESKI, MASTERS & CASE, ENGINEERS
OCT. 1936

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Manager: NCD	Project No. N1135002	Terracon Consulting Engineers & Scientists	CAIRO BRIDGE PLAN 1936
Drawn by: NCD	Scale: As Shown	611 Lunken Park Drive Cincinnati, Ohio 45226	US51 OHIO RIVER BRIDGE SCOPING STUDY
Checked by: DRK	File Name: A-5	PH. (513) 321-5816 FAX. (513) 321-0294	CDM SMITH
Approved by: DRK	Date: 03-01-013		WICKLIFFE BALLARD COUNTY KENTUCKY

Exhibit A-5

APPENDIX B

APPENDIX B - TABLE OF CONTENTS

Exhibit B-1	**Historical Subsurface Study and Well Vicinity Map**
Exhibit B-2	**Handwritten Logs from 1997 Inspection Report**
Exhibit B-3	**Cairo Bridge Commission Survey and Boring Data**
Exhibit B-3 to B-6	**IDOT Logs from Interactive Database**
Exhibit B-7	**USACE Boring Summary Table (Reproduced from USGS Cairo-Barlow Quadrangle Geologic Map)**

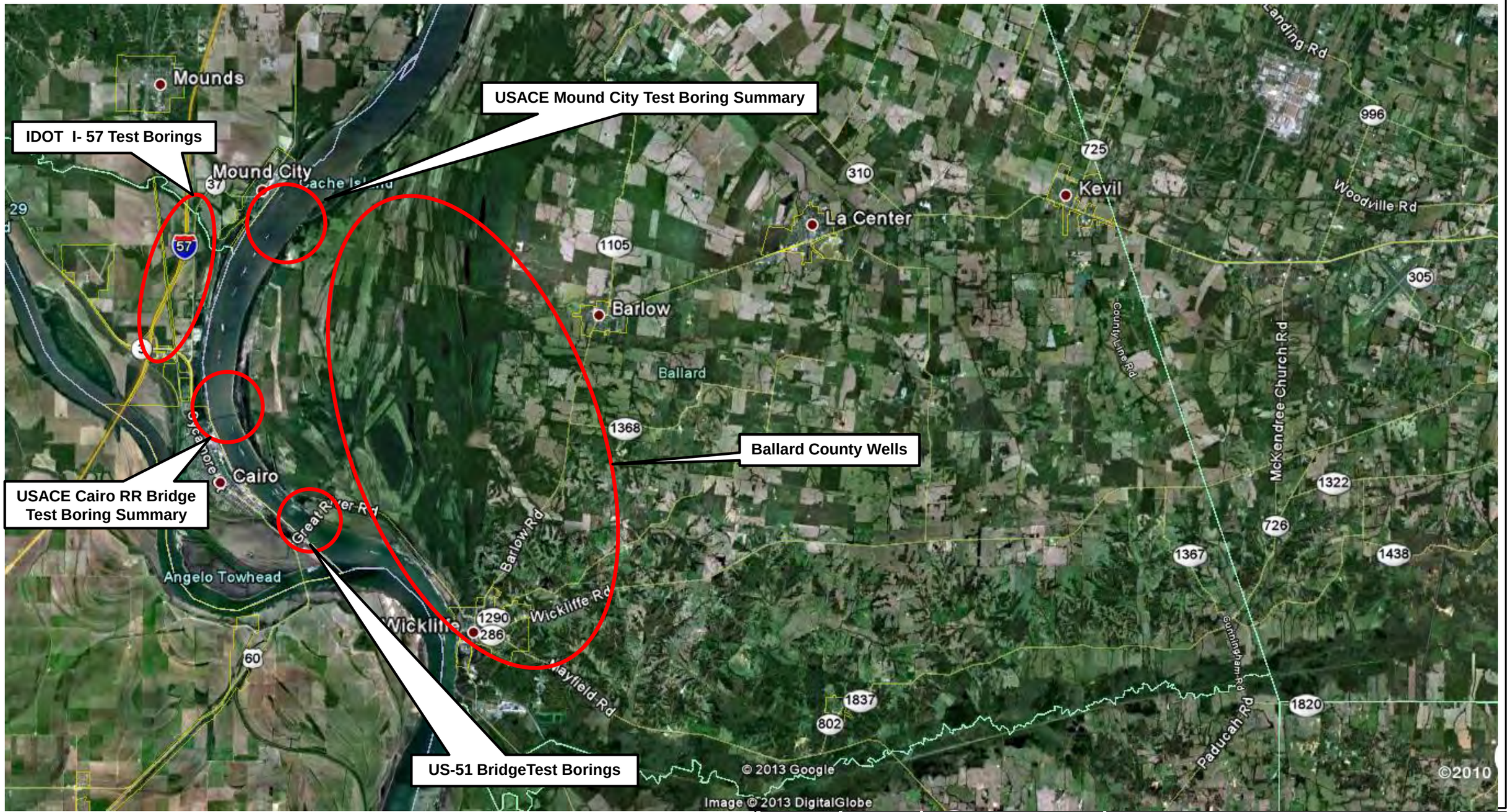


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

SOURCE: GOOGLE EARTH 2013

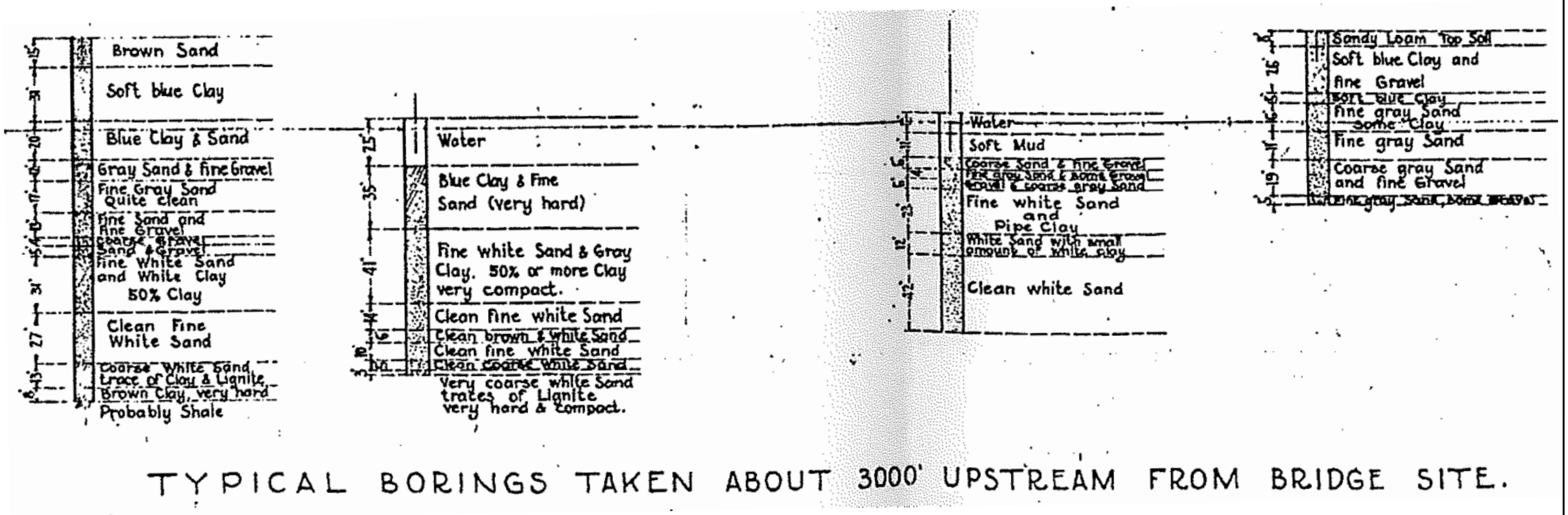
Project Manager: NCD	Project No. N1135002
Drawn by: NCD	Scale: As Shown
Checked by: DRK	File Name: B-1
Approved by: DRK	Date: 03-01-2013

Terracon
Consulting Engineers & Scientists
611 Lunken Park Drive Cincinnati, Ohio 45226
PH. (513) 321-5816 FAX. (513) 321-0294

HISTORICAL SUBSURFACE STUDY & WELL VICINITY MAP

US51 OHIO RIVER BRIDGE SCOPING STUDY
CDM SMITH
ALEXANDER COUNTY, IL BALLARD COUNTY ,KY

Exhibit B-1



TYPICAL BORINGS TAKEN ABOUT 3000' UPSTREAM FROM BRIDGE SITE.

Project Manager: NCD	Project No. N1135002	Terracon Consulting Engineers & Scientists	HANDWRITTEN LOGS 1997 INSPECTION REPORT
Drawn by: NCD	Scale: As Shown	611 Lunken Park Drive Cincinnati, Ohio 45226	US51 OHIO RIVER BRIDGE SCOPING STUDY
Checked by: DRK	File Name: B-2	PH. (513) 321-5816 FAX. (513) 321-0294	CDM SMITH
Approved by: DRK	Date: 03-01-2013		WICKLIFFE BALLARD COUNTY KENTUCKY

Exhibit B-2

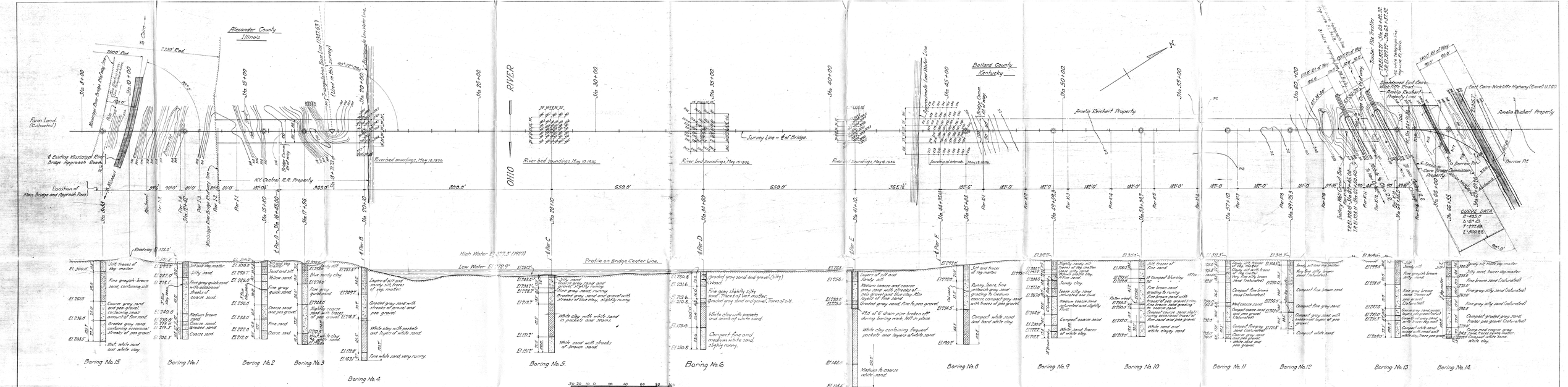
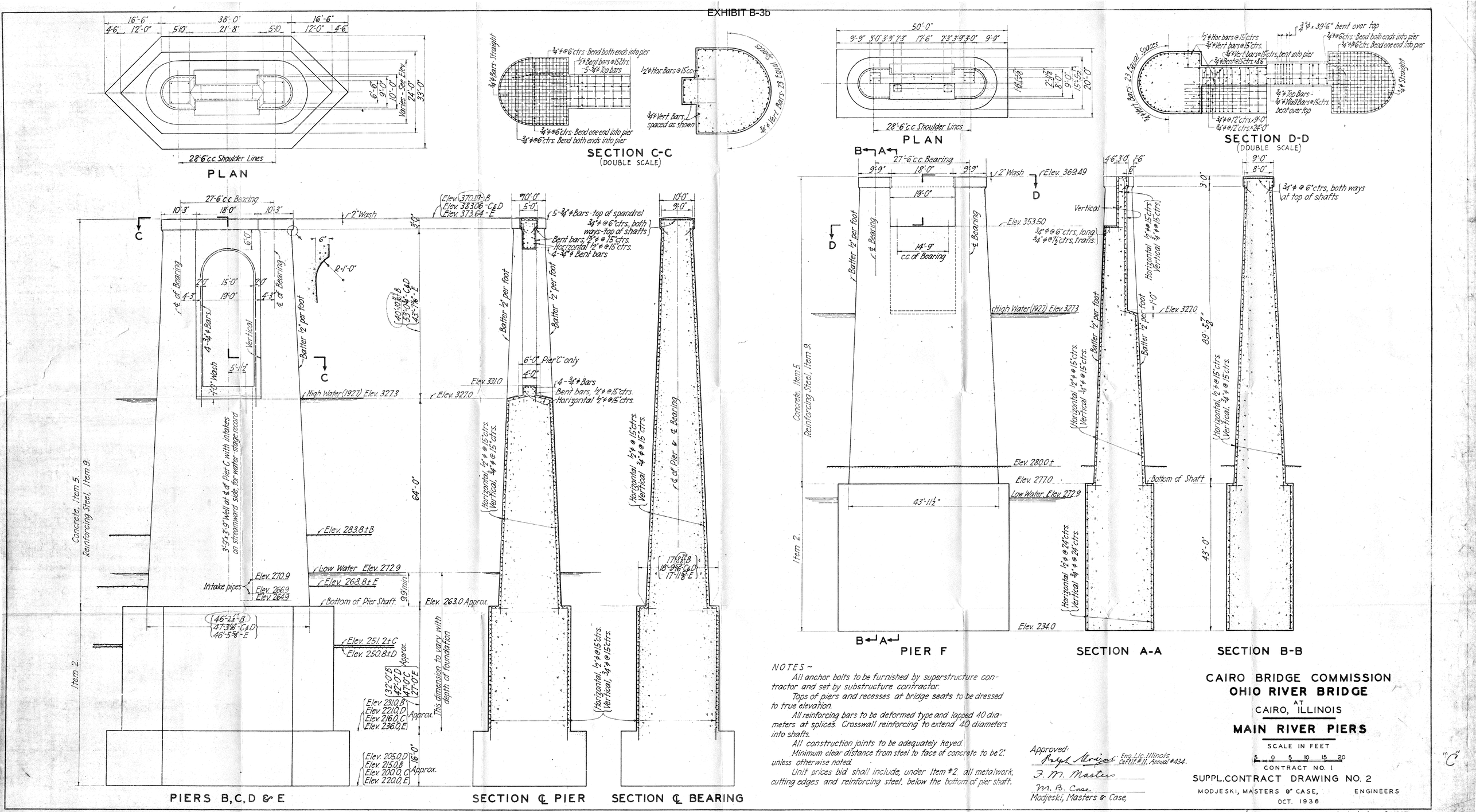

Alexander County
Illinois
Ballard County
Kentucky
OHIO RIVER
Farm Land (Cultivated)
Location of Main Bridge and Approach Piers
Survey Line - ℄ of Bridge
Amelia Reichert Property
NY Central R.R. Property
River bed soundings May 18 1936
Profile on Bridge Center Line
High Water El. 377.3' (1927)
Low Water El. 322.9'
Vertical Scale All Borings
Boring No.15
Boring No.1
Boring No.2
Boring No.3
Boring No.4
Boring No.5
Boring No.6
Boring No.7
Boring No.8
Boring No.9
Boring No.10
Boring No.11
Boring No.12
Boring No.13
Boring No.14
GUIDE DATA
Approved
U.S. Government precise Bench Mark "B2" - Elev. 372.93 referred to Sandy Hook Datum
Elevations given referred to Sandy Hook Datum
CAIRO BRIDGE COMMISSION
OHIO RIVER BRIDGE
AT
CAIRO, ILLINOIS
SURVEY AND BORING DATA
SCALE IN FEET
SUPPLEMENTARY DRAWING NO.1
MODJESKI, MASTERS & CASE, INC. - ENGINEERS
MAY 1936

EXHIBIT B-3a

EXHIBIT B-3b



NOTES ~

All anchor bolts to be furnished by superstructure contractor and set by substructure contractor.

Tops of piers and recesses at bridge seats to be dressed to true elevation.

All reinforcing bars to be deformed type and lapped 40 diameters at splices. Crosswall reinforcing to extend 40 diameters into shafts.

All construction joints to be adequately keyed.

Minimum clear distance from steel to face of concrete to be 2" unless otherwise noted.

Unit prices bid shall include, under Item #2, all metalwork, cutting edges and reinforcing steel, below the bottom of pier shaft.

Approved: Ralph Modjeski, Eng. Lic. Illinois, Certif. #11, Annual #434.

F. M. Masters

M. B. Case

Modjeski, Masters & Case,

CAIRO BRIDGE COMMISSION

OHIO RIVER BRIDGE

AT

CAIRO, ILLINOIS

MAIN RIVER PIERS

SCALE IN FEET

5 0 5 10 15 20

CONTRACT NO. 1

SUPPL. CONTRACT DRAWING NO. 2

MODJESKI, MASTERS & CASE, ENGINEERS

OCT. 1936

"C"

Revised Jan. 6, 1937

(2840—50M—12-64) 2

ILLINOIS GEOLOGICAL SURVEY, URBANA

	Thickness	Top	Bottom
Bridge Boring # 1 S Section 137-1SB Station 83+10 Offset 50' left			
Soft to medium very moist to moist brown caly A-7-6 (15)			8.0
Medium moist brown silty clay A-6 (11-12)			11.5
Very soft wet brown clay loam A-4(5-7)			13.0
Medium to stiff moist brown mottled gray clay A-7-6(15+)			23.0
Dense Wet Gray fine grained sand			30.5
Very dense wet gray coarse grained sand			53.0
Very dense wet gray fine grained sand			55.8
			TD
U.S. 51 crosses railroad 150'SL, 1000' WL.			
Copy of Highway Division log filed in Groundwater Section			
NO ENVELOPE			

COMPANY Illinois Division of Highways

FARM SBI-150 ICRR over SBI Rt. 150

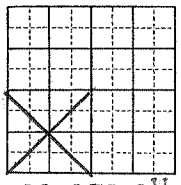
DATE DRILLED September 1965 **COUNTY NO.** 66

AUTHORITY Log by Division of Highways

ELEVATION 310' G. L.

LOCATION SW

COUNTY ALEXANDER



11-17S-1W

SAMPLE STUDY Co# 20633

Division of Highways (now IDOT), Highway Structure Test #4
NE¼ NE¼ NW¼, Sec.15, T17S, R1W
Alexander County, Cairo Quadrangle
Sample Set #C-4755
Examined by John Nelson, February 2, 2000

Samples are in small cloth sack and paper packets and were collected at intervals that vary from 2 to 10 feet (in most cases).

Thickness	Top	Bottom	
			Cahokia Formation
8.0	2.5	11.5	Silty clay, medium brownish gray, massive, finely micaceous, contains fragments of coal and modern plant debris.
5.0	11.5	16.5	Silt, medium brownish-gray, massive, coarse, has a clay matrix and contains scattered fine sand grains, slightly micaceous.
25.0	16.5	41.5	Silt, medium-light gray with yellowish-brown mottling, finer than above. Fine silt at the top becomes coarser and sandier downward, then back to fine silt with little sand. Modern-looking plant fragments are common throughout the interval.
18.5	41.5	60.0	Silt, medium to medium-light gray, generally uniform color and coarse silt, without sand. Abundant mica, massive, no plant material.

Henry Formation

26.5	60.0	86.5	Sand, light brownish-gray, fine to very coarse, subrounded to well-rounded, larger grains are more rounded. About 90% clear and smoky quartz and 10% chert and lithic grains. Scattered pebbles less than 1 cm across. Mostly loose, a little weakly lithified.
7.5	86.5	94.0	Sand and gravel, sand as above, mixed with ⅓ to ½ gravel, mostly rounded, 2 cm maximum diameter. Pebbles include quartz, many varieties of chert, siltstone, sandstone, diabase or basalt, coarse-grained granitic to intermediate igneous rocks.
2.5	94.0	96.5	Sand, light brownish gray, very fine to medium-grained, 80-90% quartz and 10-20% lithic grains. Loose to weakly lithified, silt matrix.
7.5	96.5	104.0	Sand and wood, sand medium brownish gray, very fine, borderline to coarse silt, weakly lithified, "salt and pepper" appearance from abundant lithic grains. Wood light brown, dry and brittle, fine fibrous texture (not peat or lignite). Sampled for radiocarbon dating.
5.0	106.5	111.5	Sand, brownish yellow, coarse to very coarse with small granules, mostly quartz, weakly lithified with a silt-clay matrix.

Eocene strata ?

10.0	111.5	121.5	Sand, white, well sorted, fine to medium grained, virtually 100% quartz, all loose sand.
30.0	121.5	151.5	Sand, clear to pale yellow, medium to very coarse, with small granules, subrounded to well rounded. Again it is almost 100% quartz. Only two samples for the interval.

T.D. 151.5 feet

E:\BLR\W.J.N\ss C-4755 Alexander Cty GRU.wpd

EXHIBIT B-6

(2840—50M—12-64) 2

ILLINOIS GEOLOGICAL SURVEY, URBANA

	Thickness	Top	Bottom
Bridge Boring # 2 Section 02-1B-1 Station 1138+50 Offset Centerline			
Medium to soft moist brown mottled gray silty clay to clay A-6 (12)			7.5
Medium moist dark gray mottled brown clay A7-6(13-15)			15.0
Soft very moist gray clay A-6(11-12)			20.
Medium to very loose moist to wet fine grained gray sand			25
Very loose wet gray sandy loam to sand			27.6
Loose to medium wet fine grained gray sand			32.6
Medium wet fine grained gray sand with rotten vegetation			37.6
Medium to dense wet fine grained gray sand			47.6
Medium wet medium to coarse grained gray sand			52.6
Dense wet coarse grained gray sand with some gravel			60.1
Medium to dense wet coarse gray sand and gravel			75.1
Dense to very dense wet medium to fine grained gray sand			82.1
Dense to very dense wet medium to coarse grained sand and gravel			90.6 TD
Copy of Highway Division log filed in Groundwater Section NO ENVELOPE			

COMPANY Illinois Division of Highways
FARM FAI 57 over Mississippi River **NO.**
DATE DRILLED August 18, 1964 **COUNTY NO.** 64
AUTHORITY Log by Division of Highways
ELEVATION 308' G.L.
LOCATION SW corner
COUNTY ALEXANDER

15-17S-1W

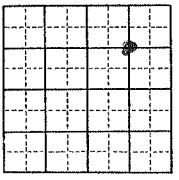
EXHIBIT B-7

(2840—50M—12-64) 2

ILLINOIS GEOLOGICAL SURVEY, URBANA

	Thickness	Top	Bottom
Bridge Boring # 9 S Section 02-1VB-1 Station 1106+34 Offset 48' Right Centerline Median			
Medium moist black silty clay loam to clay loam A-4 (8)			2.5
Medium to stiff moist brown clay A-7-6(15)			11.5
Soft very moist light brown clay A-7-6(14-15)			16.5
Stiff very moist light brown clay A-7-6(17)			19.9
Medium very moist light brown clay loam A-4(8)			21.3
Medium very moist light brown clay A-7-6(15+)			25.8
Soft to medium very moist gray clay loam A-4 (7-8)			28.8
Medium moist dark gray clay A-7-6(15+)			31.3
Stiff moist to very moist brown to mottled dark brown clay A-7-6(20+)			41.3
Medium very moist dark gray silty clay A-6(9)			44.8
No record			52.3
Medium very moist dark gray silty clay A-6(9)			54.8
Soft to medium very moist dark gray silt loam A-4 (8)			57.3
Medium moist dark gray silty clay A-7-6(13)			59.8
Medium to stiff moist dark gray silt loam A-4 (8)			68.3
Stiff moist dark gray silty clay A-6(12)			70.8
Dense to very dense wet brown fine to coarse grained sand			87.3
Very dense wet brown coarse grained sand with fine gravel			94.8
Very dense moist gray fine grained sand (continued)			97.3

COMPANY Illinois Division of Highways
FARM FAI 57 over MO Pac & GM & O RR **No.**
DATE DRILLED April 30, 1965 **COUNTY NO.** 65
AUTHORITY Log by Division of Highways
ELEVATION 337' G.L. 1000' NL, 1900' EL
LOCATION Center NE
COUNTY ALEXANDER



15-17S-1W

EXHIBIT B-7

(65600—40M—10-57) 2

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Medium moist gray silt loam to loam A-4	(5-7)		102.3
Very dense moist gray gravel			104.8
Very dense wet gray coarse grained sand			107.3
Very dense wet brown coarse grained sand			112.3
Very dense wet white very fine grained sand			122.3
Very dense wet light gray mottled brown coarse grained sand			127.3
Very dense wet light gray mottled brown to light brown fine to coarse grained sand			152.3 TD
Copy of Highway Division log filed in Groundwater Section			
NO ENVELOPE			

Illinois Division of Highways FAI-57

COUNTY ALEXANDER 15-17S-1W

Summary Table of Subsurface Data from Borings Performed at Mound City, IL[a]

Source	Boring ID	Elevation at Top of Layer (feet)				End of Boring
		Claiborne	Wilcox Formation		Porters Creek Clay	
			Upper Sandy Zone	Lower Clay Zone		
Elevation data based on unpublished records in files of Nashville District USACE, boring drilled within Ohio River channel and along west bank at Mound City	1	*	*	*	234.1	213.5
	2	*	*	243.8	240.9	220.0
	3	250.8	245.0	251.8	224.4	206.5
	4	250.0	247.0	231.5	198.5	185.4
	5	246.0	225.6	194.5	170.7	157.5
	6	251.8	*	*	151.8	150.8
	7	239.7	*	*	159.7	150.1
	8[b]		211.8	204.0	161.2	-19.5
	9	238.4	*	195.1	161.1	160.6
	10	241.7				221.4
	11	246.0	210.6	191.6	158.6	153.6
	12	239.6	225.5	197.1	157.5	124.4
	13	237.0	229.8	197.5	157.3	155.0
	14	244.5	222.7	197.5		183.1
	15	*	237.5	165.0	153.0	148.0
	16	236.0	208.9	185.6		178.3
	17	243.1	236.0	231.4	142.0	140.4
	18[c]	250.0	182.0	*	155.5	66.0
	19	237.4				189.7
	20	230.8	*	162.3	150.7	149.0
	21	242.3	*	184.4		174.9
	22	253.4				182.6
	23	253.4	233.8	216.9		180.8
	24		*	163.4	145.4	93.7
	25	247.1	181.8	178.6	153.8	151.6
	26	234.0	*	158.6	146.4	138.9
	27	230.8	*	174.7	153.3	149.5
	28	248.9	226.1	172.0	156.4	144.6
	29	*	232.0	172.8		160.5
	30	*		178.6		102.7
	31	242.2	233.3	163.9		160.6
	32	239.9	170.2	163.8	148.0	143.7
	33			153.0		98.9
	34	232.2	219.2	154.3		149.8
	35	236.0	231.0	184.9	154.4	145.0
	36	242.8	225.3	151.8		150.8
	37	235.1	219.1	193.1	142.2	141.7
	38	245.4	228.4	157.0	139.6	136.1
	39	234.1	190.1	168.5	149.1	143.1
	40	240.5	230.3	*	153.4	152.2
	41	216.2	172.3	*	149.6	145.6
	42	210.1	*	179.6	169.2	146.3
	43	211.1	*	175.5	164.5	134.5

Summary Table of Subsurface Data from Borings Performed at Cairo, IL[a]

Source	Boring ID	Elevation at Top of Layer (feet)				End of Boring
		Claiborne	Wilcox Formation		Porters Creek Clay	
			Upper Sandy Zone	Lower Clay Zone		
Elevation data at Cairo RR bridge based on unpublished records in files of Illinois Central Railroad, Chicago, IL	44	208.6				130.0
	45	184.0				105.5
	46	194.0				114.9
	47	168.0				105.0
	48	196.0				129.9
	49	198.0				140.0
	50	168.3				168.3
	51	180.0				180.0
	52	183.0				180.0
	53	186.0				180.0
	54	202.7				175.7

* formation not present

[a]Reproduced from USGS Cairo and Barlow Geologic Quadrangles

[b]Top of Clayton and McNairy Formation of Paleocene and Late Cretaceous at elevation of approx. 30 feet

[c]Top of Clayton and McNairy formations at elevation of 72.0 feet

Project Manager: RJE	Project No. N1135002	Terracon Consulting Engineers & Scientists	USACE BORING SUMMARY TABLE
Drawn by: DRK	Scale: N.T.S	3601 Mojave Court, Suite A Columbia, Missouri 65202	US 51 OHIO RIVER BRIDGE SCOPING STUDY
Checked by: RJE	File Name: B-8	PH. (573) 214-2677 FAX. (573) 214-2714	CDM SMITH
Approved by: RJE	Date: 2/22/2013		CAIRO & MOUND CITY, ALEXANDER COUNTY, ILLINOIS

FIG No. B-8

APPENDIX C

APPENDIX C – TABLE OF CONTENTS

Exhibit C-1	**Geologic Fault Map**
Exhibit C-2	**Seismic Study Results**

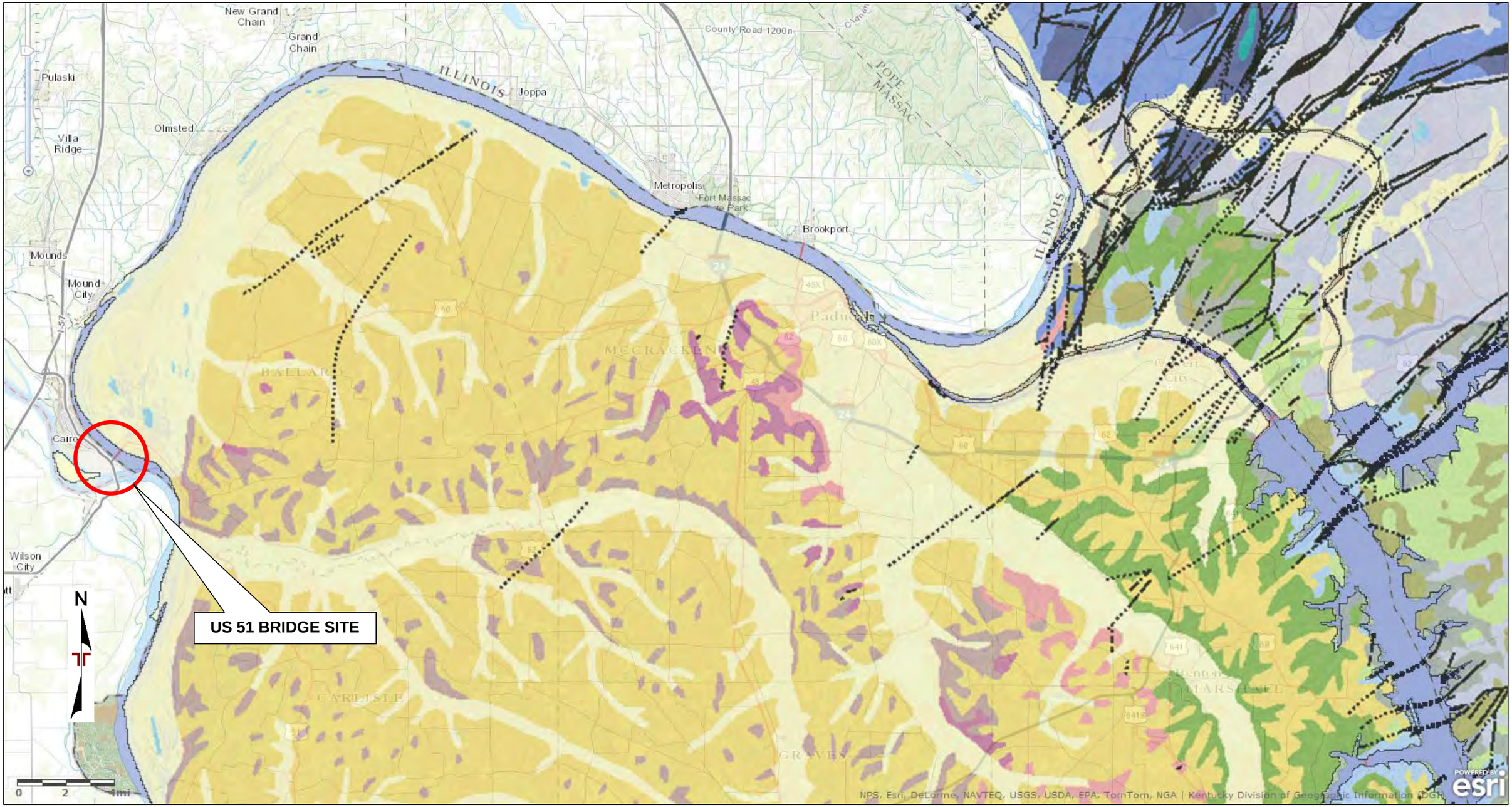


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

SOURCE: ArcGIS Kentucky Geology & Faults

Project Manager: NCD	Project No. N1135002
Drawn by: NCD	Scale: As Shown
Checked by: DRK	File Name: A1
Approved by: DRK	Date: 03-01-2013

Terracon
Consulting Engineers & Scientists
611 Lunken Park Drive Cincinnati, Ohio 45226
PH. (513) 321-5816 FAX. (513) 321-0294

GEOLOGIC FAULT MAP

US51 OHIO RIVER BRIDGE SCOPING STUDY
CDM SMITH
WICKLIFFE BALLARD COUNTY KENTUCKY

Exhibit
C-1

Design Maps Summary Report

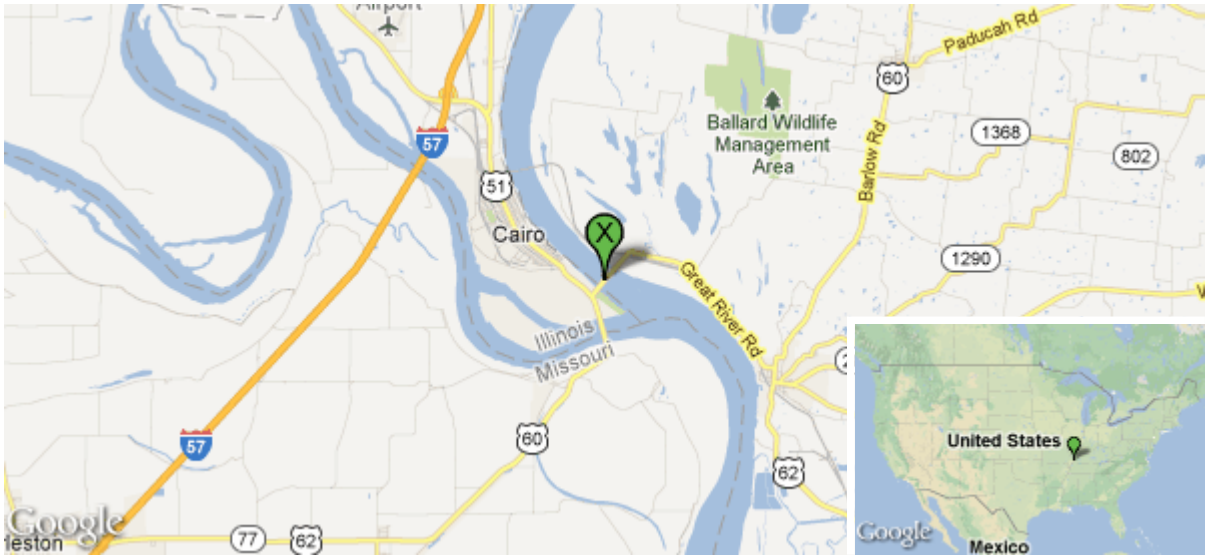
User–Specified Input

Report Title US51 Bridge@Cairo IL/Wickliffe KY
Wed January 9, 2013 15:28:35 UTC

Building Code Reference Document 2009 AASHTO Guide Specifications for LRFD Seismic Bridge Design
(which makes use of 2002 USGS hazard data)

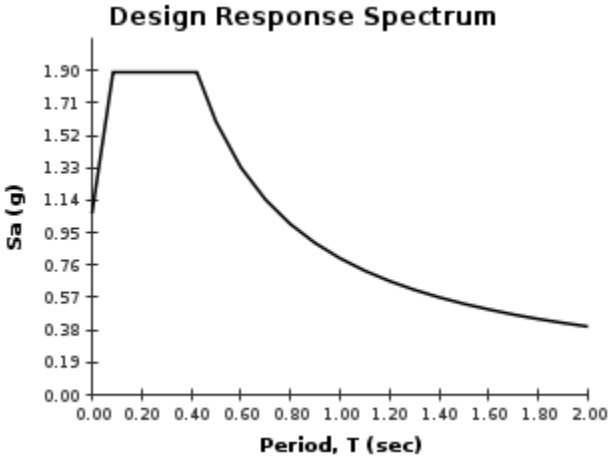
Site Coordinates 36.993°N, 89.147°W

Site Soil Classification Site Class D – "Stiff Soil"



USGS–Provided Output

PGA =	1.062 g	**A_s =**	1.062 g
S_S =	1.890 g	**S_{DS} =**	1.890 g
S_1 =	0.533 g	**S_{D1} =**	0.800 g



Although this information is a product of the U.S. Geological Survey, we provide no warranty, expressed or implied, as to the accuracy of the data contained therein. This tool is not a substitute for technical subject-matter knowledge.

EXHIBIT C-2

Design Maps Detailed Report

2009 AASHTO Guide Specifications for LRFD Seismic Bridge Design (36.993°N, 89.147°W)

Article 3.4.1 — Design Spectra Based on General Procedure

Note: Maps in the 2009 AASHTO Specifications are provided by AASHTO for Site Class B. Adjustments for other Site Classes are made, as needed, in Article 3.4.2.3.

From Figure 3.4.1-2[1]	PGA = 1.062 g
From Figure 3.4.1-3[2]	S_S = 1.890 g
From Figure 3.4.1-4[3]	S_1 = 0.533 g

EXHIBIT C-2

Article 3.4.2.1 — Site Class Definitions

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class D, based on the site soil properties in accordance with Article 3.4.2.

Table 3.4.2.1–1 Site Class Definitions

SITE CLASS	SOIL PROFILE NAME	Soil shear wave velocity, $\bar{v}_s$, (ft/s)	Standard penetration resistance, $\bar{N}$	Soil undrained shear strength, $\bar{s}_u$, (psf)
A	Hard rock	$\bar{v}_s > 5{,}000$	N/A	N/A
B	Rock	$2{,}500 < \bar{v}_s \leq 5{,}000$	N/A	N/A
C	Very dense soil and soft rock	$1{,}200 < \bar{v}_s \leq 2{,}500$	$\bar{N} > 50$	>2,000 psf
D	Stiff soil profile	$600 \leq \bar{v}_s < 1{,}200$	$15 \leq \bar{N} \leq 50$	1,000 to 2,000 psf
E	Stiff soil profile	$\bar{v}_s < 600$	$\bar{N} < 15$	<1,000 psf
E	—	Any profile with more than 10 ft of soil having the characteristics: 1. Plasticity index $PI > 20$, 2. Moisture content $w \geq 40\%$, and 3. Undrained shear strength $\bar{s}_u < 500$ psf		
F	—	Any profile containing soils having one or more of the following characteristics: 1. Soils vulnerable to potential failure or collapse under seismic loading such as liquefiable soils, quick and highly sensitive clays, collapsible weakly cemented soils. 2. Peats and/or highly organic clays ($H > 10$ feet of peat and/or highly organic clay where H = thickness of soil) 3. Very high plasticity clays ($H > 25$ feet with plasticity index $PI > 75$) 4. Very thick soft/medium stiff clays ($H > 120$ feet)		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

EXHIBIT C-2

Article 3.4.2.3 — Site Coefficients

Table 3.4.2.3-1 (for F_{pga})—Values of F_{pga} as a Function of Site Class and Mapped Peak Ground Acceleration Coefficient

Site Class	Mapped Peak Ground Acceleration				
	PGA ≤ 0.1	PGA = 0.2	PGA = 0.3	PGA = 0.4	PGA ≥ 0.5
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See AASHTO Article 3.4.3				

Note: Use straight–line interpolation for intermediate values of PGA

For Site Class = D and PGA = 1.062 g, F_{PGA} = 1.000

Table 3.4.2.3-1 (for F_a)—Values of F_a as a Function of Site Class and Mapped Short-Period Spectral Acceleration Coefficient

Site Class	Spectral Response Acceleration Parameter at Short Periods				
	S_S ≤ 0.25	S_S = 0.5	S_S = 0.75	S_S = 1	S_S ≥ 1.25
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See AASHTO Article 3.4.3				

Note: Use straight–line interpolation for intermediate values of S_S

For Site Class = D and S_S = 1.890 g, F_a = 1.000

EXHIBIT C-2

Table 3.4.2.3-2—Values of F_v as a Function of Site Class and Mapped 1-sec Period Spectral Acceleration Coefficient

Site Class	Mapped Spectral Response Acceleration Coefficient at 1-sec Periods				
	$S_1 \leq 0.1$	$S_1 = 0.2$	$S_1 = 0.3$	$S_1 = 0.4$	$S_1 \geq 0.5$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See AASHTO Article 3.4.3				

Note: Use straight–line interpolation for intermediate values of S_1

For Site Class = D and S_1 = 0.533 g, F_v = 1.500

Equation (3.4.1-1): $A_S = F_{PGA}\ PGA = 1.000 \times 1.062 = 1.062$ g

Equation (3.4.1-2): $S_{DS} = F_a\ S_S = 1.000 \times 1.890 = 1.890$ g

Equation (3.4.1-3): $S_{D1} = F_v\ S_1 = 1.500 \times 0.533 = 0.800$ g

Figure 3.4.1-1: Design Response Spectrum

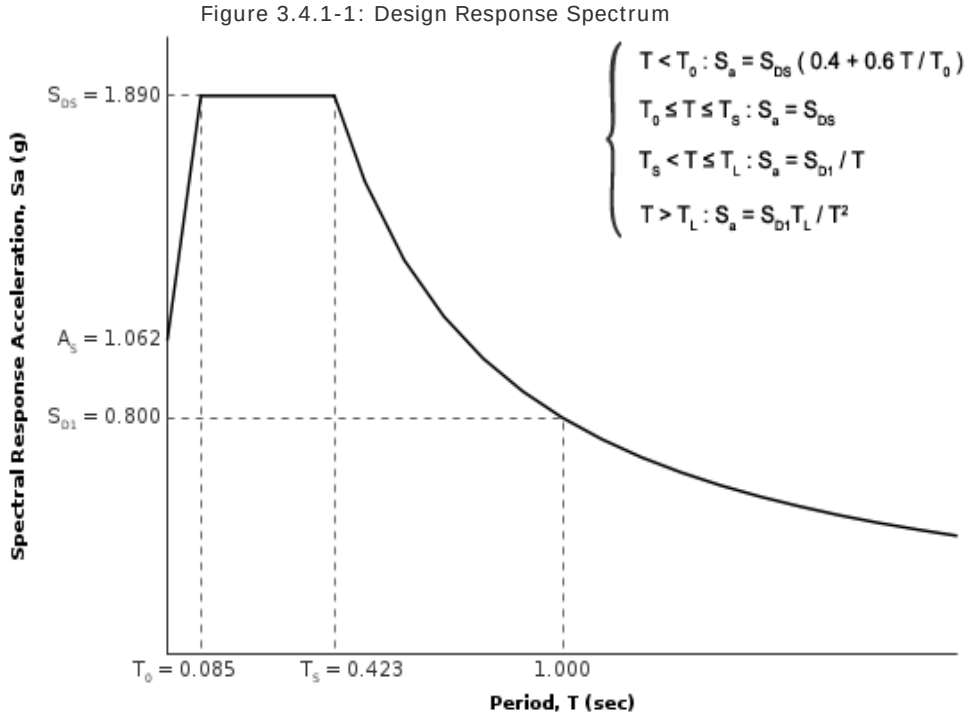


EXHIBIT C-2

Article 3.5 - Selection of Seismic Design Category (SDC)

Table 3.5-1—Partitions for Seismic Design Categories A, B, C, and D

VALUE OF S_{D1}	SDC
$S_{D1} < 0.15g$	A
$0.15g \leq S_{D1} < 0.30g$	B
$0.30g \leq S_{D1} < 0.50g$	C
$0.50g \leq S_{D1}$	D

For S_{D1} = 0.800 g, Seismic Design Category = D

Seismic Design Category ≡ “the design category in accordance with Table 3.5-1” = D

EXHIBIT C-2

References

1. *Figure 3.4.1-2*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/AASHTO-2009-Figure-3.4.1-2.pdf
2. *Figure 3.4.1-3*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/AASHTO-2009-Figure-3.4.1-3.pdf
3. *Figure 3.4.1-4*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/AASHTO-2009-Figure-3.4.1-4.pdf

EXHIBIT C-2

Design Maps Summary Report

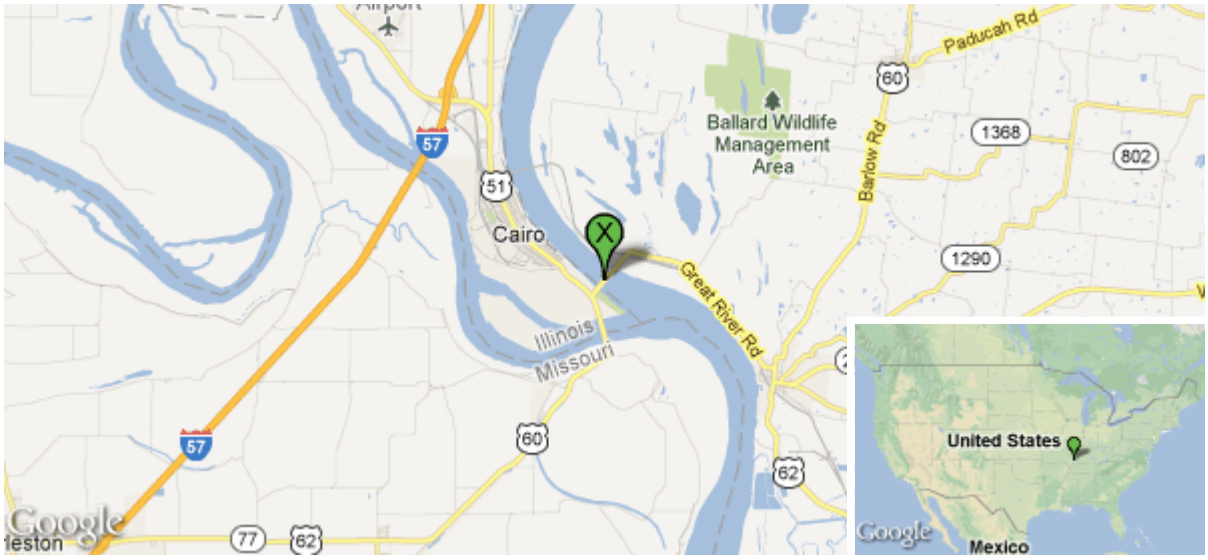
User–Specified Input

Report Title US51 Bridge@Cairo IL/Wickliffe KY
Wed January 9, 2013 15:29:09 UTC

Building Code Reference Document 2009 AASHTO Guide Specifications for LRFD Seismic Bridge Design
(which makes use of 2002 USGS hazard data)

Site Coordinates 36.993°N, 89.147°W

Site Soil Classification Site Class E – "Soft Clay Soil"



USGS–Provided Output

PGA =	1.062 g	**A_s =**	0.956 g
S_S =	1.890 g	**S_{DS} =**	1.701 g
S_1 =	0.533 g	**S_{D1} =**	1.280 g

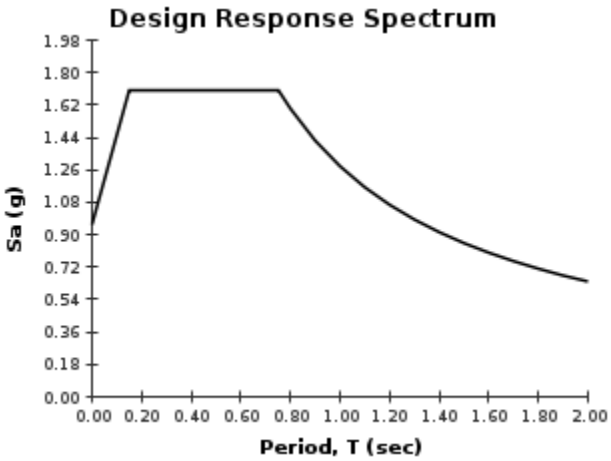


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EXHIBIT C-2

Design Maps Detailed Report

2009 AASHTO Guide Specifications for LRFD Seismic Bridge Design (36.993°N, 89.147°W)

Article 3.4.1 — Design Spectra Based on General Procedure

Note: Maps in the 2009 AASHTO Specifications are provided by AASHTO for Site Class B. Adjustments for other Site Classes are made, as needed, in Article 3.4.2.3.

From Figure 3.4.1-2[1]	PGA = 1.062 g
From Figure 3.4.1-3[2]	S_S = 1.890 g
From Figure 3.4.1-4[3]	S_1 = 0.533 g

EXHIBIT C-2

Article 3.4.2.1 — Site Class Definitions

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class E, based on the site soil properties in accordance with Article 3.4.2.

Table 3.4.2.1–1 Site Class Definitions

SITE CLASS	SOIL PROFILE NAME	Soil shear wave velocity, $\bar{v}_s$, (ft/s)	Standard penetration resistance, $\bar{N}$	Soil undrained shear strength, $\bar{s}_u$, (psf)
A	Hard rock	$\bar{v}_s > 5{,}000$	N/A	N/A
B	Rock	$2{,}500 < \bar{v}_s \leq 5{,}000$	N/A	N/A
C	Very dense soil and soft rock	$1{,}200 < \bar{v}_s \leq 2{,}500$	$\bar{N} > 50$	>2,000 psf
D	Stiff soil profile	$600 \leq \bar{v}_s < 1{,}200$	$15 \leq \bar{N} \leq 50$	1,000 to 2,000 psf
E	Stiff soil profile	$\bar{v}_s < 600$	$\bar{N} < 15$	<1,000 psf
E	—	Any profile with more than 10 ft of soil having the characteristics: 1. Plasticity index $PI > 20$, 2. Moisture content $w \geq 40\%$, and 3. Undrained shear strength $\bar{s}_u < 500$ psf		
F	—	Any profile containing soils having one or more of the following characteristics: 1. Soils vulnerable to potential failure or collapse under seismic loading such as liquefiable soils, quick and highly sensitive clays, collapsible weakly cemented soils. 2. Peats and/or highly organic clays ($H > 10$ feet of peat and/or highly organic clay where H = thickness of soil) 3. Very high plasticity clays ($H > 25$ feet with plasticity index $PI > 75$) 4. Very thick soft/medium stiff clays ($H > 120$ feet)		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

EXHIBIT C-2

Article 3.4.2.3 — Site Coefficients

Table 3.4.2.3-1 (for F_{pga})—Values of F_{pga} as a Function of Site Class and Mapped Peak Ground Acceleration Coefficient

Site Class	Mapped Peak Ground Acceleration				
	PGA ≤ 0.1	PGA = 0.2	PGA = 0.3	PGA = 0.4	PGA ≥ 0.5
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See AASHTO Article 3.4.3				

Note: Use straight–line interpolation for intermediate values of PGA

For Site Class = E and PGA = 1.062 g, F_{PGA} = 0.900

Table 3.4.2.3-1 (for F_a)—Values of F_a as a Function of Site Class and Mapped Short-Period Spectral Acceleration Coefficient

Site Class	Spectral Response Acceleration Parameter at Short Periods				
	S_S ≤ 0.25	S_S = 0.5	S_S = 0.75	S_S = 1	S_S ≥ 1.25
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See AASHTO Article 3.4.3				

Note: Use straight–line interpolation for intermediate values of S_S

For Site Class = E and S_s = 1.890 g, F_a = 0.900

EXHIBIT C-2

Table 3.4.2.3-2—Values of F_v as a Function of Site Class and Mapped 1-sec Period Spectral Acceleration Coefficient

Site Class	Mapped Spectral Response Acceleration Coefficient at 1-sec Periods				
	$S_1 \leq 0.1$	$S_1 = 0.2$	$S_1 = 0.3$	$S_1 = 0.4$	$S_1 \geq 0.5$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See AASHTO Article 3.4.3				

Note: Use straight–line interpolation for intermediate values of S_1

For Site Class = E and S_1 = 0.533 g, F_v = 2.400

Equation (3.4.1-1): $A_S = F_{PGA}\ PGA = 0.900 \times 1.062 = 0.956$ g

Equation (3.4.1-2): $S_{DS} = F_a\ S_S = 0.900 \times 1.890 = 1.701$ g

Equation (3.4.1-3): $S_{D1} = F_v\ S_1 = 2.400 \times 0.533 = 1.280$ g

Figure 3.4.1-1: Design Response Spectrum

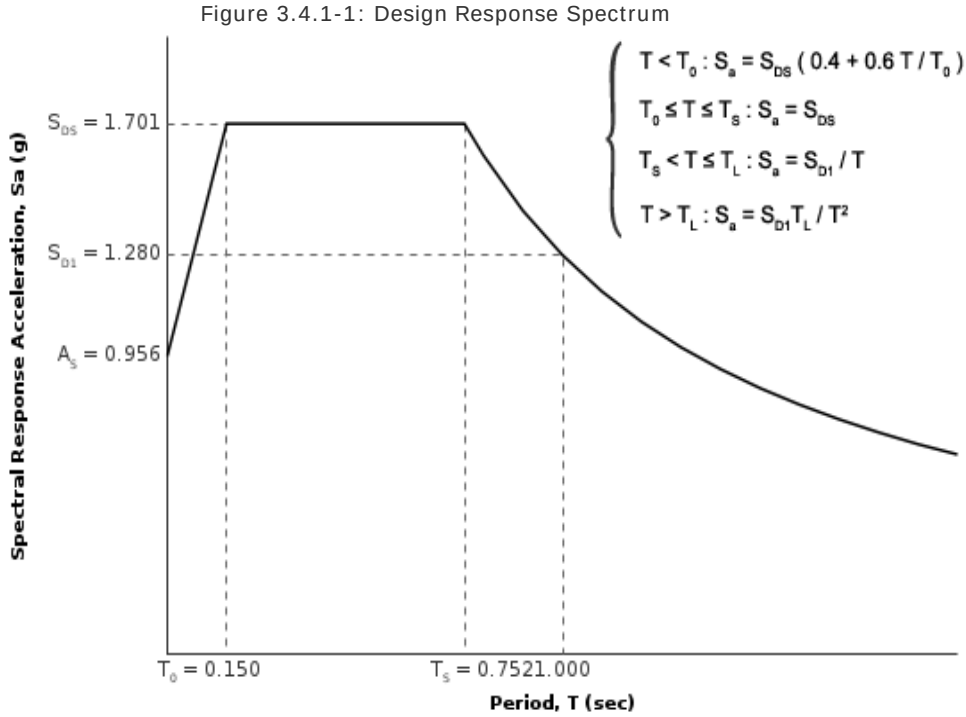

EXHIBIT C-2

Article 3.5 - Selection of Seismic Design Category (SDC)

Table 3.5-1—Partitions for Seismic Design Categories A, B, C, and D

VALUE OF S_{D1}	SDC
$S_{D1} < 0.15g$	A
$0.15g \leq S_{D1} < 0.30g$	B
$0.30g \leq S_{D1} < 0.50g$	C
$0.50g \leq S_{D1}$	D

For S_{D1} = 1.280 g, Seismic Design Category = D

Seismic Design Category ≡ “the design category in accordance with Table 3.5-1” = D

EXHIBIT C-2

References

1. *Figure 3.4.1-2*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/AASHTO-2009-Figure-3.4.1-2.pdf
2. *Figure 3.4.1-3*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/AASHTO-2009-Figure-3.4.1-3.pdf
3. *Figure 3.4.1-4*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/AASHTO-2009-Figure-3.4.1-4.pdf

EXHIBIT C-2

APPENDIX D

APPENDIX D – TABLE OF CONTENTS

Exhibit D-1	**USACE Levee Wall Location Map**
Exhibit D-2	**KGS Generalized Land Use Map with Wetland Location**
Exhibit D-3	**KGS Known Karst Risk Potential**

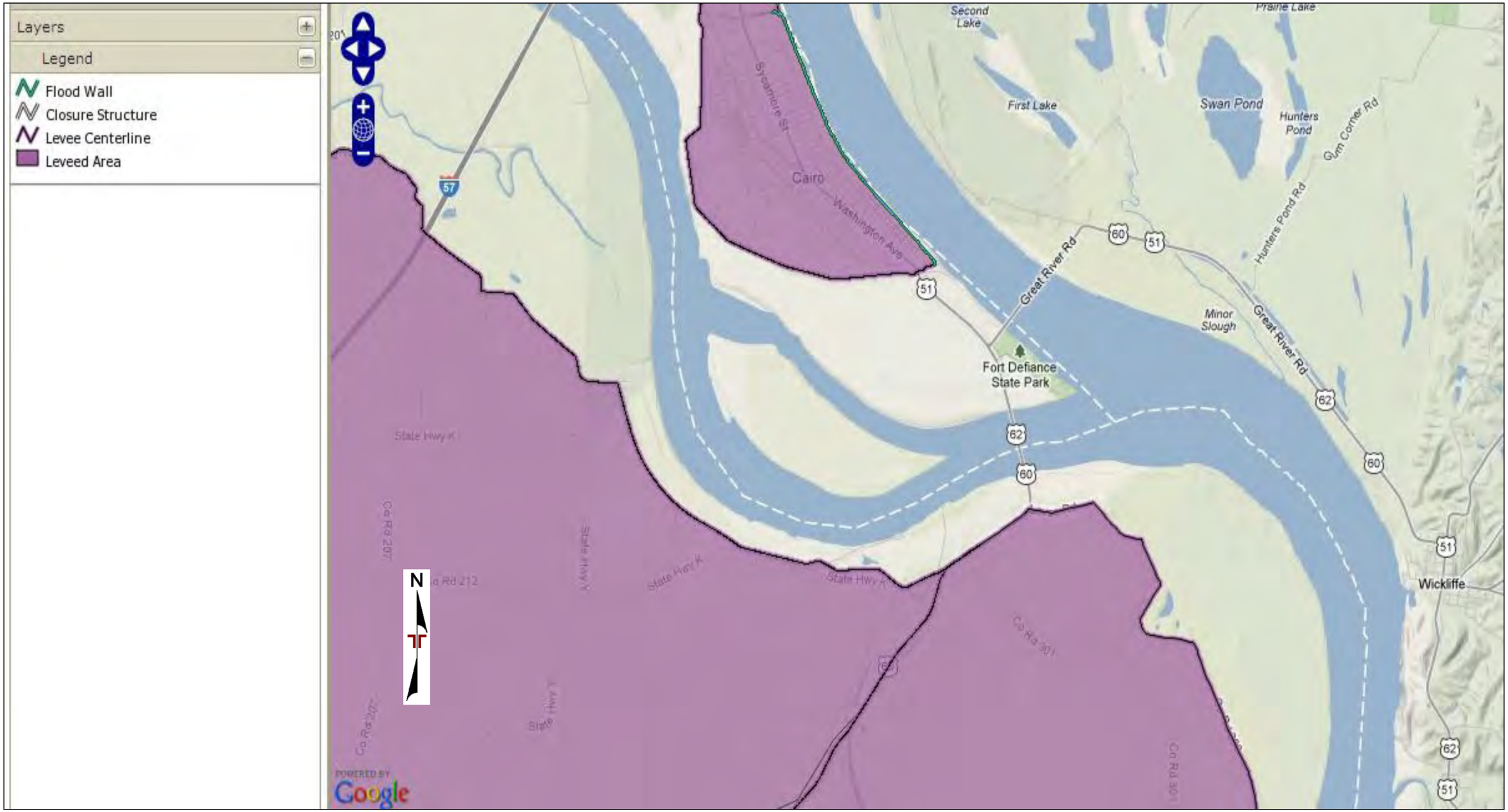

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

SOURCE: USACE NATIONAL LEVEE DATABASE

Project Manager: NCD	Project No. N1135002	Terracon Consulting Engineers & Scientists	USACE LEVEE WALL LOCATION MAP
Drawn by: NCD	Scale: NTS	611 Lunken Park Drive Cincinnati, Ohio 45226	**US51 OHIO RIVER BRIDGE SCOPING STUDY**
Checked by: DRK	File Name: D-1	PH. (513) 321-5816 FAX. (513) 321-0294	**CDM SMITH**
Approved by: DRK	Date: 03-01-2013		**CAIRO ALEXANDER COUNTY ILLINOIS**

Exhibit

D-1

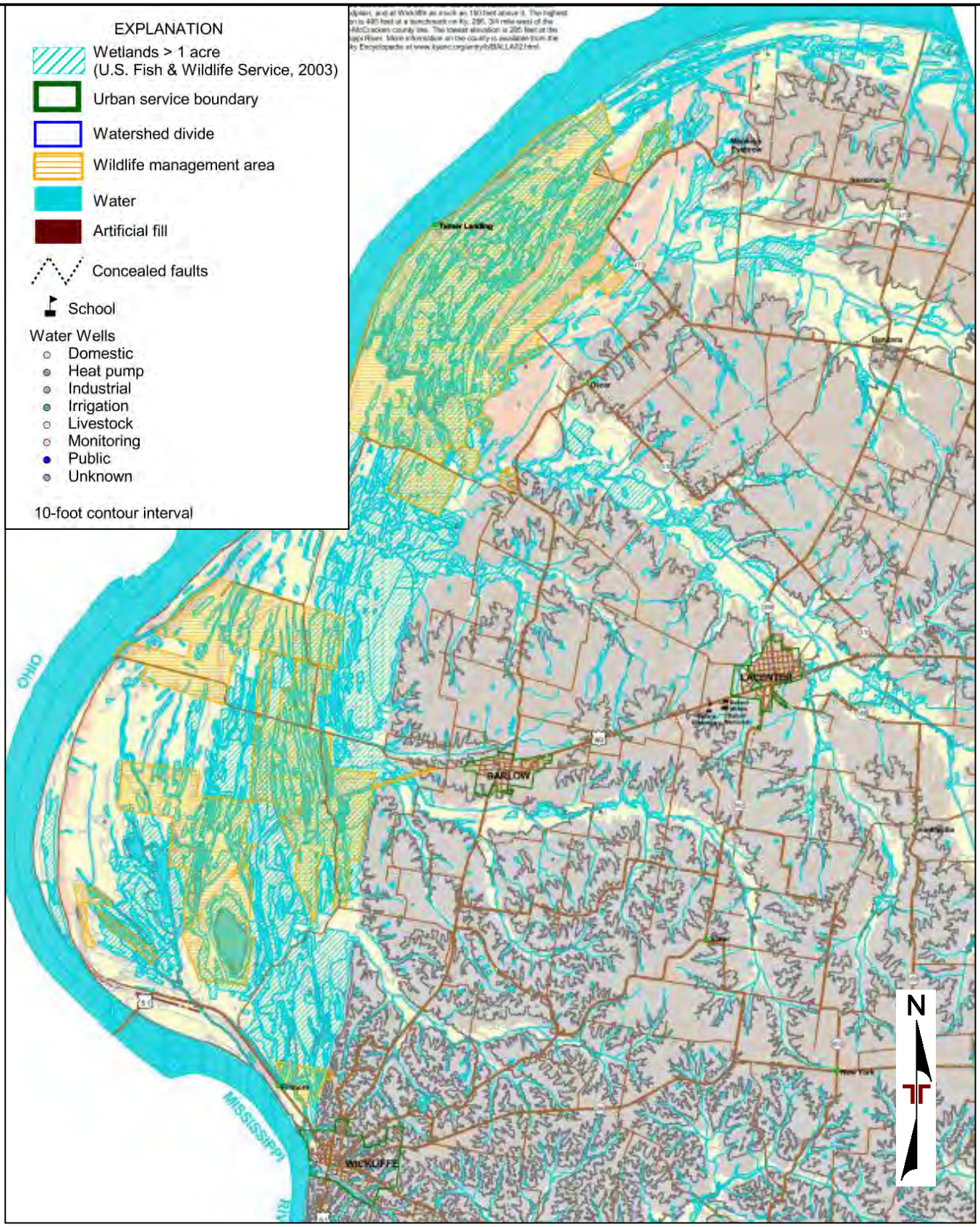

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Source: KGS: GENERALIZED LAND USE MAP

Project Manager: NCD	Project No. N1135002	Terracon Consulting Engineers & Scientists	WETLAND MAP	Exhibit
Drawn by: NCD	Scale: N.T.S	611 Lunken Park Drive Cincinnati, Ohio 45226	US51 OHIO RIVER BRIDGE SCOPING STUDY	D-2
Checked by: DRK	File Name: D-2	PH. (513) 321-5816 FAX. (513) 321-0294	CDM SMITH	
Approved by: DRK	Date: 03-01-2013		WICKLIFFE BALLARD COUNTY KENTUCKY	

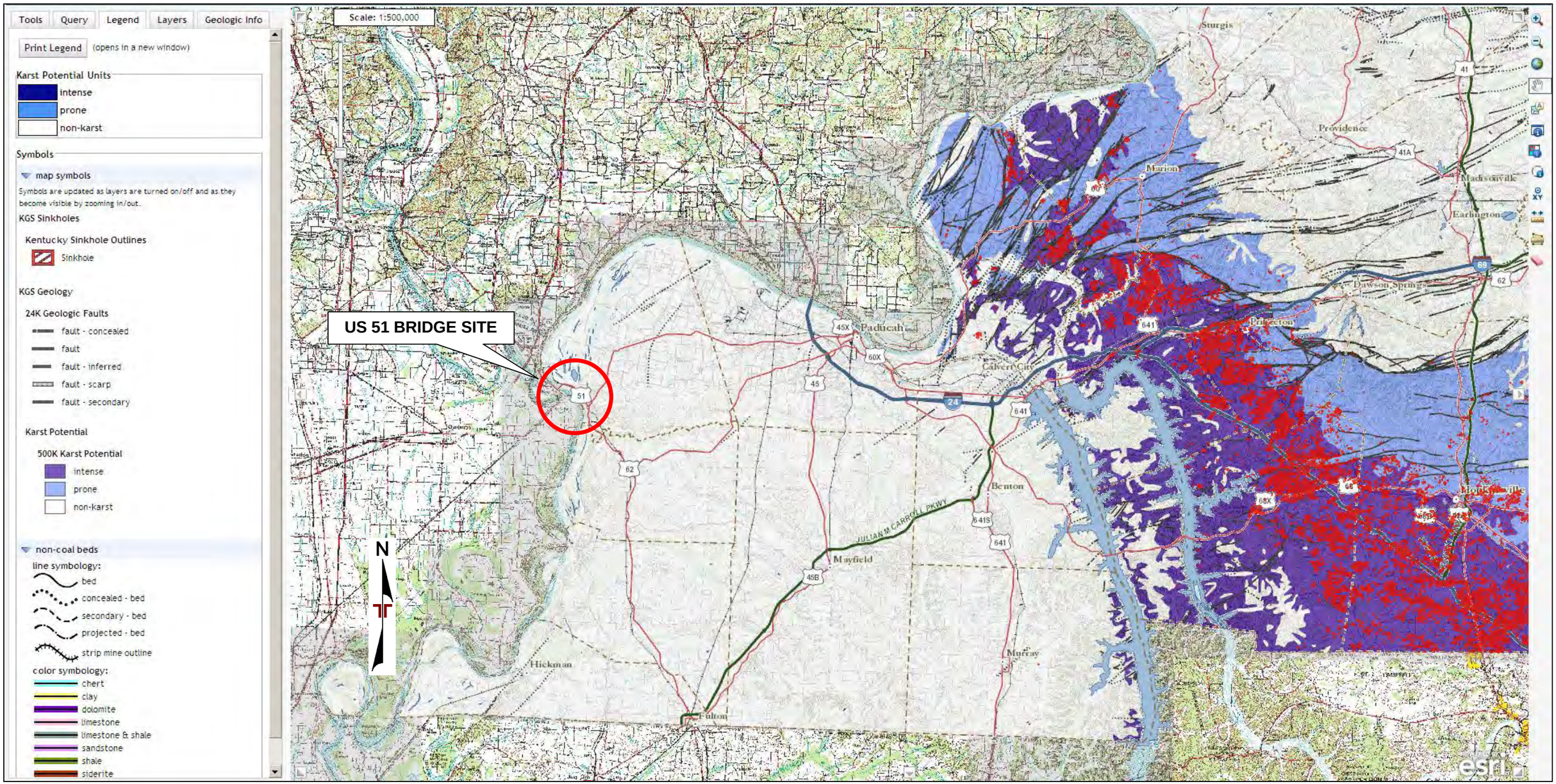

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

SOURCE: KENTUCKY GEOLOGIC MAP INFORMATION SERVICE

Project Manager: NCD	Project No. N1135002	Terracon Consulting Engineers & Scientists	GEOLOGIC KNOWN KARST MAP
Drawn by: NCD	Scale: As Shown	611 Lunken Park Drive Cincinnati, Ohio 45226	US51 OHIO RIVER BRIDGE SCOPING STUDY
Checked by: DRK	File Name: D-3	PH. (513) 321-5816 FAX. (513) 321-0294	CDM SMITH
Approved by: DRK	Date: 03-01-2013		WICKLIFFE BALLARD COUNTY KENTUCKY

Exhibit D-3

Appendix B

Resource Agency Letters regarding Threatened & Endangered Species

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Kentucky Ecological Services Field Office
330 West Broadway, Suite 265
Frankfort, Kentucky 40601
(502) 695-0468

March 13, 2013

Ms. Amanda Kerley
Third Rock Consultants
2526 Regency Road
Lexington, KY 40503

Re: FWS 2013-B-0279; KYTC 1-100.00 & 1-1140.00; US 51 bridge replacement over the Ohio River; located in Ballard County, Kentucky

Dear Ms. Kerley:

Thank you for the opportunity to provide comments on the above-referenced project. The U.S. Fish and Wildlife Service (Service) has reviewed this proposed project and offers the following comments in accordance with the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*), Bald and Golden Eagle Protection Act (54 Sat. 250, as amended, 16 U.S.C. 668a-d), and the Migratory Bird Treaty Act (MBTA) (40 Stat. 775, as amended; 16 U.S.C. 703 *et seq.*). This is not a concurrence letter. Please read carefully, as further consultation with the Service may be required.

In order to assist you in determining if the proposed project has the potential to impact protected species we have searched our records for occurrences of listed species within the vicinity of the proposed project. Based upon the information provided to us and according to our databases, we believe that the following federally listed species have the potential to occur within the project vicinity. The listed species are:

Group	Species	Common name	Legal Status
Mammals	*Myotis sodalis*	Indiana bat	E
Mussels	*Plethobasus cooperianus*	orangefoot pimpleback	E
	Cyprogenia stegaria	fanshell	E
	Lampsilis abrupta	pink mucket	E
	Obovaria retusa	ring pink	E
	Plethobasus cyphyus	sheepnose	C
	Pleurobema clava	clubshell	E
	Pleurobema plenum	rough pigtoe	E
	Potamilus capax	fat pocketbook	E
Fishes	*Scaphirhynchus albus*	pallid sturgeon	E
Birds	*Haliaeetus leucocephalus*	bald eagle	Delisted
	Sterna antillarum	interior least tern	E

* *Key to notations: E = Endangered, T = Threatened, C = Candidate, CH = Critical Habitat*

We must advise you that collection records available to the Service may not be all-inclusive. Our database is a compilation of collection records made available by various individuals and resource agencies. This information is seldom based on comprehensive surveys of all potential habitats and thus does not necessarily provide conclusive evidence that protected species are present or absent at a specific locality.

Indiana bat

The proposed project is within the home range of a known Indiana bat maternity colony. "Maternity habitat" refers to suitable summer habitat used by juveniles and reproductive (pregnant, lactating, or post-lactating) females and is an essential component of the Indiana bat's lifecycle. Female Indiana bats become pregnant in spring soon after they emerge from their hibernacula, usually caves, rockshelters, and mines. The pregnant females migrate to their maternity habitat, forming colonies of up to 100 or more individuals, and roost in "suitable roost trees." A "suitable roost tree" is any tree (live or dead) with a diameter- at- breast- height (DBH) of 5-inches or greater that exhibits any of the following characteristics: exfoliating bark, crevices or cracks. Trees with a DBH of 5-inches or greater and are not "suitable roost trees," as previously defined, still serve as foraging habitat for the Indiana bat. Each female in the colony gives birth to one pup per year. The young bats are nursed by the mother, who leaves the roost tree only to forage for food. The young stay with the maternity colony throughout their first summer.

Typically for a project of this nature, the Service would recommend seasonal tree clearing or the completion of a mist net survey before construction activities take place. Mist net surveys provide presence/absence information; however, we already know that the Indiana bats are present within the proposed project area and that the project area falls within the home range of a known maternity colony. We do not believe a survey is necessary for the proposed project. Also, seasonal tree clearing for the project could still result in indirect and/or cumulative effects to the maternity colony through changes to the landscape and the removal of potential foraging and roosting habitat. Currently, the available forested habitat within this maternity colony is already relatively low and determined sensitive, so even seasonal removal of habitat is likely to result in significant or non-discountable effects to the Indiana bat.

In order to address these concerns and be in compliance with the ESA, we recommend one of the following options:

- The project proponent can modify the proposed project to eliminate or reduce impacts to potential Indiana bat roost trees and thus avoid impacts.

- The project proponent can request formal section 7 consultation through the lead Federal Action Agency associated with the proposed project.

- The project proponent may choose to enter into a Conservation Memorandum of Agreement (MOA) with the Service to account for the incidental take of Indiana bats. By entering into a Conservation MOA with the Service, Cooperators gain flexibility with regard to the removal of suitable Indiana bat habitat. In exchange for this flexibility, the Cooperator provides recovery-focused conservation benefits to the Indiana bat through the implementation of minimization and mitigation measures that are described in the Indiana Bat Mitigation Guidance

for the Commonwealth of Kentucky. For additional information about this option, please notify our office.

Federally listed mussels

Federally listed mussel species are known to inhabit the Ohio River. Should the proposed project require disturbance of substrate that coincides with the habitat required for these mussel species, an on-site inspection or survey of the area may need to be conducted to determine if listed species are present or occur seasonally. Surveys should be done by qualified personnel and be conducted during the appropriate time of day and or year to ensure confidence in survey results. Please notify this office with the results of any surveys and an analysis of the "effects of the action," as defined by 50 CFR 402.02 on any listed species including consideration of direct, indirect, and cumulative effects.

Surveys for the listed species would not be necessary if sufficient site-specific information was available that showed that: (1) there is no potentially suitable habitat within the project area or its vicinity or (2) the species would not be present within the project area or its vicinity due to site-specific factors.

Pallid sturgeon

The pallid sturgeon is inhabits large, turbid rivers and is known in Kentucky only from Ballard and Hickman Counties. The proposed project should consider the effects of disturbance of the habitat within the Ohio River on the species.

Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) was officially removed from the List of Endangered and Threatened Species on August 8, 2007 but it continues to be protected under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA). According to our database, there are no known bald eagle nests within one mile of the proposed project area, but it is possible that new or previously unidentified nests are present.

Eagles in Kentucky typically nest in large mature trees (*e.g.*, bald cypress, sycamore, willow, etc.) near major rivers and large, open bodies of water where fish, waterfowl, and other prey are abundant. Eggs are laid in late February or early March and hatch after 35 days. Bald eagles often revisit and reuse the same nest season after season.

Breeding bald eagles occupy "territories" that they will typically defend against intrusion by other eagles, and that they likely return to each year. A territory may include one or more alternate nests that are built and maintained by the eagles, but which may not be used for nesting in a given year. Potential nest trees within a nesting territory may, therefore, provide important alternative bald eagle nest sites. In forested areas, bald eagles often select the tallest trees with limbs strong enough to support a nest that may weigh more than 1,000 pounds. Most nests are located in the upper 30 feet of the tree; the cone-shaped nest may be 6 to 8 feet in diameter and 6 to 8 feet from top to bottom. Nest sites typically include at least one perch with a clear view of the water or area where the eagles usually forage. Shoreline trees or snags located near large water bodies provide the visibility and accessibility needed to locate aquatic prey. Bald eagles are vulnerable to disturbance during courtship, nest building, egg laying, incubation, and brooding. Disturbance during this critical period may lead to nest abandonment, cracked and chilled eggs, and exposure of small young to the elements. Human activity near a nest late in the nesting cycle may also cause flightless birds to jump from the nest tree, thus reducing their chance of survival. Major threats to this species include

habitat alteration, human disturbance, and environmental contaminants (*i.e.*, organochlorine pesticides and lead).

The Service developed the National Bald Eagle Management (NBEM) Guidelines to provide landowners, land managers, and others with information and recommendations to minimize potential project impacts to bald eagles, particularly where such impacts may constitute "disturbance," which is prohibited by the BGEPA. A copy of the NBEM Guidelines is available at: http://www.fws.gov/migratorybirds/BaldEagle.htm. Those guidelines recommend: (1) maintaining a specified distance between the activity and the nest (buffer area); (2) maintaining natural areas (preferably forested) between the activity and nest trees (landscape buffers); and (3) avoiding certain activities during the breeding season. On-site personnel should be informed of the possible presence of nesting bald eagles within the project boundary, and should identify, avoid, and immediately report any such nests to this office. If a bald eagle nest is discovered within or adjacent to the proposed project area, then an evaluation must be performed to determine whether the project is likely to disturb nesting bald eagles. That evaluation may be conducted on-line at: http://www.fws.gov/southeast/es/baldeagle. Following completion of the evaluation, that website will provide a determination of whether additional consultation is necessary. The Division of Migratory Birds for the Southeast Region of the Service (phone: 404/679-7051, e-mail: SEmigratorybirds@fws.gov) has the lead role in conducting such consultations. Should you need further assistance interpreting the guidelines or performing an on-line project evaluation, please contact this office.

Interior least tern

Interior least terns breed in or near the major river systems of the Great Plains and the Midwest. In Kentucky they spend the spring and summer months around the lower Ohio River and Mississippi River, nesting in loose colonies beginning in late April to early June. Their nests are shallow depressions on sparsely vegetated sand and gravel substrates. Colonies often use habitat on bars and islands within a wide unobstructed river channel but also commonly use manmade areas, such as sand and gravel pits. Reproductive success is decreased by human disturbance. Our records indicate that several interior least tern nests have been documented in agricultural fields in the vicinity of the project area. We have the following recommendations regarding the interior least tern:

- The project proponent can design the proposed project to eliminate impacts to potential nesting areas during the breeding season, April 15 through August 31; or

- If project construction must occur between April 15 and August 31, a survey can be conducted, by a qualified biologist, to determine the presence or absence of nesting interior least terns within the vicinity of the project area. If any interior least tern or other migratory bird nests are identified, we would request written notification of such occurrence(s) and further coordination and consultation. A survey would not be necessary if sufficient site-specific information was available that showed that there is no potentially suitable nesting habitat within the project area or its vicinity

Migratory Bird Treaty Act comments

The MBTA prohibits the take of 1,007 species of birds listed under the four international migratory bird treaties signed by the U.S. (50 CFR 10.13). We have the following recommendations in regards to birds protected under the MBTA:

- If the existing bridge is removed between April 15 and August 31, the underside should be inspected for the presence of nesting birds, such as barn swallows and cliff swallows.

- Areas that provide nesting habitat (*e.g.* grasslands, wetlands) that will be disturbed between April 15 and August 31 should be surveyed for the nests of birds protected under the MBTA.

Thank you again for your request. Your concern for the protection of endangered and threatened species is greatly appreciated. If you have any questions regarding the information that we have provided, please contact Jessi Miller at (502) 695-0468 extension 104.

Sincerely,

Virgil Lee Andrews, Jr.
Field Supervisor

United States Department of the Interior

U.S. FISH AND WILDLIFE SERVICE
Marion Illinois Sub-Office (ES)
8588 Route 148
Marion, Illinois 62959
(618) 997-3344

April 1, 2013

Amanda Kerley
Third Rock Consultants
2526 Regency Road, Suite 180
Lexington, KY 40503

Dear Ms. Kerley:

Thank you for your letter dated February 28, 2013, requesting information on any federally listed threatened or endangered species that may be present in the vicinity of the proposed US 51 Bridge Replacement Project. The proposed project involves replacing the existing US 51 Bridge over the Ohio River near Cairo, Illinois and this letter addresses the portion of the proposed project located in Alexander and Pulaski Counties, Illinois. These comments are provided under the authority of and in accordance with the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.); the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq*.); the Migratory Bird Treaty Act (40 Stat. 755, as amended; 16 U.S.C. 703 *et seq.*) and, the National Environmental Policy Act (83 Stat. 852, as amended P.L. 91-190, 42 U.S.C. 4321 et seq.).

Threatened and Endangered Species

To facilitate compliance with Section 7(c) of the Endangered Species Act of 1973, as amended, Federal agencies are required to obtain from the Fish and Wildlife Service (Service) information concerning any species, listed or proposed to be listed, which may be present in the area of a proposed action. Therefore, we are furnishing you the following list of species which have ranges that include the project area and have included background information for each species in an attachment:

Classification	Common Name (Scientific Name)	Habitat
Endangered	Gray bat (*Myotis grisescens*)	Caves and mines; rivers and reservoirs adjacent to forests
Endangered	Indiana bat (*Myotis sodalis*)	Caves, mines; small stream corridors with well developed riparian woods; upland and bottomland forests
Endangered	Least tern	Bare alluvial and dredge spoil

	(*Sterna antillarum*)	islands
Endangered	Orange-footed pearlymussel (*Plethobasus cooperianus*)	Ohio River
Endangered	Pallid sturgeon (*Scaphirhynchus albus*)	Large rivers
Proposed as Threatened	Rabbitsfoot (*Quadrula cylindrica cylindrical*)	Ohio River
Proposed Critical Habitat	Rabbitsfoot (*Quadrula cylindrica cylindrical*)	Ohio River
Endangered	Sheepnose (*Plethobasus cyphyus*)	Rivers

There is no designated critical habitat in the project area at this time.

Our technical assistance website at the link below provides Section 7 consultation guidance for Federal agencies and their applicants (i.e. project proponents). From there you can go through the step-by-step instructions for the section 7(a)(2) consultation process. You will find information on threatened and endangered species and list of species by county along with other information on the consultation process. By following the instructions, you can determine what your action area is, whether listed species may be found within the action area, and if the project may affect listed species.

http://www.fws.gov/midwest/endangered/section7/s7process/index.html

Fish and Wildlife Resources

Although the bald eagle has been removed from the threatened and endangered species list, it continues to be protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act (BGEPA). **There is a known bald eagle nest in the vicinity of proposed Alternatives 3, 3A, and 4.** The Service developed the National Bald Eagle Management Guidelines to provide landowners, land managers, and others with information and recommendations regarding how to minimize potential project impacts to bald eagles, particularly where such impacts may constitute "disturbance," which is prohibited by the BGEPA. A copy of the guidelines is available at:

http://www.fws.gov/midwest/eagle/guidelines/guidelines.html

National Wetland Inventory (NWI) maps (see link below) indicate that there are forested wetlands present in the vicinity of all of the proposed alternatives. These forested wetlands could provide habitat for Indiana bats and are likely important habitats to a variety of migratory birds including neo-tropical migrants. The Service recommends that impacts to these forested

wetlands be avoided or minimized to the greatest extent possible. If forest habitats and/or wetlands are impacted an appropriate mitigation plan should be developed and coordinated with the Service.

http://www.fws.gov/wetlands/Data/Mapper.html

A portion of **Cypress Creek National Wildlife Refuge (NWR)** is located in the vicinity of Alternative 5. Cypress Creek NWR was established in 1990 under the Emergency Wetlands Resource Act of 1986 to protect, restore, and manage wetlands and bottomland forests that provide habitat for waterfowl and other migratory birds, resident wildlife, and endangered and threatened species. Impacts to Cypress Creek NWR should be avoided and any potential impacts should be coordinated with the Refuge and this office. Information about Cypress Creek NWR can be found at the following link:

http://www.fws.gov/refuge/cypress_creek/

Thank you for the opportunity to provide information concerning threatened and endangered species. For additional coordination, please contact me at (618) 997-3344, ext. 345.

Sincerely,

/s/ Matthew T. Mangan

Matthew T. Mangan
Biologist in Charge

cc: USFWS (Andrews, Brown, Nelson)

FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES INFORMATION FOR ALEXANDER AND PULASKI COUNTIES, ILLINOIS

The **gray bat** (*Myotis grisescens*) is listed as endangered and occurs in several Illinois counties where it inhabits caves both during summer and winter. This species forages over rivers and reservoirs adjacent to forests. A search for this species should be made prior to any cave impacting activity.

The endangered **Indiana bat** (*Myotis sodalis*) has been noted as occurring in several Illinois counties. Potential habitat for this species occurs statewide, therefore, Indiana bats are considered to potentially occur in any area with forested habitat. Indiana bats migrate seasonally between winter hibernacula and summer roosting habitats. Winter hibernacula include caves and abandoned mines. Females emerge from hibernation in late March or early April to migrate to summer roosts. Females form nursery colonies under the loose bark of trees (dead or alive) and/or in cavities, where each female gives birth to a single young in June or early July. A single colony may utilize a number of roost trees during the summer, typically a primary roost tree and several alternates. Some males remain in the area near the winter hibernacula during the summer months, but others disperse throughout the range of the species and roost individually or in small numbers in the same types of trees as females. The species or size of tree does not appear to influence whether Indiana bats utilize a tree for roosting provided the appropriate bark structure is present.

During the summer, Indiana bats frequent the corridors of small streams with well-developed riparian woods, as well as mature bottomland and upland forests. They forage for insects along stream corridors, within the canopy of floodplain and upland forests, over clearings with early successional vegetation (old fields), along the borders of crop lands, along wooded fence rows, and over farm ponds and in pastures. To avoid impacting the species, tree clearing activities should not occur during the period of April 1 to September 30. If a proposed action occurs within a 5-mile radius of a winter hibernacula, tree clearing should be prohibited from April 1 to November 15. If it is necessary to clear trees during this time frame, surveys may be necessary to determine if Indiana bats are present. A search for this species should be made prior to cave impacting activities.

The **least tern** (*Sterna antillarum*) is listed as endangered and occurs in several Illinois counties along the Mississippi and Ohio Rivers. It nests on bare alluvial or dredge spoil islands and sand/gravel bars in or adjacent to rivers, lakes, gravel pits and powerplant cooling ponds. It nests in colonies with other least terns and sometimes with the piping plover. This species forages in shallow water areas along the river and in backwater areas, such as side channels and sloughs. Foraging habitat must be located in close proximity to nesting habitat.

The **orange-footed pearlymussel** (*Plethobasus cooperianus*) is listed as endangered and occurs in the Ohio River in Massac and Pulaski counties and may potentially occur in other Illinois counties bordering the Ohio River. This species inhabits gravel or mixed sand and gravel substrates. Instream activities in the Ohio River will typically require a mussel survey to determine if orange-footed pearly mussels are present.

The endangered **pallid sturgeon** (*Scaphirhynchus albus*) is found in the Mississippi River downstream of Melvin Price Locks and Dam. Pallid sturgeon are adapted to large rivers with extensive micro-habitat diversity, turbid water, braided channels, irregular flows and flood cycles. Little is known of its micro-habitat preferences; however, it is suspected that sand/gravel bars and the mouths of major tributaries may be utilized for spawning. This species feeds on aquatic invertebrates and small fish.

The **rabbitsfoot** (*Quadrula cylindrica cylindrica*) is proposed as threatened and occurs in the Embarrass, Vermillion River, Salt Fork Vermillion River, Middle Fork Vermillion River, North Fork Vermillion, Middle Branch North Fork Vermillion River, Wabash, and Ohio Rivers within several Illinois counties.

The proposed critical habitat for **rabbitsfoot** (*Quadrula cylindrica cylindrica*) can be found at the following link:
http://www.fws.gov/midwest/endangered/clams/rabbitsfoot/PropCHMapUnitsIllinois.html#Unit21

The **sheepnose** (*Plethobasus cyphyus*) is listed as endangered. This species inhabits medium to large rivers and utilizes gravel and mixed sand and gravel substrates.

EcoCAT
Ecological Compliance Assessment Tool

Applicant:	Third Rock Consultants	*IDNR Project Number:*	1311157
Contact:	Rain Storm	*Date:*	03/18/2013
Address:	2526 Regency Road, Suite 180 Lex, KY 40475	*Alternate Number:*	1310244

Project: US 51 Ohio River Bridge Replacement
Address: US 51, Cairo

Description: The US 51 Ohio River Bridge, also known as the Cairo Bridge, connecting Wickliffe, Kentucky with Cairo Illinois, was constructed by the Cairo Bridge Commission and open to traffic as a toll facility on November 11, 1935. The 76 year old bridge, which carries US 60 and US 62, is officially termed "functionally obsolete" because it does not meet current traffic standards. Third Rock Consultants, LLC (Third Rock) was retained to conduct an ecological assessment of the Study Are under consideration for a replacement bridge. Alternatives have not yet been developed for the project
.

Natural Resource Review Results

This project was submitted for information only. It is not a consultation under Part 1075.

The Illinois Natural Heritage Database contains no record of State-listed threatened or endangered species, Illinois Natural Area Inventory sites, dedicated Illinois Nature Preserves, or registered Land and Water Reserves in the vicinity of the project location.

Location

The applicant is responsible for the accuracy of the location submitted for the project.

County: Alexander

Township, Range, Section:
17S, 1E, 31
17S, 1W, 11
17S, 1W, 14
17S, 1W, 23
17S, 1W, 24
17S, 1W, 25
17S, 1W, 26
17S, 1W, 36

IL Department of Natural Resources Contact
Impact Assessment Section
217-785-5500
Division of Ecosystems & Environment

Disclaimer

The Illinois Natural Heritage Database cannot provide a conclusive statement on the presence, absence, or condition of natural resources in Illinois. This review reflects the information existing in the Database at the time of this inquiry, and should not be regarded as a final statement on the site being considered, nor should it be a substitute for detailed site surveys or field surveys required for environmental assessments. If additional protected resources are encountered during the project's implementation, compliance with applicable statutes and regulations is required.

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By using this website, you acknowledge that you have read and agree to these terms. These terms may be revised by IDNR as necessary. If you continue to use the EcoCAT application after we post changes to these terms, it will mean that you accept such changes. If at any time you do not accept the Terms of Use, you may not continue to use the website.

1. The IDNR EcoCAT website was developed so that units of local government, state agencies and the public could request information or begin natural resource consultations on-line for the Illinois Endangered Species Protection Act, Illinois Natural Areas Preservation Act, and Illinois Interagency Wetland Policy Act. EcoCAT uses databases, Geographic Information System mapping, and a set of programmed decision rules to determine if proposed actions are in the vicinity of protected natural resources. By indicating your agreement to the Terms of Use for this application, you warrant that you will not use this web site for any other purpose.

2. Unauthorized attempts to upload, download, or change information on this website are strictly prohibited and may be punishable under the Computer Fraud and Abuse Act of 1986 and/or the National Information Infrastructure Protection Act.

3. IDNR reserves the right to enhance, modify, alter, or suspend the website at any time without notice, or to terminate or restrict access.

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EcoCAT operates on a state of Illinois computer system. We may use software to monitor traffic and to identify unauthorized attempts to upload, download, or change information, to cause harm or otherwise to damage this site. Unauthorized attempts to upload, download, or change information on this server is strictly prohibited by law.

Unauthorized use, tampering with or modification of this system, including supporting hardware or software, may subject the violator to criminal and civil penalties. In the event of unauthorized intrusion, all relevant information regarding possible violation of law may be provided to law enforcement officials.

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EcoCAT generates a public record subject to disclosure under the Freedom of Information Act. Otherwise, IDNR uses the information submitted to EcoCAT solely for internal tracking purposes.

KENTUCKY DEPARTMENT OF FISH & WILDLIFE RESOURCES
TOURISM, ARTS, AND HERITAGE CABINET

Steven L. Beshear
Governor

#1 Sportsman's Lane
Frankfort, Kentucky 40601
Phone (502) 564-3400
1-800-858-1549
Fax (502) 564-0506
fw.ky.gov

Marcheta Sparrow
Secretary

Dr. Jonathan W. Gassett
Commissioner

!

3 April 2013

Amanda Kerley
Third Rock Consultants
2526 Regency Road
Lexington, KY 40503

RE: US 51 Bridge Replacement over the Ohio River, Ballard County, KY
KYTC Item No. 1-100.00 & 1-1140.00

Dear Ms. Kerley:

The Kentucky Department of Fish and Wildlife Resources (KDFWR) has received the information regarding the subject project. The Kentucky Fish and Wildlife Information System indicates that the federally-endangered Indiana bat *(Myotis sodalis)*, Interior Least Tern *(Sternula antillarum athalassos)*, and Pallid Sturgeon *(Scaphirhynchus albus)* are known to occur within close proximity to the proposed project. Additionally, this project falls within known summer maternity habitat for the Indiana bat. The KDFWR recommends that the Kentucky Transportation Cabinet (KYTC) contact the US Fish and Wildlife Service Kentucky Field Office (USFWS) at 502-695-0468 for information on how to proceed with these federally-listed species. The KDFWR also recommends contacting the Kentucky State Nature Preserves Commission for information on listed flora near the site.

A documented Bald eagle nest is known to occur near alternatives 1, 2, 2A and 2B. Blasting, pile driving and other loud noises should not occur within one half mile of eagle nests during the nesting season. Prior to the start of the project, please contact Kate Heyden, KDFWR avian biologist (502-564-7109 ex. 4475) for necessary steps to reduce any potential impacts to Bald eagles. Interior Least Tern nesting also occurs near the proposed alternates, and the USFWS will have recommendations on avoidance of impacts to this species. Please be aware that our database system is a dynamic one that only represents our current knowledge of various species distributions.

Proposed alternatives 3, 3A, and 5 appear to enter the Boatwright Wildlife Management Area (WMA), which is a property owned by the KDFWR. The greatest amount of road length within the WMA would be from alternatives 3 and 5. This WMA is a popular outdoor recreation destination for bird watchers, hunters, and the general public. The KDFWR recommends alternates that avoid the Boatwright WMA so that recreation is not impaired during the lengthy construction process. Specifically, Alternatives 1, 2, 2A, and 2B are those

recommended by KDFWR that provide the least impact to the WMA, outdoor recreation, and threatened/endangered species by drastically reducing the amount of new roadways to be built.

Any planning should include measures designed to eliminate and/or reduce impacts to wetland and stream habitats. If impacts cannot be avoided, mitigation should be properly designed and proposed to offset the losses. KDFWR will recommend, at a minimum, a 2:1 mitigation ratio for any permanent loss or degradation of wetland habitats and appropriate mitigation ratios developed for stream impacts as well. To minimize indirect impacts to aquatic resources, strict erosion control measures should be developed and implemented prior to construction to minimize siltation into streams and storm water drainage systems located within the project area. Such erosion control measures may include, but are not limited to silt fences, staked straw bales, brush barriers, sediment basins, and diversion ditches. Erosion control measures will need to be installed prior to construction and should be inspected and repaired regularly as needed. Again, Alternatives 1,2, 2A, and 2B appear to have the least of amount of impact to aquatic resources in the area, and are recommended by KDFWR over other routes.

The KDFWR appreciates the opportunity for comment. I hope this information is helpful to you, and if you have questions or require additional information, please call me at (502) 564-7109 extension 4453.

Sincerely,

Dan Stoelb
Wildlife Biologist

Cc: Environmental Section File

Steven L. Beshear
Governor

Leonard K. Peters
Secretary
Energy and Environment Cabinet

Donald S. Dott, Jr.
Director

Commonwealth of Kentucky
Kentucky State Nature Preserves Commission
801 Schenkel Lane
Frankfort, Kentucky 40601-1403
502-573-2886 Voice
502-573-2355 Fax

March 5, 2013

Amanda Kerley
Third Rock Consultants
2526 Regency Rd.; Suite 180
Lexington, KY 40503

Data Request 13-054

Dear Ms. Kerley:

This letter is in response to your data request of February 25, 2013 for the US 51 Bridge Replacement over the Ohio River (Ballard County) project. We have reviewed our Natural Heritage Program Database to determine if any of the endangered, threatened, or special concern plants and animals or exemplary natural communities monitored by the Kentucky State Nature Preserves Commission occur near the project area, as shown on the map provided. Please see the attached reports for more information, which reflect analysis of the project area with three buffers applied:

1-mile for all records – 86 records
5-mile for aquatic records – 64 records
5-mile for federally listed species – 20 records
10-mile for mammals and birds – 60 records

The project area is within a high biodiversity wetlands complex that contains many rare organisms. The attached reports provide a list of species known to occur in or near the project area.

Holloway Landing Road (Alternative 5) runs along the southern border of Axe Lake Swamp State Nature Preserve.

Maternity records for these bats occur within 1 mile of the project area reviewed: Corynorhinus rafinesquii (Rafinesque's big-eared bat, federal species of management concern, KSNPC special concern), Myotis austroriparius (Southeastern myotis, federal species of

management concern, KSNPC endangered), Myotis sodalis (Indiana myotis, federally listed endangered, KSNPC endangered), and Nycticeius humeralis (Evening Bat, KSNPC special concern).

I would like to take this opportunity to remind you of the terms of the data request license, which you agreed upon in order to submit your request. The license agreement states "Data and data products received from the Kentucky State Nature Preserves Commission, including any portion thereof, may not be reproduced in any form or by any means without the express written authorization of the Kentucky State Nature Preserves Commission." The exact location of plants, animals, and natural communities, if released by the Kentucky State Nature Preserves Commission, may not be released in any document or correspondence. These products are provided on a temporary basis for the express project (described above) of the requester, and may not be redistributed, resold or copied without the written permission of the Kentucky State Nature Preserves Commission's Data Manager (801 Schenkel Lane, Frankfort, KY, 40601. Phone: (502) 573-2886).

Please note that the quantity and quality of data collected by the Kentucky Natural Heritage Program are dependent on the research and observations of many individuals and organizations. In most cases, this information is not the result of comprehensive or site-specific field surveys; many natural areas in Kentucky have never been thoroughly surveyed, and new plants and animals are still being discovered. For these reasons, the Kentucky Natural Heritage Program cannot provide a definitive statement on the presence, absence, or condition of biological elements in any part of Kentucky. Heritage reports summarize the existing information known to the Kentucky Natural Heritage Program at the time of the request regarding the biological elements or locations in question. They should never be regarded as final statements on the elements or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments. We would greatly appreciate receiving any pertinent information obtained as a result of on-site surveys.

If you have any questions or if I can be of further assistance, please do not hesitate to contact me.

Sincerely,

Sara Hines
Data Manager

SLD/SGH

Enclosures: Data Report and Interpretation Key

Standard Occurrence Report

KSNPC Monitored Elements within a 1-mi radius of the KY 51 Bridge Replacement over the Ohio River project (Ballard Co.)

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
Extant in Kentucky																		
Vascular Plants																		
PDCAB02010*003 5242	*Cabomba caroliniana*	Carolina Fanwort	G3G5	S2	T				1958-06-10	M	H	Ballard	Barlow Wickliffe Wyatt Cairo	370032N	0890713W	08010100010 - Hazel Creek 05140206110 - Ohio River/Truman Creek 08010100020 - Shawnee Creek	NEAR EDGE OF SWAN LAKE.	Swamps, ponds and quiet streams.
PDCAB02010*004 5079	*Cabomba caroliniana*	Carolina Fanwort	G3G5	S2	T				1986-06-29	S	B	Ballard	Barlow	370439N	0890514W	08010100010 - Hazel Creek	AXE LAKE SWAMP.	
PDCAB02010*007 10658	*Cabomba caroliniana*	Carolina Fanwort	G3G5	S2	T			Y	1991-05-30	S	A	Ballard	Barlow	370219N	0890519W	08010100020 - Shawnee Creek	Southeast of Buck Lake, ca 0.5 air mi SW of jct old railroad grade and Fish Lake Rd.	
PDCAB02010*010 9136	*Cabomba caroliniana*	Carolina Fanwort	G3G5	S2	T			Y	2005-06-23	S	B?	Ballard	Barlow	370055N	0890549W	08010100020 - Shawnee Creek	SLOUGH AT NE CORNER OF JCT OF GUM CORNER RD AND PRAIRIE LAKE ROAD.	
PDJUG01010*009 2307	*Carya aquatica*	Water Hickory	G5	S2S3	T			Y	2000-10-27	S	D	Ballard	Barlow	370400N	0890519W	08010100010 - Hazel Creek 08010100020 - Shawnee Creek	2.5 MI W OF BARLOW ON HALLOWAY LANDING RD, CA 600 FT E OF CLEAR LAKE AND NEAR THE EASTERN SHORE OF CLEAR LAKE APPROXIMATELY 650M NORTH OF HALLOWAY LANDING ROAD.	Bottomlands and floodplain swamps.
PDRAN08080*012 11554	*Clematis crispa*	Blue Jasmine Leather-flower	G5	S2	T			Y	2006-05-12	S	E	Ballard	Barlow	370128N	0890523W	08010100020 - Shawnee Creek	Fish Lake Road ca 0.3 mi N of jct w/ Gum Corner Road in Boatwright WMA.	

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PMHYD07010*006 1694	*Limnobium spongia*	American Frog's-bit	G4	S2S3	T			Y	1962-07-14	M	H	Ballard	Barlow Wyatt Cairo Wickliffe	370032N	0890713W	08010100020 - Shawnee Creek 08010100010 - Hazel Creek 05140206110 - Ohio River/Truman Creek	SWAN LAKE (POND).	Ponds, bayous, stagnant water.
PMHYD07010*009 6075	*Limnobium spongia*	American Frog's-bit	G4	S2S3	T			Y	2001-07-12	S	C	Ballard	Barlow	370140N	0890526W	08010100020 - Shawnee Creek	BARLOW BOTTOMS WILDLIFE MANAGEMENT AREA, E SIDE OF FISH LAKE RD, CA 0.6 RD MI N OF JCT W/ GUM CORNER RD.	
PMHYD07010*010 11555	*Limnobium spongia*	American Frog's-bit	G4	S2S3	T			Y	2006-05-12	S	E	Ballard	Barlow	370118N	0890521W	08010100020 - Shawnee Creek	Fish Lake Road ca 0.1 mi N of jct w/ Gum Corner Road in Boatwright WMA.	
PDAST6C040*005 10810	*Melanthera nivea*	Snow Squarestem	G5	S3?	S				2003-10-17	S	B	Ballard	Barlow	370411N	0890437W	08010100010 - Hazel Creek	Three locations along base of bluff approximately 1.2-1.3 km east of Clear Lake and 0.9 km, 1.2 km and 1.7 km north of Halloway Landing Road.	
PMPOT030G0*001 2622	*Potamogeton illinoensis*	Illinois Pondweed	G5	S2	S				1958-06-01	M	H	Ballard	Barlow Cairo Wickliffe Wyatt	370041N	0890715W	05140206110 - Ohio River/Truman Creek 08010100010 - Hazel Creek 08010100020 - Shawnee Creek	SWAN LAKE.	Calcareous waters of lower gradient streams, lakes, and ponds.
Aquatic Snails																		
IMGASK6010*051 11954	*Lithasia armigera*	Armored Rocksnail	G3G4	S3S4	S	SOMC		Y	2007-06-25	S	H	Ballard	Cairo	370532N	0890827W	05140206110 - Ohio River/Truman Creek	ORM 972.3 just above Mound City, IL.	
IMGASK6100*028 11953	*Lithasia verrucosa*	Varicose Rocksnail	G4Q	S3S4	S	SOMC		Y	2007-06-25	S	E	Ballard	Cairo	370532N	0890827W	05140206110 - Ohio River/Truman Creek	ORM 972.3, just upstream from Mound City, IL.	
Freshwater Mussels																		

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IMBIV31030*038 10597	*Obovaria retusa*	Ring Pink	G1	S1	E	LE		Y	No Date	S	X	Ballard	Cairo	370424N	0890942W	05140206110 - Ohio River/Truman Creek	OHIO RIVER MILE 974.0 AT POWERLINE CROSSING 0.8 MI S OF MOUND CITY.	Large river species that inhabits gravel and sand bars (Bogan and Parmalee 1983, Goodrich and Van Der Schalie 1944, Neel and Allen 1964, Stansbery 1976).
IMBIV34020*034 3238	*Plethobasus cooperianus*	Orangefoot Pimpleback	G1	S1	E	LE		Y	No Date	S	X	Ballard	Cairo	370424N	0890942W	05140206110 - Ohio River/Truman Creek	Ohio River mile 974.0 at powerline crossing 0.8 mi S of Mound City.	Usually found in large rivers in sand and gravel substrates (Ahlstedt 1983, Bogan and Parmalee 1983, Miller, A.C. et al. 1986).
IMBIV34030*070 7346	*Plethobasus cyphyus*	Sheepnose	G3	S1	E	LE		Y	1988-07-27	S	D	Ballard	Cairo	370505N	0890901W	05140206110 - Ohio River/Truman Creek	OHIO RIVER MILE 973.0, MID-CHANNEL GRAVEL BAR ACROSS FROM MOUND CITY, IL.	Usually found in large rivers in current on mud, sand, or gravel bottoms at depth of 1-2 meters or more (Baker 1928, Parmalee 1967, Gordon and Layzer 1989).
IMBIV39041*035 1926	*Quadrula cylindrica cylindrica*	Rabbitsfoot	G3G4T3	S2	T	PT		Y	1981-01-17	M	H	Ballard	Cairo	370518N	0890913W	05140206110 - Ohio River/Truman Creek	OHIO RIVER AT MOUND CITY, ORM 972.8-973.1.	Small to large rivers with sand, gravel, and cobble and moderate to swift current, sometimes in deep water (Parmalee 1967, Bogan and Parmalee 1983).
IMBIV39041*117 11565	*Quadrula cylindrica cylindrica*	Rabbitsfoot	G3G4T3	S2	T	PT		Y	2006-06-26	S	X	Ballard	Cairo	370532N	0890827W	05140206110 - Ohio River/Truman Creek	Ohio River: Least Tern nesting bar just upstream from Mound City, IL., ca ORM 971.7 closer to KY shore.	

Crustaceans

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ICMAL09010*006 3328	*Cambarellus shufeldtii*	Cajun Dwarf Crayfish	G5	S2	S			Y	1984-07-21	S	B	Ballard	Barlow	370331N	0890543W	08010100020 - Shawnee Creek	FISH LAKE 4.8 KM W OF BARLOW AT HWY 118 CROSSING (ACTUALLY HOLLOWAY LANDING ROAD CROSSING).	Inhabits swamps, sloughs, ditches, lakes, ponds, and sluggish streams (Hobbs 1989) on the coastal plain, and may burrow to survive droughts (Page 1985).
ICMAL11060*005 1369	*Orconectes lancifer*	Shrimp Crayfish	G5	S1	E			Y	1978-07-21	S	H	Ballard	Barlow	370331N	0890543W	08010100020 - Shawnee Creek	FISH LAKE 4.8 KM W OF BARLOW AT KY 118 CROSSING (ACTUALLY HOLLOWAY LANDING ROAD CROSSING).	Oxbow lakes and streams on the Gulf Coastal Plain (Page 1985), where it lives among organic debris, usually near bald cypress (Burr and Hobbs 1984).
Insects																		
IIODO77010*005 11332	*Amphiagrion saucium*	Eastern Red Damsel	G5	S1	E			Y	1972-06-06	M	H?	Ballard	Barlow	370040N	0890628W	08010100020 - Shawnee Creek	Wickliffe, Hunters Pond.	
Fishes																		
AFCBA02010*005 5515	*Atractosteus spatula*	Alligator Gar	G3G4	S1	E	SOMC		Y	1980-pre	G	H	Ballard Carlisle	Wyatt Wickliffe Barlow Cairo	365920N	0890814W	08010100010 - Hazel Creek 05140206110 - Ohio River/Truman Creek 08010100030 - Mississippi River/Sandy Branch 08010100020 - Shawnee Creek 08010201030 - Stovall Creek	Mouth of the Ohio River.	Sluggish pools and backwaters of large rivers, backwaters, and oxbow lakes (Burr and Warren 1986, Page and Burr 1991, Etnier and Starnes 1993).

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AFCJB49210*009 5925	*Cyprinella venusta*	Blacktail Shiner	G5	S3	S			Y	1979-05-16	G	H	Ballard	Wickliffe	365755N	0890540W	08010201030 - Stovall Creek 08010100020 - Shawnee Creek	MISSISSIPPI RIVER AT WICKLIFFE.	Occurs in creeks and small streams of the coastal plain over firm sand and gravel of riffles and raceways, and along undercut banks or among submerged stumps and logs (Burr and Warren 1986). Also, over firm sand or gravel in the Mississippi and Lower Ohio Rivers.
AFCJC05020*013 4566	*Erimyzon sucetta*	Lake Chubsucker	G5	S2	T			Y	1986-04-23	S	D	Ballard	Barlow	370150N	0890512W	08010100020 - Shawnee Creek	WETLAND APPROX 0.75 KM SSE OF S END OF BUCK LAKE.	Lowland lentic habitats (wetlands and floodplain lakes) with submergent and floating vegetation (Burr and Warren 1986, Etnier and Starnes 1993).
AFCJC05020*020 10883	*Erimyzon sucetta*	Lake Chubsucker	G5	S2	T			Y	2003-06-24	S	BC	Ballard	Barlow	370410N	0890437W	08010100010 - Hazel Creek	Axe Lake ca 3.4 air km NW of Barlow, Axe Lake State Nature Preserve.	
AFCHD01040*019 5684	*Esox niger*	Chain Pickerel	G5	S3	S			Y	1999-09-09	S	B	Ballard	Barlow	370435N	0890524W	08010100010 - Hazel Creek	AXE LAKE SLOUGH E OF BOAT RAMP AT AXE LAKE HUNT CLUB.	Coastal Plain wetlands, streams, and vegetated oxbow lake shorelines, and it also tolerates reservoir conditions (Burr and Warren 1986, Etnier and Starnes 1993).
AFCHD01040*020 11193	*Esox niger*	Chain Pickerel	G5	S3	S			Y	2004-04-14	S	A	Ballard	Barlow	370443N	0890514W	08010100010 - Hazel Creek	Axe Lake.	

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AFCQC02600*009 10696	*Etheostoma proeliare*	Cypress Darter	G5	S2	T			Y	1986-11-17	M	B	Ballard	Barlow	370252N	0890533W	08010100010 - Hazel Creek 08010100020 - Shawnee Creek	FISH LAKE, 4.8 KM W BARLOW.	Small to medium-size sluggish streams, oxbows, and wetlands where the bottom is soft and aquatic vegetation abounds (Burr and Mayden 1979, Kuehne and Barbour 1983, Page 1983, Burr and Warren 1986).
AFCQC02600*015 810	*Etheostoma proeliare*	Cypress Darter	G5	S2	T			Y	1982-05-07	S	D	Ballard	Barlow	370232N	0890532W	08010100020 - Shawnee Creek	SHAWNEE CREEK AT FISH LAKE ROAD, 4.5 KM WSW OF KY 60-KY 1105 JCT AT BARLOW.	
AFCJB16030*005 6661	*Hybognathus hayi*	Cypress Minnow	G5	S1	E			Y	1970-08-30	S	E	Ballard	Barlow	370120N	0890639W	08010100020 - Shawnee Creek	Prairie Lake, 3 mi W Gum Corners.	Oxbow lakes and quiet water of low gradient streams on the Coastal Plain and Shawnee Hills. Usually over mud or sand bottoms, but occasionally associated with submerged aquatic vegetation or other cover (Burr and Warren 1986, Pflieger 1975, Smith 1979, Gilbert 1980, Burr et al. 1980). Needs wetlands adjacent to streams/lakes for reproduction/nursery areas (B.M. Burr, pers comm).
AFCJB16030*024 6807	*Hybognathus hayi*	Cypress Minnow	G5	S1	E			Y	1994-03-22	S	D	Ballard	Barlow	370410N	0890437W	08010100010 - Hazel Creek	AXE LAKE SWAMP CA 3.4 AIR KM NW OF BARLOW.	
AFCJB16050*001 3349	*Hybognathus placitus*	Plains Minnow	G4	S1	S	SOMC		Y	1980-pre	G	H	Ballard	Wyatt Wickliffe Cairo	365912N	0891011W	08010100020 - Shawnee Creek 05140206110 - Ohio River/Truman Creek 08010100010 - Hazel Creek	NEAR MOUTH OF THE OHIO RIVER.	Occurs over sand/silt bottom in areas with current in the main channel of the Mississippi River (Pflieger 1975, Burr and Warren 1986).

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AFBAA01020*009 9855	*Ichthyomyzon castaneus*	Chestnut Lamprey	G4	S2	S				1951	M	H	Ballard	Cairo Wyatt	370036N	0890951W	05140206110 - Ohio River/Truman Creek	Ohio River at Cairo, Ill.	Moderate-size creeks, large rivers, and reservoirs. Substrate consists of gravel and rubble with areas of sand and silt. Larvae require clear streams with stable bars of silt, sand and organic detritis (Becker 1983, Pflieger 1975, Rohde and Lanteigne-Courchere 1980, Scott and Crossman 1973, Smith 1979).
AFCJC07030*032 6525	*Ictiobus niger*	Black Buffalo	G5	S3	S			Y	1997-09-07	M	D	Ballard	Wickliffe	365755N	0890540W	08010201030 - Stovall Creek 08010100020 - Shawnee Creek	MISSISSIPPI RIVER NEAR WICKLIFFE.	Reservoirs and medium to large rivers with moderate to low gradient and sometime swift current (Becker 1983, Pflieger 1975, Smith 1979, Trautman 1981, and Burr and Warren 1986).
AFCJC07030*037 11126	*Ictiobus niger*	Black Buffalo	G5	S3	S			Y	2004-04-14	S	C	Ballard	Barlow	370443N	0890514W	08010100010 - Hazel Creek	Axe Lake.	
AFCJC07030*045 12814	*Ictiobus niger*	Black Buffalo	G5	S3	S			Y	2008-08-11	S	E	Ballard	Cairo	370528N	0890756W	05140206110 - Ohio River/Truman Creek	Ohio River, Cache Island, at rm 972 (mkh based on coordinates provided).	
AFCQB11120*008 8769	*Lepomis miniatus*	Redspotted Sunfish	G5	S2	T			Y	1978-07-27	M	H	Ballard	Barlow	370252N	0890533W	08010100010 - Hazel Creek 08010100020 - Shawnee Creek	FISH LAKE, 4.8 KM W BARLOW.	Occurs in well-vegetated swamps, sloughs, bottomland lakes, and low gradient streams (Burr and Mayden 1979, Pflieger 1975, Smith 1979, Burr and Warren 1986, Etnier adn Starnes 1993).

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AFCQB11120*014 2399	*Lepomis miniatus*	Redspotted Sunfish	G5	S2	T			Y	1982-05-07	S	B	Ballard	Barlow	370232N	0890532W	08010100020 - Shawnee Creek	SHAWNEE CREEK AT CROSSING ON FISH LAKE ROAD, APPROX 1.9 KM S OF HOLLOWAY LANDING ROAD.	Occurs in well-vegetated swamps, sloughs, bottomland lakes, and low gradient streams (Burr and Mayden 1979, Pflieger 1975, Smith 1979, Burr and Warren 1986, Etnier adn Starnes 1993).
AFCQB11120*030 1539	*Lepomis miniatus*	Redspotted Sunfish	G5	S2	T			Y	1999-05-13	S	A	Ballard	Barlow	370410N	0890437W	08010100010 - Hazel Creek	AXE LAKE SWAMP, CA 3.4 AIR KM NW OF BARLOW, AXE LAKE STATE NATURE PRESERVE.	
AFCQB11120*036 6882	*Lepomis miniatus*	Redspotted Sunfish	G5	S2	T			Y	1996-04	S	D	Ballard	Barlow	370055N	0890549W	08010100020 - Shawnee Creek	SHAWNEE CREEK AT UNNAMED RD 3.5 KM W OF KY 60 AND 5.8 KM SW OF BARLOW (SITE 36).	
AFCQB11120*037 9953	*Lepomis miniatus*	Redspotted Sunfish	G5	S2	T			Y	1999-09-09	S	B	Ballard	Barlow	370435N	0890524W	08010100010 - Hazel Creek	AXE LAKE SLOUGH E OF BOAT RAMP AT AXE LAKE HUNT CLUB.	
AFCQB11120*043 11194	*Lepomis miniatus*	Redspotted Sunfish	G5	S2	T			Y	2004-04-14	S	B	Ballard	Barlow	370443N	0890514W	08010100010 - Hazel Creek	Axe Lake.	
AFCQB11120*049 12050	*Lepomis miniatus*	Redspotted Sunfish	G5	S2	T			Y	2004-08-04	S	D	Ballard	Barlow	370259N	0890418W	08010100020 - Shawnee Creek	Shawnee Creek, Ballard County: 0.5 mi upstream from Oldham Rd, near Barlow	
AFCJB53020*001 6568	*Macrhybopsis gelida*	Sturgeon Chub	G3	S1	E			Y	1980-pre	G	H	Ballard Carlisle	Wyatt Wickliffe Barlow Cairo	365920N	0890814W	08010100010 - Hazel Creek 08010201030 - Stovall Creek 05140206110 - Ohio River/Truman Creek 08010100020 - Shawnee Creek 08010100030 - Mississippi River/Sandy Branch	Ohio River near it's mouth.	Adults inhabit large, turbid rivers where they live in swift, shallow water over sand or gravel bottoms (Smith 1979, Burr and Warren 1986, Etnier and Starnes 1993).

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AFCJB53030*001 4515	*Macrhybopsis meeki*	Sicklefin Chub	G3	S1	E			Y	1980-pre	G	H	Ballard Carlisle	Wyatt Cairo Wickliffe Barlow	365920N	0890814W	08010100020 - Shawnee Creek 08010201030 - Stovall Creek 08010100010 - Hazel Creek 05140206110 - Ohio River/Truman Creek 08010100030 - Mississippi River/Sandy Branch	CONFLUENCE OF OHIO AND MISSISSIPPI RIVERS.	Firm sand and/or gravel with some current in the main channel of large, turbid rivers (Burr and Warren 1986, Etnier and Starnes 1993). Young inhabit silty side channels or backwaters (Burr and Warren 1986).
AFCND02010*001 6039	*Menidia beryllina*	Inland Silverside	G5	S2	T			Y	1975-pre	G	H	Ballard Carlisle	Wyatt Wickliffe Barlow Cairo	365907N	0890735W	08010100020 - Shawnee Creek 08010100010 - Hazel Creek 08010201030 - Stovall Creek 05140206110 - Ohio River/Truman Creek 08010100030 - Mississippi River/Sandy Branch	MISSISSIPPI RIVER (VICINITY OF CONFLUENCE WITH OHIO RIVER ACCORDING TO MAP).	Schooling surface fish that occurs in the Mississippi River and floodplain lakes (Burr and Warren 1986, Etnier and Starnes 1993).
AFCND02010*014 11125	*Menidia beryllina*	Inland Silverside	G5	S2	T			Y	2004-04-14	S	D	Ballard	Barlow	370443N	0890514W	08010100010 - Hazel Creek	Axe Lake.	
AFCND02010*018 11669	*Menidia beryllina*	Inland Silverside	G5	S2	T			Y	2000-08-09	M	E	Ballard	Cairo	370306N	0891025W	05140206110 - Ohio River/Truman Creek	Ohio River, Ballard Co: Ohio River Mile 977.7	
AFCJB28550*001 5660	*Notropis hudsonius*	Spottail Shiner	G5	S2	S			Y	1971-pre	M	H	Ballard	Wyatt Wickliffe	365853N	0890823W	08010100010 - Hazel Creek 05140206110 - Ohio River/Truman Creek	MISSISSIPPI RIVER AT CONFLUENCE WITH OHIO RIVER.	Occurs over firm sand along the shoreline of big rivers where rapid current is avoided (Burr and Warren 1986).
AFCJB28650*004 425	*Notropis maculatus*	Taillight Shiner	G5	S2S3	T			Y	1970-08-30	M	H	Ballard	Barlow Wickliffe Cairo	370104N	0890637W	08010100010 - Hazel Creek 08010100020 - Shawnee Creek	PRAIRIE LAKE, 5 KM W OF GUM CORNERS.	Low gradient streams, oxbow lakes, and sloughs in and around cypress knees, marginal vegetation, and accumulations of sticks and detritus (Burr and Page 1975, Burr and Warren 1986, Etnier and Starnes 1993).

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Standard Occurrence Report

KSNPC Monitored Elements within a 1-mi radius of the KY 51 Bridge Replacement over the Ohio River project (Ballard Co.)

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
AFCJB28650*005 4453	*Notropis maculatus*	Taillight Shiner	G5	S2S3	T			Y	1978-07-27	M	H	Ballard	Barlow	370252N	0890533W	08010100020 - Shawnee Creek 08010100010 - Hazel Creek	FISH LAKE, 5 KM W OF BARLOW.	Low gradient streams, oxbow lakes, and sloughs in and around cypress knees, marginal vegetation, and accumulations of sticks and detritus (Burr and Page 1975, Burr and Warren 1986, Etnier and Starnes 1993).
AFCJB28650*008 7757	*Notropis maculatus*	Taillight Shiner	G5	S2S3	T			Y	1970-08-31	M	E	Ballard	Barlow Wickliffe Cairo Wyatt	370013N	0890616W	08010100020 - Shawnee Creek 05140206110 - Ohio River/Truman Creek 08010100010 - Hazel Creek	Slough, 3 mi W Gum Corners, roadside ditch SE Hunters Pond.	
AFCJB28650*016 4073	*Notropis maculatus*	Taillight Shiner	G5	S2S3	T			Y	1986-04-23	S	C	Ballard	Barlow	370150N	0890512W	08010100020 - Shawnee Creek	WETLAND APPROX 0.75 KM SSE OF S END OF BUCK LAKE.	
AFCKA02220*013 292	*Noturus stigmosus*	Northern Madtom	G3	S2S3	S	SOMC		Y	1959-08-27	M	H	Ballard	Cairo	370459N	0890906W	05140206110 - Ohio River/Truman Creek	Ohio River, at Mound City, Pulaski Co, Illinois.	Large streams and rivers in moderate to swift current over gravel and sand, and sometimes debris or pondweed for cover (Burr and Warren 1986, Etnier and Starnes 1993).
AFCJB57010*002 252	*Platygobio gracilis*	Flathead Chub	G5	S1	S	SOMC		Y	1983-08-18	M	C	Ballard	Wyatt Wickliffe Barlow Cairo	365907N	0890735W	05140206110 - Ohio River/Truman Creek 08010100020 - Shawnee Creek 08010100010 - Hazel Creek	MISSISSIPPI RIVER, AT THE MOUTH OF THE OHIO RIVER.	Large, turbid rivers and their tributaries with swift current over sand, gravel, or silt substrates (Burr and Warren 1986, Etnier and Starnes 1993).
AFCJB57010*003 9710	*Platygobio gracilis*	Flathead Chub	G5	S1	S	SOMC		Y	1980-09-06	M	H	Ballard	Cairo Wyatt	370036N	0890951W	05140206110 - Ohio River/Truman Creek	Ohio River at east Cairo.	

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EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
AFCAA02010*002 5256	*Scaphirhynchus albus*	Pallid Sturgeon	G2	S1	E	LE		Y	1979-	M	H	Ballard	Wickliffe Wyatt	365813N	0890610W	08010100020 - Shawnee Creek 08010100010 - Hazel Creek 05140206110 - Ohio River/Truman Creek	MISSISSIPPI RIVER AT [NR] CAIRO, RIVER MILE 952.	Restricted to the deep, turbid, and swiftly flowing main channel of the Mississippi and Missouri Rivers where it usually occurs over firm sand mixed with some gravel and mud (Burr and Warren 1986, Etnier and Starnes 1993).
Amphibians																		
AAABC02030*002 1642	*Hyla avivoca*	Bird-voiced Treefrog	G5	S3	S			Y	1971-06-05	M	X	Ballard	Barlow Cairo	370350N	0890714W	08010100010 - Hazel Creek	4 mi W Barlow.	In Kentucky, the species appears to be restricted to floodplain wetlands, especially those dominated by bald cypress, water tupelo, green ash, and buttonbush.
Reptiles																		
ARAAG01022*007 3844	*Apalone mutica mutica*	Midland Smooth Softshell	G5T5	S3	S			Y	1987-06-29	S	B	Ballard	Wickliffe	365755N	0890551W	08010100020 - Shawnee Creek	Mississippi River at Wickliffe.	Open water habitats; Most numerous in open river situations with gravel or sand substrates, but also present in slower rivers and impoundments.
ARADB14012*014 9730	*Farancia abacura reinwardtii*	Western Mud Snake	G5T5	S3	S			Y	1948-08-01	G	H	Ballard	Cairo Barlow	370331N	0890542W	08010100010 - Hazel Creek 08010100020 - Shawnee Creek 05140206110 - Ohio River/Truman Creek	Near Barlow.	Wooded swamps, sloughs.
ARADB14012*021 12378	*Farancia abacura reinwardtii*	Western Mud Snake	G5T5	S3	S			Y	2004 or 2005	S	E	Ballard	Wickliffe	365915N	0890536W	08010100020 - Shawnee Creek	South of the easternmost of the two Twin Lakes SE of Swan Lake (plotted in small ag field SSW of S end of easternmost lake).	

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EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
ARAAB02010*005 5763	*Macrochelys temminckii*	Alligator Snapping Turtle	G3G4	S2	T	SOMC		Y	1998-06	S	E	Ballard	Wickliffe	365816N	0890555W	08010100020 - Shawnee Creek	Kentucky side of Mississippi River, ca 0.3 stream mi upstream from Wickliffe.	Floodplain sloughs, backwater areas of larger rivers, impoundments. Seems to prefer muddy substrate with dark retreats including muskrat and beaver dens, logs, or sheltering vegetation.
Breeding Birds																		
ABNGA04040*001 1731	*Ardea alba*	Great Egret	G5	S2B	T			Y	1993-06-24	S	X	Ballard	Barlow	370423N	0890504W	08010100010 - Hazel Creek	Axe Lake Swamp, 3.0 mi NW of Barlow; rookery located several hundred yards SE of the S end of the lake.	Marshes, swampy woods, tidal estuaries, lagoons, mangroves, along streams, lakes, and ponds.
ABNGA04040*022 11961	*Ardea alba*	Great Egret	G5	S2B	T			Y	2007-06-12	S	C	Ballard	Barlow	370142N	0890601W	08010100020 - Shawnee Creek	Black Wolf Swamp, on Haney Tract of Peal Unit along Shawnee Creek, S of Flat Lake.	
ABPBA01010*001 3952	*Certhia americana*	Brown Creeper	G5	S1S2B, S4S5N	E			Y	1997-07-03	S	A	Ballard	Barlow	370439N	0890504W	08010100010 - Hazel Creek	Axe Lake Swamp, surrounding E side open portion of Axe Lake.	Forest, woodland, swamps; also scrub and parks in winter and migration.
ABPBG10010*002 6571	*Cistothorus platensis*	Sedge Wren	G5	S3B	S			Y	1991-08-17	S	E	Ballard	Cairo Barlow	370025N	0890729W	08010100020 - Shawnee Creek	Swan Lake WMA, along W side of entrance rd.	Grasslands and savanna, especially where wet or boggy, sedge marshes, locally in dry cultivated grainfields. In migration and winter also in brushy grasslands. (B83COM01NA)

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ABPAV10080*002 1236	*Corvus ossifragus*	Fish Crow	G5	S3B	S			Y	1993-06-24	M	E	Ballard	Barlow Olmsted Cairo Wickliffe	365810N	0890522W	05140206110 - Ohio River/Truman Creek 05140206130 - Humphrey Creek 08010100010 - Hazel Creek 08010100020 - Shawnee Creek	Barlow Bottoms, including various locations on Ballard WMA, Wickliffe (002A).	Beaches, bays, lagoons, inlets, swamps, near marshes, and, less frequently, deciduous or coniferous woodland, in inland situations primarily in baldcypress swamps and along major watercourses. Also garbage dumps.
ABNKC10010*006 1137	*Haliaeetus leucocephalus*	Bald Eagle	G5	S2B,S2 S3N	T	Delisted		Y	2003	S	B	Ballard	Barlow	370128N	0890716W	08010100020 - Shawnee Creek 08010100010 - Hazel Creek	Swan Lake WMA, "Little Green Sea" (former site now unmapped) and E of Long Pond along old RR bed just SE of "Little Green Sea" (006A).	Primarily associated with larger rivers and lakes although also occurs along medium sized stream floodplains. In winter, may associate with waterfowl concentrations or congregate in areas with abundant dead fish.
ABNKC10010*026 5444	*Haliaeetus leucocephalus*	Bald Eagle	G5	S2B,S2 S3N	T	Delisted		Y	2003	S	C	Ballard	Barlow	370503N	0890712W	08010100010 - Hazel Creek	Honey Slough [Lake], ca 1.0 air mi N of Holloway Landing Road.	
ABNKC10010*064 12324	*Haliaeetus leucocephalus*	Bald Eagle	G5	S2B,S2 S3N	T	Delisted		Y	2008-03-25	S	C	Ballard	Barlow Wickliffe	370003N	0890643W	08010100020 - Shawnee Creek	South of Swan Lake, along W side Gum Corner Road, ca 0.5 air mi NE of jct US 51.	
ABNKC09010*011 4141	*Ictinia mississippiensis*	Mississippi Kite	G5	S2B	S			Y	1993-06	M	E	Ballard	Barlow Wyatt Wickliffe Cairo Olmsted	370348N	0890632W	08010100020 - Shawnee Creek 05140206110 - Ohio River/Truman Creek 08010100010 - Hazel Creek 05140206130 - Humphrey Creek	CW BLOCK OF QUADRANGLE.	Tall forest, open woodland, prairie, semiarid rangeland, shelterbelts, wooded areas bordering lakes and streams in more open regions, scrubby oaks and mesquite.
ABNGA13010*021 7714	*Nyctanassa violacea*	Yellow-crowned Night-heron	G5	S2B	T			Y	1993-06-24	S	B	Ballard	Barlow	370428N	0890525W	08010100010 - Hazel Creek	Axe Lake Swamp, in back yard of one of the local residents, 0.2 air mi SW of boat ramp.	Marshes, swamps, lakes, lagoons, and mangroves.

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ABNFD01020*002 6596	*Phalacrocorax auritus*	Double-crested Cormorant	G5	S2B	T			Y	1936	M	X	Ballard	Barlow	370444N	0890452W	08010100010 - Hazel Creek	Near Barlow, on the Mound City, Ill Road located E at Axe Lake, btwn the lake and the bluffs.	Lakes, rivers, swamps, and seacoasts.
ABNNM08102*003 6774	*Sternula antillarum athalassos*	Interior Least Tern	G4T2Q	S2B	T	LE		Y	1907-08-01	M	X	Ballard	Wyatt	365932N	0890825W	05140206110 - Ohio River/Truman Creek 08010100010 - Hazel Creek	Sandbar nr Cairo, IL, at the mouth of the Ohio River.	Bare or nearly bare alluvial islands or sand bars; will also use bare flats along the margin of industrial ponds.
ABNNM08102*021 666	*Sternula antillarum athalassos*	Interior Least Tern	G4T2Q	S2B	T	LE		Y	2001-06-25	S	D	Ballard	Barlow Cairo	370040N	0890738W	08010100020 - Shawnee Creek	Swan Lake WMA, field to W of slough W of entrance rd W of Swan Lake (021A) and field to E of entrance rd, ca 0.4 air mi N of US 51 (021B).	
ABNNM08102*029 11408	*Sternula antillarum athalassos*	Interior Least Tern	G4T2Q	S2B	T	LE		Y	2007-07	S	C	Ballard	Cairo	370531N	0890817W	05140206110 - Ohio River/Truman Creek	Ohio River upstream from Mound City, IL (ca ORM 972.3).	
Mammals																		
AMACC08020*117 5453	*Corynorhinus rafinesquii* Maternity area mist-net record	Rafinesque's Big-eared Bat	G3G4	S3	S	SOMC		Y	2007-08-11	S	E	Ballard	Cairo Barlow	370112N	0890731W	08010100020 - Shawnee Creek 08010100010 - Hazel Creek	Swan Lake Unit Boatwright WMA, ca 0.3 air mi NE jct main WMA rd and abandoned RR grade (117A) and Ben Waller Tract at Gum Corner Road, ca 0.3 rd mi SW jct Fish Lake Road (117B).	This bat uses a variety of sites for roosting including caves, protected sites along clifflines, large, hollow trees, old mine portals, abandoned tunnels, cisterns, old or seldom used buildings, etc.
AMACC08020*235 5805	*Corynorhinus rafinesquii* Maternity area record	Rafinesque's Big-eared Bat	G3G4	S3	S	SOMC		Y	2001-07-18	S	E	Ballard	Barlow	370243N	0890554W	08010100020 - Shawnee Creek	Barlow Bottoms along Fish Lake Rd just N of old RR grade (235A), along E shore of Flat Lake (235B, 235C), nr NE end of Fish Lake (235D), and nr S end of Fish Lake (235E).	

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AMACC01030*018 3375	*Myotis austroriparius* Maternity area mist-net record	Southeastern Myotis	G3G4	S1S2	E	SOMC		Y	2007-08-11	S	E	Ballard	Barlow	370422N	0890505W	08010100010 - Hazel Creek 08010100020 - Shawnee Creek	Barlow Bottoms, Boatwright WMA, old rd ca 100 yds W of Buck Lake Rd nr S end Buck Lake (018A), Fish Lake Rd N of old RR grade (018B), S Axe Lake Swamp (018C), E margin of Clear Lake, ca 600 m N of Holloway Landing Rd (018D), and Waller Ben Tract at Gum Corner Road, ca 0.3 rd mi SW jct Fish Lake Road (018E).	Primarily uses caves for hibernacula and uses caves, bridges, and hollow trees as summer maternity and roosting sites.
AMACC01100*189 11996	*Myotis sodalis* Maternity area mist-net record	Indiana Bat	G2	S1S2	E	LE		Y	2007-05-21	S	E	Ballard	Barlow	370100N	0890533W	08010100020 - Shawnee Creek	Boatwright WMA, Waller Ben Tract at Gum Corner Road, ca 0.3 rd mi SW jct Fish Lake Road.	
AMACC01100*190 11997	*Myotis sodalis* Maternity area mist-net record?	Indiana Bat	G2	S1S2	E	LE		Y	2007-08-11	S	E	Ballard	Cairo	370257N	0890751W	08010100010 - Hazel Creek	Boatwright WMA, West Payne Tract S of Holloway Landing Road.	
AMACC06010*016 7206	*Nycticeius humeralis* Maternity area mist-net record?	Evening Bat	G5	S3	S			Y	1993-06-02	S	E	Ballard	Cairo Barlow	370112N	0890731W	08010100020 - Shawnee Creek 08010100010 - Hazel Creek	Swan Lake WMA, ca 0.3 air mi NE jct main WMA rd and abandoned RR grade.	The evening bat is a colonial species that roosts in trees and houses. It apparently migrates southward in winter.
AMACC06010*023 3212	*Nycticeius humeralis* Maternity area mist-net record	Evening Bat	G5	S3	S			Y	2003-08-20	S	E	Ballard	Barlow	370336N	0890525W	08010100010 - Hazel Creek 08010100020 - Shawnee Creek	Axe Lake Swamp State Nature Preserve, along levee cutting through swamp where NS levee turns E at its S end (023A), and E side of Clear Lake, ca 250 m (023B) and 600 m (023C) N of Holloway Landing Rd.	

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AMACC06010*046 774	*Nycticeius humeralis* Maternity area mist-net record	Evening Bat	G5	S3	S			Y	2001-07-11	S	E	Ballard	Barlow	370322N	0890537W	08010100020 - Shawnee Creek	Barlow Bottoms, along Fish Lake Rd, just N of old RR grade (046A) and nr NE end of Fish Lake (046B).	The evening bat is a colonial species that roosts in trees and houses. It apparently migrates southward in winter.
Communities																		
CPSWP50000*004 2833	*Cypress (tupelo) swamp*		GNR	S1	E			Y	2002-09-12	S	C	Ballard	Barlow	370444N	0890445W	08010100010 - Hazel Creek	Axe Lake Swamp, ca 3.0 air mi NW of Barlow.	
Historically known from Kentucky																		
Vascular Plants																		
PDSAL02030*001 4865	*Salix amygdaloides*	Peach-leaved Willow	G5	SH	H			Y	No Date	G	H	Ballard Carlisle	Wickliffe Wyatt	365755N	0890540W	08010100020 - Shawnee Creek 05140206110 - Ohio River/Truman Creek 08010201030 - Stovall Creek 08010100010 - Hazel Creek 08010100030 - Mississippi River/Sandy Branch	WICKLIFFE.	Alluvial soils in floodplain swamps, usually near water.

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Extant in Kentucky																		
Freshwater Mussels																		
IMBIV31030*038 10597	*Obovaria retusa*	Ring Pink	G1	S1	E	LE		Y	No Date	S	X	Ballard	Cairo	370424N	0890942W	05140206110 - Ohio River/Truman Creek	OHIO RIVER MILE 974.0 AT POWERLINE CROSSING 0.8 MI S OF MOUND CITY.	Large river species that inhabits gravel and sand bars (Bogan and Parmalee 1983, Goodrich and Van Der Schalie 1944, Neel and Allen 1964, Stansbery 1976).
IMBIV34020*022 4265	*Plethobasus cooperianus*	Orangefoot Pimpleback	G1	S1	E	LE		Y	2005-09-29	M	D	Ballard	Olmsted Barlow	370837N	0890546W	05140206110 - Ohio River/Truman Creek	Ohio River mile 966.4-969.3, 50-200 yds from north shore.	Usually found in large rivers in sand and gravel substrates (Ahlstedt 1983, Bogan and Parmalee 1983, Miller, A.C. et al. 1986).
IMBIV34020*028 9632	*Plethobasus cooperianus*	Orangefoot Pimpleback	G1	S1	E	LE		Y	1984	S	D	Ballard	Olmsted	370758N	0890610W	05140206110 - Ohio River/Truman Creek	OHIO RIVER MILE 968.6.	
IMBIV34020*034 3238	*Plethobasus cooperianus*	Orangefoot Pimpleback	G1	S1	E	LE		Y	No Date	S	X	Ballard	Cairo	370424N	0890942W	05140206110 - Ohio River/Truman Creek	Ohio River mile 974.0 at powerline crossing 0.8 mi S of Mound City.	
IMBIV34020*052 154	*Plethobasus cooperianus*	Orangefoot Pimpleback	G1	S1	E	LE		Y	1984-08	S	D	Ballard	Barlow	370708N	0890634W	05140206110 - Ohio River/Truman Creek	OHIO RIVER MI 969.7, JUST UPSTREAM OF MOUND CITY, IL.	
IMBIV34030*043 7019	*Plethobasus cyphyus*	Sheepnose	G3	S1	E	LE		Y	1992-08-15	M	D	Ballard	Olmsted	370918N	0890535W	05140206130 - Humphrey Creek 05140206110 - Ohio River/Truman Creek	OHIO RIVER MILE 966.6 TO 967.2 (PLOTTED AT MIDPOINT).	Usually found in large rivers in current on mud, sand, or gravel bottoms at depth of 1-2 meters or more (Baker 1928, Parmalee 1967, Gordon and Layzer 1989).
IMBIV34030*066 6143	*Plethobasus cyphyus*	Sheepnose	G3	S1	E	LE		Y	2005-09-19	G	D	Ballard	Olmsted Barlow	370833N	0890553W	05140206110 - Ohio River/Truman Creek 08010100010 - Hazel Creek 05140206130 - Humphrey Creek	OHIO RIVER 5 MI N OF MOUND CITY.	

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IMBIV34030*070 7346	*Plethobasus cyphyus*	Sheepnose	G3	S1	E	LE		Y	1988-07-27	S	D	Ballard	Cairo	370505N	0890901W	05140206110 - Ohio River/Truman Creek	OHIO RIVER MILE 973.0, MID-CHANNEL GRAVEL BAR ACROSS FROM MOUND CITY, IL.	Usually found in large rivers in current on mud, sand, or gravel bottoms at depth of 1-2 meters or more (Baker 1928, Parmalee 1967, Gordon and Layzer 1989).
IMBIV39041*035 1926	*Quadrula cylindrica cylindrica*	Rabbitsfoot	G3G4T3	S2	T	PT		Y	1981-01-17	M	H	Ballard	Cairo	370518N	0890913W	05140206110 - Ohio River/Truman Creek	OHIO RIVER AT MOUND CITY, ORM 972.8-973.1.	Small to large rivers with sand, gravel, and cobble and moderate to swift current, sometimes in deep water (Parmalee 1967, Bogan and Parmalee 1983).
IMBIV39041*042 5263	*Quadrula cylindrica cylindrica*	Rabbitsfoot	G3G4T3	S2	T	PT		Y	1907-08-18	G	H	Ballard	Olmsted	370918N	0890535W	05140206110 - Ohio River/Truman Creek 05140206130 - Humphrey Creek	OHIO RIVER 6 MI N OF MOUND CITY, 12 MI NNE OF CAIRO, IL.	
IMBIV39041*104 10071	*Quadrula cylindrica cylindrica*	Rabbitsfoot	G3G4T3	S2	T	PT		Y	1999-09-22	M	D	Ballard	Barlow Olmsted Cairo	370708N	0890634W	05140206110 - Ohio River/Truman Creek	OHIO RIVER MI 969.5 (IL SHORELINE).	
IMBIV39041*117 11565	*Quadrula cylindrica cylindrica*	Rabbitsfoot	G3G4T3	S2	T	PT		Y	2006-06-26	S	X	Ballard	Cairo	370532N	0890827W	05140206110 - Ohio River/Truman Creek	Ohio River: Least Tern nesting bar just upstream from Mound City, IL., ca ORM 971.7 closer to KY shore.	
Fishes																		
AFCAA02010*002 5256	*Scaphirhynchus albus*	Pallid Sturgeon	G2	S1	E	LE		Y	1979-	M	H	Ballard	Wickliffe Wyatt	365813N	0890610W	08010100020 - Shawnee Creek 08010100010 - Hazel Creek 05140206110 - Ohio River/Truman Creek	MISSISSIPPI RIVER AT [NR] CAIRO, RIVER MILE 952.	Restricted to the deep, turbid, and swiftly flowing main channel of the Mississippi and Missouri Rivers where it usually occurs over firm sand mixed with some gravel and mud (Burr and Warren 1986, Etnier and Starnes 1993).
Breeding Birds																		

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Standard Occurrence Report

KSNPC Federal Status Elements within a 5-mi radius of the KY 51 Bridge Replacement over the Ohio River project (Ballard Co.)

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
ABNNM08102*003 6774	*Sternula antillarum athalassos*	Interior Least Tern	G4T2Q	S2B	T	LE		Y	1907-08-01	M	X	Ballard	Wyatt	365932N	0890825W	05140206110 - Ohio River/Truman Creek 08010100010 - Hazel Creek	Sandbar nr Cairo, IL, at the mouth of the Ohio River.	Bare or nearly bare alluvial islands or sand bars; will also use bare flats along the margin of industrial ponds.
ABNNM08102*005 8633	*Sternula antillarum athalassos*	Interior Least Tern	G4T2Q	S2B	T	LE		Y	2007-06-25	S	C	Carlisle	Wickliffe Arlington	365331N	0890655W	08010100030 - Mississippi River/Sandy Branch	Sandbar just downstream from Island No 1, Miss River mi 945.5L (opposite Back Slough and 1.5 mi NW of Laketon) (lower end of sandbar) and upstream in dikefield adj to Island No 1, Miss River mi 948, ca 3.0 mi NNW of Laketon (upper end of sandbar)	
ABNNM08102*021 666	*Sternula antillarum athalassos*	Interior Least Tern	G4T2Q	S2B	T	LE		Y	2001-06-25	S	D	Ballard	Barlow Cairo	370040N	0890738W	08010100020 - Shawnee Creek	Swan Lake WMA, field to W of slough W of entrance rd W of Swan Lake (021A) and field to E of entrance rd, ca 0.4 air mi N of US 51 (021B).	
ABNNM08102*029 11408	*Sternula antillarum athalassos*	Interior Least Tern	G4T2Q	S2B	T	LE		Y	2007-07	S	C	Ballard	Cairo	370531N	0890817W	05140206110 - Ohio River/Truman Creek	Ohio River upstream from Mound City, IL (ca ORM 972.3).	
Mammals																		
AMACC01100*148 11153	*Myotis sodalis* Maternity area mist-net record?	Indiana Bat	G2	S1S2	E	LE		Y	2003-08-13	S	E	Ballard	Wickliffe	365613N	0890231W	08010201030 - Stovall Creek	Meade Westvaco Mill tract, in Mayfield Creek floodplain, on N side of Mayfield Creek ca 3.4 air mi SE of Wickliffe.	
AMACC01100*189 11996	*Myotis sodalis* Maternity area mist-net record	Indiana Bat	G2	S1S2	E	LE		Y	2007-05-21	S	E	Ballard	Barlow	370100N	0890533W	08010100020 - Shawnee Creek	Boatwright WMA, Waller Ben Tract at Gum Corner Road, ca 0.3 rd mi SW jct Fish Lake Road.	

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KSNPC Federal Status Elements within a 5-mi radius of the KY 51 Bridge Replacement over the Ohio River project (Ballard Co.)

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
AMACC01100*190 11997	*Myotis sodalis* Maternity area mist-net record?	Indiana Bat	G2	S1S2	E	LE		Y	2007-08-11	S	E	Ballard	Cairo	370257N	0890751W	08010100010 - Hazel Creek	Boatwright WMA, West Payne Tract S of Holloway Landing Road.	

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EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
Extant in Kentucky																		
Aquatic Snails																		
IMGASK6010*027 9460	*Lithasia armigera*	Armored Rocksnail	G3G4	S3S4	S	SOMC		Y	2001-09-15	S	D	Carlisle	Wickliffe	365420N	0890615W	08010100030 - Mississippi River/Sandy Branch	MISSISSIPPI RIVER MILE 947.5; POOLS ALONG KY SHORE.	Bars and pools with sand, gravel, and rock substrates (KNPC), sloping rock outcrops with pockets of sand, gravel and mud, partially buried logs, and rock riprap (Sickel 1988).
IMGASK6010*051 11954	*Lithasia armigera*	Armored Rocksnail	G3G4	S3S4	S	SOMC		Y	2007-06-25	S	H	Ballard	Cairo	370532N	0890827W	05140206110 - Ohio River/Truman Creek	ORM 972.3 just above Mound City, IL.	
IMGASK6100*001 1271	*Lithasia verrucosa*	Varicose Rocksnail	G4Q	S3S4	S	SOMC		Y	2001-09-15	S	D	Carlisle	Wickliffe	365420N	0890615W	08010100030 - Mississippi River/Sandy Branch	MISSISSIPPI RIVER MILE 947.5; POOLS ALONG KY SHORE.	Observations on the habitat include specimens taken from recently exposed bars and pools with sand, gravel, and rock substrates (Haag and Palmer-Ball, pers comm).
IMGASK6100*028 11953	*Lithasia verrucosa*	Varicose Rocksnail	G4Q	S3S4	S	SOMC		Y	2007-06-25	S	E	Ballard	Cairo	370532N	0890827W	05140206110 - Ohio River/Truman Creek	ORM 972.3, just upstream from Mound City, IL.	
Freshwater Mussels																		
IMBIV21130*027 7946	*Lampsilis ovata*	Pocketbook	G5	S1	E			Y	1983-09-29	M	D	Ballard	Olmsted	370918N	0890535W	05140206110 - Ohio River/Truman Creek 05140206130 - Humphrey Creek	OHIO RIVER MILE 966.6 TO 967.2 (PLOTTED AT MIDPOINT).	Considered a large river species (Clench and Van Der Schalie 1944, Parmalee 1967, Stansbery 1976), but occurs in medium-sized streams in gravel, sand, or even mud (Parmalee 1967, Johnson 1970, Gordon and Layzer 1989). In the Lower Wabash and Ohio Rivers specimens were taken in deep water (6-10 feet or more) in current from sand or gravel.

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EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
IMBIV21130*132 12235	*Lampsilis ovata*	Pocketbook	G5	S1	E			Y	2005-10-06	S	D	Ballard	Olmsted	370838N	0890551W	05140206110 - Ohio River/Truman Creek	Ohio River at 4 km ds of Olmsted Dam.	
IMBIV31030*038 10597	*Obovaria retusa*	Ring Pink	G1	S1	E	LE		Y	No Date	S	X	Ballard	Cairo	370424N	0890942W	05140206110 - Ohio River/Truman Creek	OHIO RIVER MILE 974.0 AT POWERLINE CROSSING 0.8 MI S OF MOUND CITY.	Large river species that inhabits gravel and sand bars (Bogan and Parmalee 1983, Goodrich and Van Der Schalie 1944, Neel and Allen 1964, Stansbery 1976).
IMBIV34020*022 4265	*Plethobasus cooperianus*	Orangefoot Pimpleback	G1	S1	E	LE		Y	2005-09-29	M	D	Ballard	Olmsted Barlow	370837N	0890546W	05140206110 - Ohio River/Truman Creek	Ohio River mile 966.4-969.3, 50-200 yds from north shore.	Usually found in large rivers in sand and gravel substrates (Ahlstedt 1983, Bogan and Parmalee 1983, Miller, A.C. et al. 1986).
IMBIV34020*028 9632	*Plethobasus cooperianus*	Orangefoot Pimpleback	G1	S1	E	LE		Y	1984	S	D	Ballard	Olmsted	370758N	0890610W	05140206110 - Ohio River/Truman Creek	OHIO RIVER MILE 968.6.	
IMBIV34020*034 3238	*Plethobasus cooperianus*	Orangefoot Pimpleback	G1	S1	E	LE		Y	No Date	S	X	Ballard	Cairo	370424N	0890942W	05140206110 - Ohio River/Truman Creek	Ohio River mile 974.0 at powerline crossing 0.8 mi S of Mound City.	
IMBIV34020*052 154	*Plethobasus cooperianus*	Orangefoot Pimpleback	G1	S1	E	LE		Y	1984-08	S	D	Ballard	Barlow	370708N	0890634W	05140206110 - Ohio River/Truman Creek	OHIO RIVER MI 969.7, JUST UPSTREAM OF MOUND CITY, IL.	
IMBIV34030*043 7019	*Plethobasus cyphyus*	Sheepnose	G3	S1	E	LE		Y	1992-08-15	M	D	Ballard	Olmsted	370918N	0890535W	05140206130 - Humphrey Creek 05140206110 - Ohio River/Truman Creek	OHIO RIVER MILE 966.6 TO 967.2 (PLOTTED AT MIDPOINT).	Usually found in large rivers in current on mud, sand, or gravel bottoms at depth of 1-2 meters or more (Baker 1928, Parmalee 1967, Gordon and Layzer 1989).
IMBIV34030*066 6143	*Plethobasus cyphyus*	Sheepnose	G3	S1	E	LE		Y	2005-09-19	G	D	Ballard	Olmsted Barlow	370833N	0890553W	05140206110 - Ohio River/Truman Creek 08010100010 - Hazel Creek 05140206130 - Humphrey Creek	OHIO RIVER 5 MI N OF MOUND CITY.	

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IMBIV34030*070 7346	*Plethobasus cyphyus*	Sheepnose	G3	S1	E	LE		Y	1988-07-27	S	D	Ballard	Cairo	370505N	0890901W	05140206110 - Ohio River/Truman Creek	OHIO RIVER MILE 973.0, MID-CHANNEL GRAVEL BAR ACROSS FROM MOUND CITY, IL.	Usually found in large rivers in current on mud, sand, or gravel bottoms at depth of 1-2 meters or more (Baker 1928, Parmalee 1967, Gordon and Layzer 1989).
IMBIV37060*002 132	*Potamilus purpuratus*	Bleufer	G5	S1	E			Y	1973-06	G	H	Ballard	Olmsted Bandana Barlow	370923N	0890309W	05140206110 - Ohio River/Truman Creek 05140206130 - Humphrey Creek 08010100010 - Hazel Creek	SMALL LAKE IN BALLARD CO WILDL MGMT AREA, 1-3 MI NNW OF OSCAR.	Deep streams with deep mud and fairly quiet pools (Murray and Leonard 1962). In Missouri Bootheel streams, it is found in small to medium gravel with mud occasionally interspersed (Oesch 1984). In the St. Francis River of Arkansas and Missouri, individuals were found in the channel where shifting sand met mud or clay of the banks (Ahlstedt and Jenkinson 1987). It occurred less commonly in a dredged area on mud flats or sand bars.
IMBIV37060*004 968	*Potamilus purpuratus*	Bleufer	G5	S1	E			Y	2002-08-15	M	C	Ballard	Barlow Olmsted Cairo	370708N	0890634W	05140206110 - Ohio River/Truman Creek 08010100010 - Hazel Creek	Ohio River near river mile 970 along IL shoreline.	
IMBIV37060*008 13227	*Potamilus purpuratus*	Bleufer	G5	S1	E			Y	2008-08-25	G	E	Carlisle	Wickliffe	365415N	0890645W	08010100030 - Mississippi River/Sandy Branch	Mississippi River, Fulton County: somewhere along Island Number 1	
IMBIV39041*035 1926	*Quadrula cylindrica cylindrica*	Rabbitsfoot	G3G4T3	S2	T	PT		Y	1981-01-17	M	H	Ballard	Cairo	370518N	0890913W	05140206110 - Ohio River/Truman Creek	OHIO RIVER AT MOUND CITY, ORM 972.8-973.1.	Small to large rivers with sand, gravel, and cobble and moderate to swift current, sometimes in deep water (Parmalee 1967, Bogan and Parmalee 1983).

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IMBIV39041*042 5263	*Quadrula cylindrica cylindrica*	Rabbitsfoot	G3G4T3	S2	T	PT		Y	1907-08-18	G	H	Ballard	Olmsted	370918N	0890535W	05140206110 - Ohio River/Truman Creek 05140206130 - Humphrey Creek	OHIO RIVER 6 MI N OF MOUND CITY, 12 MI NNE OF CAIRO, IL.	Small to large rivers with sand, gravel, and cobble and moderate to swift current, sometimes in deep water (Parmalee 1967, Bogan and Parmalee 1983).
IMBIV39041*104 10071	*Quadrula cylindrica cylindrica*	Rabbitsfoot	G3G4T3	S2	T	PT		Y	1999-09-22	M	D	Ballard	Barlow Olmsted Cairo	370708N	0890634W	05140206110 - Ohio River/Truman Creek	OHIO RIVER MI 969.5 (IL SHORELINE).	
IMBIV39041*117 11565	*Quadrula cylindrica cylindrica*	Rabbitsfoot	G3G4T3	S2	T	PT		Y	2006-06-26	S	X	Ballard	Cairo	370532N	0890827W	05140206110 - Ohio River/Truman Creek	Ohio River: Least Tern nesting bar just upstream from Mound City, IL., ca ORM 971.7 closer to KY shore.	
Crustaceans																		
ICMAL09010*005 10590	*Cambarellus shufeldtii*	Cajun Dwarf Crayfish	G5	S2	S			Y	1973-09-22	M	F	Ballard	Olmsted	370900N	0890250W	05140206110 - Ohio River/Truman Creek 05140206130 - Humphrey Creek	Mitchell Lake, 1 mi W Oscar.	Inhabits swamps, sloughs, ditches, lakes, ponds, and sluggish streams (Hobbs 1989) on the coastal plain, and may burrow to survive droughts (Page 1985).
ICMAL09010*006 3328	*Cambarellus shufeldtii*	Cajun Dwarf Crayfish	G5	S2	S			Y	1984-07-21	S	B	Ballard	Barlow	370331N	0890543W	08010100020 - Shawnee Creek	FISH LAKE 4.8 KM W OF BARLOW AT HWY 118 CROSSING (ACTUALLY HOLLOWAY LANDING ROAD CROSSING).	
ICMAL11060*005 1369	*Orconectes lancifer*	Shrimp Crayfish	G5	S1	E			Y	1978-07-21	S	H	Ballard	Barlow	370331N	0890543W	08010100020 - Shawnee Creek	FISH LAKE 4.8 KM W OF BARLOW AT KY 118 CROSSING (ACTUALLY HOLLOWAY LANDING ROAD CROSSING).	Oxbow lakes and streams on the Gulf Coastal Plain (Page 1985), where it lives among organic debris, usually near bald cypress (Burr and Hobbs 1984).
Fishes																		

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AFCBA02010*005 5515	*Atractosteus spatula*	Alligator Gar	G3G4	S1	E	SOMC		Y	1980-pre	G	H	Ballard Carlisle	Wyatt Wickliffe Barlow Cairo	365920N	0890814W	08010100010 - Hazel Creek 05140206110 - Ohio River/Truman Creek 08010100030 - Mississippi River/Sandy Branch 08010100020 - Shawnee Creek 08010201030 - Stovall Creek	Mouth of the Ohio River.	Sluggish pools and backwaters of large rivers, backwaters, and oxbow lakes (Burr and Warren 1986, Page and Burr 1991, Etnier and Starnes 1993).
AFCJB49210*009 5925	*Cyprinella venusta*	Blacktail Shiner	G5	S3	S			Y	1979-05-16	G	H	Ballard	Wickliffe	365755N	0890540W	08010201030 - Stovall Creek 08010100020 - Shawnee Creek	MISSISSIPPI RIVER AT WICKLIFFE.	Occurs in creeks and small streams of the coastal plain over firm sand and gravel of riffles and raceways, and along undercut banks or among submerged stumps and logs (Burr and Warren 1986). Also, over firm sand or gravel in the Mississippi and Lower Ohio Rivers.
AFCJC05020*013 4566	*Erimyzon sucetta*	Lake Chubsucker	G5	S2	T			Y	1986-04-23	S	D	Ballard	Barlow	370150N	0890512W	08010100020 - Shawnee Creek	WETLAND APPROX 0.75 KM SSE OF S END OF BUCK LAKE.	Lowland lentic habitats (wetlands and floodplain lakes) with submergent and floating vegetation (Burr and Warren 1986, Etnier and Starnes 1993).
AFCJC05020*020 10883	*Erimyzon sucetta*	Lake Chubsucker	G5	S2	T			Y	2003-06-24	S	BC	Ballard	Barlow	370410N	0890437W	08010100010 - Hazel Creek	Axe Lake ca 3.4 air km NW of Barlow, Axe Lake State Nature Preserve.	
AFCHD01040*011 10103	*Esox niger*	Chain Pickerel	G5	S3	S			Y	1982-05-18	S	D	Ballard	Barlow	370644N	0890506W	08010100010 - Hazel Creek	CLEAR POND, 5.3 KM WNW OF OHIO VALLEY CHURCH, 4.8 KM NW OF KY 1105 CROSSING OF HAZEL CREEK.	Coastal Plain wetlands, streams, and vegetated oxbow lake shorelines, and it also tolerates reservoir conditions (Burr and Warren 1986, Etnier and Starnes 1993).

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AFCHD01040*019 5684	*Esox niger*	Chain Pickerel	G5	S3	S			Y	1999-09-09	S	B	Ballard	Barlow	370435N	0890524W	08010100010 - Hazel Creek	AXE LAKE SLOUGH E OF BOAT RAMP AT AXE LAKE HUNT CLUB.	Coastal Plain wetlands, streams, and vegetated oxbow lake shorelines, and it also tolerates reservoir conditions (Burr and Warren 1986, Etnier and Starnes 1993).
AFCHD01040*020 11193	*Esox niger*	Chain Pickerel	G5	S3	S			Y	2004-04-14	S	A	Ballard	Barlow	370443N	0890514W	08010100010 - Hazel Creek	Axe Lake.	
AFCQC02600*009 10696	*Etheostoma proeliare*	Cypress Darter	G5	S2	T			Y	1986-11-17	M	B	Ballard	Barlow	370252N	0890533W	08010100010 - Hazel Creek 08010100020 - Shawnee Creek	FISH LAKE, 4.8 KM W BARLOW.	Small to medium-size sluggish streams, oxbows, and wetlands where the bottom is soft and aquatic vegetation abounds (Burr and Mayden 1979, Kuehne and Barbour 1983, Page 1983, Burr and Warren 1986).
AFCQC02600*015 810	*Etheostoma proeliare*	Cypress Darter	G5	S2	T			Y	1982-05-07	S	D	Ballard	Barlow	370232N	0890532W	08010100020 - Shawnee Creek	SHAWNEE CREEK AT FISH LAKE ROAD, 4.5 KM WSW OF KY 60-KY 1105 JCT AT BARLOW.	
AFCJB16030*005 6661	*Hybognathus hayi*	Cypress Minnow	G5	S1	E			Y	1970-08-30	S	E	Ballard	Barlow	370120N	0890639W	08010100020 - Shawnee Creek	Prairie Lake, 3 mi W Gum Corners.	Oxbow lakes and quiet water of low gradient streams on the Coastal Plain and Shawnee Hills. Usually over mud or sand bottoms, but occasionally associated with submerged aquatic vegetation or other cover (Burr and Warren 1986, Pflieger 1975, Smith 1979, Gilbert 1980, Burr et al. 1980). Needs wetlands adjacent to streams/lakes for reproduction/nursery areas (B.M. Burr, pers comm).

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AFCJB16030*024 6807	*Hybognathus hayi*	Cypress Minnow	G5	S1	E			Y	1994-03-22	S	D	Ballard	Barlow	370410N	0890437W	08010100010 - Hazel Creek	AXE LAKE SWAMP CA 3.4 AIR KM NW OF BARLOW.	Oxbow lakes and quiet water of low gradient streams on the Coastal Plain and Shawnee Hills. Usually over mud or sand bottoms, but occasionally associated with submerged aquatic vegetation or other cover (Burr and Warren 1986, Pflieger 1975, Smith 1979, Gilbert 1980, Burr et al. 1980). Needs wetlands adjacent to streams/lakes for reproduction/nursery areas (B.M. Burr, pers comm).
AFCJB16050*001 3349	*Hybognathus placitus*	Plains Minnow	G4	S1	S	SOMC		Y	1980-pre	G	H	Ballard	Wyatt Wickliffe Cairo	365912N	0891011W	08010100020 - Shawnee Creek 05140206110 - Ohio River/Truman Creek 08010100010 - Hazel Creek	NEAR MOUTH OF THE OHIO RIVER.	Occurs over sand/silt bottom in areas with current in the main channel of the Mississippi River (Pflieger 1975, Burr and Warren 1986).
AFBAA01020*009 9855	*Ichthyomyzon castaneus*	Chestnut Lamprey	G4	S2	S				1951	M	H	Ballard	Cairo Wyatt	370036N	0890951W	05140206110 - Ohio River/Truman Creek	Ohio River at Cairo, Ill.	Moderate-size creeks, large rivers, and reservoirs. Substrate consists of gravel and rubble with areas of sand and silt. Larvae require clear streams with stable bars of silt, sand and organic detritis (Becker 1983, Pflieger 1975, Rohde and Lanteigne-Courchere 1980, Scott and Crossman 1973, Smith 1979).

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AFCJC07030*032 6525	*Ictiobus niger*	Black Buffalo	G5	S3	S			Y	1997-09-07	M	D	Ballard	Wickliffe	365755N	0890540W	08010201030 - Stovall Creek 08010100020 - Shawnee Creek	MISSISSIPPI RIVER NEAR WICKLIFFE.	Reservoirs and medium to large rivers with moderate to low gradient and sometime swift current (Becker 1983, Pflieger 1975, Smith 1979, Trautman 1981, and Burr and Warren 1986).
AFCJC07030*037 11126	*Ictiobus niger*	Black Buffalo	G5	S3	S			Y	2004-04-14	S	C	Ballard	Barlow	370443N	0890514W	08010100010 - Hazel Creek	Axe Lake.	
AFCJC07030*045 12814	*Ictiobus niger*	Black Buffalo	G5	S3	S			Y	2008-08-11	S	E	Ballard	Cairo	370528N	0890756W	05140206110 - Ohio River/Truman Creek	Ohio River, Cache Island, at rm 972 (mkh based on coordinates provided).	
AFCQB11120*006 9404	*Lepomis miniatus*	Redspotted Sunfish	G5	S2	T			Y	1979-pre	M	H	Ballard Carlisle	Wickliffe	365630N	0890217W	08010201030 - Stovall Creek	SHELTON CREEK, 6 KM W OF JCT 121 AND 802.	Occurs in well-vegetated swamps, sloughs, bottomland lakes, and low gradient streams (Burr and Mayden 1979, Pflieger 1975, Smith 1979, Burr and Warren 1986, Etnier adn Starnes 1993).
AFCQB11120*008 8769	*Lepomis miniatus*	Redspotted Sunfish	G5	S2	T			Y	1978-07-27	M	H	Ballard	Barlow	370252N	0890533W	08010100010 - Hazel Creek 08010100020 - Shawnee Creek	FISH LAKE, 4.8 KM W BARLOW.	
AFCQB11120*014 2399	*Lepomis miniatus*	Redspotted Sunfish	G5	S2	T			Y	1982-05-07	S	B	Ballard	Barlow	370232N	0890532W	08010100020 - Shawnee Creek	SHAWNEE CREEK AT CROSSING ON FISH LAKE ROAD, APPROX 1.9 KM S OF HOLLOWAY LANDING ROAD.	
AFCQB11120*030 1539	*Lepomis miniatus*	Redspotted Sunfish	G5	S2	T			Y	1999-05-13	S	A	Ballard	Barlow	370410N	0890437W	08010100010 - Hazel Creek	AXE LAKE SWAMP, CA 3.4 AIR KM NW OF BARLOW, AXE LAKE STATE NATURE PRESERVE.	

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Standard Occurrence Report

KSNPC Monitored Aquatic Elements within a 5-mi radius of the KY 51 Bridge Replacement over the Ohio River project (Ballard Co.)

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
AFCQB11120*035 7137	*Lepomis miniatus*	Redspotted Sunfish	G5	S2	T			Y	1996-04	S	D	Ballard	Barlow	370700N	0890243W	05140206130 - Humphrey Creek	HUMPHREY CREEK AT KY 1105.	Occurs in well-vegetated swamps, sloughs, bottomland lakes, and low gradient streams (Burr and Mayden 1979, Pflieger 1975, Smith 1979, Burr and Warren 1986, Etnier adn Starnes 1993).
AFCQB11120*036 6882	*Lepomis miniatus*	Redspotted Sunfish	G5	S2	T			Y	1996-04	S	D	Ballard	Barlow	370055N	0890549W	08010100020 - Shawnee Creek	SHAWNEE CREEK AT UNNAMED RD 3.5 KM W OF KY 60 AND 5.8 KM SW OF BARLOW (SITE 36).	
AFCQB11120*037 9953	*Lepomis miniatus*	Redspotted Sunfish	G5	S2	T			Y	1999-09-09	S	B	Ballard	Barlow	370435N	0890524W	08010100010 - Hazel Creek	AXE LAKE SLOUGH E OF BOAT RAMP AT AXE LAKE HUNT CLUB.	
AFCQB11120*043 11194	*Lepomis miniatus*	Redspotted Sunfish	G5	S2	T			Y	2004-04-14	S	B	Ballard	Barlow	370443N	0890514W	08010100010 - Hazel Creek	Axe Lake.	
AFCQB11120*049 12050	*Lepomis miniatus*	Redspotted Sunfish	G5	S2	T			Y	2004-08-04	S	D	Ballard	Barlow	370259N	0890418W	08010100020 - Shawnee Creek	Shawnee Creek, Ballard County: 0.5 mi upstream from Oldham Rd, near Barlow	
AFCJB53020*001 6568	*Macrhybopsis gelida*	Sturgeon Chub	G3	S1	E			Y	1980-pre	G	H	Ballard Carlisle	Wyatt Wickliffe Barlow Cairo	365920N	0890814W	08010100010 - Hazel Creek 08010201030 - Stovall Creek 05140206110 - Ohio River/Truman Creek 08010100020 - Shawnee Creek 08010100030 - Mississippi River/Sandy Branch	Ohio River near it's mouth.	Adults inhabit large, turbid rivers where they live in swift, shallow water over sand or gravel bottoms (Smith 1979, Burr and Warren 1986, Etnier and Starnes 1993).

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AFCJB53030*001 4515	*Macrhybopsis meeki*	Sicklefin Chub	G3	S1	E			Y	1980-pre	G	H	Ballard Carlisle	Wyatt Cairo Wickliffe Barlow	365920N	0890814W	08010100020 - Shawnee Creek 08010201030 - Stovall Creek 08010100010 - Hazel Creek 05140206110 - Ohio River/Truman Creek 08010100030 - Mississippi River/Sandy Branch	CONFLUENCE OF OHIO AND MISSISSIPPI RIVERS.	Firm sand and/or gravel with some current in the main channel of large, turbid rivers (Burr and Warren 1986, Etnier and Starnes 1993). Young inhabit silty side channels or backwaters (Burr and Warren 1986).
AFCND02010*001 6039	*Menidia beryllina*	Inland Silverside	G5	S2	T			Y	1975-pre	G	H	Ballard Carlisle	Wyatt Wickliffe Barlow Cairo	365907N	0890735W	08010100020 - Shawnee Creek 08010100010 - Hazel Creek 08010201030 - Stovall Creek 05140206110 - Ohio River/Truman Creek 08010100030 - Mississippi River/Sandy Branch	MISSISSIPPI RIVER (VICINITY OF CONFLUENCE WITH OHIO RIVER ACCORDING TO MAP).	Schooling surface fish that occurs in the Mississippi River and floodplain lakes (Burr and Warren 1986, Etnier and Starnes 1993).
AFCND02010*014 11125	*Menidia beryllina*	Inland Silverside	G5	S2	T			Y	2004-04-14	S	D	Ballard	Barlow	370443N	0890514W	08010100010 - Hazel Creek	Axe Lake.	
AFCND02010*018 11669	*Menidia beryllina*	Inland Silverside	G5	S2	T			Y	2000-08-09	M	E	Ballard	Cairo	370306N	0891025W	05140206110 - Ohio River/Truman Creek	Ohio River, Ballard Co: Ohio River Mile 977.7	
AFCJB28550*001 5660	*Notropis hudsonius*	Spottail Shiner	G5	S2	S			Y	1971-pre	M	H	Ballard	Wyatt Wickliffe	365853N	0890823W	08010100010 - Hazel Creek 05140206110 - Ohio River/Truman Creek	MISSISSIPPI RIVER AT CONFLUENCE WITH OHIO RIVER.	Occurs over firm sand along the shoreline of big rivers where rapid current is avoided (Burr and Warren 1986).
AFCJB28650*004 425	*Notropis maculatus*	Taillight Shiner	G5	S2S3	T			Y	1970-08-30	M	H	Ballard	Barlow Wickliffe Cairo	370104N	0890637W	08010100010 - Hazel Creek 08010100020 - Shawnee Creek	PRAIRIE LAKE, 5 KM W OF GUM CORNERS.	Low gradient streams, oxbow lakes, and sloughs in and around cypress knees, marginal vegetation, and accumulations of sticks and detritus (Burr and Page 1975, Burr and Warren 1986, Etnier and Starnes 1993).

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AFCJB28650*005 4453	*Notropis maculatus*	Taillight Shiner	G5	S2S3	T			Y	1978-07-27	M	H	Ballard	Barlow	370252N	0890533W	08010100020 - Shawnee Creek 08010100010 - Hazel Creek	FISH LAKE, 5 KM W OF BARLOW.	Low gradient streams, oxbow lakes, and sloughs in and around cypress knees, marginal vegetation, and accumulations of sticks and detritus (Burr and Page 1975, Burr and Warren 1986, Etnier and Starnes 1993).
AFCJB28650*008 7757	*Notropis maculatus*	Taillight Shiner	G5	S2S3	T			Y	1970-08-31	M	E	Ballard	Barlow Wickliffe Cairo Wyatt	370013N	0890616W	08010100020 - Shawnee Creek 05140206110 - Ohio River/Truman Creek 08010100010 - Hazel Creek	Slough, 3 mi W Gum Corners, roadside ditch SE Hunters Pond.	
AFCJB28650*014 1588	*Notropis maculatus*	Taillight Shiner	G5	S2S3	T			Y	1982-05-18	S	B	Ballard	Barlow	370644N	0890506W	08010100010 - Hazel Creek	CLEAR POND, 5.3 KM WNW OF OHIO VALLEY CHURCH, 4.8 KM NW OF HWY 1105 CROSSING OF HAZEL CREEK.	
AFCJB28650*016 4073	*Notropis maculatus*	Taillight Shiner	G5	S2S3	T			Y	1986-04-23	S	C	Ballard	Barlow	370150N	0890512W	08010100020 - Shawnee Creek	WETLAND APPROX 0.75 KM SSE OF S END OF BUCK LAKE.	
AFCKA02220*013 292	*Noturus stigmosus*	Northern Madtom	G3	S2S3	S	SOMC		Y	1959-08-27	M	H	Ballard	Cairo	370459N	0890906W	05140206110 - Ohio River/Truman Creek	Ohio River, at Mound City, Pulaski Co, Illinois.	Large streams and rivers in moderate to swift current over gravel and sand, and sometimes debris or pondweed for cover (Burr and Warren 1986, Etnier and Starnes 1993).
AFCJB57010*002 252	*Platygobio gracilis*	Flathead Chub	G5	S1	S	SOMC		Y	1983-08-18	M	C	Ballard	Wyatt Wickliffe Barlow Cairo	365907N	0890735W	05140206110 - Ohio River/Truman Creek 08010100020 - Shawnee Creek 08010100010 - Hazel Creek	MISSISSIPPI RIVER, AT THE MOUTH OF THE OHIO RIVER.	Large, turbid rivers and their tributaries with swift current over sand, gravel, or silt substrates (Burr and Warren 1986, Etnier and Starnes 1993).

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KSNPC Monitored Aquatic Elements within a 5-mi radius of the KY 51 Bridge Replacement over the Ohio River project (Ballard Co.)

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AFCJB57010*003 9710	*Platygobio gracilis*	Flathead Chub	G5	S1	S	SOMC		Y	1980-09-06	M	H	Ballard	Cairo Wyatt	370036N	0890951W	05140206110 - Ohio River/Truman Creek	Ohio River at east Cairo.	Large, turbid rivers and their tributaries with swift current over sand, gravel, or silt substrates (Burr and Warren 1986, Etnier and Starnes 1993).
AFCAA02010*002 5256	*Scaphirhynchus albus*	Pallid Sturgeon	G2	S1	E	LE		Y	1979-	M	H	Ballard	Wickliffe Wyatt	365813N	0890610W	08010100020 - Shawnee Creek 08010100010 - Hazel Creek 05140206110 - Ohio River/Truman Creek	MISSISSIPPI RIVER AT [NR] CAIRO, RIVER MILE 952.	Restricted to the deep, turbid, and swiftly flowing main channel of the Mississippi and Missouri Rivers where it usually occurs over firm sand mixed with some gravel and mud (Burr and Warren 1986, Etnier and Starnes 1993).

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KSNPC Monitored Bird and Mammal Elements within a 10-mi radius of the KY 51 Bridge Replacement over the Ohio River project (Ballard Co.)

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
Extant in Kentucky																		
Breeding Birds																		
ABNGA04040*001 1731	*Ardea alba*	Great Egret	G5	S2B	T			Y	1993-06-24	S	X	Ballard	Barlow	370423N	0890504W	08010100010 - Hazel Creek	Axe Lake Swamp, 3.0 mi NW of Barlow; rookery located several hundred yards SE of the S end of the lake.	Marshes, swampy woods, tidal estuaries, lagoons, mangroves, along streams, lakes, and ponds.
ABNGA04040*003 8166	*Ardea alba*	Great Egret	G5	S2B	T			Y	2007-06-12	S	D	Carlisle	Arlington	365004N	0890714W	08010100030 - Mississippi River/Sandy Branch	North end of Fish Lake, ca 4.5 km NW of Berkley.	
ABNGA04040*008 628	*Ardea alba*	Great Egret	G5	S2B	T			Y	1999-06-04	S	X?	Carlisle	Blandville	365610N	0885457W	08010201010 - Mayfield Creek	Mayfield Creek, N of ditch, ca 1.5 air mi upstream of KY 121.	
ABNGA04040*022 11961	*Ardea alba*	Great Egret	G5	S2B	T			Y	2007-06-12	S	C	Ballard	Barlow	370142N	0890601W	08010100020 - Shawnee Creek	Black Wolf Swamp, on Haney Tract of Peal Unit along Shawnee Creek, S of Flat Lake.	
ABPBA01010*001 3952	*Certhia americana*	Brown Creeper	G5	S1S2B, S4S5N	E			Y	1997-07-03	S	A	Ballard	Barlow	370439N	0890504W	08010100010 - Hazel Creek	Axe Lake Swamp, surrounding E side open portion of Axe Lake.	Forest, woodland, swamps; also scrub and parks in winter and migration.
ABPBX96010*033 4176	*Chondestes grammacus*	Lark Sparrow	G5	S2S3B	T			Y	1979-06-13	G	H	Carlisle Hickman	Arlington Wickliffe SW	364854N	0890450W	08010201030 - Stovall Creek 08010100030 - Mississippi River/Sandy Branch 08010201040 - Obion Creek	Bardwell BBS Route (at one of Stops 1-10 -- 1977,1974, 1972) (033A) and Bardwell BBS Route (at one of Stops 11-20 -- 1979) (033B).	Open situations with scattered bushes and trees, prairie, forest edge, cultivated areas, orchards, fields with bushy borders, and savanna (B83COM01NA).
ABPBG10010*002 6571	*Cistothorus platensis*	Sedge Wren	G5	S3B	S			Y	1991-08-17	S	E	Ballard	Cairo Barlow	370025N	0890729W	08010100020 - Shawnee Creek	Swan Lake WMA, along W side of entrance rd.	Grasslands and savanna, especially where wet or boggy, sedge marshes, locally in dry cultivated grainfields. In migration and winter also in brushy grasslands. (B83COM01NA)

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ABPAV10080*001 10508	*Corvus ossifragus*	Fish Crow	G5	S3B	S			Y	1990s	M	E	Carlisle Hickman	Arlington Wickliffe SW Wickliffe	364709N	0890635W	08010100030 - Mississippi River/Sandy Branch 08010201030 - Stovall Creek	Fish Lake vicinity, Westvaco WMA (001A), S end of Fish Lake (001B), Island No 1 sandbars (001C), Campbell Dikes (001D), and Back Slough at Laketon (001E).	Beaches, bays, lagoons, inlets, swamps, near marshes, and, less frequently, deciduous or coniferous woodland, in inland situations primarily in baldcypress swamps and along major watercourses. Also garbage dumps.
ABPAV10080*002 1236	*Corvus ossifragus*	Fish Crow	G5	S3B	S			Y	1993-06-24	M	E	Ballard	Barlow Olmsted Cairo Wickliffe	365810N	0890522W	05140206110 - Ohio River/Truman Creek 05140206130 - Humphrey Creek 08010100010 - Hazel Creek 08010100020 - Shawnee Creek	Barlow Bottoms, including various locations on Ballard WMA, Wickliffe (002A).	
ABPAV10080*003 7948	*Corvus ossifragus*	Fish Crow	G5	S3B	S			Y	1990-06-28	M	E	Ballard	Blandville	365617N	0885710W	08010201010 - Mayfield Creek	Near Blandville, along Mayfield Creek.	
ABNKC10010*001 10531	*Haliaeetus leucocephalus*	Bald Eagle	G5	S2B,S2S3N	T	Delisted		Y	2003	S	B	Ballard	Olmsted	371044N	0890220W	05140206110 - Ohio River/Truman Creek 05140206130 - Humphrey Creek	Ballard Co WMA, at various points incl Mud Slough, ca 1400 ft SW of Turner Landing Road (001A), Round Pond (001B), Big Turner Lake, just NE of camping area (001C), just SE of Goose Pond (001D), NE end of Big Turner Lake (001E), Beaverdam Slough along KY 473 (001F) and slough SW of Turkey Lakes (001G).	Primarily associated with larger rivers and lakes although also occurs along medium sized stream floodplains. In winter, may associate with waterfowl concentrations or congregate in areas with abundant dead fish.
ABNKC10010*006 1137	*Haliaeetus leucocephalus*	Bald Eagle	G5	S2B,S2S3N	T	Delisted		Y	2003	S	B	Ballard	Barlow	370128N	0890716W	08010100020 - Shawnee Creek 08010100010 - Hazel Creek	Swan Lake WMA, "Little Green Sea" (former site now unmapped) and E of Long Pond along old RR bed just SE of "Little Green Sea" (006A).	

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ABNKC10010*018 5653	*Haliaeetus leucocephalus*	Bald Eagle	G5	S2B,S2 S3N	T	Delisted		Y	1997-03-17	S	C	Carlisle	Wickliffe	365305N	0890540W	08010201030 - Stovall Creek	Back Slough, at high point on ridge along E side.	Primarily associated with larger rivers and lakes although also occurs along medium sized stream floodplains. In winter, may associate with waterfowl concentrations or congregate in areas with abundant dead fish.
ABNKC10010*026 5444	*Haliaeetus leucocephalus*	Bald Eagle	G5	S2B,S2 S3N	T	Delisted		Y	2003	S	C	Ballard	Barlow	370503N	0890712W	08010100010 - Hazel Creek	Honey Slough [Lake], ca 1.0 air mi N of Holloway Landing Road.	
ABNKC10010*028 1904	*Haliaeetus leucocephalus*	Bald Eagle	G5	S2B,S2 S3N	T	Delisted		Y	2003	S	C	Carlisle Ballard	Wickliffe	365508N	0890426W	08010201030 - Stovall Creek	Mayfield Creek, along the bank in meander, ca 1.2 air mi SW of Winford Pond.	
ABNKC10010*064 12324	*Haliaeetus leucocephalus*	Bald Eagle	G5	S2B,S2 S3N	T	Delisted		Y	2008-03-25	S	C	Ballard	Barlow Wickliffe	370003N	0890643W	08010100020 - Shawnee Creek	South of Swan Lake, along W side Gum Corner Road, ca 0.5 air mi NE of jct US 51.	
ABNKC10010*065 12325	*Haliaeetus leucocephalus*	Bald Eagle	G5	S2B,S2 S3N	T	Delisted		Y	2008-03-25	S	BC	Ballard	Olmsted	370836N	0890330W	05140206130 - Humphrey Creek	South end of Mud Slough, across from handicapped hunting blind.	
ABNKC10010*066 12326	*Haliaeetus leucocephalus*	Bald Eagle	G5	S2B,S2 S3N	T	Delisted		Y	2008-03-25	S	C	Ballard	Olmsted	371158N	0890055W	05140206110 - Ohio River/Truman Creek	Kelly Branch, in woods along NW side ca. 0.3 air mi SW of confluence with Cross Slough.	
ABNKC09010*009 787	*Ictinia mississippiensis*	Mississippi Kite	G5	S2B	S			Y	1990-06	M	E	Carlisle Hickman	Arlington Wickliffe SW Wickliffe	365001N	0890715W	08010100030 - Mississippi River/Sandy Branch 08010201040 - Obion Creek 08010201030 - Stovall Creek	CW BLOCK OF QUADRANGLE.	Tall forest, open woodland, prairie, semiarid rangeland, shelterbelts, wooded areas bordering lakes and streams in more open regions, scrubby oaks and mesquite.

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ABNKC09010*010 785	*Ictinia mississippiensis*	Mississippi Kite	G5	S2B	S			Y	1990-06-28	M	E	Ballard Carlisle	Blandville Lovelaceville	365617N	0885710W	08010201010 - Mayfield Creek 08010201030 - Stovall Creek	CW BLOCK OF QUADRANGLE.	Tall forest, open woodland, prairie, semiarid rangeland, shelterbelts, wooded areas bordering lakes and streams in more open regions, scrubby oaks and mesquite.
ABNKC09010*011 4141	*Ictinia mississippiensis*	Mississippi Kite	G5	S2B	S			Y	1993-06	M	E	Ballard	Barlow Wyatt Wickliffe Cairo Olmsted	370348N	0890632W	08010100020 - Shawnee Creek 05140206110 - Ohio River/Truman Creek 08010100010 - Hazel Creek 05140206130 - Humphrey Creek	CW BLOCK OF QUADRANGLE.	
ABNGA02010*004 9154	*Ixobrychus exilis*	Least Bittern	G5	S1S2B	T			Y	1981-06-21	M	H	Ballard	Olmsted	370900N	0890250W	05140206130 - Humphrey Creek 05140206110 - Ohio River/Truman Creek	Mitchell Lake, Ballard Wildlife Management Area.	Tall vegetation in marshes, primarily freshwater, less commonly in coastal brackish marshes and mangrove swamps. Preference for marshes with scattered bushes or other woody growth. Infrequently in marshes <5 ha in IA (A86BRO02NA).
ABNGA02010*006 10363	*Ixobrychus exilis*	Least Bittern	G5	S1S2B	T			Y	1981-06-21	M	H	Ballard	Olmsted	371052N	0890103W	05140206130 - Humphrey Creek	Beaverdam Slough just NW of jct KY 473 and road to HQ of Ballard WMA.	
ABNJB20010*003 751	*Lophodytes cucullatus*	Hooded Merganser	G5	S1S2B, S3S4N	T			Y	1980-06-20	S	H	Ballard	Olmsted	371021N	0890319W	05140206130 - Humphrey Creek 05140206110 - Ohio River/Truman Creek	Ballard Wildlife Management Area. Mud Slough (003A), Goose Pond (003B), and Shelby Lake (003C).	Streams, lakes, swamps, marshes, and estuaries; winters mostly in freshwater but also regularly in estuaries and sheltered bays (B83COM01NA).
ABNGA13010*021 7714	*Nyctanassa violacea*	Yellow-crowned Night-heron	G5	S2B	T			Y	1993-06-24	S	B	Ballard	Barlow	370428N	0890525W	08010100010 - Hazel Creek	Axe Lake Swamp, in back yard of one of the local residents, 0.2 air mi SW of boat ramp.	Marshes, swamps, lakes, lagoons, and mangroves.

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ABNKC01010*025 11676	*Pandion haliaetus*	Osprey	G5	S2S3B	S			Y	2006-SU	S	E	Ballard	Olmsted	371053N	0890358W	05140206110 - Ohio River/Truman Creek	Olmsted Locks and Dam on Ohio River.	
ABNFD01020*002 6596	*Phalacrocorax auritus*	Double-crested Cormorant	G5	S2B	T			Y	1936	M	X	Ballard	Barlow	370444N	0890452W	08010100010 - Hazel Creek	Near Barlow, on the Mound City, Ill Road located E at Axe Lake, btwn the lake and the bluffs.	Lakes, rivers, swamps, and seacoasts.
ABPAU08010*004 10079	*Riparia riparia*	Bank Swallow	G5	S3B	S			Y	1980-06-18	S	X	Ballard	Olmsted	371014N	0890407W	05140206110 - Ohio River/Truman Creek	Ohio River bank at Turner's Landing on the Ballard County Wildlife Management Area.	Open and partly open situations, frequently near flowing water (B83COM01NA).
ABNNM08102*003 6774	*Sternula antillarum athalassos*	Interior Least Tern	G4T2Q	S2B	T	LE		Y	1907-08-01	M	X	Ballard	Wyatt	365932N	0890825W	05140206110 - Ohio River/Truman Creek 08010100010 - Hazel Creek	Sandbar nr Cairo, IL, at the mouth of the Ohio River.	Bare or nearly bare alluvial islands or sand bars; will also use bare flats along the margin of industrial ponds.
ABNNM08102*005 8633	*Sternula antillarum athalassos*	Interior Least Tern	G4T2Q	S2B	T	LE		Y	2007-06-25	S	C	Carlisle	Wickliffe Arlington	365331N	0890655W	08010100030 - Mississippi River/Sandy Branch	Sandbar just downstream from Island No 1, Miss River mi 945.5L (opposite Back Slough and 1.5 mi NW of Laketon) (lower end of sandbar) and upstream in dikefield adj to Island No 1, Miss River mi 948, ca 3.0 mi NNW of Laketon (upper end of sandbar)	
ABNNM08102*013 3147	*Sternula antillarum athalassos*	Interior Least Tern	G4T2Q	S2B	T	LE		Y	2007-06-25	S	C	Carlisle Hickman	Wickliffe SW Arlington	364827N	0890757W	08010100030 - Mississippi River/Sandy Branch	Campbell Dikes, Mississippi River mile 941 to rm 940.5.	
ABNNM08102*017 3069	*Sternula antillarum athalassos*	Interior Least Tern	G4T2Q	S2B	T	LE		Y	1988-06-03	S	D	Ballard	Olmsted	371139N	0890216W	05140206110 - Ohio River/Truman Creek	Ohio River immediately downstream from Dam #53.	

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Standard Occurrence Report

KSNPC Monitored Bird and Mammal Elements within a 10-mi radius of the KY 51 Bridge Replacement over the Ohio River project (Ballard Co.)

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
ABNNM08102*021 666	*Sternula antillarum athalassos*	Interior Least Tern	G4T2Q	S2B	T	LE		Y	2001-06-25	S	D	Ballard	Barlow Cairo	370040N	0890738W	08010100020 - Shawnee Creek	Swan Lake WMA, field to W of slough W of entrance rd W of Swan Lake (021A) and field to E of entrance rd, ca 0.4 air mi N of US 51 (021B).	Bare or nearly bare alluvial islands or sand bars; will also use bare flats along the margin of industrial ponds.
ABNNM08102*029 11408	*Sternula antillarum athalassos*	Interior Least Tern	G4T2Q	S2B	T	LE		Y	2007-07	S	C	Ballard	Cairo	370531N	0890817W	05140206110 - Ohio River/Truman Creek	Ohio River upstream from Mound City, IL (ca ORM 972.3).	
ABNSA01010*021 759	*Tyto alba*	Barn Owl	G5	S3	S			Y	1981-05-20	M	E	Carlisle	Arlington	365209N	0890058W	08010201030 - Stovall Creek	Bardwell, on edge of town along KY 123.	Open and partly open country in a wide variety of situations, often around human habitation (B83COM01NA). In northern winter often roosts in dense conifers; also roosts in nest boxes if available (A85MAR01NA).
Mammals																		
AMACC08020*016 4149	*Corynorhinus rafinesquii* Former hibernaculum	Rafinesque's Big-eared Bat	G3G4	S3	S	SOMC		Y	1979-02-14	M	X	Carlisle	Arlington	365140N	0890601W	08010201030 - Stovall Creek	Laketon Loess Bluff.	This bat uses a variety of sites for roosting including caves, protected sites along clifflines, large, hollow trees, old mine portals, abandoned tunnels, cisterns, old or seldom used buildings, etc.
AMACC08020*117 5453	*Corynorhinus rafinesquii* Maternity area mist-net record	Rafinesque's Big-eared Bat	G3G4	S3	S	SOMC		Y	2007-08-11	S	E	Ballard	Cairo Barlow	370112N	0890731W	08010100020 - Shawnee Creek 08010100010 - Hazel Creek	Swan Lake Unit Boatwright WMA, ca 0.3 air mi NE jct main WMA rd and abandoned RR grade (117A) and Ben Waller Tract at Gum Corner Road, ca 0.3 rd mi SW jct Fish Lake Road (117B).	
AMACC08020*205 6025	*Corynorhinus rafinesquii* Summer mist-net record	Rafinesque's Big-eared Bat	G3G4	S3	S	SOMC		Y	1993-07-27	M	E	Carlisle Ballard	Blandville	365547N	0885638W	08010201010 - Mayfield Creek	Mayfield Creek at HWY 121 crossing.	

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EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
AMACC08020*220 3451	*Corynorhinus rafinesquii* Maternity area mist-net record	Rafinesque's Big-eared Bat	G3G4	S3	S	SOMC		Y	1989-06-20	M	E	Ballard	Olmsted	371044N	0890247W	05140206110 - Ohio River/Truman Creek	Ballard Wildlife Management Area, in woods nr gravel rd ca 0.75 mi NE of Goose Pond.	This bat uses a variety of sites for roosting including caves, protected sites along clifflines, large, hollow trees, old mine portals, abandoned tunnels, cisterns, old or seldom used buildings, etc.
AMACC08020*235 5805	*Corynorhinus rafinesquii* Maternity area record	Rafinesque's Big-eared Bat	G3G4	S3	S	SOMC		Y	2001-07-18	S	E	Ballard	Barlow	370243N	0890554W	08010100020 - Shawnee Creek	Barlow Bottoms along Fish Lake Rd just N of old RR grade (235A), along E shore of Flat Lake (235B, 235C), nr NE end of Fish Lake (235D), and nr S end of Fish Lake (235E).	
AMACC01030*014 6726	*Myotis austroriparius* Post-summer mist-net record	Southeastern Myotis	G3G4	S1S2	E	SOMC		Y	1991-08-06	S	E	Ballard	Olmsted	371123N	0890212W	05140206110 - Ohio River/Truman Creek	Ballard WMA, nr mouth of Gar Creek.	Primarily uses caves for hibernacula and uses caves, bridges, and hollow trees as summer maternity and roosting sites.
AMACC01030*018 3375	*Myotis austroriparius* Maternity area mist-net record	Southeastern Myotis	G3G4	S1S2	E	SOMC		Y	2007-08-11	S	E	Ballard	Barlow	370422N	0890505W	08010100010 - Hazel Creek 08010100020 - Shawnee Creek	Barlow Bottoms, Boatwright WMA, old rd ca 100 yds W of Buck Lake Rd nr S end Buck Lake (018A), Fish Lake Rd N of old RR grade (018B), S Axe Lake Swamp (018C), E margin of Clear Lake, ca 600 m N of Holloway Landing Rd (018D), and Waller Ben Tract at Gum Corner Road, ca 0.3 rd mi SW jct Fish Lake Road (018E).	
AMACC01030*019 10043	*Myotis austroriparius* Summer mist-net record	Southeastern Myotis	G3G4	S1S2	E	SOMC		Y	1991-06-19	S	E	Carlisle	Blandville	365547N	0885638W	08010201010 - Mayfield Creek	Mayfield Creek, channelized section, ca 100 yds downstream from KY 121 bridge.	

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KSNPC Monitored Bird and Mammal Elements within a 10-mi radius of the KY 51 Bridge Replacement over the Ohio River project (Ballard Co.)

EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
AMACC01030*028 11152	*Myotis austroriparius* Post-summer mist-net record	Southeastern Myotis	G3G4	S1S2	E	SOMC		Y	2004-08-10	S	E	Ballard	Wickliffe	365613N	0890231W	08010201030 - Stovall Creek	Meade Westvaco Mill tract, in Mayfield Creek floodplain on N side of Mayfield Creek, ca 3.4 air mi SE of Wickliffe.	
AMACC01100*148 11153	*Myotis sodalis* Maternity area mist-net record?	Indiana Bat	G2	S1S2	E	LE		Y	2003-08-13	S	E	Ballard	Wickliffe	365613N	0890231W	08010201030 - Stovall Creek	Meade Westvaco Mill tract, in Mayfield Creek floodplain, on N side of Mayfield Creek ca 3.4 air mi SE of Wickliffe.	
AMACC01100*189 11996	*Myotis sodalis* Maternity area mist-net record	Indiana Bat	G2	S1S2	E	LE		Y	2007-05-21	S	E	Ballard	Barlow	370100N	0890533W	08010100020 - Shawnee Creek	Boatwright WMA, Waller Ben Tract at Gum Corner Road, ca 0.3 rd mi SW jct Fish Lake Road.	
AMACC01100*190 11997	*Myotis sodalis* Maternity area mist-net record?	Indiana Bat	G2	S1S2	E	LE		Y	2007-08-11	S	E	Ballard	Cairo	370257N	0890751W	08010100010 - Hazel Creek	Boatwright WMA, West Payne Tract S of Holloway Landing Road.	
AMACC06010*014 9266	*Nycticeius humeralis* Summer mist-net record	Evening Bat	G5	S3	S			Y	1992-06-24	S	E	Carlisle	Blandville	365547N	0885638W	08010201010 - Mayfield Creek	Mayfield Creek, ca 0.1 air mi W of KY 121 at channelized section.	The evening bat is a colonial species that roosts in trees and houses. It apparently migrates southward in winter.
AMACC06010*016 7206	*Nycticeius humeralis* Maternity area mist-net record?	Evening Bat	G5	S3	S			Y	1993-06-02	S	E	Ballard	Cairo Barlow	370112N	0890731W	08010100020 - Shawnee Creek 08010100010 - Hazel Creek	Swan Lake WMA, ca 0.3 air mi NE jct main WMA rd and abandoned RR grade.	
AMACC06010*018 7189	*Nycticeius humeralis* Summer mist-net record	Evening Bat	G5	S3	S			Y	1991-07-18	S	E	Ballard	Olmsted	370927N	0890330W	05140206130 - Humphrey Creek	Ballard County Wildlife Management Area, ca 2.2 rd mi NW of Oscar, on old rd W of Lake Slough ca 0.2 air mi SW of KY 310.	
AMACC06010*019 2156	*Nycticeius humeralis* Summer mist-net record	Evening Bat	G5	S3	S			Y	1991-07-18	S	E	Ballard	Olmsted	370857N	0890358W	05140206130 - Humphrey Creek	Ballard County Wildlife Management Area, Round Pond area, ca 0.8 air mi SE of area rd brdg over Burnt Slough Lake.	

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EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
AMACC06010*020 2157	*Nycticeius humeralis* Summer mist-net record	Evening Bat	G5	S3	S			Y	1991-07-17	S	E	Ballard	Olmsted	370802N	0890333W	05140206130 - Humphrey Creek	Ballard County Wildlife Management Area, ca 0.1 air mi N of Humphrey Creek Road, at point ca 1.9 rd mi E of Humphrey Creek Road terminus.	The evening bat is a colonial species that roosts in trees and houses. It apparently migrates southward in winter.
AMACC06010*021 10170	*Nycticeius humeralis* Summer mist-net record	Evening Bat	G5	S3	S			Y	1991-05-30	S	E	Ballard	Olmsted	371011N	0890317W	05140206110 - Ohio River/Truman Creek	Ballard Wildlife Management Area, old rd past deer corral, ca 0.2 air mi ESE of SW end of Goose Pond.	
AMACC06010*022 10497	*Nycticeius humeralis* Summer mist-net record	Evening Bat	G5	S3	S			Y	1991-08-06	S	E	Ballard	Olmsted	371124N	0890211W	05140206110 - Ohio River/Truman Creek	Ballard County Wildlife Management Area, Gar Creek, several hundred yds downstream from rd to Dam 53.	
AMACC06010*023 3212	*Nycticeius humeralis* Maternity area mist-net record	Evening Bat	G5	S3	S			Y	2003-08-20	S	E	Ballard	Barlow	370336N	0890525W	08010100010 - Hazel Creek 08010100020 - Shawnee Creek	Axe Lake Swamp State Nature Preserve, along levee cutting through swamp where NS levee turns E at its S end (023A), and E side of Clear Lake, ca 250 m (023B) and 600 m (023C) N of Holloway Landing Rd.	
AMACC06010*046 774	*Nycticeius humeralis* Maternity area mist-net record	Evening Bat	G5	S3	S			Y	2001-07-11	S	E	Ballard	Barlow	370322N	0890537W	08010100020 - Shawnee Creek	Barlow Bottoms, along Fish Lake Rd, just N of old RR grade (046A) and nr NE end of Fish Lake (046B).	
AMACC06010*051 11154	*Nycticeius humeralis* Summer mist-net record	Evening Bat	G5	S3	S			Y	2004-08-10	S	E	Ballard	Wickliffe	365613N	0890231W	08010201030 - Stovall Creek	Meade Westvaco Mill tract, in Mayfield Creek floodplain on N side of Mayfield Creek, ca 3.4 air mi SE of Wickliffe.	

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EOCODE EOID	SNAME EO Type	SCOMNAME	GRANK	SRANK	SPROT	USESA	OTHER STATUS	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	LAT	LONG	EPA WATERBODY	DIRECTIONS	HABITAT
AMAFF03080*001 2225	*Peromyscus gossypinus*	Cotton Mouse	G5	S2	T			Y	1992-05-08	S	C	Carlisle	Arlington	365125N	0890607W	08010201030 - Stovall Creek	OLD TOWN SITE OF LAKETON, ALONG BLUFF CA 0.15 AIR MI S OF LAKETON RD (MARGNUM 34), AND 0.65 MI S OF LAKETON (MARGNUM 47).	Preferred habitat may be wooded streambanks, swampy woods and brushland (Barbour and Davis 1974).
AMAFF03080*002 6849	*Peromyscus gossypinus*	Cotton Mouse	G5	S2	T			Y	1991-04-08	S	C	Carlisle	Arlington	365155N	0890324W	08010201030 - Stovall Creek	Unnamed tributary of Truman Creek, on gravel rd ca 0.4 rd mi SW of KY 1022.	

SENSITIVE ELEMENTS: Locational information for sensitive plants, animals, and natural communities, if released by the Kentucky State Nature Preserves Commission, may not be released in any document or correspondence. Please refer to the Data License Agreement for a full description of rights and restrictions.

Extant in Kentucky

Mammals

AMACC01100*100 6188	*Myotis sodalis* Maternity site	Indiana Bat	G2	S1S2	E	LE		Y	1992-07	S	E	Ballard Carlisle		CONTACT KSNPC	CONTACT KSNPC		SENSITIVE ELEMENT-CONTACT KSNPC	Primarily use caves for hibernacula, although they are occasionally found in old mine portals. During summer, colonies are found behind slabs of exfoliating bark of dead trees, often in bottomland or floodplain habitats, but also in upland situations.

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Appendix C

Socioeconomic White Paper

Socioeconomic White Paper
US 51 Bridge Project

April 24, 2013

Table of Contents

1. Introduction 1
2. Methodology/Findings 1
    2.1 Existing Land Use 1
    2.2 Farmlands 4
    2.3 Community Resources 6
    2.4 Population Demographics 10
    2.5 Economic Importance of the US 51 Bridge 11

List of Exhibits

Figure 1 – Study Area Map 2
Figure 2 – Existing Land Uses 3
Figure 3 – Farmlands 5
Figure 4 – Community Resources 7

List of Tables

Table 1 - Historic Population Levels for Study Area Counties 10
Table 2 - Population Below Poverty Level 10
Table 3 - Population by Race & Ethnicity 11

Appendices

Appendix A: Screenshots from EPA EJView website

1. Introduction

The project proposes replacement or rehabilitation of the existing US 51 Bridge that connects Wickliffe in Ballard County, Kentucky with Cairo in Alexander County, Illinois. The purpose of the project is to provide a safe, reliable facility that addresses the area's transportation needs. The project is needed because the existing structure has substandard deck geometry and deck alignment. The existing bridge has a sufficiency rating of 39.8 and is functionally obsolete.

Third Rock Consultants, LLC (Third Rock) was retained to conduct a socioeconomic assessment of the Study Area shown in **Figure 1**. The Study Area covers over 40 square miles.

2. Methodology/Findings

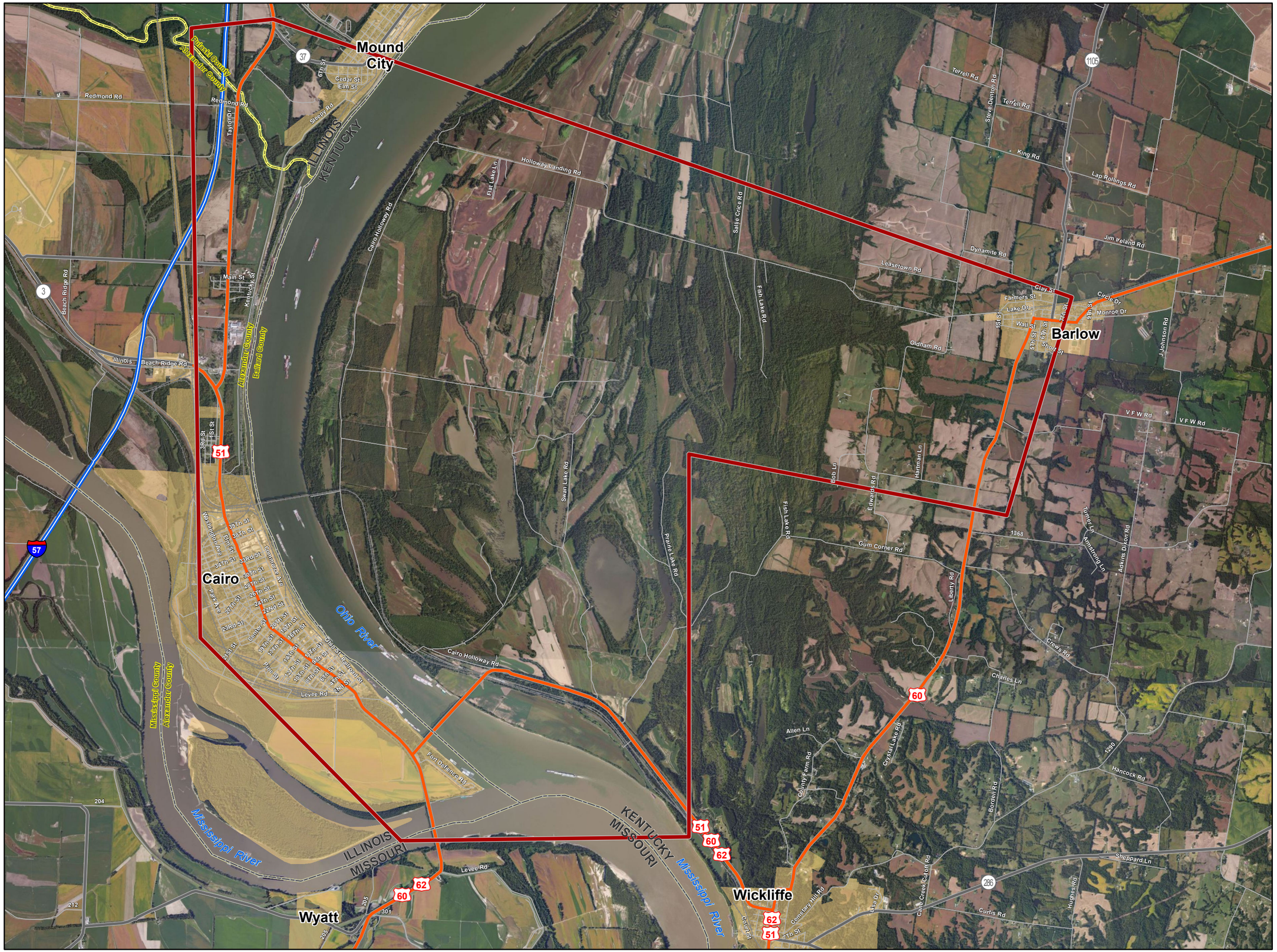
Third Rock socioeconomic analysts utilized a desktop data review to assess the socioeconomic conditions of the Study Area. Information from the US Census Bureau, Kentucky Department of Travel, US Department of Agriculture, University of Kentucky College of Agriculture, Kentucky Cabinet for Economic Development, and the Illinois Department of Commerce and Economic Opportunity was utilized to assess the Study Area's socioeconomic conditions. Topographic mapping from the US Geological Survey and aerial images from the US Department of Agriculture and Google Earth were also utilized.

This report presents an overview of the existing socioeconomic conditions in the Study Area including Existing Land Use (Section 2.1), Farmlands (Section 2.2), Community Resources (Section 2.3), Demographics (Section 2.4), and the Economic Importance of the Bridge to the communities (Section 2.5).

2.1 Existing Land Use

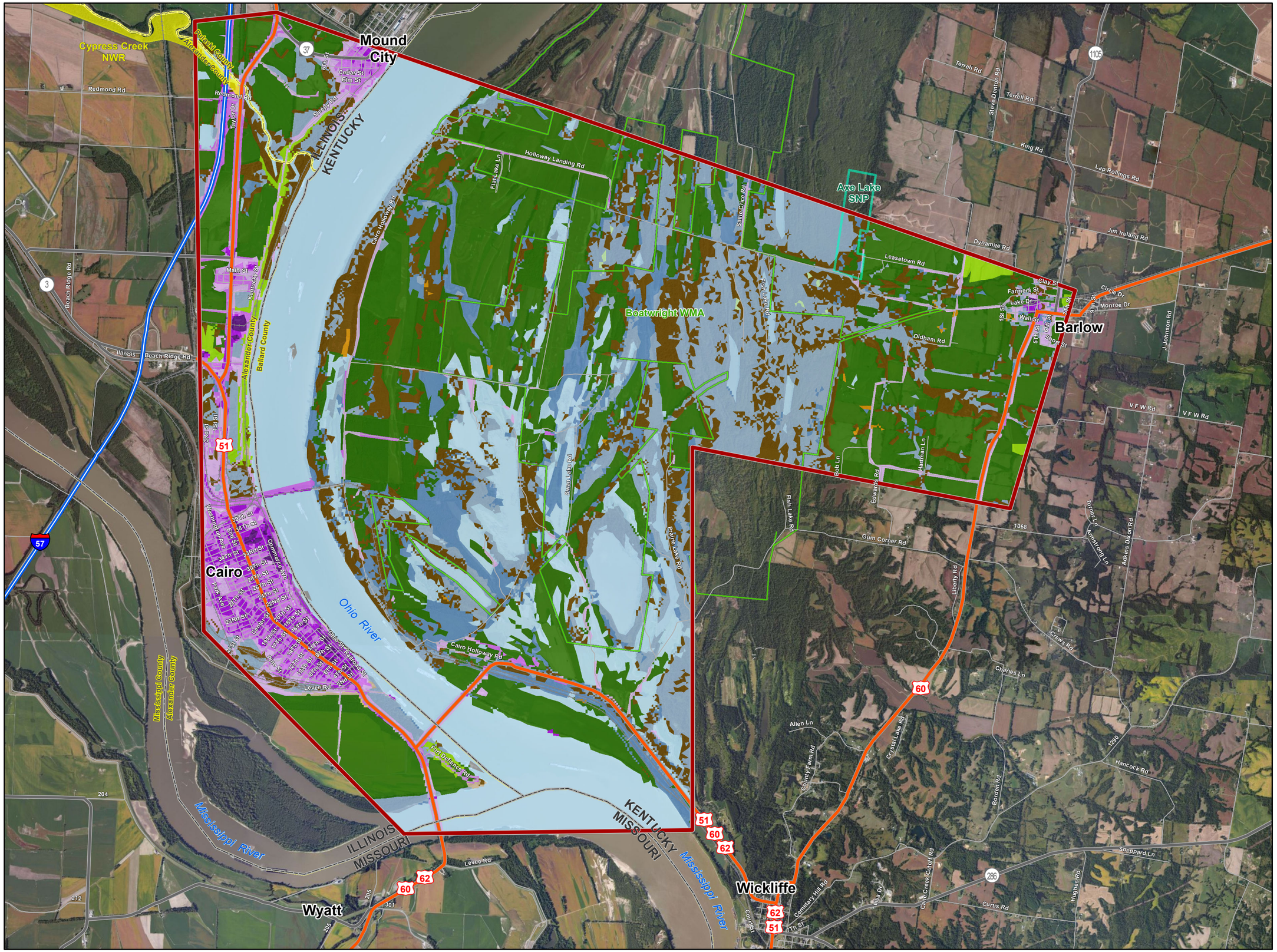
The Study Area includes nearly all of the City of Cairo, Illinois; portions of the smaller cities of Barlow in Ballard County, Kentucky and Mound City in Pulaski County, Illinois are also present in the Study Area. The City of Wickliffe falls just south of the Study Area limits.

Existing land uses are shown in **Figure 2**. Formal land use plans are not available for the Study Area, but a review of aerial mapping indicates that the majority of land use in the Kentucky portion of the Study Area is agricultural or undeveloped. Ballard County's Boatwright Wildlife Management Area (WMA), which contains approximately 8,300 acres, comprises approximately 20% of the Study Area in Kentucky. Kentucky land not within the WMA is primarily used for lower density rural residential and agricultural purposes. According to Census data, the population densities within the city limits of Wickliffe and Barlow are 491 and 1,350 persons per square mile, respectively. The cities of Wickliffe and Barlow are comprised of small land areas (1.4 square miles and 0.5 square mile, respectively). Ballard County as a whole has a population density of 33 people per square mile.



US 51
Ohio River Bridge

Study Area



Interstate
US Highway
State Highway
Local Road
Railroad
State Boundary
County Boundary
Study Area

Landuse

Barren Land (Rock/Sand/Clay)
Cultivated Crops
Pasture/Hay
Shrub/Scrub
Developed, High Intensity
Developed, Medium Intensity
Developed, Low Intensity
Developed, Open Space
Deciduous Forest
Evergreen Forest
Mixed Forest
Grassland/Herbaceous
Emergent Herbaceous Wetlands
Woody Wetlands
Open Water
Nature Preserve
Wildlife Management Area
National Wildlife Refuge

N

0 2,000 4,000 Feet

0 0.5 1 Miles

US 51
Ohio River Bridge
Landuse

Aerial mapping indicates that the Kentucky portion of the Study Area more closely approximates the lower population density of Ballard County than the higher densities of either town. The remainder of the Kentucky portion of the Study Area is comprised of either the WMA or agricultural or undeveloped land.

Aerial mapping also indicates that the Illinois portion of the Study Area contains more residential, commercial, and industrial development than the Kentucky portion, particularly in the City of Cairo. According to Census data, Cairo has a population density of 515 persons per square mile. Nearly all of Cairo's 6.7 square mile land area is located within the Study Area. It is the largest municipality in the Study Area. As such, it contains more homes, businesses, and other facilities than are located in the Kentucky portion. An industrial area is also present in Cairo along the Ohio River.

The Study Area's existing land use is not expected to change a result of the proposed project. The project is being designed to address the area's need for a safe, reliable facility to replace the existing functionally obsolete structure. Rehabilitation or reconstruction of the US 51 Bridge is not anticipated to directly increase growth and development in the Study Area.

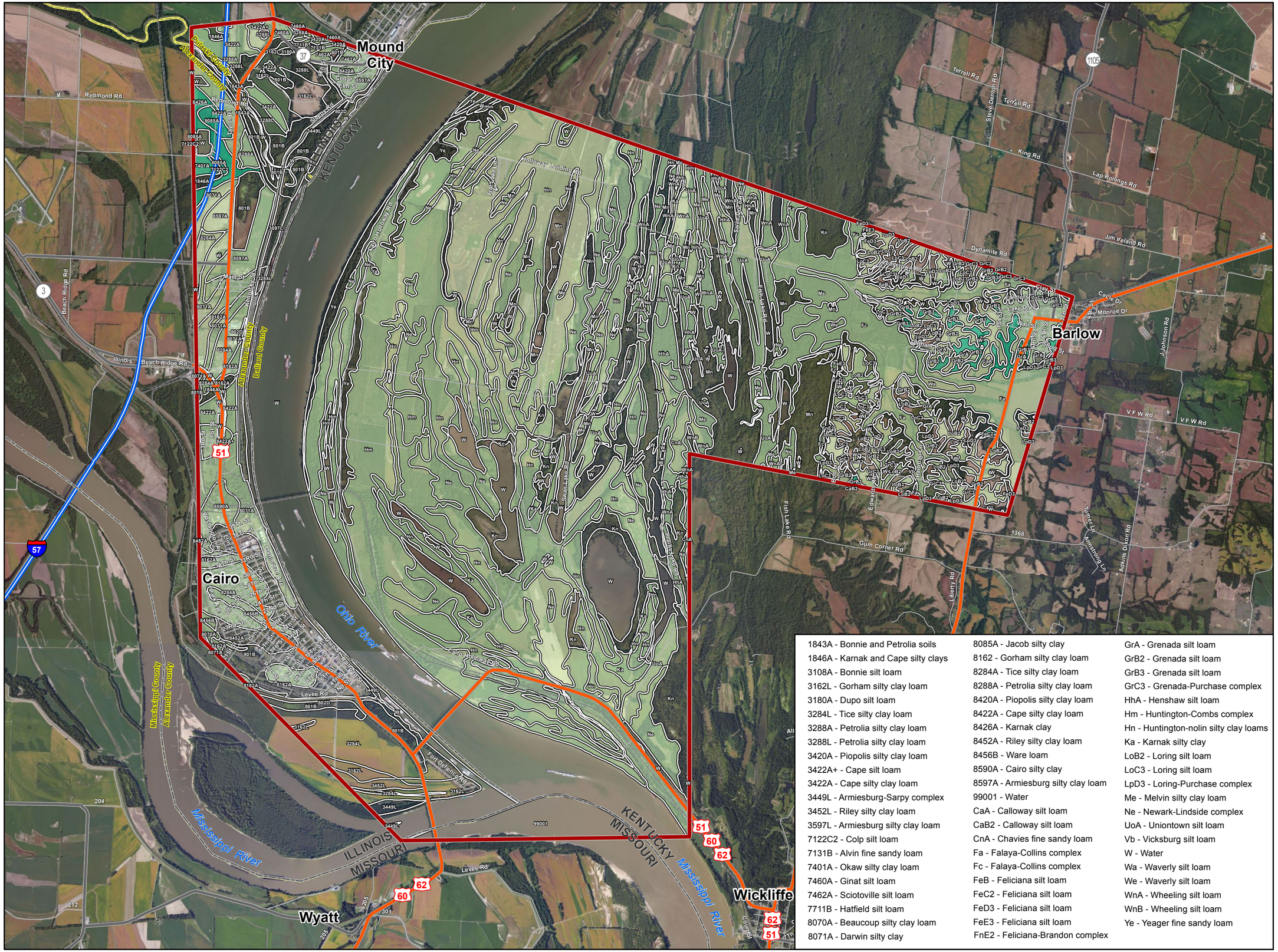
2.2 Farmlands

Though the Illinois portion of the Study Area contains soils classified as Prime or Statewide Important Farmland, much of these soils are contained within Cairo and Mound City and are not being used for agriculture. Limited areas of farmland are present between the two cities. According to the US Department of Agriculture's 2007 Census of Agriculture, Alexander County, Illinois contains 47,626 acres of land in farms. The average farm size is 333 acres. Approximately 77 percent of Alexander County farmland is devoted to crops; soybeans are the top crop item. The average market value of products sold per farm is $91,674, an increase of 33 percent since the last Census of Agriculture, which was conducted in 2002.

Farmland is more prevalent in the Kentucky portion of the Study Area. According to the 2007 Census of Agriculture, Ballard County contains 110,199 acres of land in farms. The average farm size is 229 acres. The majority (77 percent) is cropland; soybeans and corn are the top crop items. The average market value of products sold per farm is $125,580, a 78 percent increase from the 2002 Census of Agriculture.

Fifty-five percent of soils in the Study Area (14,366 acres) are classified as Prime Farmland. Two percent of soils (370 acres) are classified as Statewide Important Farmland. These soils are shown on **Figure 3**.

The provisions of the Farmland Protection Policy Act apply to the portion of the Study Area located outside of municipal boundaries. Coordination with the US Department of Agriculture will be conducted as part of the agency coordination process for the project. As with most projects, alternatives that follow the existing roadway alignment will minimize impacts to farmland soils.



1843A - Bonnie and Petrolia soils	8085A - Jacob silty clay	GrA - Grenada silt loam
1846A - Karnak and Cape silty clays	8162 - Gorham silty clay loam	GrB2 - Grenada silt loam
3108A - Bonnie silt loam	8284A - Tice silty clay loam	GrB3 - Grenada silt loam
3162L - Gorham silty clay loam	8288A - Petrolia silty clay loam	GrC3 - Grenada-Purchase complex
3180A - Dupo silt loam	8420A - Piopolis silty clay loam	HhA - Henshaw silt loam
3284L - Tice silty clay loam	8422A - Cape silty clay loam	Hm - Huntington-Combs complex
3288A - Petrolia silty clay loam	8426A - Karnak clay	Hn - Huntington-nolin silty clay loams
3288L - Petrolia silty clay loam	8452A - Riley silty clay loam	Ka - Karnak silty clay
3420A - Piopolis silty clay loam	8456B - Ware loam	LoB2 - Loring silt loam
3422A+ - Cape silt loam	8590A - Cairo silty clay	LoC3 - Loring silt loam
3422A - Cape silty clay loam	8597A - Armiesburg silty clay loam	LpD3 - Loring-Purchase complex
3449L - Armiesburg-Sarpy complex	99001 - Water	Me - Melvin silty clay loam
3452L - Riley silty clay loam	CaA - Calloway silt loam	Ne - Newark-Lindside complex
3597L - Armiesburg silty clay loam	CaB2 - Calloway silt loam	UoA - Uniontown silt loam
7122C2 - Colp silt loam	CnA - Chavies fine sandy loam	Vb - Vicksburg silt loam
7131B - Alvin fine sandy loam	Fa - Falaya-Collins complex	W - Water
7401A - Okaw silty clay loam	Fc - Falaya-Collins complex	Wa - Waverly silt loam
7460A - Ginat silt loam	FeB - Feliciana silt loam	We - Waverly silt loam
7462A - Sciotoville silt loam	FeC2 - Feliciana silt loam	WnA - Wheeling silt loam
7711B - Hatfield silt loam	FeD3 - Feliciana silt loam	WnB - Wheeling silt loam
8070A - Beaucoup silty clay loam	FeE3 - Feliciana silt loam	Ye - Yeager fine sandy loam
8071A - Darwin silty clay	FnE2 - Feliciana-Brandon complex	

- Interstate
- US Highway
- State Highway
- Local Road
- Railroad
- State Boundary
- County Boundary
- Study Area
- Soils
- Prime Farmland
- Statewide Important Farmland

N

0 2,000 4,000 Feet

0 0.5 1 Miles

US 51
Ohio River Bridge
Farmlands

2.3 Community Resources

This section examines community resources in the Study Area: parklands/wildlife refuges, medical facilities, schools, churches/cemeteries, and major employers. Community resources are shown on **Figure 4**.

2.3.1 Parklands & Wildlife Refuges

Section 4(f) of the US Department of Transportation Act states that all park and recreation lands, wildlife and waterfowl refuges, and historic sites must be considered in transportation project development. Section 4(f) applies to all projects that receive federal funding or require approval by any agencies of the Department of Transportation. It requires that an alternative that uses a Section 4(f) resources may only be selected if it can be proven that no other prudent or feasible alternatives exist, and that the selected alternative minimizes disturbance to the resource. In 2005, the act was amended to allow *de minimis* ruling in the event any impacts would not appreciably alter the attributes, features, or function of the resource.

Several Section 4(f) resources are located in the Study Area.

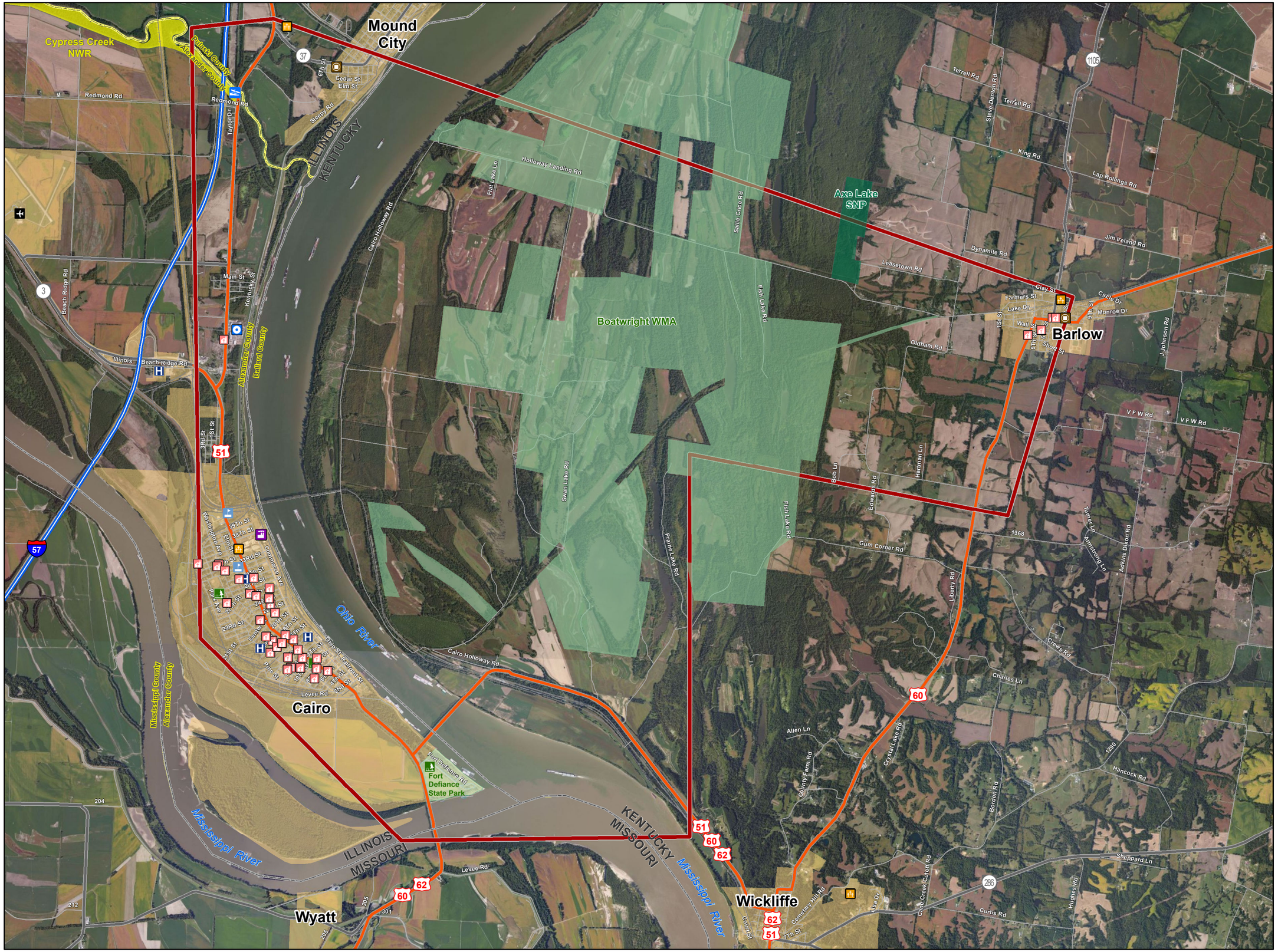
Fort Defiance Park, a former Civil War military fort, is located to the south of Cairo, at the confluence of the Ohio and Mississippi Rivers. Previously a state park, the park is now owned and maintained by the City of Cairo. Amenities include an observation tower, a Civil War museum/visitor center, interpretative signage, scattered picnic tables, and greenspace for passive recreation.

Two smaller community parks, Halliday Park and Saint Mary's Park, are also located in Cairo. Halliday Park is a small pocket park located between US 51 and Poplar Street between 9th and 10th Streets. Saint Mary's Park, located between 33rd Street, Magnolia Drive, 28th Street, and Park Place, contains tennis courts, a baseball field, playground equipment, a covered shelter, picnic tables, and greenspace.

The easternmost tip of the Cypress Creek National Wildlife Refuge lies in the Study Area along the Alexander/Pulaski County line. The refuge provides valuable habitat for a diversity of waterfowl and other migratory birds, resident wildlife, and endangered and threatened species. A public boat ramp provides access to the Cache River adjacent to IL 37.

In Kentucky, the state-owned Boatwright Wildlife Management Area (WMA) contains trails and is open to the public for wildlife viewing, hunting, and fishing. The southern end of Axe Lake Swamp Nature Preserve, a 458 acre bald cypress-tupelo swamp, also falls within northern limits of the Study Area. Located just south of the Study Area, Wickliffe Mounds State Historic Site offers a variety of recreational and educational amenities on the site of a prehistoric Native American village.

Impacts to any of these facilities could constitute a use under Section 4(f), established by the US Department of Transportation (US DOT) Act of 1966 and amended in 1989 (49 U.S.C. Section 303).



- Interstate
- US Highway
- State Highway
- Local Road
- Railroad
- State Boundary
- County Boundary
- Study Area
- Wildlife Management Area
- National Wildlife Refuge
- State Nature Preserve
- City
- Solid Waste Facility

Community Resources

- Airport
- Boat Ramp
- Cemetery
- Health Facility
- Park
- School
- House of Worship

Major Employers

- Industrial Area
- Marine Transportation

N

0 2,000 4,000 Feet

0 0.5 1 Miles

US 51
Ohio River Bridge

Community Resources

No other recreational facilities have been identified in the Study Area.

2.3.2 Community Facilities

This section describes medical facilities, schools, churches, cemeteries, and other similar resources that fall within the Study Area.

There are limited medical facilities located in the Study Area. The nearest major hospitals are located in Paducah, Kentucky; Cape Girardeau, Missouri; and Sikeston, Missouri. The Ballard County Medical Clinic is a walk-in clinic located in Barlow. Southern Seven Health Department, which provides non-emergency health services to the seven southernmost counties of Illinois, is located in Cairo.

The Ballard County School District serves the Kentucky portion of the Study Area; all of the county's schools are located to the east of Barlow, outside of the Study Area. The Cairo Unified School District #1 serves the Illinois portion of the Study Area. Two schools – Cairo Elementary School and Cairo Junior/Senior High School – are present in Cairo.

Numerous small country churches are located throughout the Study Area, concentrated in Cairo, Mound City, Wickliffe, and Barlow. There are three known cemeteries within the Study Area: Barlow Cemetery (north of Barlow along KY 1105), Green Lawn Memorial Gardens in northern Cairo, and the historic Mound City National Cemetery (at the junction of SR 37 and US 51).

Barlow is also home to a post office, volunteer fire department, and local government office, all within the city limits. The southern portion of Mound City in the Study Area contains the local government office and the fire department. Cairo contains numerous typical small town resources: local government offices, a post office, a public library, and a fire department. Because the two cities in Illinois date back to the Civil War era, there are also several historic buildings and museums. (Additional information on historic resources is presented in the Environmental Overview Report for the project.) Further, several small clusters of rural homes are found in the Study Area including Future City, Urbandale, and Golden Lily on the Illinois riverfront between Cairo and Mound City.

Additional data collection - including a windshield survey of the project area – will be undertaken as alternatives are developed.

2.3.3 Viewshed

Several visually sensitive resources are located within the Study Area.

The town of Cairo, founded in 1837, has a rich history that is reflected in its surviving architecture. A large portion of the city, roughly bounded by 33rd, Sycamore, Division, Park, Cedar, and 4th Streets is listed on the National Register of Historic Places as a historic district and represents a potentially sensitive viewshed issue. (Additional

information on historic resources is presented in the Environmental Overview Report for the project.)

Portions of several routes in the study area are designated as National Scenic Byways:

- The Great River Road follows the Mississippi River through 10 states, stretching over 2,000 miles. In the Study Area, it follows SR 3/US 51 into Cairo, crosses the US 51 bridge into KY, then continues south through Wickliffe.
- The Ohio River Byway meanders along the northern bank of the Ohio River over 900 miles. It begins in the Study Area at Fort Defiance Park then follows US 51 north through Cairo to SR 37 northbound along the Ohio River.

As a nature-oriented recreational facility, the Boatwright WMA may be considered a visually sensitive feature.

Fort Defiance Park is located to the south of the existing US 51 Bridge. As such, the bridge is already a component of the viewshed of the park.

No other sensitive viewsheds have been identified in the Study Area.

2.3.4 Local/Regional Economy

According to the Illinois Department of Commerce and Economic Development, major employers in Cairo and surrounding Alexander County include Community Health and Emergency (freestanding emergency medical centers employing approximately 150 people), American Commercial Lines (inland water freight transportation employing approximately 150 people), Delta Center (social service and welfare organizations employing approximately 100 people) and Daystar Care Center (nursing and convalescent homes employing approximately 100 people). The Kentucky Cabinet for Economic Development lists major non-agricultural employers in Ballard County: the NewPage Paper Mill at Wickliffe, which employs approximately 500 individuals, James Marine (a service center/barge repair business that employs approximately 100 individuals), and Harris Engineering (a manufacturer of gun and rifle components that employs approximately 60 people).

According to the Illinois Department of Commerce and Economic Development, major industries in Cairo are Manufacturing and Education, Health, and Social Services. Combined, these industries employ approximately half of all Cairo workers. These are also the top two industries employing Alexander County residents as a whole.

Manufacturing is the top industry in Ballard County, employing approximately 25 percent of county workers. Trade, Transportation, and Utilities and Services are the other major industries in the county, employing approximately 10 percent and eight percent of county workers, respectively.

Agriculture is the third largest sector of Ballard County's economy. The University of Kentucky's College of Agriculture prepared an *Agricultural Comprehensive Plan* for Ballard County in 2008. Cropland comprises the majority of Ballard County farmland,

though some beef cattle farms are present. Since the 1990s, hog farming and dairy cattle have declined, but poultry production has increased in the county. The county has productive land, consistently ranking in the top 10 to 15 counties in Kentucky for agricultural production.

According to county data from the 2006-2010 American Community Survey collected by the US Census Bureau, 109 residents of Ballard County commute into nearby Alexander County, Illinois or to nearby Missouri counties (Cape Girardeau, Mississippi, or Scott Counties). Additionally, an estimated 145 residents in nearby Illinois (Alexander or Pulaski Counties) and Missouri (Mississippi, New Madrid, or Scott Counties) commute into Ballard County, Kentucky. The US 51 bridge provides the most direct link for these commuters.

2.4 Population Demographics

The population of the Study Area has decreased over the past seventy years. Cairo's population has decreased with each decennial census conducted since 1940, when the municipality contained approximately 14,000 residents. Historic population data is not available for the cities of Wickliffe or Barlow, but generally the population of Ballard County has also decreased since 1940. Historic population levels for Alexander and Ballard Counties are shown in **Table 1**.

Table 1 – Historic Population Levels for Study Area Counties

Census Year	Alexander Co, IL	Ballard Co, KY
1900	19,384	10,761
1910	22,741	12,690
1920	23,980	12,045
1930	22,542	9,910
1940	25,496	9,480
1950	20,316	8,545
1960	16,061	8,291
1970	12,015	8,276
1980	12,264	8,798
1990	10,626	7,902
2000	9,590	8,286
2010	8,238	8,249

Table 2 presents poverty data from the 2011 American Community Survey for the Study Area counties and tracts. **Figure A-1** in **Appendix A** shows this data graphically at the tract level from the US EPA's EJView website. As shown, the Illinois portions of the study area have a considerably higher concentration of persons below the federal poverty level than the Kentucky portion of the Study Area or of Alexander County as a whole. **Figure A-2** in **Appendix A** presents per capita income for each tract; levels range from $9,870 in southern Cairo to $26,541 for Barlow and the northwestern portion of Ballard County.

Table 2 – Population Below Poverty Level

Geography	Total Population for whom poverty status is determined	Below Poverty Level	
		Total	%
Alexander County, IL	7,788	2,009	25.8%
Tract 9578	1,592	532	33.4%
Tract 9579	1,316	721	53.0%
Ballard County, KY	8,004	1,164	14.5%
Tract 9502	1,380	263	19.1%
Tract 9503	2,647	293	11.1%

Table 3 presents minority data from the 2011 American Community Survey for the Study Area counties and tracts. **Figure A-3** in **Appendix A** shows this data graphically at the tract level from the US EPA's EJView website. As shown, the Illinois portions of the study area have a considerably higher concentration of minorities than the Kentucky portion of the Study Area or of Alexander County as a whole. Overall, there are very few persons of Hispanic ethnicity in the Study Area. As shown in **Figure A-4** in **Appendix A**, English proficiency is not a concern for the region.

Table 3 – Population by Race & Ethnicity

Geography	Total Population	Minority Population		Hispanic Population	
		Total	%	Total	%
Alexander County, IL	8,314	3,178	38.2%	101	1.2%
Tract 9578	1,650	1,167	70.7%	4	0.2%
Tract 9579	1,423	1,038	72.9%	0	0.0%
Ballard County, KY	8,235	411	5.0%	93	1.1%
Tract 9502	1,454	80	5.5%	6	0.4%
Tract 9503	2,670	151	5.7%	18	0.7%

2.4.1 Environmental Justice Populations

Based on the demographics information presented above, there is a high potential to encounter Environmental Justice populations within the study area, particularly within Cairo and the Illinois portions of the Study Area. As alternatives are developed, additional analysis will be required to assess effects on these communities.

If the existing US 51 Bridge continues to deteriorate and it is closed without a replacement, Environmental Justice populations will likely be negatively impacted. The next closest bridge connecting Wickliffe to Cairo is approximately 34 miles from the existing bridge location. Changing travel patterns to accommodate an additional 70-mile trip per direction to travel between Cairo and Wickliffe would be a hardship for many members of the Environmental Justice population.

If a replacement bridge is constructed away from the existing crossing location, a more detailed Environmental Justice analysis will be conducted to ensure that these communities do not bear a disproportionate share of adverse project impacts.

2.5 Economic Importance of US 51 Bridge

Approximately 5,400 vehicles per day use the existing river crossing between Wickliffe, KY and Cairo, IL. About 35% of the daily traffic is made up of commercial vehicles. If the US 51 Bridge were not available for local traffic, the detour trip between Wickliffe and Cairo increases from 7 miles to 70+ miles per direction. This increase in travel times, distances, and costs would have a major impact on the economies of the region.

Despite Cairo's early status as a regional economic hub, the departure of the city's key industries – ferries, railroads, and shipping – dramatically impacted the economy of Cairo from the mid-20th century to present day. As the economy has declined, so too has the city's population. Wickliffe and Barlow are also small communities. These smaller communities are unable to sustain many service providers, employers, and retail and entertainment outlets; thus, residents of Cairo, Wickliffe, and Barlow often must leave the Study Area to access these destinations.

A good transportation network is vital for Study Area residents, including Environmental Justice populations, to reach destinations in other communities, including jobs and major medical facilities.

Cairo's unemployment rate (19.6%) is approximately double that of Wickliffe (9.6%) or Barlow (10.0%). At 13.7%, Mound City also has a higher unemployment rate than either of the Kentucky communities or Ballard County (7.6%). These higher rates of unemployment indicate that jobs are not readily available in Cairo or Mound City and residents must often commute out of their city of residence for employment. Cairo and Mound City residents working in Kentucky rely on the US 51 Bridge for access to their jobs. Wickliffe and Barlow residents also rely on the bridge for access to jobs in Illinois. As discussed previously, over 250 employees rely on the US 51 Bridge for access to work according to 2010 American Community Survey data.

The US 51 Bridge is also essential for farmers. Agriculture is a major component of Ballard County's economy and the bridge facilitates transport of crops and livestock from the county's farms to market. The bridge provides access to the nation's interstate highway system via I-57 in Illinois and Missouri. The bridge also provides access to inland freight transportation services from Cairo and Mound City ports.

If continuing deterioration were to result in the closure of the existing bridge, Study Area residents and businesses would be negatively impacted. The bridge is a vital component in the transportation network as it facilitates transportation of people and goods between Illinois, Kentucky, and nearby Missouri. There are alternative river crossings in the region, but the travel distances do not make these crossings viable choices for local traffic. Other major river crossings include the following:

Ohio River (upstream)

- US 45 Bridge at Paducah, KY (37 miles northeast of US 51 Bridge)
- I-24 Ohio River Bridge at Paducah, KY (34 miles northeast of US 51 Bridge)

Mississippi River (upstream from confluence with Ohio River)

- I-57 Bridge northwest of Cairo, IL (7 miles northwest of US 51 Bridge)
- US 60/US 62 Bridge south of Cairo, IL (1/2 mile south of US 51 Bridge)

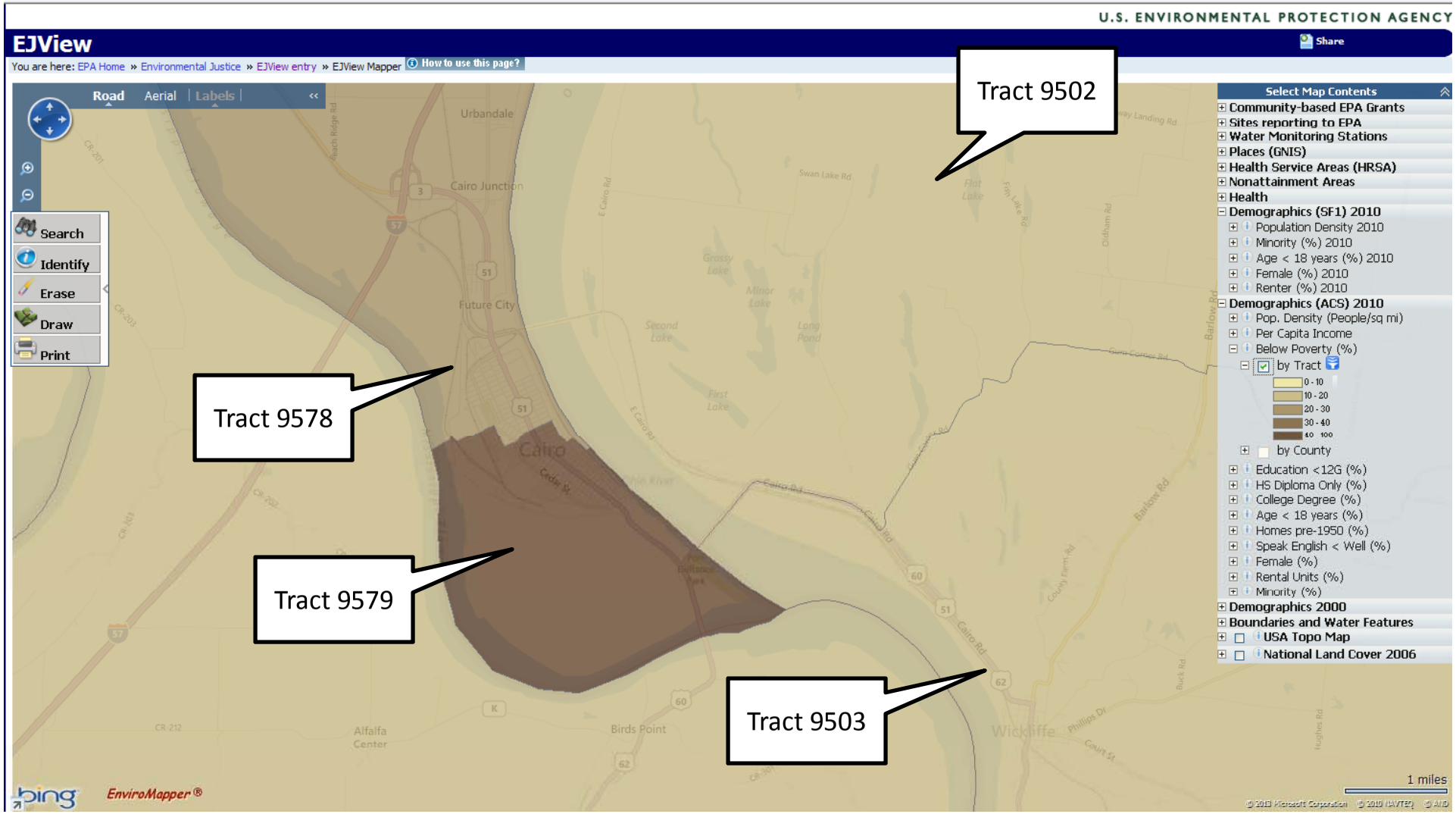
Mississippi River (downstream)

- Dorena-Hickman Ferry (40 miles south of US 51 Bridge)
- I-155 Bridge near Caruthersville, MO (84 miles south of US 51 Bridge)

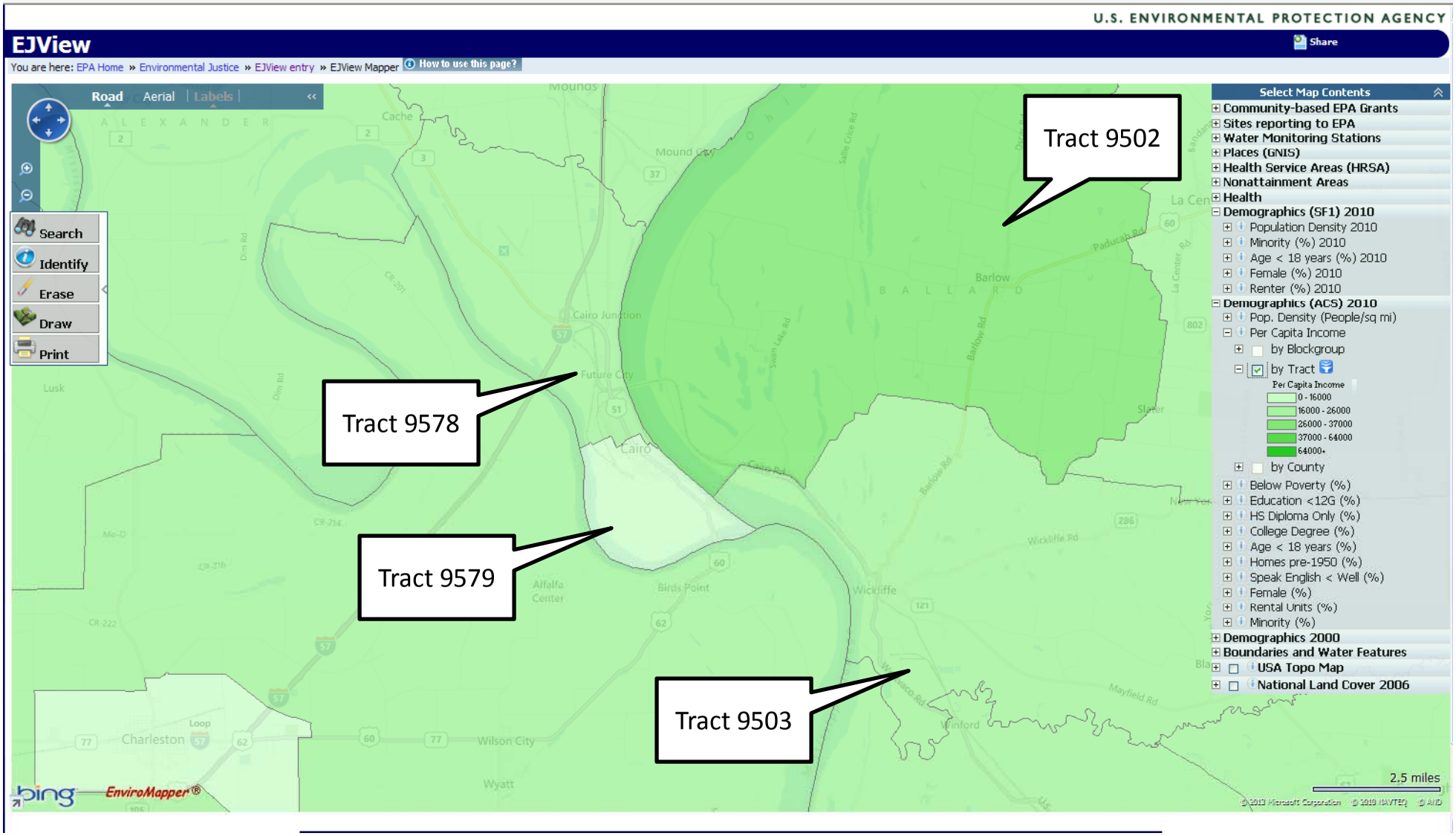
Adding approximately 70 miles per direction to trips between Illinois and Kentucky would be a hardship to area residents and businesses. Residents would have to travel much farther to access jobs, hospitals, retail, and commercial destinations, which could negatively impact businesses. If residents have to travel further, they may reduce trips to area businesses, which would negatively impact the local economy. In the absence of the bridge, businesses would also suffer from the loss of employees who are unable to access their jobs, and would have to reconfigure transportation routes for shipping/receiving goods, which could result in higher costs.

Appendix A:
Screenshots from US EPA's EJView website

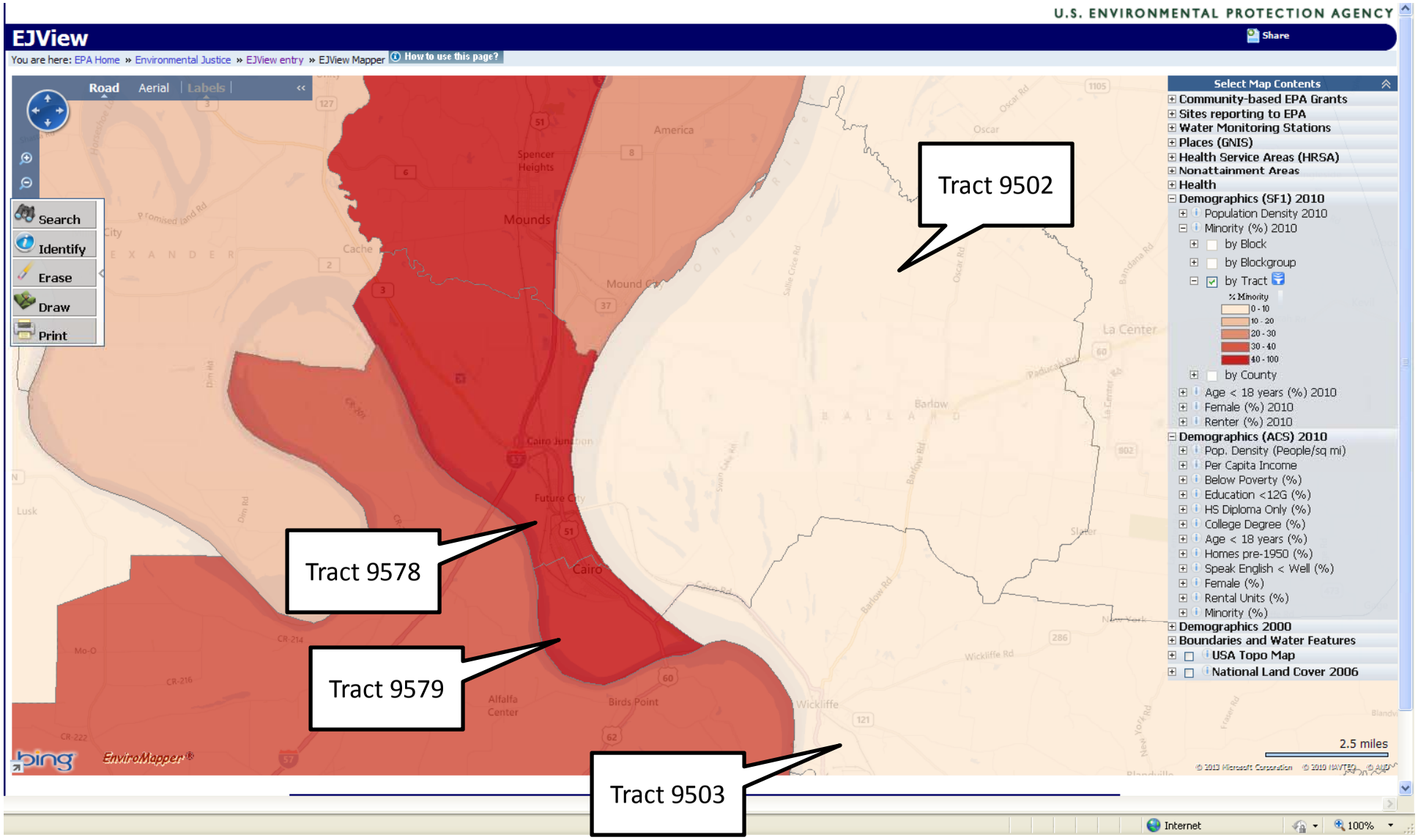
A1: Percent of Population Below Poverty Level by Census Tract



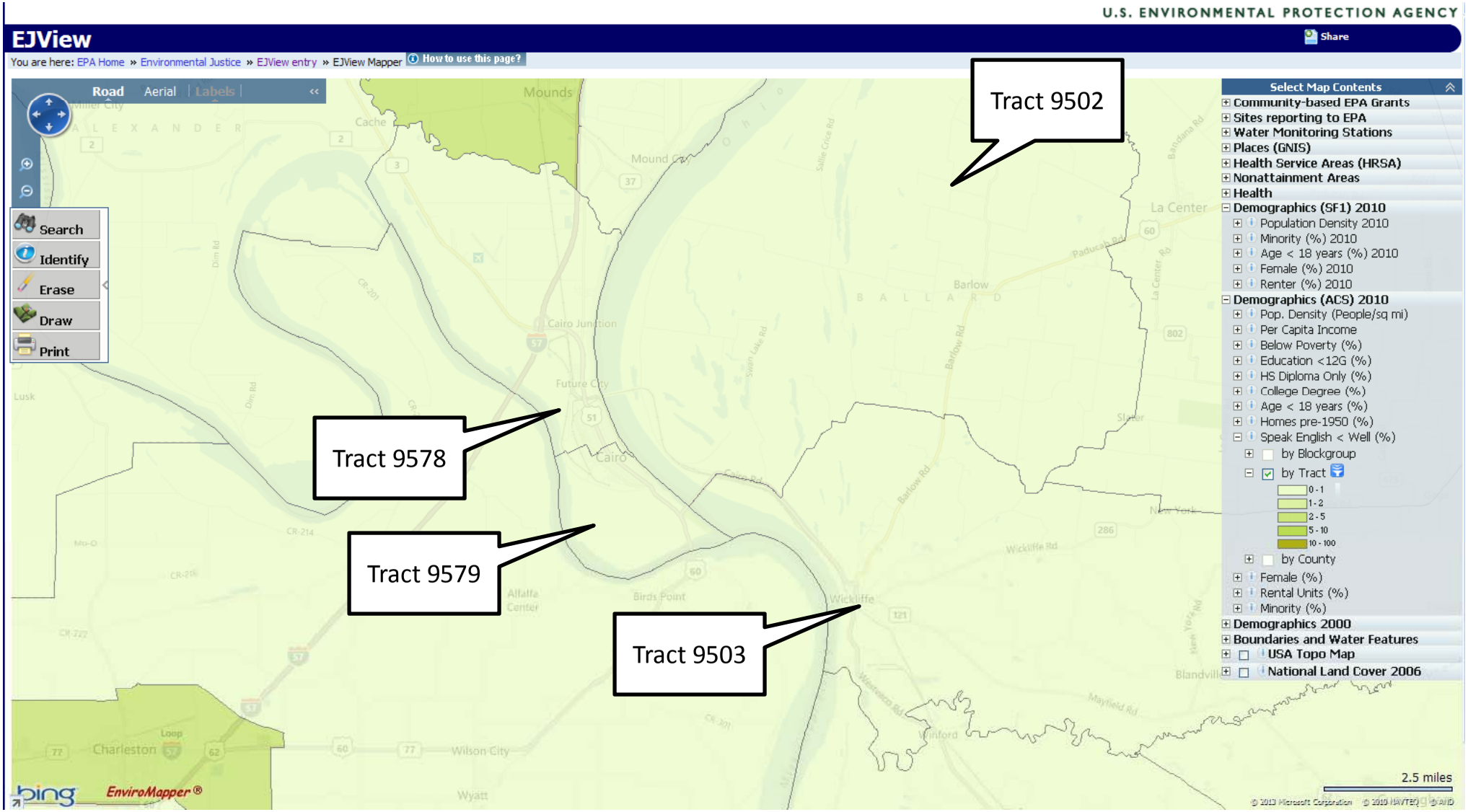
A2: Per Capita Income by Census Tract



A3: Percent Minority by Census Tract



A4: Population who Speak English less than very well by Census Tract



Appendix D

Cultural Resources White Paper

Cultural Resources White Paper

US 51 Ohio River Bridge Study between Wickliffe, KY, and Cairo, IL
Kentucky Transportation Cabinet
Item No. 1-100.00 and 1-1140.00

April 24, 2013

REVISION HISTORY

The following table summarizes changes which have been made to this White Paper.

Version	Date	Name	Description of Changes

Table of Contents

Section 1 - Introduction **1-1**
1.1 Project Background 1-1
1.2 Methodology and Data Sources 1-2
1.3 Study Area 1-2
Section 2 - Cultural Context and Summary of Known Sites **2-1**
2.1 Prehistoric Period 2-1
2.2 Historic Period 2-3
Section 3 - Known Cultural Resources **3-1**
3.1 Archaeological Sites 3-1
3.2 Historic Architectural Properties 3-6
3.3 US 51 Bridge History 3-15
Section 4 - Conclusion **4-1**
Section 5 - References **5-1**

List of Figures

Figure 1.1. Basemap Showing Study Area Boundary 1-3
Figure 3.1. Map Showing Location of NR Listed and Eligible Properties within the US51 Study Area 3-11
Figure 3.2. 1927 W.R. Jillson Kentucky Geological Survey Map of Ballard County 3-16
Figure 3.3. 1935 US Army Corps of Engineers Topographic Quadrangle Map of Wickliffe 3-17

List of Tables

Table 3.1. Summary of Known Sites in Kentucky and Illinois. 3-1
Table 3.2. Summary of Previously Documented Properties within the Study Area. 3-7
Table 4.1. Summary of Archaeological and Historic Architectural Sites Listed or Eligible for Listing on the NRHP. 4-1

Section 1 - Introduction

A planning study is being conducted for the US 51 Bridge for the Kentucky Transportation Cabinet (KYTC). The project proposes replacement or rehabilitation of the existing US 51 Bridge that connects Wickliffe, Ballard County, Kentucky with Cairo, Alexander County, Illinois. The purpose of the project is to provide a safe, reliable facility that addresses the area's transportation needs. The project is needed because the existing structure has poor deck geometry and deck alignment. The existing bridge has a sufficiency rating of 39.8 and is functionally obsolete.

A cultural resource assessment will be required to identify cultural historic sites within the Area of Potential Effect and then to determine if the sites are eligible for listing on the National Register of Historic Places (NRHP). This white paper provides a preliminary view of documented cultural historic resources within the study area (Figure 1.1).

This study was undertaken in agreement with provisions of the National Historic Preservation Act of 1966 (P.L. 89-665; 80 Stat. 915, 16 U.S.C. 470 et seq.), the National Environmental Policy Act of 1969 (P.L. 910190; 83 Stat. 852, 42 U.S.C. 4321 et seq.), Procedures of the Advisory Council on Historic Preservation (36CRF800), and Executive Order 11593, Protection and Enhancement of the Cultural Environment (16 U.S.C. 470; Supp. 1, 1971).

The following discussion provides a description of the methodology and results of the records check in Kentucky and Illinois for known archaeological sites and historic architectural properties.

1.1 Project Background

The Cairo Bridge carries US 51, US 60, and US 62 traffic across the Ohio River. The bridge carries approximately 5,500 vehicles across the Ohio River each day between Wickliffe, KY and Cairo, IL with approximately 35% of that being truck traffic. It also provides a connection to the US 60/US 62 Mississippi River Bridge, which is located at the southern tip of Illinois and continues to Missouri.

The US 51 Ohio River Bridge was constructed by the Cairo Bridge Commission as a toll facility and opened to traffic in 1938. Tolls were removed from the crossing on November 11, 1948, when the highway departments of Kentucky and Illinois took over maintenance of the structure. The Cairo Bridge is at Ohio River navigation mile point 980.4.

The existing two-lane bridge on US 51 over the Ohio River has a sufficiency rating of 39.8.. The structure width is 22.6 feet curb to curb with an approaching roadway width of 24 feet including shoulders. The 76-year-old structure is officially designated as "functionally obsolete" because it does not meet current geometric standards.

The nearest alternate river crossings are the I-24 Ohio River Bridge (39 miles upstream) at Paducah, KY, the Dorena-Hickman Ferry (32 miles downstream), and the I-155 Mississippi River Bridge (122 miles downstream) near Caruthersville, Mo.

CDM Smith is leading a team of three primary consulting firms to undertake a planning study of the US 51 Bridge for the KYTC. The purpose of this phase of the project is to study options for improving the US 51 crossing of the Ohio River between Wickliffe, Kentucky and Cairo, Illinois. This planning study

will consider several improvement scenarios, including: 1) rehabilitation of the existing bridge, 2) replacement of the bridge in its current location, 3) the feasibility of a new bridge in a new location, and 4) a no-build or do-nothing alternative. This study will include a location study, an environmental overview, and recommendations for a preferred alternative to be considered further under NEPA in the next phase of work.

1.2 Methodology and Data Sources

The data used for this white paper was obtained through a review of archaeological and historic architectural site files held by the Kentucky Heritage Council (KHC) in Frankfort, Kentucky and through a review of the Historic Architectural and Archaeology Resources Geographic Information System (HAARGIS) hosted by the Preservation Services Division of the Illinois Historic Preservation Agency. The records check involved studying the archaeological and historic architectural site files and reports for previously known cultural historic sites within the study area.

1.3 Study Area

The study area for this white paper is shown in Figure 1.1, below.

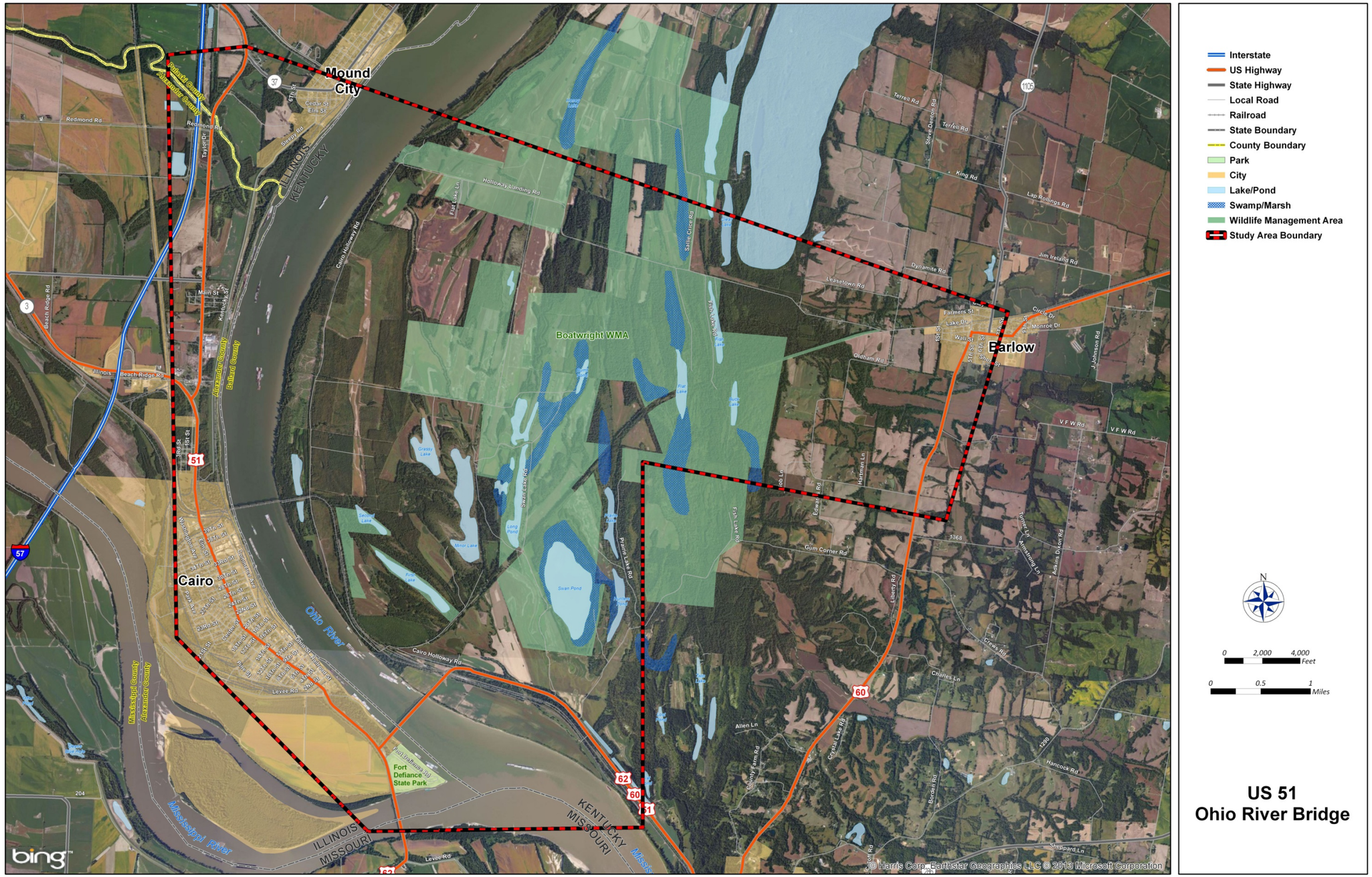


Figure 1.1. Basemap Showing Study Area Boundary

Section 2 -

Cultural Context and Summary of Known Sites

2.1 Prehistoric Period

The prehistoric cultural chronology of the region can be divided into a series of periods that generally correspond to major shifts in subsistence procurement strategies, social organization, technology, and settlement patterning. They are also linked to distinct material cultural styles, particularly in projectile point shapes and (in later times) ceramic vessel form and decoration. These periods form a convenient framework for the discussion of human societies in eastern North America.

Since the Late Pleistocene, humans have occupied all areas of the continental U.S., adapting to the regionally diverse ecosystems and the long-term changes brought about by human occupation. Only the past 500 years is historically documented in any fashion; most of the past 15,000 years can be documented only by the study of prehistoric sites. This period of prehistory is commonly divided into four major chronological periods, which are discussed below.

2.1.1 Paleoindian Period (9,500 to 8,000 B.C.)

The Paleoindian period begins around 10,000 B.C. and continues to circa 8,000 B.C., coinciding with the end of the Pleistocene and the beginning of the Holocene. The arrival of humans in the region was probably linked to the movements of the Pleistocene glaciers. During the Paleoindian period, the last of these glacial advances and retreats, called Great Lakes Stadial (after 9,900 B.C.), occurred. Although the glaciers never actually extended south of the Ohio River, the climatic effects were felt. A cooler, moister climate affected the composition and distribution of floral and faunal communities. Paleoindian subsistence and settlement strategies respond to these changes.

2.1.2 Archaic Period (8,000 to 1,500 B.C.)

The Archaic period includes a long span of time during which important cultural changes that occurred in response to environmental changes that took place at the close of the Pleistocene. The Archaic period is customarily divided into three sub-periods: Early (8,000 to 6,000 B.C.), Middle (6,000 to 3,500 B.C.), and Late (3,500 to 1,500 B.C.).

2.1.2.1 Early Archaic

During the Early Archaic, the last glaciers retreated, and the arctic-like boreal forest began developing into the eastern deciduous forest. Social and technological changes during this period are attributed the technological and social changes that occurred in response to the retreat of the last Pleistocene glacier.

2.1.2.2 Middle Archaic

The environment during the Middle Archaic sub-period was dryer and warmer than modern conditions. By the beginning of the Middle Archaic period, environmental remnants of the Pleistocene had disappeared and animal and plant communities more closely resembled those present at the time of European-American contact. This period is recognized as a time of increased regionalization of cultures, and the development of more complex technological, settlement, subsistence, and social traits.

2.1.2.3 Late Archaic

In response to the changing environment, with its associated changes in plant and animal life, Late Archaic peoples developed a more diversified subsistence strategy based on local choices from a variety of subsistence options including hunting, plant food gathering, fishing, and in some areas, the beginnings of plant domestication in a planned seasonal round exploitation strategy. The Late Archaic was a time of continued cultural expansion and growing complexity. Adaptation to unique regional environmental conditions resulted in the development of specialized technologies used to exploit locally available plant and animal resources.

2.1.3 Woodland Period (1,500 B.C. to 1000 A.D)

Although initially there was very little difference between Late Archaic and Woodland period settlement, over the two millennia of the period, Woodland cultures diverged sharply from their Archaic period beginnings. Chief among these developments were burial mounds and earthwork enclosures that went along with the intensification of plant domestication started during the Late Archaic period, the development of fired clay ceramic containers (first used as ceremonial containers, later used more widely), and the intensification of trade with distant regions. The Woodland period is customarily divided into Early (1,500 to 300 B.C.), Middle (300 B.C. to A.D. 400), and Late (400 to A.D. 1000) sub-periods. Of these, the Early Woodland is the least known, but reflects its Archaic origins.

2.1.3.1 Early Woodland

The Early Woodland period is typically marked by the appearance of ceramics along with a number of other new cultural characteristics such as burial mounds, stylistic shifts, an introduction of a range of new artifact types, and the incorporation of domesticates as a key feature of subsistence strategy. However, the subsistence patterns changed little from the preceding Late Archaic period.

2.1.3.2 Middle Woodland

Changes during the Middle Woodland period relate to increases in population density, as reflected in an increasing size and number of sites, as well as to changing technology and subsistence patterns. During this time, the construction of earthen enclosures and burial mounds continued and reached its height of popularity.

2.1.3.3 Late Woodland

The Late Woodland populations continued to follow an economic adaptation similar to that of the preceding periods and many of the trends in the settlement and subsistence patterns rooted in the earlier periods also continued to develop. In other words, there continues to be a shift towards larger settlements that are used over longer periods of time, and an increased importance of horticultural products in the diet.

2.1.4 Late Prehistoric Period (Mississippian)

The Mississippian cultural period can be described as a time of increasing sedentary with agricultural practices, nucleated settlements centered on villages and towns, and with ranked socio-economic organizations. This period is not only marked by the rise of maize agriculture, but by increases in cultural complexity, population movement, and dispersal (warfare). Even between similar groups, there is still diversity in settlement size, form, location, and ceramic styles. During this time, shell tempered ceramics began along with hierarchical settlement systems ranging from farmsteads to administrative centers with platform mounds.

One such large mound is Wickliffe Mound (15Ba4), located in southern Ballard County, which is now a state historic site with museum exhibits and recreational facilities, managed by Kentucky State Parks.

2.2 Historic Period

The project area spans two states, Kentucky and Illinois. The majority of the area lies within Ballard County in Kentucky and a small sliver in Alexander and Pulaski Counties in Illinois. A brief history of Alexander and Pulaski Counties will be presented first followed by a brief history of Ballard County.

2.2.1 Alexander and Pulaski Counties, Illinois

2.2.1.1 Pre-Settlement

That Historic Period history of the area that would become Alexander County begins around the time of early explorations of the Mississippi River, its peoples, and land by Marquette and Joliet. Finding the area rich in furs, a profitable trade good, the French government began to develop a system of forts and trading posts along the Mississippi and Ohio rivers to protect their newly found economic interest. Soon conflict arose over control over the fur trade and the yet untapped economic resources. The influence of the French over the Mississippi and Ohio rivers were reduced following the French and Indian War in 1763 (Webb et al. 1989:16). A tannery was established near present day Mound City by Frenchman Charles Juchereau de St. Denys in 1702 but abandoned shortly after in 1704 (Fortier and Chaput 1969:394-400).

2.2.1.2 Early Settlement

Following the American Revolutionary War, the area of Alexander County initially fell under the jurisdiction of the Ohio Territory established in 1783. Soon afterwards the first settlement, McElmurry's Station, was established along the Mississippi River near Fayville. By 1809 the Illinois territory had been created from the Ohio Territory. The numbers of settlers in the area continued to increase as routes of travel became secure through war, treaties, and conquest. Alexander County was created in the same year that Illinois was admitted to the Union (1819). The increase in population and economic trade lead to the establishment of several towns, including the important river ports of Cairo and Mound City (Webb et al. 1989:16-17; Smith 1912:425).

2.2.1.3 Antebellum

Taking advantage of the river traffic through Cairo, Alexander County prospered on the trade of agricultural produce and forestry materials. The Mississippi River was a natural trade route for goods traveling up and down stream. However, during the middle of the 19th century, the Illinois Central Railroad was constructed, finding its way through Alexander County. As with many river towns during this time, the presence of an alternative means to bring goods to market led to the reduction of river based traffic. This decline in the importance of the Mississippi River as a trade route would continue as more infrastructure was built away from the river (Webb et al. 1989:17). Pulaski County was formed from Alexander and Johnson Counties with Caledonia as the county seat in 1843 and later Mound City in 1861 (Smith 1912:519-521).

2.2.1.4 Civil War

The Civil War had a significant impact on the state, both politically and economically. Several hundreds of thousands of Union troops were provided by the state, which was also a major supplier of food and other necessary goods needed for the war effort. Other economic changes at this time included the beginning of a long transition to an industrial economy from strictly an agricultural one.

Cairo and Mound City served as a Union supply center for distributing goods via the Illinois Central Railroad and the Mississippi River. A Union Navy shipyard in nearby Mound City manufactured ironclad warships and other ships of war for use along the Mississippi River and its tributaries (WPA 1939:455).

Many Civil War camps were established along the course of the Mississippi and Ohio Rivers. One such camp was Camp Defiance in Alexander County. Camp Defiance was established south of Cairo at the confluence of the Ohio and Mississippi rivers. It served as a supply depot and naval base, supporting military actives along the rivers overland into the South.

2.2.1.5 Postbellum

One of the biggest changes to affect Alexander County after the war was the development of the sharecropping or tenant farm labor system. During the war, and afterwards, the influence of southern agricultural practices on the techniques employed in southern Illinois shared many of the same tenants with southern former slave holding states, particularly the adaption of tenant farming. Unlike their northern cousins in and around Chicago where industrialization was leading the post-war economy, southern Indiana remained largely agricultural based.

2.2.1.6 20th Century

By the turn of the century, agricultural production had recovered. However, this period also witnessed the decline of the ante-bellum African-American agricultural labor base as they migrated northward to large urban areas such as Chicago and Detroit to take advantage of the developing industrialization of those cities (Katznelson 1973).

Coinciding with the erosion of the agricultural labor base was the introduction of farm mechanization. Tractors were introduced in the 1930s and mechanical cotton pickers followed in the 1940s (Holley 2000). With the switch to mechanized agriculture, the need for farm labor decreased even further. As a result, many small communities disappeared while the average farm size increased.

2.2.2 Ballard County, Kentucky

2.2.2.1 Pre-Settlement

It is not exactly known when the first Europeans entered Kentucky, but early explorers like Marquette and Jolliet certainly witnessed the western portion of Kentucky as they traveled the Mississippi River and its tributaries. In 1682 La Salle visited a village near the present-day city of Wickliffe (Newhall 1992:358-359). The area of Ballard County would remain under control of the Chickasaw, though the pressure being brought to bear on them politically would see them soon sell their lands.

2.2.2.2 Early Settlement

In 1792 Kentucky became a state. Statehood brought state-funded transportation improvements. Besides road developments, improvements and regulation in river transportation included the first passenger boats in 1799 and ferry crossings on rivers and larger creeks.

As part of the growth of a young republic, military fortifications were used to express its growing authority. To secure the Mississippi River near the confluence of the Ohio, Fort Jefferson was erected in 1780 but abandoned by 1781 (Carstens 1992:345). The abandonment of the fort would foreshadow a lapse in settlement of this area until the land officially came under the control of the federal government at least 30 years later. The area that would become Ballard County was initially part of the Jackson Purchase in 1818 (Hancock 1992:460-462). However, settlement had begun a year earlier

(Collins 1877:39). In 1821 the area was organized as Hickman County and later became part of McCracken County. Ballard County was then formed from parts of McCracken and Hickman County in 1842 (Kleber 1992:44-45).

2.2.2.3 Antebellum

Despite having a rich bottom land suitable for farming, Ballard County was sparsely settled during the first half of the 19th century (Kleber1992:44-45).

2.2.2.4 Civil War

The Civil War had long and lasting effects on Kentucky and Ballard County. Despite being part of the State of Kentucky, the citizens of Ballard County had strong sympathies for their southern neighbors. The location of Ballard County along the Mississippi River and the function of Wickliffe as an important river port resulted in a strong Union presence (Kleber 1992:44-45).

2.2.2.5 Postbellum

After the war, Ballard County returned to its agricultural base. During this time, Carlisle County was created from Ballard County due to the difficulties of traveling over Mayfield Creek when flooded (Kleber 1992:44-45). The county seat was also moved from Blandville to Wickliffe. Wickliffe enjoyed economic benefits such as river travel and rail transportation that Blandville lacked (Kleber 1992:44-45).

2.2.2.6 20th Century

Ballard County continued to prosper into the 20th century in part due to the strong agricultural market and the development of Wickliffe as a major transportation center serving rail lines and river trade (Kleber 1992:44-45).

Section 3 -

Known Cultural Resources

This section presents a summary of the known archaeological and historic architectural properties that are within the project area. Detailed information about the US 51 Bridge itself is presented at the end of the chapter.

3.1 Archaeological Sites

There are thirty-five (35) known archeological sites within the US 51 study area. Twelve (12) sites are located in Illinois and twenty-three (23) are in Kentucky. All thirty-five (35) sites are summarized in Table 3.1 and are discussed by state below.

Table 3.1. Summary of Known Sites in Kentucky and Illinois

Site	Paleo-Indian	Archaic				Woodland				Late Prehistoric		Prehistoric Indeterminate	Historic	National Register Status
		E	M	L	I	E	M	L	I	MI	FA			
15Ba2										X				Listed
15Ba9										X				Not Assessed
15Ba12									X	X				Not Assessed
15Ba14								X		X				Not Assessed
15Ba51												X	X	Not Assessed
15Ba52					X				X	X				Not Assessed
15Ba79												X	X	Not Eligible
15Ba80												X	X	Not Assessed
15Ba87										X			X	Not Assessed
15Ba88										X			X	Not Assessed
15Ba89										X			X	Not Assessed
15Ba92													X	Not Assessed
15Ba98													X	Not Assessed
15Ba99													X	Not Assessed
15Ba101													X	Not Assessed
15Ba102										X			X	Not Assessed
15Ba125						X								Not Assessed
15Ba131							X		X	X		X		Not Assessed
15Ba140												X		Not Eligible
15Ba141										X		X		Not Eligible
15Ba144										X		X	X	Not Assessed
15Ba145				X		X							X	Not Assessed
15Ba146													X	Not Assessed
11Ax32										X				Not Assessed

Site	Paleo-Indian	Archaic				Woodland				Late Prehistoric		Prehistoric Indeterminate	Historic	National Register Status
		E	M	L	I	E	M	L	I	MI	FA			
11Ax226													X	Not Eligible
11Ax557													X	Not Eligible
11Ax558													X	Not Eligible
11Ax561													X	Not Eligible
11Pu23 (Unnamed Mound)										X				Not Assessed
11Pu140													X	Eligible
11Pu141													X	Not Assessed
11Pu206 Schuller Mound										X				Not Assessed
11Pu207 Winkler Mound(s)										X				Not Assessed
11Pu208 Burton Site										X				Not Eligible
11Pu209 Garden Site										X				Not Eligible

E=Early, M=Middle, L=Late, MI=Mississippian; A=Fort Ancient; I=Indeterminate; Listed=Currently listed on the NRHP; Not Assessed=NRHP eligibility has not been determined.

3.1.1 Archaeological Sites in Kentucky

Twenty-three (23) sites are located within Ballard County and fall within the Purchase Management Area for prehistoric archaeological sites for Kentucky (Pollack 2008a:12).

3.1.1.1 Site 15Ba2

Site 15Ba9 is an open habitation with mounds prehistoric occupation affiliated with a terminal Late Woodland and Mississippian cultural groups. The site, located on a levy in Barlow Bottoms, near the confluence of the Ohio and Mississippi Rivers, is called the Twin Mounds site (Applegate 2008:379). The site area consists of two large mounds, a plaza, and middens (Burks and Stout 1996). The site is postulated to have functioned as a large administrative mound center during the Dorena and Meldey phases of the Mississippi River Section and the Middle and Late Wickliffe periods of the Ohio River I Section (Pollock 2008b:626). The site is currently listed on the NRHP.

3.1.1.2 Site 15Ba9

Site 15Ba9 is an open habitation without mounds prehistoric occupation affiliated with an indeterminate Late Woodland Mississippian cultural group. The NRHP status for the site has not been assessed.

3.1.1.3 Site 15Ba12

Site 15Ba12 is a multi-component open habitation without mounds prehistoric occupation with both indeterminate Woodland and Late Woodland Mississippian cultural groups. The NRHP status for the site has not been assessed.

3.1.1.4 Site 15Ba14

Site 15Ba14 is called the Sandy Slough site (Weinland and Gauts 1979). It is a multi-component open habitation without mounds prehistoric occupation with both indeterminate Late Woodland and Late Woodland Mississippian and Fort Ancient cultural groups. The site was a major terminal Late Woodland village site (Applegate 2008:379). The NRHP status for the site has not been assessed.

3.1.1.5 Site 15Ba51

Site 15Ba15 is a multi-component site with both a prehistoric and historic occupation. The prehistoric component is an open habitation without mounds occupation by an indeterminate prehistoric cultural group. Although a historic occupation is indicated on the archaeological site form, the type and duration of the historical occupation is unknown. The NRHP status for the site has not been assessed.

3.1.1.6 Site 15Ba52

Site 15Ba52 is a multi-component open habitation without mounds site with occupations associated with indeterminate Archaic, Woodland, and Late Prehistoric cultural groups. The NRHP status for the site has not been assessed.

3.1.1.7 Site 15Ba79

Site 15Ba79 is a multi-component site with both a prehistoric and historic occupation. The prehistoric component is an open habitation without mounds occupation by an indeterminate prehistoric cultural group. The historic occupation is classified as a farm/residence dating from the early to middle 20th century. The site is not considered eligible for listing on the NRHP.

3.1.1.8 Site 15Ba80

Site 15Ba80 is a multi-component site with both a prehistoric and historic occupation. The prehistoric component is an open habitation without mounds occupation by an indeterminate prehistoric cultural group. The historic occupation is classified as a farm/residence dating from the middle 19th to the early 20th century. The NRHP status for the site has not been assessed.

3.1.1.9 Site 15Ba87

Site 15Ba87 is a multi-component site with both a prehistoric and historic occupation. The prehistoric component is an open habitation without mounds occupation by a Mississippian cultural group. The historic occupation is classified as a farm/residence dating from the middle 19th to the middle 20th century. The NRHP status for the site has not been assessed.

3.1.1.10 Site 15Ba88

Site 15Ba88 is a multi-component site with both a prehistoric and historic occupation. The prehistoric component is an open habitation without mounds occupation by a Mississippian cultural group. The historic occupation is classified as a farm/residence dating from the middle 19th to the middle 20th century. The NRHP status for the site has not been assessed.

3.1.1.11 Site 15Ba89

Site 15Ba89 is a multi-component site with both a prehistoric and historic occupation. The prehistoric component is an open habitation without mounds occupation by a Mississippian cultural group. The historic occupation is classified as a farm/residence dating from the middle 19th to the middle 20th century. The NRHP status for the site has not been assessed.

3.1.1.12 Site 15Ba92

Site 15Ba92 is a historic farm/residence dating from the middle 19th to the middle 20th century. The NRHP status for the site has not been assessed.

3.1.1.13 Site 15Ba98

Site 15Ba98 is a historic farm/residence dating from the middle 19th to the middle 20th century. The NRHP status for the site has not been assessed.

3.1.1.14 Site 15Ba99

Site 15Ba99 is a historic farm/residence dating from the middle 19th to the middle 20th century. The NRHP status for the site has not been assessed.

3.1.1.15 Site 15Ba101

Site 15Ba101 is a multi-component site with both a prehistoric and historic occupation. The prehistoric component is an open habitation without mounds occupation by a Mississippian cultural group. The historic occupation is classified as a farm/residence dating from the middle 19th to the middle 20th century. The NRHP status for the site has not been assessed.

3.1.1.16 Site 15Ba102

Site 15Ba1029 is a multi-component site with both a prehistoric and historic occupation. The prehistoric component is an open habitation without mounds occupation by a Mississippian cultural group. The historic occupation is of unknown type dating from the early to middle 20th century. The NRHP status for the site has not been assessed.

3.1.1.17 Site 15Ba125

Site 15Ba125 is an open habitation without mounds prehistoric occupation by an indeterminate Early Woodland cultural group. The NRHP status for the site has not been assessed.

3.1.1.18 Site 15Ba131

Site 15Ba131 is a multi-component open habitation without mounds prehistoric site with occupations by indeterminate Middle and Late Woodland Mississippian cultural groups. The NRHP status for the site has not been assessed.

3.1.1.19 Site 15Ba140

Site 15Ba125 is an open habitation without mounds prehistoric occupation by an indeterminate cultural group. The site is not considered eligible for listing on the NRHP.

3.1.1.20 Site 15Ba141

Site 15Ba141 is a multi-component open habitation without mounds prehistoric site with occupations by an indeterminate prehistoric and Late Woodland Mississippian cultural groups. The site is not considered eligible for listing on the NRHP.

3.1.1.21 Site 15Ba144

Site 15Ba144 is a multi-component site with both a prehistoric and historic occupation. It is known as the Grassy Lake site. The prehistoric component is an open habitation without mounds occupation by a Mississippian cultural group toward the end of the early Mississippian James Bayou and Jonathan Creek phases (USDA 2013). The historic occupation is classified as a farm/residence dating from the early to middle 20th century. The NRHP status for the site has not been assessed.

3.1.1.22 Site 15Ba145

Site 15Ba145 is a multi-component site with both a prehistoric and historic occupation. The prehistoric component is an open habitation without mounds occupation by an indeterminate Late Archaic cultural group, an indeterminate Early Woodland cultural group, and an indeterminate prehistoric cultural group. The historic occupation is classified as a farm/residence dating from the middle 19th century to the middle 20th century. The NRHP status for the site has not been assessed.

3.1.1.23 Site 15Ba146

Site 15Ba146 is a multi-component site with both a prehistoric and historic occupation. The prehistoric component is an open habitation without mounds occupation by an indeterminate cultural group. The historic occupation is classified as a farm/residence dating from the early 19th century to the middle 20th century. The NRHP status for the site has not been assessed.

3.1.2 Archaeological Sites in Illinois

There are twelve (12) sites are in within Illinois that fall inside the project area. Five (5) are in Alexander County and seven (7) are in Pulaski County.

3.1.2.1 Site 11Ax32

Site 15Ax11 is an open habitation without mounds prehistoric site occupied by an indeterminate Late Woodland Mississippian cultural group. The NRHP status for the site has not been assessed.

3.1.2.2 Site 11Ax226

Site 11Ax11 is a historic commercial site dating from the mid-19th to the early 20th century. The site is not considered eligible for listing on the NRHP (Nixon 1980).

3.1.2.3 Site 11Ax557

Site 11Ax557 is a historic commercial/residential site dating from the late 19th to the early 20th century. The site is not considered eligible for listing on the NRHP (Ott et al 1999).

3.1.2.4 Site 11Ax558

Site 11Ax558 is a historic commercial/residential site dating from the late 19th to the early 20th century. The site is not considered eligible for listing on the NRHP (Burrow and Titus 2001).

3.1.2.5 Site 11Ax561

Site 11Ax561 is a historic commercial site dating from the mid-19th to the late 20th century. The site is not considered eligible for listing on the NRHP (Burrow 2003).

3.1.2.6 Site 11Pu23

Site 11Pu23 is a Mississippian mound and associated village area. The NRHP status for the site has not been assessed.

3.1.2.7 Site 11Pu140

Site 11Pu140 encompasses the Mound City Marine Ways, built by the Emporium Company between 1857 and 1859, and which was in operation until sometime after 1935 (Watson 1981). This site was considered significant and was recommended for nomination to the NRHP after a revisit by WAPORA, Inc., in 1981 during an archaeological survey conducted under contract with the U.S. Army Corps of Engineers (Watson 1981). This determination was made based on the intact and in-place machinery that, though modified in the early to mid- twentieth century, offers significant research potential.

Additionally the site was the first heavy industry to exist in the region; during the Civil War three ironclad ships were constructed at the site.

3.1.2.8 Site 11Pu141

Site 11Pu141 is the location of a Civil War era hospital. The NRHP status for the site has not been assessed.

3.1.2.9 Site 11Pu206, Schuller Mound

The Schuller Mound site was first recorded during a historical structures survey of Pulaski County (IHSS 1972) and revisited by Rackerby (1975). At the time of Rackberby's visit, the mound was in good condition and had not been disturbed. The NRHP status for the site has not been assessed.

3.1.2.10 Site 11Pu207, Winkler Mound(s)

The Winkler Mound(s) site was identified by Rackerby (1975). The site is the location of one or possibly two dome shaped mounds that have been leveled and the area graded. A residential structure occupied the area of the mounds at the time of Rackerby's visit. The NRHP status for the site has not been assessed.

3.1.2.11 Site 11Pu208, Burton Site

The Burton Site was first identified by Rackerby (1975) and revisited by Commonwealth (1977). The site is a Woodland period occupation that produced non-diagnostic prehistoric lithics as well as plain and cord-marked grit-tempered prehistoric pottery sherds. Rackerby believed the site was associated with nearby 11Pu207, Winkler Mounds. The revisit by Commonwealth (1977) determined that the stratigraphy was disturbed to such an extent that it was considered illegible for the NRHP.

3.1.2.12 Site 11Pu209, Garden Site

The Garden Site is a Woodland occupation associated with nearby Winkler (11Pu207) and Schuller (11Pu206) mounds (Rackerby 1975). During a revisit (Commonwealth 1977), non-diagnostic prehistoric lithics and plain and cord-marked grit-tempered prehistoric pottery sherds were recovered from a disturbed plow zone in association with non-diagnostic historic materials and no features. Due to the compromised stratigraphy, and the site was not recommended for listing in the NRHP.

3.2 Historic Architectural Properties

The project area includes four individually listed NRHP structures in Illinois (Old Custom House, Magnolia Manor, Mound City Civil War Hospital, and Mound City National Cemetery) and one in Kentucky (Barlow House). There are two structures determined eligible for the NRHP (US 60/US 62 Bridge in Missouri/Illinois, and US 51 Bridge in Illinois/Kentucky) and two historic districts listed on the NRHP in Illinois (Cairo Historic District, Mound City National Cemetery Historic District). In addition, 111 structures are located in the Illinois portion of the study area whose NRHP status is undetermined. The properties that are listed on the NRHP or eligible for listing are presented in Table 3.2 and their location shown in Figure 3.1.

Table 3.2. Summary of Previously Documented Properties within the Study Area

Reference #	Type	Location	Status	
			Individually	Contributing
BA 79	Barlow House	Jct. of Broadway and S. Fifth St., Barlow	NR Listed	No
100533	Old Custom House	1400 Washington Ave. Cairo, IL 62914	NR Listed	Yes (Cairo Historic District)
100537	Magnolia Manor	2700 Washington Ave. Cairo, IL 62914	NR Listed	Yes (Cairo Historic District)
200780	Mound City Civil War Naval Hospital	Commercial Ave & Central St. Mound City, IL 62963	NR Listed; Demolished	No
201093	Mound City Cemetery	Old US 51 Mound City, IL 62963	NR Listed	Yes (Mound City Cemetery Historic District)
153677	US 60/62 Bridge over Mississippi River	US 60/62 Bridge over Mississippi River between IL and MO	Eligible	No
153678	US 51 Bridge over Ohio River	US 51 over Ohio River between IL and KY	Eligible	No
100541	Garrison School	34th west of Poplar St., Cairo	Undetermined	No
100548		3511 Elm, Cairo	Undetermined	No
100552		711 Jefferson, Cairo	Undetermined	No
100560		2502 Sycamore, Cairo	Undetermined	No
100601		3408 Washington, Cairo	Undetermined	No
100621		527 10th, Cairo	Undetermined	No
100623		523 11th, Cairo	Undetermined	No
100634		321 26th St., Cairo	Undetermined	No
100639	Elmwood School	518 36th St., Cairo	Undetermined	No
100670		2004 Cedar, Cairo	Undetermined	No
100681	Simmons Supply Co.	216 Commercial, Cairo	Undetermined	No
100691		2201 Commercial, Cairo	Undetermined	No
100692		3314 Commercial, Cairo	Undetermined	No
100708		3410 Elm, Cairo	Undetermined	No
100709		3414 Elm, Cairo	Undetermined	No
100720		2403 Park, Cairo	Undetermined	No
100726		2985 Park, Cairo	Undetermined	No
100730		2837 Park Place, Cairo	Undetermined	No
100731		2845 Park Place, Cairo	Undetermined	No
100732		2903 Park Place, Cairo	Undetermined	No
100733		3011 Park Place, Cairo	Undetermined	No
100740	Summer High School	2201 Poplar, Cairo	Undetermined	No
100741		3409 Sycamore, Cairo	Undetermined	No

Reference #	Type	Location	Status	
			Individually	Contributing
100742	Power Co. Building	3800 Sycamore, Cairo	Undetermined	No
100779		3406 Washington, Cairo	Undetermined	No
100780		3410 Washington, Cairo	Undetermined	No
100803	First Christian Church	16th, Cairo	Undetermined	No
100817		320 25th, Cairo	Undetermined	No
100818		324 25th, Cairo	Undetermined	No
100842		637 34th St., Cairo	Undetermined	No
100843		742 34th St., Cairo	Undetermined	No
100857		3rd St., Cairo	Undetermined	No
100862		201 High, Mound City	Undetermined	No
100874		Main St., Mound City	Undetermined	No
100875		Main St., Mound City	Undetermined	No
100876		Main St., Mound City	Undetermined	No
100877		Main St., Mound City	Undetermined	No
100878		Main St., Mound City	Undetermined	No
100879		Main St., Mound City	Undetermined	No
100880		Main St., Mound City	Undetermined	No
100882	Railroad Depot	Merrit, Mound City	Undetermined	No
100883	St. Mary's Catholic Church	4th & Walnut, Mound City	Undetermined	No
100884	St. Peters Episcopal Church	Walnut & 3rd, Mound City	Undetermined	No
100885		217 4th St., Mound City	Undetermined	No
100886		207 5th St., Mound City	Undetermined	No
100906		119 High, Mound City	Undetermined	No
100907		311 High, Mound City	Undetermined	No
100908		High, Mound City	Undetermined	No
100909		High, Mound City	Undetermined	No
100910		High, Mound City	Undetermined	No
100911		Main St., Mound City	Undetermined	No
100912		Main St., Mound City	Undetermined	No
100913		Main St., Mound City	Undetermined	No
100914		Merrit, Mound City	Undetermined	No
100915	First Methodist Episcopal Church	Merrit, Mound City	Undetermined	No
100916		137 Pearl, Mound City	Undetermined	No
100917		219 Pearl, Mound City	Undetermined	No
100918		Pearl, Mound City	Undetermined	No

Reference #	Type	Location	Status	
			Individually	Contributing
100919		Pearl, Mound City	Undetermined	No
100920		202 Poplar, Mound City	Undetermined	No
100921		314 Poplar, Mound City	Undetermined	No
100922		501 Poplar, Mound City	Undetermined	No
100924		Walnut, Mound City	Undetermined	No
100928		117 1st, Mound City	Undetermined	No
100929		120 1st, Mound City	Undetermined	No
100930		E. First St., Mound City	Undetermined	No
100931		1st, Mound City	Undetermined	No
100932		First, Mound City	Undetermined	No
100933		1st, Mound City	Undetermined	No
100945		102 3rd, Mound City	Undetermined	No
100946		211 3rd, Mound City	Undetermined	No
100947		213 3rd, Mound City	Undetermined	No
100948		219 3rd, Mound City	Undetermined	No
100949		221 3rd, Mound City	Undetermined	No
100950		311 3rd, Mound City	Undetermined	No
100951		113 4th, Mound City	Undetermined	No
100952		117 5th, Mound City	Undetermined	No
100969		102 Front, Mounds	Undetermined	No
300098	Illinois Central Railroad Bridge	T17S R1W, across the Ohio River, Cairo	Undetermined	No
300109	St. Charles Hotel--Annex; Halliday Hotel	2nd & Railroad St., Cairo	Undetermined	No
300110	Cairo Point/Fort Defiance State Park	Cairo Point, T17S R1W S36, Cairo	Undetermined	No
300118	Ohio Levee Riverfront	T17S R1W S26, info only, Cairo	Undetermined	No
300119	Mound City Public Park	Main St., T16S R1W, Mound City	Undetermined	No
300136	Lowell School	224 High St., Mound City	Undetermined	No
502432	Rural Survey Property	17S 1W 11 NW,	Undetermined	No
502433	Rural Survey Property	17S 1W 11 NW,	Undetermined	No
502434	Rural Survey Property	17S 1W 11 NW,	Undetermined	No
502435	Rural Survey Property	17S 1W 1 NW, Urbandale	Undetermined	No
502436	Rural Survey Property	17S 1W 11 NW, Urbandale	Undetermined	No
502437	Rural Survey Property	17S 1W 11 NW, Urbandale	Undetermined	No
502438	Rural Survey Property	17S 1W 11 NW, Urbandale	Undetermined	No
502439	Rural Survey Property	17S 1W 11 NW, Urbandale	Undetermined	No
502440	Rural Survey Property	17S 1W 11 NW, Urbandale	Undetermined	No

Reference #	Type	Location	Status	
			Individually	Contributing
502441	Rural Survey Property	17S 1W 11 NW, Urbandale	Undetermined	No
502442	Rural Survey Property	17S 1W 11 NW, Urbandale	Undetermined	No
502443	Rural Survey Property	17S 1W 11 NW, Urbandale	Undetermined	No
502444	Rural Survey Property	17S 1W 11 NW, Urbandale	Undetermined	No
502445	Rural Survey Property	17S 1W 11 NW, Urbandale	Undetermined	No
502446	Rural Survey Property	17S 1W 11 NE, Urbandale	Undetermined	No
502447	Rural Survey Property	17S 1W 11 NE, Urbandale	Undetermined	No
502448	Rural Survey Property	17S 1W 11 NE, Urbandale	Undetermined	No
502449	Rural Survey Property	17S 1W 11 NE, Urbandale	Undetermined	No
502450	Rural Survey Property	17S 1W 11 NE, Urbandale	Undetermined	No
502451	Rural Survey Property	17S 1W 11 NE, Urbandale	Undetermined	No
502452	Rural Survey Property	17S 1W 11 NE, Urbandale	Undetermined	No
502453	Rural Survey Property	17S 1W 11 NE, Urbandale	Undetermined	No
502454	Rural Survey Property	17S 1W 11 NE, Urbandale	Undetermined	No
502455	Rural Survey Property	17S 1W 11 NE, Urbandale	Undetermined	No
502456	Rural Survey Property	17S 1W 11 NE, Urbandale	Undetermined	No
502469	Rural Survey Property	16S 1W 35 SE, Golden Lilly	Undetermined	No

3.2.1 Historic Architectural Properties in Kentucky

A review of National Park Service and Kentucky SHPO records conducted by Palmer Engineering (2013) indicate that there is one (1) historic architectural property listed on the NRHP and one (1) that has been determined eligible for listing on the NRHP within the study area for Kentucky.

3.2.1.1 Properties Listed on the NRHP

There is one historic architectural property listed on the NRHP located within the Ballard County portion of the study area. It is the Barlow House (BA 79).

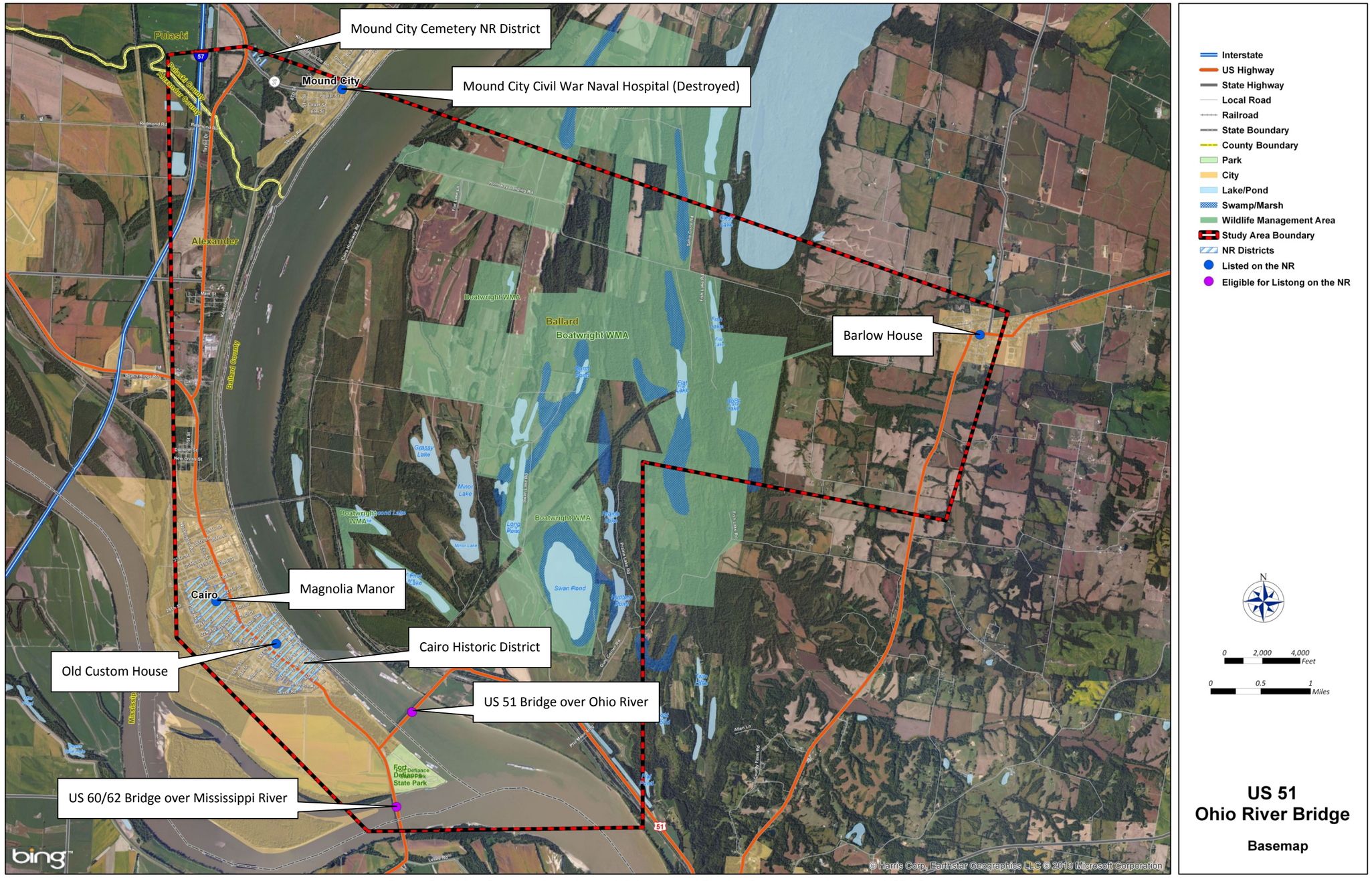


Figure 3.1. Map Showing Location of NR Listed and Eligible Properties within the US51 Study Area

3.2.1.1.1 Barlow House (BA 79)

The Barlow House (BA-79) is a two-story, symmetrical, frame, Queen-Anne styled domestic structure located on the main street of the small farming community of Barlow, in Ballard County, Kentucky. Situated on a large lot shaded by large oak and hackberry trees, the Barlow House has a distinct small-town setting with its surroundings of late 19th and early 20th century houses. The agricultural nature of the area is underscored by the location of a large lot to the rear of the Barlow House yard that was traditionally used by the Barlow family to raise tobacco. The Barlow House is located a block from the main intersection of the town, around which are the few commercial buildings of the community, including a grocery store and farm supply business. The self-sufficiency aspect of the Barlow House is reflected in the location of a brick outbuilding on the property that was used by the family as a smokehouse, laundry, and storage building. The property also contains a cast-iron fence that runs across the front and is original to the 1903 building date (Barlow House National Register Form 1991; KHC 1978: 104-105).

3.2.1.2 Properties Eligible for Listing on the NRHP

There is one historic architectural property located within the Ballard County portion of the study area that is eligible for listing on the NRHP. It is the US 51 Bridge (153677) over the Ohio River.

3.2.1.2.1 US 51 Bridge (153677)

The only known historic property eligible for listing on the NRHP within the study area is the US 51 Cairo Bridge (#4-005-B00021) that is also documented within the Illinois section as eligible for the National Register. A detailed history of the bridge is presented at the end of this chapter.

3.2.2 Historic Architectural Properties in Illinois

A review of National Park Service and Illinois SHPO records indicate that there are several NRHP listed or eligible structures within the study area. The project area includes four individually listed NRHP structures (Old Custom House, Magnolia Manor, Mound City Civil War Hospital, and Mound City National Cemetery), two structures determined eligible for the National Register (US 60/US 62 Bridge and US 51 Bridge), two historic districts listed on the National Register (Cairo Historic District, Mound City National Cemetery Historic District), and 111 structures listed as undetermined. Of the four individually listed on the National Register, two of these are within the Cairo Historic District: the Old Custom House and the Magnolia Manor. Of the four individually listed on the National Register, one of these is within the Mound City National Cemetery District, the Mound City Cemetery. The fourth structure listed on the National Register (the Mound City Civil War Naval Hospital) has since been demolished. These structures are all discussed below.

3.2.2.1 Historic Districts

There are two NRHP listed historic districts within the study area: the Cairo Historic District and the Mound City National Cemetery Historic District.

3.2.2.1.1 Cairo Historic District

The Cairo Historic District is approximately bounded by Park Avenue, 33rd Street, Sycamore Street, 21st Street, Cedar Street, 4th Street, and the Ohio River. The Cairo Historic District demonstrates the architectural styles popular in Illinois between 1850 and World War I. The district embodies the unique history of the city of Cairo. The remaining structures range from Italianate quasi-palazzi to the working man's shack, and the commercial establishments, although now vacant and dilapidated, demonstrate the city's once great importance as shipping port. The public buildings showcase the faded glory that once was bestowed on this forgotten city.

The district includes commercial, educational, government, industrial, military, transportation, park, religious, and residential related structures. The district structures range from excellent to deteriorated condition as of 1970 when the survey form was filled out. Cairo's position along the confluence of the Mississippi and Ohio Rivers made it a strategic port, which continued to prosper during and after the Civil War. As a large shipping center, Cairo has important ties to the Civil War, to the beginning of the Illinois Central Railroad, and to the river trade history. At the time the district was documented in 1970, decay and poverty were already threatening the survival of the vast history told in these structures. Of the hundreds of structures within the district boundary, 47 buildings are identified in the NRHP nomination form as architecturally and/or historically significant. Two of these properties are also listed individually on the National Register: the Old Custom House and the Magnolia Mansion (Cairo Historic District National Register Form 1977; HAARGIS Property Information Report).

3.2.2.1.2 Mound City National Cemetery Historic District

The district is discussed above as part of Mound City National Cemetery (201093). Along with the presence of the shipyards, Mound City also served as a large hospital following the battles of Shilo, Vicksburg, and other battles on the western front. In 1864, the federal government designated a plot of land near the general hospital to serve as a national cemetery. The original 1,644 interments at Mound City National Cemetery were men who had died there. Later interments would include casualties of battles at Cairo, IL; Belmont, MO; and Paducah, KY. An 1871 report by the inspector of national cemeteries lists approximately 2,300 known service men interred at Mound City and over 2,400 unknowns. Mound City National Cemetery was listed in the National Register of Historic Places in 1997 as part of the Civil War Era National Cemeteries Multiple Property Listing (United States Department of Veterans Affair 2013).

3.2.2.2 Individual Properties Listed on the NRHP

There are four properties currently listed on the NRHP that fall within the study area. They are the Old Custom House (100533), Magnolia Manor (100537), Mound City Civil War Naval Hospital (200780), and the Mound City National Cemetery (201093).

3.2.2.2.1 Old Custom House (100533)

The Old Custom House, which now serves as the local police department, is listed on the National Register and is also part of the Cairo Historic District. It is located at 1400 Washington Avenue in Cairo. It was constructed between 1869 and 1872, and housed a post office, customs house, and a court. It was designed by Alfred S. Mullet, the U.S. Supervising Architect between 1865 and 1880. The building was constructed of hewn stone, and is cast in a monumental palazzo or commercial Italianate style. The building has an elevator that is enclosed only by a wire cage on three sides, and is believed to have been installed at the time of construction, making it a very early example. At the time of the building's construction, Cairo was a boomtown with an important role in commerce due to its position at the confluence on the Ohio and Mississippi Rivers. It is one of only a few remaining federal custom houses, and its Italianate style is rare among government buildings. It is also an important link with the history of the era of river commerce. In 1942, a new post office was built and the building was given to the city and now serves as police headquarters (HAARGIS Property Information Report).

3.2.2.2.2 Magnolia Manor (100537)

The Magnolia Manor, also known as the Charles A. Galigher House, is listed on the National Register and is associated with the Cairo Historic District. It is located at 2700 Washington Avenue in Cairo and was built between 1869 and 1872, when Cairo was a boomtown. It is an Italianate Victorian style

house that exemplifies the prosperity of the boomtown era. It has fourteen rooms and had maintained its original style and furnishings as of 1969, when the survey form was completed. It was constructed of locally fired red brick with substantial trim and stone. General Ulysses S. Grant made several visits to the house as he was friends with Charles A. Galigher, a prosperous milling and lumber merchant. The house was purchased by the Cairo Historical Association in 1952, who opened it for viewing year round (HAARGIS Property Information Report).

3.2.2.2.3 Mound City Civil War Naval Hospital (200780)

The Mound City Civil War Naval Hospital was listed on the National Register but has since been demolished. The building was taken over by the U.S. Government in 1861, and was one of the largest military hospitals during the war in the west. Its location was a factor in the designation of the Mound City National Cemetery. It would have held around 1,500 patients, and the Roman Catholic nuns of the Order of the Holy Cross at Notre Dame from South Bend, Indiana worked as nuns in the facility. The hospital tended patients from the Battle of Belmont, from fighting at Fort Donelson, and from Shiloh (HAARGIS Property Information Report).

3.2.2.2.4 Mound City National Cemetery (201093)

The Mound City National Cemetery is part of the Mound City National Cemetery Historic District, which is listed on the National Register. The cemetery is also listed individually. It is located at the junction of IL 37 and US 51 within Mound City. The cemetery was deemed significant under Criteria A and C due to its association with the Civil War, and its having a lodge designed by Quartermaster General Montgomery C. Meigs, who was a master architect of civil works projects for the Quartermaster Corps. The lodge is a two-story brick Victorian design that replaced the original one story brick lodge in 1880. In addition to the Civil War era interments, the cemetery is the final resting place for veterans associated with every war and branch of service since it opened in 1864. It has been chosen by Congress as a primary memorial for the military history of the U.S. As a result, it is also significant under Criteria D. The period of significance ends in 1941 (HAARGIS Property Information Report).

3.2.2.3 Properties Eligible for Listing on the NRHP

There are two properties in the Illinois portion of the study area that have been previously identified as eligible for listing on the NRHP. They are the US 60/US 62 Bridge (153677) and the US 51 Bridge (153678).

3.2.2.3.1 US60 and US62 Bridge (153677)

The bridge that carries US 60 and US 62 over the Mississippi River between Illinois and Missouri was previously determined eligible for the National Register. It is approximately one mile south of Cairo (HAARGIS Property Information Report).

3.2.2.3.2 US51 Bridge (153678)

The bridge, carrying US 51 over the Ohio River between Kentucky and Illinois, was previously determined eligible for the National Register. Details about the bridge's history are presented at the end of this chapter.

3.2.2.4 Undetermined Properties

The 111 undetermined structures listed in the HAARGIS database consist of a variety of types including a the Fort Defiance State Park, the St. Charles Hotel-Annex, the Simmons Supply Company, the First Christian Church, Summer High School, Elmwood School, the Power Company building,

multiple residential houses and rural homes. They are spread out from Cairo to the Mound City area (HAARGIS Property Information Report).

3.3 US 51 Bridge History

During January 2013, Palmer Engineering, Inc. conducted a Cultural Historic Overview of the project vicinity for the rehabilitation/replacement of the historic KY 51 Cairo Bridge in Ballard County, Kentucky. Located in the Purchase Area of Kentucky, the US-51/Cairo Ohio River Bridge connects Cairo, Illinois with Ballard County, Kentucky four miles north of Wickliffe, the Ballard County seat. The bridge is approximately one mile north of the confluence of the Ohio and Mississippi Rivers. The US-51 Cairo Bridge is an important crossing and is vital to the surrounding communities on each side of the river. The bridge opened to traffic in 1938 by the Mt. Vernon Bridge Company from Ohio; in 1951, after repayment of the bonds sold for construction, the ownership of the bridge was transferred to the Commonwealth of Kentucky. In 1996, this cantilever structure was determined eligible for listing in the NRHP.

The 1927 Kentucky Geological Survey Map of Ballard County clearly shows the vast natural area that is adjacent to the Cairo Bridge location (Figure 3.2). The Cairo Bridge is located about four miles north of Wickliffe. The 1935 Missouri-Illinois-Kentucky, Wickliffe Quadrangle identifies the bridge as "proposed highway bridge" (Figure 3.3).

3.3.1 Construction of the Bridge

The original Federal legislation, "an Act to regulate the construction of bridges over navigable waters" was enacted by Congress on March 23, 1906. The Cairo Bridge Commission was created by an Act of Congress (Public Act No. 156), 73rd Congress, which was in session from March 4, 1933 to January 3, 1935.

The official Act authorizing the Cairo Bridge and Terminal Company of St. Louis to construct, maintain, and operate the structure was approved on April 13, 1934. The legislation was enacted provided that "such bridge shall not be built or commenced until the plans, specifications for its construction, together with such drawings and map of location thereof as may be required, for a full understanding of the subject, have been submitted to and approved by the Chief of Engineers and by the Secretary of War; and whereas, the said Cairo Bridge Commission has submitted for examination and approval plans, specifications, drawings, and map of location of a bridge proposed to be built across said river at said place, which comply with the requirements of said Act of March 23, 1906."

The Cairo Bridge and Terminal Company applied for the approval of the location and plans on November 29, 1935. Contractors included the Modjeski, Masters and Case engineering firm; the Missouri Valley Bridge and Iron Company, who was responsible for the substructure; and the Mt. Vernon Bridge Company, who was responsible for the superstructure. This application was approved and signed by R.M. Markam, U.S. Chief of Engineers, on December 3, 1935, and by Harry H. Woodring, the U.S. Assistant Secretary of War, on December 4, 1935 (Approval of Location and Plans 1935:4).

A Special Instrument submitted to Congress for approval by the Cairo Bridge and Terminal Company were plans for raising the elevation of a portion of the approaches to the above-mentioned bridge on the Illinois side, as shown in the attached Clearance Diagram by Modjeski, Masters and Case. The diagram indicated that on the Illinois side, the high water elevation of 327.3 would not give 50 to 60

feet clearance of the bridge deck. This plan was approved and signed by G.H. Pillsbury, Brigadier General, Acting Chief of Engineers, U.S. Chief of Engineers, on September 24, 1937, and by Louis Johnson, the U.S. Assistant Secretary of War, on December 4, 1937 (Approval 1935:2-3). Construction on the bridge was completed November 11, 1938.

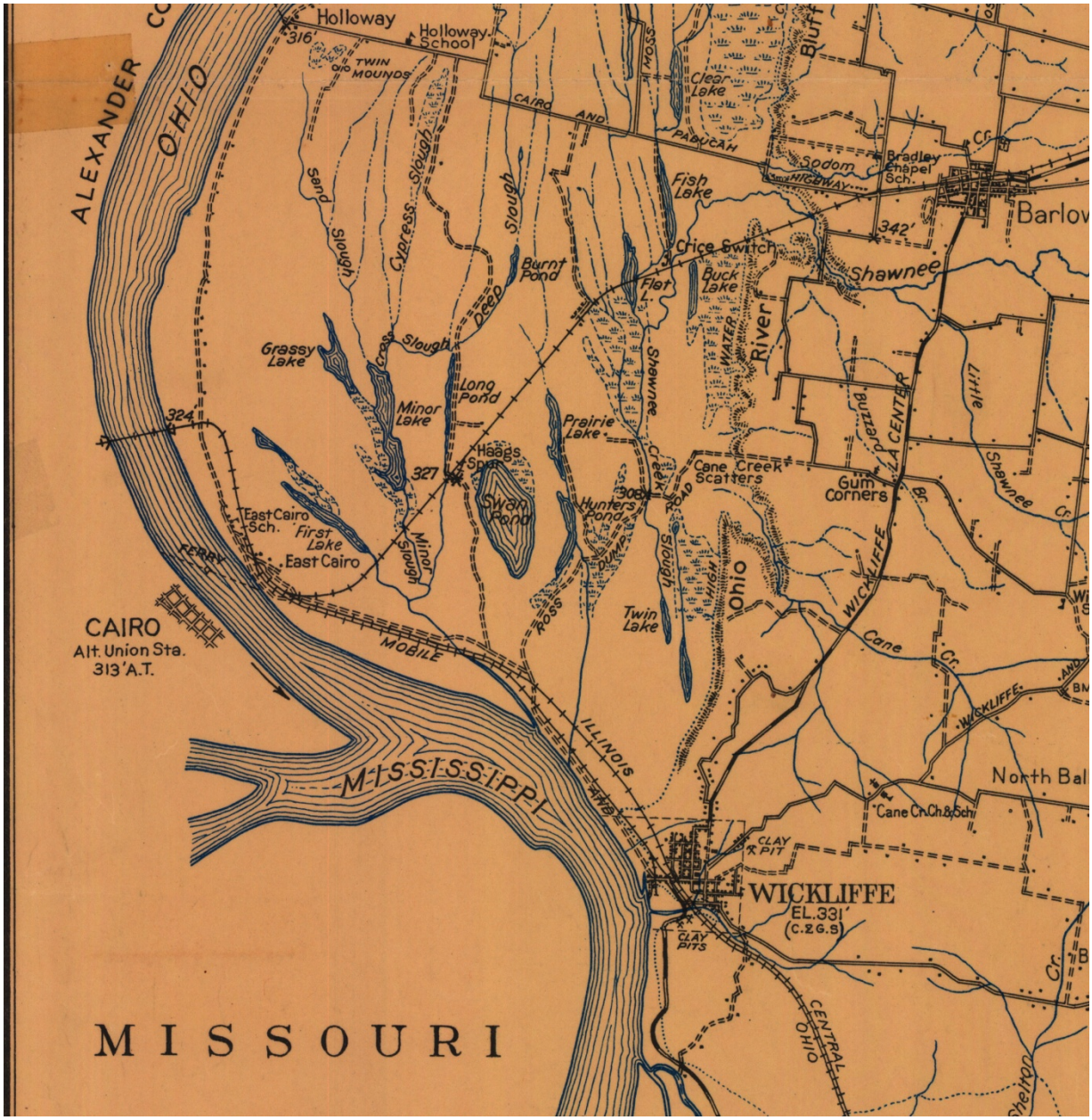


Figure 3.2. 1927 W.R. Jillson Kentucky Geological Survey Map of Ballard County

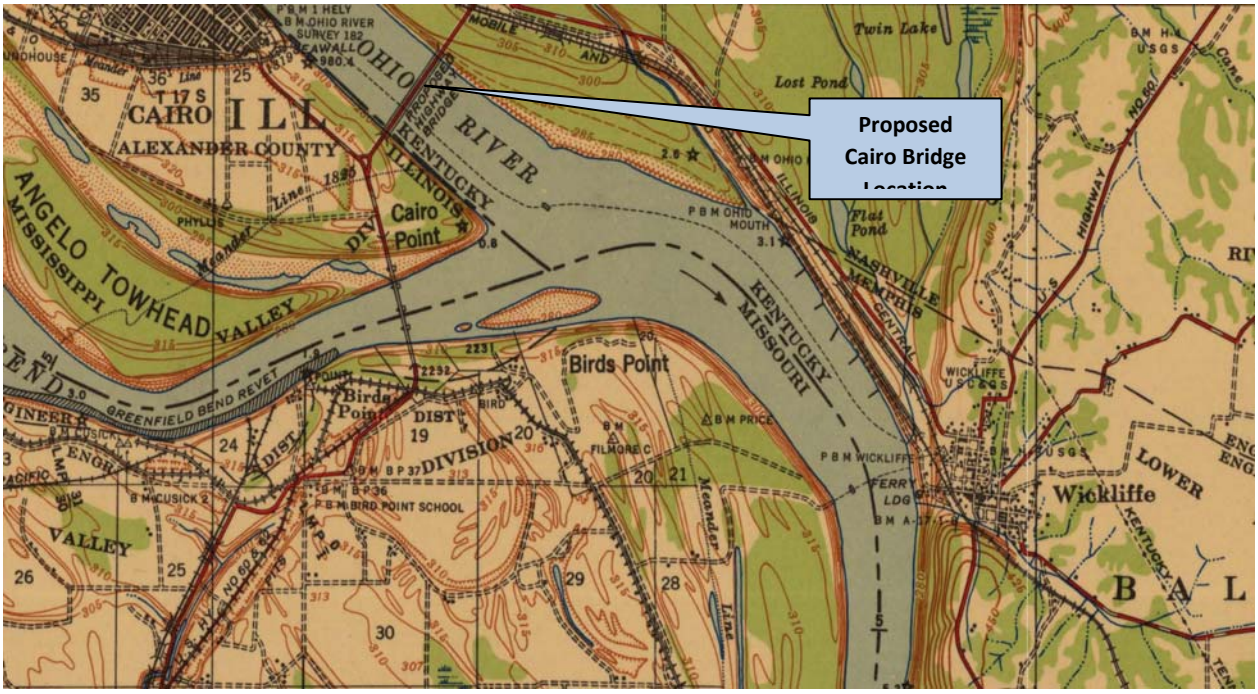


Figure 3.3. 1935 US Army Corps of Engineers Topographic Quadrangle Map of Wickliffe

3.3.1.1 Cantilever Bridges

The bridge is a continuous span cantilever Warren truss bridge with anchor arm spans at each end. It opened to traffic in 1938; the engineering company responsible for bridge design and construction was Modjeski, Masters and Case. The Missouri Valley Bridge and Iron Company constructed the substructure. The Mount Vernon Bridge Company was responsible for construction of the superstructure.

The Cairo Bridge is nearly identical to the 1929 George Rogers Clark Memorial Bridge spanning the Ohio River in Louisville, Kentucky. The Louisville Bridge was designed by Ralph Modjeski, Engineer (KYTC 1982:72).

The main spans are four steel Cantilever Warren trusses that total 2,830 feet in length. The Cairo Bridge is the longest cantilever truss in Kentucky. The main spans are flanked by Warren deck truss approaches at each end; the approach spans on the Illinois side are 570 feet in length, while the Kentucky approach spans are 2,684 feet in length.

The structural design of a Cantilever Bridge is based on the balance and counterbalance of its anchor arms, cantilever arms, and suspended spans. The anchor arms are secured at both ends of the structure (to an abutment or pier) and counterbalance the cantilevered arms, which support the suspended span. The suspended span is then lifted into place or constructed in-place using traveling supports. Because of the need for more strength at the balanced Cantilever's supports, the bridge superstructure often takes the form of towers above the foundation piers. The Cairo Bridge has four Cantilever towers resting upon four reinforced concrete piers.

Steel truss Cantilevers support tension loads in the upper members and compression in the lower ones. The structure distributes the tension via the anchor arms to the outermost supports; the compression is carried to the foundation beneath the central towers. On the Cairo Bridge, each

Cantilever arm meets in the center of the main span and each supports one end of the suspended span. On a Cantilever Bridge, the stress of moving loads sets up a complex system of strains. At one moment a steel member is under tension and at the next, as the load passes, it will be under compression (KYTC 1982:72).

All truss members of the Cairo Bridge are built up of standard rolled sections: two channels and lacing bars; two channels and cover plates; or paired angles and batten plates. Floor beams and stringers in the floor system are rolled I-beams. The entire bridge has riveted connections and gusset plates at panel point connections and bearing plates.

The approach spans are steel Warren Deck Trusses composed of 3 plates with angles and lacing bars and paired angles and lacing bars.

3.3.2 Maintenance of the Bridge

In 1951, after the payment of the bonds sold to erect the structure, an Agreement was signed between the State of Kentucky and the State of Illinois to provide for the maintenance, operation, and repair of the bridge.

The Act stated:

> "[it is] for the purpose of erecting a bridge over the Ohio River near the city of Cairo, Illinois, and for the purpose of operating and maintaining said bridge and collecting tolls thereon for the purpose of paying off the bonds issued for the financing the bridge, and
>
> WHEREAS said bridge has been erected and operated and the tolls collected and the bonds retired pertinent to the provisions of the aforesaid Public Act, and
>
> WHEREAS Section 7 of said Public Act provided that after payment of said public bonds, or the collection of funds sufficient for their payment, so much of the bridge and bridge property as lay within the confines of the Commonwealth of Kentucky should be conveyed to that state, and so much lay within the confines of the State of Illinois should be conveyed to that state, both conveyances to be made under the condition that the bridge thereafter be properly maintained, operated and repaired, by Kentucky and Illinois in such manner as may be agreed by them.
>
> NOW, THEREFORE, in order to carry out the provisions of said public act and to provide for the operation and maintenance of the bridge and its approaches after the portions thereof lying within the borders of each state shall have been conveyed to that state by the Cairo Bridge Commission, the parties hereto agree and contract that from and after 12:00 noon on January 4, 1951, the maintenance, operation and repair of said bridge, approaches, rights of way, et cetera shall be on the following terms and conditions" (Agreement 1951:1-2).
>
> 1. The State of Illinois shall maintain, operate, and repair, at its own expense, the approaches to the bridge on the Illinois side of the Ohio River to Station No. 10+71.73, which is the extreme back edge of the abutment parapet wall on the Illinois side.
>
> 2. The Commonwealth of Kentucky shall maintain, operate, and repair, at its own expense, the approaches to the bridge on the Kentucky side of the Ohio River to Station No.69+42.26 which is the extreme back edge of the abutment parapet wall on the Kentucky side (Agreement 1951:5).

The costs of maintaining, operating, and repairing the mid-section of the bridge between those stations was to be borne equally by both states, with the actual work being conducted by the Department of Highways, Commonwealth of Kentucky. They then billed the State of Illinois for its share of the costs incurred. The joint states were required to inspect the bridge annually and the tracings and prints of the structure were to be entrusted with the Commonwealth of Kentucky.

In 1977, the deck of the Cairo Bridge had seriously deteriorated and restoration and rehabilitation was needed. With the approval of the Federal Highway Administration (FHWA), both states agreed to use Great River Road funds for repair of the bridge deck.

3.3.3 Historic Evaluation

With funding from the FHWA, the KYTC has conducted four comprehensive historic bridge surveys, the first in 1982. This survey was followed by a second in 1988 that examined a different historic context. These two surveys determined a total 53 structures potentially eligible for listing in the NRHP. In 1996, the most comprehensive survey and evaluation was undertaken to develop a comprehensive historic context for transportation in Kentucky as related to historic bridges. A total of 250 bridges that had not been previously documented were evaluated. Eighty-six of these met the criterion for listing; this number, combined with the 53 extant bridges that were previously determined eligible, totals 139 historic bridges in Kentucky that are now considered eligible for listing in the NRHP (Hudson: 1997:Volume I).

The US 51/Cairo Bridge (#4-005-B00021) was determined potentially eligible in the 1996 bridge evaluation. It is one of two extant cantilever bridges constructed during the period of the Great Depression and World War II (1935-1945) in the Purchase Region of Kentucky. The SHPO concurred with the eligibility findings of the 1996 survey. Maintenance and rehabilitation work on the structure occurred in 1977 with the replacement of the deck. This work has not compromised the historic integrity of the structure (Hudson: 1997: Volume II).

The US 51 Bridge is also identified as an NRHP eligible resource in Illinois SHPO records.

Section 4 - Conclusion

A review of the available information for known archaeological sites and historic architectural properties was conducted for the US 51 Ohio River Bridge study area. As a result, nine (9) historic architectural properties and archaeological sites were identified as being either listed on the NRHP or considered as eligible for listing on the NRHP (Table 4.1). Many other resources in the study area have been identified but their NRHP eligibility has not been assessed to date.

Table 4.1. Summary of Archaeological and Historic Architectural Sites Listed or Eligible for Listing on the NRHP.

State	Resource Type	Number	Name	NRHP Status
Kentucky	Archaeological	15Ba2	Twin Mounds Site	Listed
Kentucky	Historic Architectural	BA 79	Barlow House	Listed
Illinois	Historic Architectural	100533	Old Custom House	Listed
Illinois	Historic Architectural	100537	Magnolia Manor	Listed
Illinois	Historic Architectural	200780	Mound City Civil War Naval Hospital	Listed
Illinois	Historic Architectural	201093	Mound City Cemetery	Listed
Illinois	Archaeological	11Pu140	Mound City Marine Ways	Eligible
Illinois/Kentucky	Historic Architectural	153677	US 60/62 Bridge over Mississippi River	Eligible
Illinois	Historic Architectural	153678	US 51 Bridge over Ohio River	Eligible

This white paper presents an overview of the known archaeological and historic architectural properties information that is currently available for sites located within the study area.

An archaeological survey will be necessary to locate and identify any archaeological sites along the preferred alternative or alternatives. Deep testing will be necessary for areas in the floodplain that are within the area of potential effect. Testing of the archaeological sites may be necessary to determine eligibility for listing on the NRHP. If any of the sites are determined to be eligible, a mitigation of the effects may be required. Without doing Phase I surveys or Phase II testing, it is not possible to know the number or condition of the sites within the study area or within a particular alternative. It is not possible to determine the potential costs of archaeological testing or mitigation of an alternative with the present data available.

A historic architectural assessment will also be required to identify historic architectural properties in the proposed alternatives and to determine if the sites are eligible for listing on NRHP.

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Appendix E

Hazardous Materials White Paper

Barlow - KY12-020
Barlow
Barlow, KY 42024

Inquiry Number: 3529734.1s
February 26, 2013

EDR Summary Radius Map Report

Environmental Data Resources Inc

440 Wheelers Farms Road
Milford, CT 06461
Toll Free: 800.352.0050
www.edrnet.com

TABLE OF CONTENTS

SECTION	PAGE
Executive Summary	ES1
Overview Map	2
Detail Map	3
Map Findings Summary	4
Map Findings	7
Orphan Summary	33
Government Records Searched/Data Currency Tracking	GR-1

GEOCHECK ADDENDUM

Physical Setting Source Addendum	A-1
Physical Setting Source Summary	A-2
Physical Setting Source Map	A-8
Physical Setting Source Map Findings	A-9
Physical Setting Source Records Searched	A-30

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EXECUTIVE SUMMARY

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TARGET PROPERTY INFORMATION

ADDRESS

BARLOW
BARLOW, KY 42024

COORDINATES

Latitude (North):	37.0490000 - 37˚ 2' 56.40''
Longitude (West):	89.0482000 - 89˚ 2' 53.52''
Universal Tranverse Mercator:	Zone 16
UTM X (Meters):	317861.1
UTM Y (Meters):	4102066.8
Elevation:	365 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property:	TP
Source:	USGS 7.5 min quad index

AERIAL PHOTOGRAPHY IN THIS REPORT

Portions of Photo from:	2010, 2011
Source:	USDA

MAPPED SITES SUMMARY

Target Property Address:
BARLOW
BARLOW, KY 42024

Click on Map ID to see full detail.

MAP ID	SITE NAME	ADDRESS	DATABASE ACRONYMS	RELATIVE ELEVATION	DIST (ft.) DIRECTION
A1	JOHN SULLIVAN	HWY 60 & WALLL ST	SB193	Higher	463, NNE
A2	JOHN SULLIVAN PROPER	HWY 60 & WALLL ST	UST	Higher	463, NNE
A3	MAC & MAC EQUIPMENT	HWY 60 & WALL ST	RCRA NonGen / NLR, FINDS, SB193	Higher	463, NNE
A4	VEACH OIL & GAS	HWY 60 & WALL ST	RCRA NonGen / NLR, FINDS	Higher	463, NNE
5		144 S 4TH ST	EDR US Hist Auto Stat	Higher	796, NNE
6		242 BROADWAY ST	EDR US Hist Auto Stat	Higher	1092, NNW
7	BETTYS CORNER CAFE	BROADWAY ST & 4TH	UST	Higher	1094, NNE
8		175 BROADWAY ST	EDR US Hist Auto Stat	Higher	1276, NW
B9	J & J AUTO SERVICE	556 BROADWAY	RCRA NonGen / NLR, FINDS	Higher	1408, NE
B10	J AND J AUTO SERVICE	556 BROADWAY	SB193	Higher	1408, NE
B11	J & J AUTO SERVICE	556 BROADWAY	UST	Higher	1408, NE
12	HAGOOD BULK PLANT	102 BROADWAY	Financial Assurance	Higher	1502, NW
13	BALLARD COUNTY RECYC	326 LAKE DR.	SWRCY	Higher	1546, NNW
B14	BARLOW WWTP	END OF 6TH STREET	SHWS	Higher	1559, NE
C15	CUTMART	799 BROADWAY ST	UST, Financial Assurance	Higher	2226, ENE
C16	BLUEGRASS RECYCLING	105 S 7TH ST	SWF/LF, HIST LF	Higher	2239, ENE
17	J AND J AUTO SERVICE	756 BROADWAY	Financial Assurance	Higher	2606, ENE
D18	ALLRED SERVICE STATI	HWY 60 808 BROADWAY	Financial Assurance	Higher	2989, ENE
D19	ALLREDS SERVICE STAT	808 BROADWAY	UST	Higher	2989, ENE
20	HAGOOD OIL CO INC	902 BROADWAY	NPDES	Higher	3598, ENE

EXECUTIVE SUMMARY

TARGET PROPERTY SEARCH RESULTS

The target property was not listed in any of the databases searched by EDR.

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were identified in the following databases.

Elevations have been determined from the USGS Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified. Sites with an elevation equal to or higher than the target property have been differentiated below from sites with an elevation lower than the target property.
Page numbers and map identification numbers refer to the EDR Radius Map report where detailed data on individual sites can be reviewed.

Sites listed in ***bold italics*** are in multiple databases.

Unmappable (orphan) sites are not considered in the foregoing analysis.

STANDARD ENVIRONMENTAL RECORDS

State- and tribal - equivalent CERCLIS

SHWS: A review of the SHWS list, as provided by EDR, and dated 01/02/2013 has revealed that there is 1 SHWS site within approximately 2 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
BARLOW WWTP Facility Status: Active	END OF 6TH STREET	NE 1/4 - 1/2 (0.295 mi.)	B14	9

State and tribal landfill and/or solid waste disposal site lists

SWF/LF: A review of the SWF/LF list, as provided by EDR, and dated 11/28/2012 has revealed that there is 1 SWF/LF site within approximately 1.5 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
BLUEGRASS RECYCLING	***105 S 7TH ST***	***ENE 1/4 - 1/2 (0.424 mi.)***	***C16***	***10***

State and tribal leaking storage tank lists

SB193: A review of the SB193 list, as provided by EDR, and dated 09/05/2006 has revealed that there are 3 SB193 sites within approximately 1.5 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
JOHN SULLIVAN	HWY 60 & WALLL ST	NNE 0 - 1/8 (0.088 mi.)	A1	7
MAC & MAC EQUIPMENT	***HWY 60 & WALL ST***	***NNE 0 - 1/8 (0.088 mi.)***	***A3***	***7***

EXECUTIVE SUMMARY

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
J AND J AUTO SERVICE	556 BROADWAY	NE 1/4 - 1/2 (0.267 mi.)	B10	8

State and tribal registered storage tank lists

UST: A review of the UST list, as provided by EDR, and dated 10/01/2012 has revealed that there are 5 UST sites within approximately 1.25 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
JOHN SULLIVAN PROPER	HWY 60 & WALLL ST	NNE 0 - 1/8 (0.088 mi.)	A2	7
BETTYS CORNER CAFE	BROADWAY ST & 4TH	NNE 1/8 - 1/4 (0.207 mi.)	7	8
J & J AUTO SERVICE	556 BROADWAY	NE 1/4 - 1/2 (0.267 mi.)	B11	9
CUTMART	***799 BROADWAY ST***	***ENE 1/4 - 1/2 (0.422 mi.)***	***C15***	***9***
ALLREDS SERVICE STAT	808 BROADWAY	ENE 1/2 - 1 (0.566 mi.)	D19	10

ADDITIONAL ENVIRONMENTAL RECORDS

Local Lists of Landfill / Solid Waste Disposal Sites

HIST LF: A review of the HIST LF list, as provided by EDR, and dated 05/01/2003 has revealed that there is 1 HIST LF site within approximately 1.5 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
BLUEGRASS RECYCLING	***105 S 7TH ST***	***ENE 1/4 - 1/2 (0.424 mi.)***	***C16***	***10***

SWRCY: A review of the SWRCY list, as provided by EDR, and dated 10/26/2010 has revealed that there is 1 SWRCY site within approximately 1.5 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
BALLARD COUNTY RECYC	326 LAKE DR.	NNW 1/4 - 1/2 (0.293 mi.)	13	9

Other Ascertainable Records

RCRA NonGen / NLR: A review of the RCRA NonGen / NLR list, as provided by EDR, and dated 12/11/2012 has revealed that there are 3 RCRA NonGen / NLR sites within approximately 1.25 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
MAC & MAC EQUIPMENT	***HWY 60 & WALL ST***	***NNE 0 - 1/8 (0.088 mi.)***	***A3***	***7***
VEACH OIL & GAS	***HWY 60 & WALL ST***	***NNE 0 - 1/8 (0.088 mi.)***	***A4***	***7***
J & J AUTO SERVICE	***556 BROADWAY***	***NE 1/4 - 1/2 (0.267 mi.)***	***B9***	***8***

EXECUTIVE SUMMARY

FINDS: A review of the FINDS list, as provided by EDR, and dated 10/23/2011 has revealed that there are 3 FINDS sites within approximately 1 mile of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
MAC & MAC EQUIPMENT	***HWY 60 & WALL ST***	***NNE 0 - 1/8 (0.088 mi.)***	***A3***	***7***
VEACH OIL & GAS	***HWY 60 & WALL ST***	***NNE 0 - 1/8 (0.088 mi.)***	***A4***	***7***
J & J AUTO SERVICE	***556 BROADWAY***	***NE 1/4 - 1/2 (0.267 mi.)***	***B9***	***8***

NPDES: A review of the NPDES list, as provided by EDR, and dated 12/10/2012 has revealed that there is 1 NPDES site within approximately 1 mile of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
HAGOOD OIL CO INC	902 BROADWAY	ENE 1/2 - 1 (0.681 mi.)	20	10

Financial Assurance: A review of the Financial Assurance list, as provided by EDR, and dated 11/26/2012 has revealed that there are 4 Financial Assurance sites within approximately 1 mile of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
HAGOOD BULK PLANT	102 BROADWAY	NW 1/4 - 1/2 (0.284 mi.)	12	9
CUTMART	***799 BROADWAY ST***	***ENE 1/4 - 1/2 (0.422 mi.)***	***C15***	***9***
J AND J AUTO SERVICE	756 BROADWAY	ENE 1/4 - 1/2 (0.494 mi.)	17	10
ALLRED SERVICE STATI	HWY 60 808 BROADWAY	ENE 1/2 - 1 (0.566 mi.)	D18	10

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR US Hist Auto Stat: A review of the EDR US Hist Auto Stat list, as provided by EDR, has revealed that there are 3 EDR US Hist Auto Stat sites within approximately 1.25 miles of the target property.

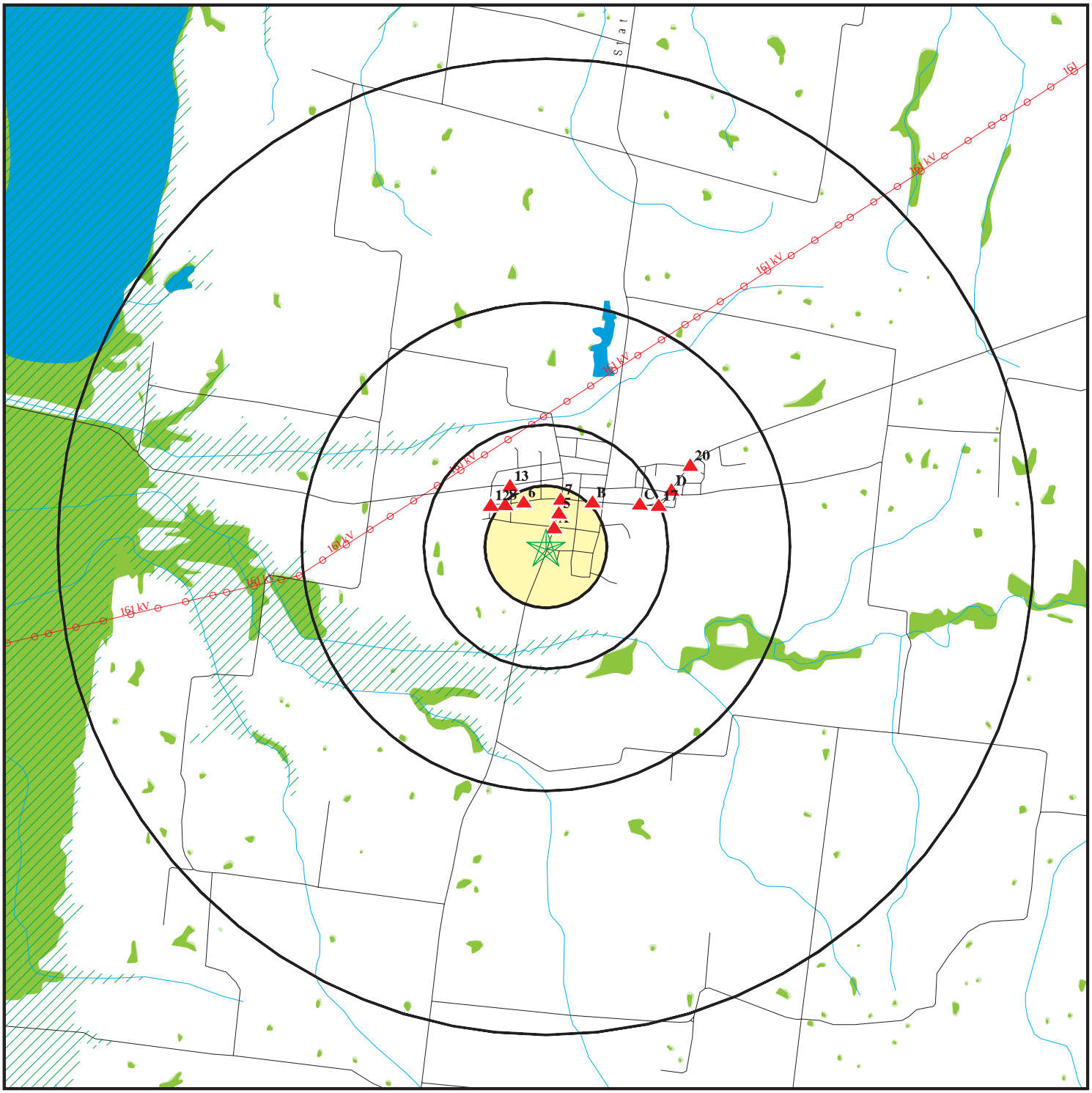
Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
Not reported	144 S 4TH ST	NNE 1/8 - 1/4 (0.151 mi.)	5	7
Not reported	242 BROADWAY ST	NNW 1/8 - 1/4 (0.207 mi.)	6	8
Not reported	175 BROADWAY ST	NW 1/8 - 1/4 (0.242 mi.)	8	8

Count: 29 records.

ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)
BALLARD COUNTY	2011981462	OHIO RIVER - MILE 979	OHIO RIVER - MILE 979		ERNS
BARLOW	U001183181	ROLLINGS FARMS	RT 1	42024	UST
BARLOW	U003415696	WICKLIFFE ELEMENTARY SCHOOL	RT 1	42024	UST
BARLOW	U000808483	KENTUCKY UTILITIES CO STOREROOM	HWY 1105	42024	UST
BARLOW	U003555005	VEACH OIL AND GAS	HWY 60	42024	SB193, UST, PSTEAF, Financial Assurance
BARLOW	S108016216	JOHN SULLIVAN PROPERTY	HWY 60	42024	Financial Assurance
BARLOW	S108011629	BETTY'S CORNER CAFE	HWY 60 & BROADWAY	42024	Financial Assurance
BARLOW	S108017216	MAC & MAC EQUIPMENT CO. INC.	HWY 60	42024	Financial Assurance
BARLOW	U003555012	MAC & MAC EQUIP CO	HWY 60	42024	UST, PSTEAF
BARLOW	1014888265	64223 - BETTYS CORNER CAFE	BROADWAY ST & 4TH	42024	FINDS
BARLOW	S107863943	BARLOW STP	END OF SOUTH 6TH ST	42024	NPDES
BARLOW	1004510005	BARLOW STP	END OF SOUTH 6TH ST	42024	FINDS
SYMSONIA	1001087724	GOODMAN SAWMILL	MAYFIELD HWY	42087	RCRA NonGen / NLR, FINDS
WICKLIFFE	1000864026	EARL HALL PROPERTY	RT 1	42087	RCRA NonGen / NLR, FINDS
WICKLIFFE	1007299755	WESTVACO CORPORATION - FINE PAPERS	HIGHWAY 51 SOUTH	42087	FTTS, HIST FTTS
WICKLIFFE	1001002909	WICKLIFFE CITY OF LANDFILL	HWY 51 S	42087	HIST LF
WICKLIFFE	S108021359	WESTVACO CORPORATION	HWY 51 S	42087	Financial Assurance
WICKLIFFE	S111241428	WICKLIFFE PAPER COMPANY	HWY 51 S	42087	SHWS
WICKLIFFE	U001180568	WALDSCHMIDT LUMBER CO	HWY 51 S	42087	UST
WICKLIFFE	S108021427	WICKLIFE ASHLAND	HWY 62	42087	Financial Assurance
WICKLIFFE	S111161655	WICKLIFFE PAPER COMPANY	1724 FORT JEFFERSON HILL RD	42087	SWF/LF, AIRS
WICKLIFFE	S107864226	C & L FARMS	KY HWY 121ST & HENRY LN	42087	NPDES
WICKLIFFE	S107867727	WICKLIFFE STP	OFF KY HWY SE	42087	NPDES
WICKLIFFE	S108013395	CUT MART #2	USHY 51 & USHY	42087	Financial Assurance
WICKLIFFE	S107603213	WICKLIFFE LANDFILL	USHY 51 S	42087	SWF/LF
WICKLIFFE	S107603207	WESTVACO KY LP	USHY 51	42087	SWF/LF
WICKLIFFE	1015731142	WESTVACO CORPORATION	USHY 51	42087	CERCLIS
WICKLIFFE	1010318207	KYDOH FD52 004-0051-007-009	USHY 51 OVEROHIO RIVER	42087	RCRA NonGen / NLR
WICKLIFFE	U003201252	WICKLIFFE ASHLAND	USHY 62	42087	UST

OVERVIEW MAP - 3529734.1s



- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Power transmission lines
- Oil & Gas pipelines from USGS
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- State Wetlands

0 1/2 1 2 Miles

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: Barlow - KY12-020 ADDRESS: Barlow Barlow KY 42024 LAT/LONG: 37.049 / 89.0482	CLIENT: Third Rock Consultants LLC CONTACT: Cory Bloyd INQUIRY #: 3529734.1s DATE: February 26, 2013 5:31 pm

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KY12-020 - Cairo
KY12-020
Cairo, IL 62914

Inquiry Number: 3529749.1s
February 26, 2013

EDR Summary Radius Map Report

Environmental Data Resources Inc

440 Wheelers Farms Road
Milford, CT 06461
Toll Free: 800.352.0050
www.edrnet.com

TABLE OF CONTENTS

SECTION	PAGE
Executive Summary	ES1
Overview Map	2
Detail Map	3
Map Findings Summary	4
Map Findings	8
Orphan Summary	121
Government Records Searched/Data Currency Tracking	GR-1

GEOCHECK ADDENDUM

Physical Setting Source Addendum	A-1
Physical Setting Source Summary	A-2
Physical Setting SSURGO Soil Map	A-5
Physical Setting Source Map	A-10
Physical Setting Source Map Findings	A-12
Physical Setting Source Records Searched	A-22

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TARGET PROPERTY INFORMATION

ADDRESS

KY12-020
CAIRO, IL 62914

COORDINATES

Latitude (North):	37.0032000 - 37˚ 0' 11.52''
Longitude (West):	89.1681000 - 89˚ 10' 5.16''
Universal Tranverse Mercator:	Zone 16
UTM X (Meters):	307081.6
UTM Y (Meters):	4097221.5
Elevation:	318 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property:	TP
Source:	USGS 7.5 min quad index

Target Property:	S
Source:	USGS 7.5 min quad index

AERIAL PHOTOGRAPHY IN THIS REPORT

Portions of Photo from:	2010, 2011
Source:	USDA

MAPPED SITES SUMMARY

Target Property Address:
KY12-020
CAIRO, IL 62914

Click on Map ID to see full detail.

MAP ID	SITE NAME	ADDRESS	DATABASE ACRONYMS	RELATIVE ELEVATION	DIST (ft.) DIRECTION
A1	CAIRO PUBLIC UTILITY	1100 COMMERCIAL AVEN	IL UST	Lower	178, SW
A2	CAIRO PUBLIC UTILITY	1100 COMMERCIAL AVE	RCRA-CESQG, PADS, FINDS, NY MANIFEST	Lower	178, SW
B3	SERVICE MASTER COMPA	1210 COMMERCIAL	FTTS, HIST FTTS	Lower	363, WNW
B4	ECOLAB INC.	1210 COMMERCIAL AVE	SSTS	Lower	366, WNW
B5		1210 COMMERCIAL AVE	ERNS	Lower	366, WNW
B6	ARAMARK MANAGEMENT S	1210 COMMERCIAL AVE	SSTS	Lower	366, WNW
B7	SERVICEMASTER CO., L	1210 COMMERCIAL AVEN	SSTS	Lower	366, WNW
B8	ARAMARK SERVICE MAST	1210 COMMERCIAL AVE	RCRA NonGen / NLR, FINDS, IL ENG CONTROLS, IL SRP	Lower	366, WNW
B9		1210 COMMERCIAL AVE	IL SPILLS	Lower	366, WNW
B10	INTER-RAIL SYSTEMS	1210 COM ME RCIAL AV	TX Ind. Haz Waste	Lower	366, WNW
B11	INTER-RAIL SYSTEMS I	200 INDUSTRIAL PARK	RCRA NonGen / NLR, FINDS	Lower	366, WNW
C12	912 COMMERCIAL AVE	912 COMMERCIAL AVE	FINDS	Lower	470, SSE
C13	DOWNTOWN CAIRO	901 COMMERCIAL STREE	CERCLIS	Lower	501, SSE
C14	DOWNTOWN CAIRO	901 COMMERCIAL STREE	FINDS	Lower	501, SSE
C15	WHITAKER, CHARLES &	10TH & COMMERCIAL	FINDS	Lower	507, SSE
D16		1308 POPLAR ST	EDR US Hist Auto Stat	Lower	714, SW
17	DOWNTOWN CAIRO	801-915 COMMERCIAL S	IL SSU	Lower	754, SSE
D18	1408 POPLAR ST	1408 POPLAR ST	FINDS	Lower	790, WSW
E19	IL BELL	221 15TH ST	FINDS	Lower	848, WNW
E20	IL BELL DBA SBC ILLI	221 15TH ST	RCRA-CESQG, WI MANIFEST	Lower	848, WNW
E21	ILLINOIS BELL TELEPH	221 15TH STREET	IL TIER 2	Lower	848, WNW
F22	VEACH OIL CO.	1110 WASHINGTON ST.	IL LUST	Lower	874, SSW
F23	WHITELINE TIRE	1110 WASHINGTON	FINDS	Lower	874, SSW
F24	MERRICK & UPSHAW SER	1110 WASHINGTON	IL UST	Lower	874, SSW
D25	CLOTHING STORE	1212-1214 WASHINGTON	IL INST CONTROL, IL SRP	Lower	888, SW
D26	CLOTHING STORE	1214 WASHINGTON AVE	IL SSU, IL LUST, IL SPILLS	Lower	889, SW
D27	CLOTHING STORE	1214 WASHINGTON AVE	FINDS	Lower	889, SW
D28	G & L CLOTHING	1214 WASHINGTON AVE.	IL UST	Lower	889, SW
G29	GREATER GILLESPIE CH	1310 -12 WASHINGTON	FINDS	Lower	979, WSW
H30	STEPHENSON TIRES	1601 COMMERCIAL	FINDS	Lower	1065, NW
H31	TRIANGLE WHOLESALE	1601 COMMERICAL AVE	IL UST	Lower	1065, NW
H32	FIVE CO VOC SYS-ADUL	1615 COMMERCIAL AVE	FINDS	Lower	1108, NW
H33	FIVE COUNTY REGIONAL	1615 COMMERCIAL AVE	FINDS	Lower	1108, NW
I34	ILLINOIS AMERICAN WA	618 COMMERCIAL AVE	FINDS	Lower	1200, SE
I35	ILLINOIS AMERICAN WA	618 COMMERCIAL AVE.	IL LUST	Lower	1200, SE
I36	CAIRO OFFICE	618 COMMERCIAL AVE	IL UST	Lower	1200, SE
G37	WHITAKER	425 14TH ST	FINDS	Lower	1219, WSW
J38	US POST OFFICE	1500 WASHINGTON AVE	FINDS	Lower	1256, West
J39	CAIRO FIRE DEPT	1513 WASHINGTON AVE.	IL UST	Lower	1291, West

MAPPED SITES SUMMARY

Target Property Address:
KY12-020
CAIRO, IL 62914

Click on Map ID to see full detail.

MAP ID	SITE NAME	ADDRESS	DATABASE ACRONYMS	RELATIVE ELEVATION	DIST (ft.) DIRECTION
J40	CAIRO FIRE DEPARTMEN	1513 WASHINGTON AVE	FINDS	Lower	1291, West
K41	CAIRO NEWSPAPERS INC	711 WASHINGTON ST	RCRA-CESQG, FINDS	Lower	1425, SSE
K42	CAIRO EVENING CITIZE	711 WASHINGTON	FINDS	Lower	1425, SSE
43	CAIRO, CITY OF MAINT	105 6TH	FINDS	Lower	1509, SE
44	CAIRO COCA-COLA BOTT	424 8TH ST	IL UST	Lower	1822, South
L45	0459 CLARK SERVICE S	501 WASHINGTON STREE	IL UST	Lower	1861, SSE
M46	FILL UP MART	1811 WASHINGTON AVEN	IL LUST, IL UST, IL SPILLS	Lower	1917, West
M47		1811 WASHINGTON AVE	IL SPILLS	Lower	1917, West
M48	MAYFLOWER CONTRACT S	1811 WASHINGTON	FINDS	Lower	1917, West
M49	HORNBERGER, GEORGE	1811 WASHINGTON AVE	FINDS	Lower	1917, West
M50	BENNETT ELEM SCHOOL	434 18TH ST	FINDS	Lower	1995, West
L51	MILITARY & NAVAL DEP	410 WASHINGTON AVE	IL AIRS	Lower	2059, SSE
L52	MILITARY & NAVAL DEP	410 WASHINGTON AVENU	FINDS	Lower	2059, SSE
53	WATERFRONT SERVICES	4TH & OHIO STS	FINDS	Higher	2075, SE
N54	IL AMERICAN WATER CO	20TH & COMMERCIAL ST	IL LUST	Lower	2080, NW
N55	ILLINOIS AMERICAN WA	20TH STREET & COMMER	IL UST	Lower	2080, NW
M56	MAINTENANCE BLDG	1901 WASHINGTON AVE	IL UST	Lower	2119, WNW
M57		1901 WASHINGTON AVE	EDR US Hist Auto Stat	Lower	2119, WNW
58	NEAL, GEORGE T	8TH & CEDAR	FINDS	Lower	2211, SSW
59	THOMPSON, ROBERT & T	401 JEFFERSON	FINDS	Lower	2310, South
60	POLICE HEADQUARTERS-	2000 WASHINGTON ST.	FINDS	Lower	2416, WNW
61	ALEXANDER COUNTY SUB	1903 MLK	FINDS	Lower	2431, West
O62	LOWE OIL CO	JEFFERSON & FOURTH	FINDS, IL AIRS	Lower	2454, SSE
O63	LOWE OIL COMPANY	4TH & JEFFERSON	IL UST	Lower	2457, SSE
O64	THOMPSON, ROBERT & T	4TH & JEFFERSON	IL LUST	Lower	2457, SSE
P65	STEPHENSON TIRES	RTE51 .2MI N OF RT3	FINDS	Lower	2531, SE
P66	CAIRO CITY 2ND & OHI	2ND ST & OHIO	FINDS	Higher	2547, SE
67	FT DEFIANCE STATE PA	US RTE 51	RCRA NonGen / NLR, FINDS	Lower	2701, SE
68	MORELANDS RADIATOR S	327 22ND ST	FINDS	Lower	2862, WNW
69	STANDARD OIL DIV AMO	WASHINGTON & SYCAMOR	IL UST	Lower	2915, WNW
70	CAIRO STP	OHIO STREET	FINDS	Higher	3069, SE
Q71	DAYSTAR CARE CENTER	2001 CEDAR STREET	IL UST	Lower	3185, West
Q72	SOUTHERN MEDICAL CEN	2020 CEDAR STREET	FINDS	Lower	3219, West
Q73	SOUTHERN MEDICAL CEN	2020 CEDAR ST	IL AIRS	Lower	3219, West
Q74	SOUTHERN MEDICAL CEN	2020 CEDAR STREET	CERCLIS, PRP	Lower	3219, West
Q75	SOUTHERN MEDICAL CTR	2022 CEDAR STREET	IL UST	Lower	3223, West
R76	CAIRO CLEANERS	2301 SYCAMORE	RCRA-CESQG, FINDS	Lower	3304, WNW
R77		2301 SYCAMORE ST	EDR US Hist Cleaners	Lower	3313, WNW
R78	ANDYS DRIVE INN	2308 SYCAMORE ST	FINDS	Lower	3324, WNW

MAPPED SITES SUMMARY

Target Property Address:
KY12-020
CAIRO, IL 62914

Click on Map ID to see full detail.

MAP ID	SITE NAME	ADDRESS	DATABASE ACRONYMS	RELATIVE ELEVATION	DIST (ft.) DIRECTION
R79		2308 SYCAMORE ST	IL SPILLS	Lower	3324, WNW
R80	ANDY'S DRIVE-IN	2308 SYCAMORE AVE.	IL LUST, IL UST	Lower	3324, WNW
81	ALEXANDER COUNTY SUB	704 CENTER ST	FINDS	Lower	3432, West
82		511 24TH ST	ERNS	Lower	3839, WNW
S83	CAIRO JR HIGH SCHOOL	2403 WALNUT ST	FINDS	Lower	3994, WNW
S84	CAIRO ALTENATIVE CEN	2403 WALNUT	FINDS	Lower	3994, WNW
85	HOWARDS TIRE CO	2111 HOLBROOK	FINDS	Lower	4101, West
T86	FFP #852	2715 SYCAMORE	IL LUST, IL UST	Lower	4197, NW
T87	FFP OPERATING PARTNE	2715 SYCAMORE	FINDS	Lower	4197, NW
88		217 29TH ST	EDR US Hist Auto Stat	Lower	4236, NW
U89	CAIRO SCHOOL	29TH AND SYCAMORE	IL SSU	Lower	4618, NW
U90		2902 SYCAMORE ST	EDR US Hist Cleaners	Lower	4628, NW
V91	D. KOCH UPTOWN SHELL	3009 SYCAMORE STREET	IL LUST, IL UST	Lower	4878, NW
V92	SHELL, D KOCH UPTOWN	3009 SYCAMORE ST	FINDS	Lower	4878, NW
V93		3009 SYCAMORE ST	IL SPILLS	Lower	4878, NW
W94	BUNGE CORP	BOX 113	FINDS, IL AIRS	Lower	5256, NW
95	CAIRO MUNI 2	21ST ST & LEVEE	FINDS	Higher	5264, WSW
96	BUNGE NORTH AMERICA	203 34TH ST	IL LUST, IL SPILLS, IL AIRS	Lower	5456, NNW
W97	BUNGE CORP	34TH & COMMERCIAL AV	RCRA NonGen / NLR, TRIS, FINDS, IL UST	Lower	5485, NW
X98	BURKART FOAM INC	36TH & SYCAMORE	RCRA NonGen / NLR	Lower	6307, NW
X99	BURKART FOAM, INC.	3600 SYCAMORE STREET	IL SRP	Lower	6311, NW
100	SHAWNEE TERMINAL RAI	38TH & COMMERCIAL	RCRA NonGen / NLR, FINDS	Lower	6507, NNW
101	ELMWOOD SCHOOL	500 37TH STREET	IL SSU	Lower	6740, NW

EXECUTIVE SUMMARY

TARGET PROPERTY SEARCH RESULTS

The target property was not listed in any of the databases searched by EDR.

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were identified in the following databases.

Elevations have been determined from the USGS Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified. Sites with an elevation equal to or higher than the target property have been differentiated below from sites with an elevation lower than the target property.
Page numbers and map identification numbers refer to the EDR Radius Map report where detailed data on individual sites can be reviewed.

Sites listed in ***bold italics*** are in multiple databases.

Unmappable (orphan) sites are not considered in the foregoing analysis.

STANDARD ENVIRONMENTAL RECORDS

Federal CERCLIS list

CERCLIS: A review of the CERCLIS list, as provided by EDR, and dated 11/02/2012 has revealed that there are 2 CERCLIS sites within approximately 1.5 miles of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
DOWNTOWN CAIRO	901 COMMERCIAL STREE	SSE 0 - 1/8 (0.095 mi.)	C13	10
SOUTHERN MEDICAL CEN	***2020 CEDAR STREET***	***W 1/2 - 1 (0.610 mi.)***	***Q74***	***22***

Federal RCRA generators list

RCRA-CESQG: A review of the RCRA-CESQG list, as provided by EDR, and dated 12/11/2012 has revealed that there are 4 RCRA-CESQG sites within approximately 1.25 miles of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
CAIRO PUBLIC UTILITY	***1100 COMMERCIAL AVE***	***SW 0 - 1/8 (0.034 mi.)***	***A2***	***8***
IL BELL DBA SBC ILLI	***221 15TH ST***	***WNW 1/8 - 1/4 (0.161 mi.)***	***E20***	***11***
CAIRO NEWSPAPERS INC	***711 WASHINGTON ST***	***SSE 1/4 - 1/2 (0.270 mi.)***	***K41***	***15***
CAIRO CLEANERS	***2301 SYCAMORE***	***WNW 1/2 - 1 (0.626 mi.)***	***R76***	***22***

Federal ERNS list

ERNS: A review of the ERNS list, as provided by EDR, and dated 12/31/2012 has revealed that there are

EXECUTIVE SUMMARY

2 ERNS sites within approximately 1 mile of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
Not reported	1210 COMMERCIAL AVE	WNW 0 - 1/8 (0.069 mi.)	B5	8
Not reported	511 24TH ST	WNW 1/2 - 1 (0.727 mi.)	82	23

State- and tribal - equivalent CERCLIS

IL SSU: A review of the IL SSU list, as provided by EDR, and dated 07/10/2012 has revealed that there are 4 IL SSU sites within approximately 2 miles of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
DOWNTOWN CAIRO	801-915 COMMERCIAL S	SSE 1/8 - 1/4 (0.143 mi.)	17	10
CLOTHING STORE	***1214 WASHINGTON AVE***	***SW 1/8 - 1/4 (0.168 mi.)***	***D26***	***12***
CAIRO SCHOOL	29TH AND SYCAMORE	NW 1/2 - 1 (0.875 mi.)	U89	25
ELMWOOD SCHOOL	500 37TH STREET	NW 1 - 2 (1.277 mi.)	101	27

State and tribal leaking storage tank lists

IL LUST: A review of the IL LUST list, as provided by EDR, and dated 01/08/2013 has revealed that there are 10 IL LUST sites within approximately 1.5 miles of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
VEACH OIL CO. NFA/NFR Letter: 12/16/2011	1110 WASHINGTON ST.	SSW 1/8 - 1/4 (0.166 mi.)	F22	11
CLOTHING STORE NFA/NFR Letter: 04/27/2010	***1214 WASHINGTON AVE***	***SW 1/8 - 1/4 (0.168 mi.)***	***D26***	***12***
ILLINOIS AMERICAN WA	618 COMMERCIAL AVE.	SE 1/8 - 1/4 (0.227 mi.)	I35	14
FILL UP MART NFA/NFR Letter: 10/04/2012	***1811 WASHINGTON AVEN***	***W 1/4 - 1/2 (0.363 mi.)***	***M46***	***16***
IL AMERICAN WATER CO	20TH & COMMERCIAL ST	NW 1/4 - 1/2 (0.394 mi.)	N54	18
THOMPSON, ROBERT & T NFA/NFR Letter: 04/21/2008	4TH & JEFFERSON	SSE 1/4 - 1/2 (0.465 mi.)	O64	20
ANDY'S DRIVE-IN NFA/NFR Letter: 09/24/2012	***2308 SYCAMORE AVE.***	***WNW 1/2 - 1 (0.630 mi.)***	***R80***	***23***
FFP #852	***2715 SYCAMORE***	***NW 1/2 - 1 (0.795 mi.)***	***T86***	***24***
D. KOCH UPTOWN SHELL	***3009 SYCAMORE STREET***	***NW 1/2 - 1 (0.924 mi.)***	***V91***	***25***
BUNGE NORTH AMERICA	***203 34TH ST***	***NNW 1 - 2 (1.033 mi.)***	***96***	***26***

State and tribal registered storage tank lists

IL UST: A review of the IL UST list, as provided by EDR, and dated 11/20/2012 has revealed that there

are 19 IL UST sites within approximately 1.25 miles of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
CAIRO PUBLIC UTILITY	1100 COMMERCIAL AVEN	SW 0 - 1/8 (0.034 mi.)	A1	8
MERRICK & UPSHAW SER	1110 WASHINGTON	SSW 1/8 - 1/4 (0.166 mi.)	F24	12
G & L CLOTHING	1214 WASHINGTON AVE.	SW 1/8 - 1/4 (0.168 mi.)	D28	13
TRIANGLE WHOLESALE	1601 COMMERICAL AVE	NW 1/8 - 1/4 (0.202 mi.)	H31	13
CAIRO OFFICE	618 COMMERCIAL AVE	SE 1/8 - 1/4 (0.227 mi.)	I36	14
CAIRO FIRE DEPT	1513 WASHINGTON AVE.	W 1/8 - 1/4 (0.245 mi.)	J39	15
CAIRO COCA-COLA BOTT	424 8TH ST	S 1/4 - 1/2 (0.345 mi.)	44	16
0459 CLARK SERVICE S	501 WASHINGTON STREE	SSE 1/4 - 1/2 (0.352 mi.)	L45	16
FILL UP MART	***1811 WASHINGTON AVEN***	***W 1/4 - 1/2 (0.363 mi.)***	***M46***	***16***
ILLINOIS AMERICAN WA	20TH STREET & COMMER	NW 1/4 - 1/2 (0.394 mi.)	N55	18
MAINTENANCE BLDG	1901 WASHINGTON AVE	WNW 1/4 - 1/2 (0.401 mi.)	M56	18
LOWE OIL COMPANY	4TH & JEFFERSON	SSE 1/4 - 1/2 (0.465 mi.)	O63	19
STANDARD OIL DIV AMO	WASHINGTON & SYCAMOR	WNW 1/2 - 1 (0.552 mi.)	69	21
DAYSTAR CARE CENTER	2001 CEDAR STREET	W 1/2 - 1 (0.603 mi.)	Q71	21
SOUTHERN MEDICAL CTR	2022 CEDAR STREET	W 1/2 - 1 (0.610 mi.)	Q75	22
ANDY'S DRIVE-IN	***2308 SYCAMORE AVE.***	***WNW 1/2 - 1 (0.630 mi.)***	***R80***	***23***
FFP #852	***2715 SYCAMORE***	***NW 1/2 - 1 (0.795 mi.)***	***T86***	***24***
D. KOCH UPTOWN SHELL	***3009 SYCAMORE STREET***	***NW 1/2 - 1 (0.924 mi.)***	***V91***	***25***
BUNGE CORP	***34TH & COMMERCIAL AV***	***NW 1 - 2 (1.039 mi.)***	***W97***	***26***

State and tribal institutional control / engineering control registries

IL ENG CONTROLS: A review of the IL ENG CONTROLS list, as provided by EDR, and dated 01/18/2013 has revealed that there is 1 IL ENG CONTROLS site within approximately 1.5 miles of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
ARAMARK SERVICE MAST	***1210 COMMERCIAL AVE***	***WNW 0 - 1/8 (0.069 mi.)***	***B8***	***9***

IL INST CONTROL: A review of the IL INST CONTROL list, as provided by EDR, and dated 01/18/2013 has revealed that there is 1 IL INST CONTROL site within approximately 1.5 miles of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
CLOTHING STORE	***1212-1214 WASHINGTON***	***SW 1/8 - 1/4 (0.168 mi.)***	***D25***	***12***

State and tribal voluntary cleanup sites

IL SRP: A review of the IL SRP list, as provided by EDR, and dated 01/18/2013 has revealed that there are 3 IL SRP sites within approximately 1.5 miles of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
ARAMARK SERVICE MAST	***1210 COMMERCIAL AVE***	***WNW 0 - 1/8 (0.069 mi.)***	***B8***	***9***
CLOTHING STORE	***1212-1214 WASHINGTON***	***SW 1/8 - 1/4 (0.168 mi.)***	***D25***	***12***

EXECUTIVE SUMMARY

Lower Elevation	Address	Direction / Distance	Map ID	Page
BURKART FOAM, INC.	3600 SYCAMORE STREET	NW 1 - 2 (1.195 mi.)	X99	27

ADDITIONAL ENVIRONMENTAL RECORDS

Records of Emergency Release Reports

IL SPILLS: A review of the IL SPILLS list, as provided by EDR, and dated 01/28/2013 has revealed that there are 6 IL SPILLS sites within approximately 1 mile of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
Not reported	1210 COMMERCIAL AVE	WNW 0 - 1/8 (0.069 mi.)	B9	9
CLOTHING STORE	***1214 WASHINGTON AVE***	***SW 1/8 - 1/4 (0.168 mi.)***	***D26***	***12***
FILL UP MART	***1811 WASHINGTON AVEN***	***W 1/4 - 1/2 (0.363 mi.)***	***M46***	***16***
Not reported	1811 WASHINGTON AVE	W 1/4 - 1/2 (0.363 mi.)	M47	17
Not reported	2308 SYCAMORE ST	WNW 1/2 - 1 (0.630 mi.)	R79	23
Not reported	3009 SYCAMORE ST	NW 1/2 - 1 (0.924 mi.)	V93	25

Other Ascertainable Records

RCRA NonGen / NLR: A review of the RCRA NonGen / NLR list, as provided by EDR, and dated 12/11/2012 has revealed that there are 6 RCRA NonGen / NLR sites within approximately 1.25 miles of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
ARAMARK SERVICE MAST	***1210 COMMERCIAL AVE***	***WNW 0 - 1/8 (0.069 mi.)***	***B8***	***9***
INTER-RAIL SYSTEMS I	***200 INDUSTRIAL PARK***	***WNW 0 - 1/8 (0.069 mi.)***	***B11***	***9***
FT DEFIANCE STATE PA	***US RTE 51***	***SE 1/2 - 1 (0.512 mi.)***	***67***	***20***
BUNGE CORP	***34TH & COMMERCIAL AV***	***NW 1 - 2 (1.039 mi.)***	***W97***	***26***
BURKART FOAM INC	36TH & SYCAMORE	NW 1 - 2 (1.195 mi.)	X98	26
SHAWNEE TERMINAL RAI	***38TH & COMMERCIAL***	***NNW 1 - 2 (1.232 mi.)***	***100***	***27***

FTTS: A review of the FTTS list, as provided by EDR, and dated 04/09/2009 has revealed that there is 1 FTTS site within approximately 1 mile of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
SERVICE MASTER COMPA	***1210 COMMERCIAL***	***WNW 0 - 1/8 (0.069 mi.)***	***B3***	***8***

EXECUTIVE SUMMARY

HIST FTTS: A review of the HIST FTTS list, as provided by EDR, and dated 10/19/2006 has revealed that there is 1 HIST FTTS site within approximately 1 mile of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
SERVICE MASTER COMPA	***1210 COMMERCIAL***	***WNW 0 - 1/8 (0.069 mi.)***	***B3***	***8***

SSTS: A review of the SSTS list, as provided by EDR, and dated 12/31/2009 has revealed that there are 3 SSTS sites within approximately 1 mile of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
ECOLAB INC.	1210 COMMERCIAL AVE	WNW 0 - 1/8 (0.069 mi.)	B4	8
ARAMARK MANAGEMENT S	1210 COMMERCIAL AVE	WNW 0 - 1/8 (0.069 mi.)	B6	9
SERVICEMASTER CO., L	1210 COMMERCIAL AVEN	WNW 0 - 1/8 (0.069 mi.)	B7	9

PADS: A review of the PADS list, as provided by EDR, and dated 11/01/2010 has revealed that there is 1 PADS site within approximately 1 mile of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
CAIRO PUBLIC UTILITY	***1100 COMMERCIAL AVE***	***SW 0 - 1/8 (0.034 mi.)***	***A2***	***8***

FINDS: A review of the FINDS list, as provided by EDR, and dated 10/23/2011 has revealed that there are 47 FINDS sites within approximately 1 mile of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
WATERFRONT SERVICES	4TH & OHIO STS	SE 1/4 - 1/2 (0.393 mi.)	53	18
CAIRO CITY 2ND & OHI	2ND ST & OHIO	SE 1/4 - 1/2 (0.482 mi.)	P66	20
CAIRO STP	OHIO STREET	SE 1/2 - 1 (0.581 mi.)	70	21
CAIRO MUNI 2	21ST ST & LEVEE	WSW 1/2 - 1 (0.997 mi.)	95	26

Lower Elevation	Address	Direction / Distance	Map ID	Page
CAIRO PUBLIC UTILITY	***1100 COMMERCIAL AVE***	***SW 0 - 1/8 (0.034 mi.)***	***A2***	***8***
ARAMARK SERVICE MAST	***1210 COMMERCIAL AVE***	***WNW 0 - 1/8 (0.069 mi.)***	***B8***	***9***
INTER-RAIL SYSTEMS I	***200 INDUSTRIAL PARK***	***WNW 0 - 1/8 (0.069 mi.)***	***B11***	***9***
912 COMMERCIAL AVE	912 COMMERCIAL AVE	SSE 0 - 1/8 (0.089 mi.)	C12	10
DOWNTOWN CAIRO	901 COMMERCIAL STREE	SSE 0 - 1/8 (0.095 mi.)	C14	10
WHITAKER, CHARLES &	10TH & COMMERCIAL	SSE 0 - 1/8 (0.096 mi.)	C15	10
1408 POPLAR ST	1408 POPLAR ST	WSW 1/8 - 1/4 (0.150 mi.)	D18	11
IL BELL	221 15TH ST	WNW 1/8 - 1/4 (0.161 mi.)	E19	11
WHITELINE TIRE	1110 WASHINGTON	SSW 1/8 - 1/4 (0.166 mi.)	F23	12
CLOTHING STORE	1214 WASHINGTON AVE	SW 1/8 - 1/4 (0.168 mi.)	D27	12
GREATER GILLESPIE CH	1310 -12 WASHINGTON	WSW 1/8 - 1/4 (0.185 mi.)	G29	13
STEPHENSON TIRES	1601 COMMERCIAL	NW 1/8 - 1/4 (0.202 mi.)	H30	13
FIVE CO VOC SYS-ADUL	1615 COMMERCIAL AVE	NW 1/8 - 1/4 (0.210 mi.)	H32	13
FIVE COUNTY REGIONAL	1615 COMMERCIAL AVE	NW 1/8 - 1/4 (0.210 mi.)	H33	14
ILLINOIS AMERICAN WA	618 COMMERCIAL AVE	SE 1/8 - 1/4 (0.227 mi.)	I34	14
WHITAKER	425 14TH ST	WSW 1/8 - 1/4 (0.231 mi.)	G37	14
US POST OFFICE	1500 WASHINGTON AVE	W 1/8 - 1/4 (0.238 mi.)	J38	15

EXECUTIVE SUMMARY

Lower Elevation	Address	Direction / Distance	Map ID	Page
CAIRO FIRE DEPARTMEN	1513 WASHINGTON AVE	W 1/8 - 1/4 (0.245 mi.)	J40	15
CAIRO NEWSPAPERS INC	***711 WASHINGTON ST***	***SSE 1/4 - 1/2 (0.270 mi.)***	***K41***	***15***
CAIRO EVENING CITIZE	711 WASHINGTON	SSE 1/4 - 1/2 (0.270 mi.)	K42	15
CAIRO, CITY OF MAINT	105 6TH	SE 1/4 - 1/2 (0.286 mi.)	43	16
MAYFLOWER CONTRACT S	1811 WASHINGTON	W 1/4 - 1/2 (0.363 mi.)	M48	17
HORNBERGER, GEORGE	1811 WASHINGTON AVE	W 1/4 - 1/2 (0.363 mi.)	M49	17
BENNETT ELEM SCHOOL	434 18TH ST	W 1/4 - 1/2 (0.378 mi.)	M50	17
MILITARY & NAVAL DEP	410 WASHINGTON AVENU	SSE 1/4 - 1/2 (0.390 mi.)	L52	17
NEAL, GEORGE T	8TH & CEDAR	SSW 1/4 - 1/2 (0.419 mi.)	58	19
THOMPSON, ROBERT & T	401 JEFFERSON	S 1/4 - 1/2 (0.438 mi.)	59	19
POLICE HEADQUARTERS-	2000 WASHINGTON ST.	WNW 1/4 - 1/2 (0.458 mi.)	60	19
ALEXANDER COUNTY SUB	1903 MLK	W 1/4 - 1/2 (0.460 mi.)	61	19
LOWE OIL CO	***JEFFERSON & FOURTH***	***SSE 1/4 - 1/2 (0.465 mi.)***	***O62***	***19***
STEPHENSON TIRES	RTE51 .2MI N OF RT3	SE 1/4 - 1/2 (0.479 mi.)	P65	20
FT DEFIANCE STATE PA	***US RTE 51***	***SE 1/2 - 1 (0.512 mi.)***	***67***	***20***
MORELANDS RADIATOR S	327 22ND ST	WNW 1/2 - 1 (0.542 mi.)	68	20
SOUTHERN MEDICAL CEN	2020 CEDAR STREET	W 1/2 - 1 (0.610 mi.)	Q72	21
CAIRO CLEANERS	***2301 SYCAMORE***	***WNW 1/2 - 1 (0.626 mi.)***	***R76***	***22***
ANDYS DRIVE INN	2308 SYCAMORE ST	WNW 1/2 - 1 (0.630 mi.)	R78	22
ALEXANDER COUNTY SUB	704 CENTER ST	W 1/2 - 1 (0.650 mi.)	81	23
CAIRO JR HIGH SCHOOL	2403 WALNUT ST	WNW 1/2 - 1 (0.756 mi.)	S83	23
CAIRO ALTENATIVE CEN	2403 WALNUT	WNW 1/2 - 1 (0.756 mi.)	S84	24
HOWARDS TIRE CO	2111 HOLBROOK	W 1/2 - 1 (0.777 mi.)	85	24
FFP OPERATING PARTNE	2715 SYCAMORE	NW 1/2 - 1 (0.795 mi.)	T87	24
SHELL, D KOCH UPTOWN	3009 SYCAMORE ST	NW 1/2 - 1 (0.924 mi.)	V92	25
BUNGE CORP	***BOX 113***	***NW 1/2 - 1 (0.995 mi.)***	***W94***	***26***

IL AIRS: A review of the IL AIRS list, as provided by EDR, and dated 12/31/2011 has revealed that there are 4 IL AIRS sites within approximately 1 mile of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
MILITARY & NAVAL DEP	410 WASHINGTON AVE	SSE 1/4 - 1/2 (0.390 mi.)	L51	17
LOWE OIL CO	***JEFFERSON & FOURTH***	***SSE 1/4 - 1/2 (0.465 mi.)***	***O62***	***19***
SOUTHERN MEDICAL CEN	2020 CEDAR ST	W 1/2 - 1 (0.610 mi.)	Q73	21
BUNGE CORP	***BOX 113***	***NW 1/2 - 1 (0.995 mi.)***	***W94***	***26***

IL TIER 2: A review of the IL TIER 2 list, as provided by EDR, and dated 12/31/2011 has revealed that there is 1 IL TIER 2 site within approximately 1 mile of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
ILLINOIS BELL TELEPH	221 15TH STREET	WNW 1/8 - 1/4 (0.161 mi.)	E21	11

EXECUTIVE SUMMARY

PRP: A review of the PRP list, as provided by EDR, and dated 10/01/2012 has revealed that there is 1 PRP site within approximately 1 mile of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
SOUTHERN MEDICAL CEN	***2020 CEDAR STREET***	***W 1/2 - 1 (0.610 mi.)***	***Q74***	***22***

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR US Hist Auto Stat: A review of the EDR US Hist Auto Stat list, as provided by EDR, has revealed that there are 3 EDR US Hist Auto Stat sites within approximately 1.25 miles of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
Not reported	1308 POPLAR ST	SW 1/8 - 1/4 (0.135 mi.)	D16	10
Not reported	1901 WASHINGTON AVE	WNW 1/4 - 1/2 (0.401 mi.)	M57	18
Not reported	217 29TH ST	NW 1/2 - 1 (0.802 mi.)	88	24

EDR US Hist Cleaners: A review of the EDR US Hist Cleaners list, as provided by EDR, has revealed that there are 2 EDR US Hist Cleaners sites within approximately 1.25 miles of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
Not reported	2301 SYCAMORE ST	WNW 1/2 - 1 (0.627 mi.)	R77	22
Not reported	2902 SYCAMORE ST	NW 1/2 - 1 (0.877 mi.)	U90	25

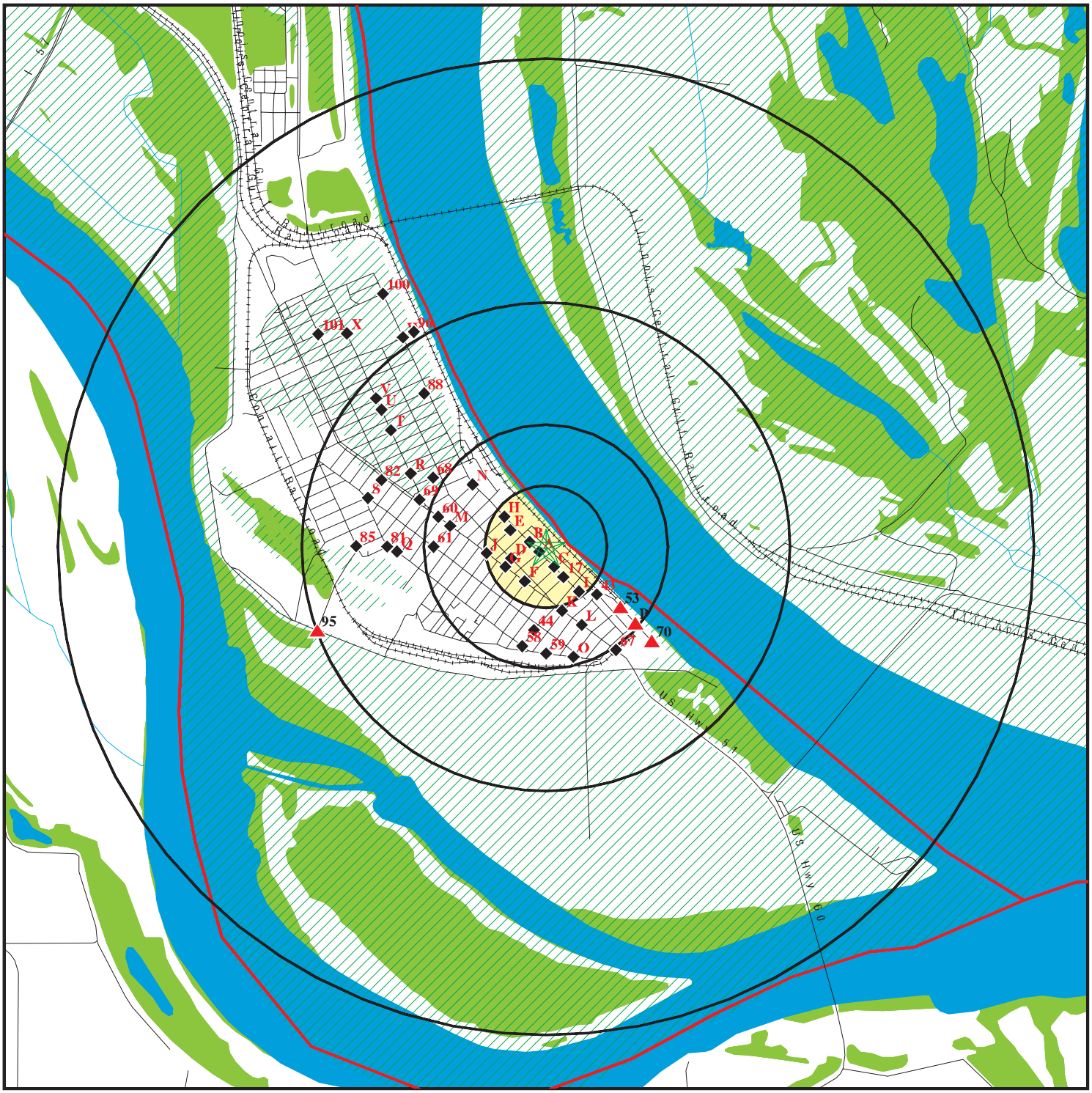
City	EDR ID	Site Name	Site Address	Zip	Database(s)
BARLOW	U001183181	ROLLINGS FARMS	RT 1	42024	KY UST
BARLOW	U003415696	WICKLIFFE ELEMENTARY SCHOOL	RT 1	42024	KY UST
BARLOW	U000808483	KENTUCKY UTILITIES CO STOREROOM	HWY 1105	42024	KY UST
BARLOW	U003555005	VEACH OIL AND GAS	HWY 60	42024	KY UST, KY Financial Assurance
BARLOW	S108016216	JOHN SULLIVAN PROPERTY	HWY 60	42024	KY Financial Assurance
BARLOW	S108011629	BETTY'S CORNER CAFE	HWY 60 & BROADWAY	42024	KY Financial Assurance
BARLOW	S108017216	MAC & MAC EQUIPMENT CO. INC.	HWY 60	42024	KY Financial Assurance
BARLOW	U003555012	MAC & MAC EQUIP CO	HWY 60	42024	KY UST
BARLOW	1014888265	64223 - BETTYS CORNER CAFE	BROADWAY ST & 4TH	42024	FINDS
BARLOW	S107863943	BARLOW STP	END OF SOUTH 6TH ST	42024	KY NPDES
CAIRO	1004477504	ILLINI READY MIX INC	RT 1	62914	FINDS, IL AIRS, US AIRS
CAIRO	S109092164	CAIRO, CITY OF	1ST AND OHIO ST	62914	IL NPDES
CAIRO	1006816961	CAIRO TRUCK REPAIR	RT 3 & I57	62914	RCRA-CESQG
CAIRO	1008132866	IDOT CAIRO YARD	RTE 3 & RTE 51	62914	FINDS
CAIRO	1007057112	CAIRO TRUCK REPAIR	RT 3 & I57	62914	FINDS
CAIRO	1009716411	REG INC	34TH ST	62914	FINDS, US AIRS
CAIRO	1014349686	BURKART FOAM	36TH AND SYCAMORE ST	62914	US BROWNFIELDS
CAIRO	1011817625	BURKART FOAM, INC.	36TH & SCYAMORE	62914	RMP
CAIRO	S110360323	ILLINI READY MIX, INC.	14372 HWY 37	62914	IL TIER 2
CAIRO	U001132536	CAIRO MAIN STATION	42ND & OHIO STS	62914	IL UST
CAIRO	U000780931	CAIRO READY MIX	RT 51 N	62914	IL UST
CAIRO	U001132537	JD STREETT & CO INC	HWY 51 N	62914	IL UST
CAIRO	S110153362	ILLINI READY MIX, INC.	HWY 51 N	62914	IL TIER 2
CAIRO	U004137944	ROSE'S STEAKS & STUFF	RT 51 N	62914	IL UST
CAIRO	1008143437	CAIRO DRAINAGE DIST	RTE 51-1MI N OF CAIRO	62914	FINDS
CAIRO	U001135769	FORT DEFIANCE STATE PARK	62 HWY 60	62914	IL UST
CAIRO	1008199640	CAIRO REGIONAL AIRPORT	AIRPORT RD	62914	FINDS
CAIRO	U001132532	CAIRO AIRPORT	BEECHRIDGE RD	62914	IL UST
CAIRO	S107740477	CAIRO DRY KILNS INC	2 OF CAIRO		IL AIRS
CAIRO	1005636534	CAIRO DRY KILNS INC	2 OF CAIRO	62914	FINDS, US AIRS
CAIRO	S109167349	CAIRO DRY KILNS INC	2 OF CAIRO	62914	IL AIRS
CAIRO	1008217443	CAIRO TRUCK STOP	I-57, EXIT 1 OFF RT 3	62914	FINDS
CAIRO	1011509864	CAIRO TRUCK STOP	I-57, EXIT 1 OFF RT 3 CAIRO	62914	ICIS
CAIRO	S110704805	ILLINOIS CENTRAL RAILROAD CORP	JCT & HWY 51	62914	IL NPDES
CAIRO	S110062745	CAIRO TRUCK PLAZA	13107 KESSLER RD	62914	IL LUST
CAIRO	1008337908	CAIRO SERVICE STATION (S. OF I-57	SOUTH OF I-57 & RT. 3 (N:37.03	62914	FINDS
CAIRO	1008133082	CAIRO CRA, CITY OF	W OF RTE 51 S OF ICGRR	62914	FINDS
CAIRO	S110151375	CAIRO PLANT	4100 OHIO ST	62914	IL TIER 2
CAIRO	1012070322	ILLINOIS AMERICAN WATER - CAIRO TR	4100 OHIO	62914	FINDS
CAIRO	1011828101	ILLINOIS AMERICAN WATER - CAIRO TR	4100 OHIO	62914	RMP
CAIRO	S110360328	ILLINOIS BELL - CAIRO	12737 PATIERDALE RD	62914	IL TIER 2
CAIRO	1006172323	J D STREETT & CO INC - CAIRO TERMI	RURAL		FINDS, IL AIRS
CAIRO	S110828658	AT&T Q43240	STHY 3 & USHY 31	62914	IL TIER 2

Count: 84 records.

ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)
CAIRO	1005636533	ZINCA PROCESSING INC	4801 SYCAMORE AVE		FINDS, IL AIRS
CAIRO	S106895530	CAIRO REDEVELOPMENT SITE	USHY 51		IL BROWNFIELDS
CAIRO	U004123171	FORMER SAVE WAY OIL CO.	USHY 51 URBANDALE N	62914	IL UST
CAIRO	U001132540	ROY G SQUIRES	USHY 51 N	62914	IL UST
CAIRO	U001132539	ROAD MAX INC. TERMINAL	USHY 51 URBANDALE N	62914	IL UST
CAIRO	U004060400	GEORGE MOSS / FORMER GLEN'S TRUCK	USHY 51 & 1ST AVE	62914	IL UST
CAIRO	S104491157	ILLINOIS POWER TOWN GAS PLANT	WASHINGTON AVE & 1ST ST	62914	IL SRP
CHARLESTON	1014750084	MISSISSIPPI COUNTY READY MIX -	HWY 105 S	63834	FINDS
CHARLESTON	1000631004	SAM AMOCO	HWY 105 & 57TH ST	63834	RCRA NonGen / NLR, FINDS
CHARLESTON	1004538515	DELTA GROWERS ASSN	313 HWY 105 SOUTH	63834	SSTS
CHARLESTON	U003980099	REEVES AMOCO STATION	HWY 105	63834	MO UST
CHARLESTON	U003403913	MISSISSIPPI COUNTY AIRPORT	HWY 105 S & STATE RT C	63834	MO LUST, MO UST
CHARLESTON	S109119896	CARGILL, INC. - BUFFALO ISLAND B	RR 2	63834	MO AIRS
CHARLESTON	U003979843	BUNGE CORPORATION	RT 2	63834	MO UST
CHARLESTON	S110767281		202 N 5TH ST	63834	MO SPILLS, MO CDL
CHARLESTON	1004542302	MISSISSIPPI CO HWY DEPT	HWY 60 W	63834	FTTS, HIST FTTS, FINDS
CHARLESTON	1014739750	BROWN SHOE CO - CHARLESTON PLANT	7TH & MARSHALL STS	63834	FINDS
CHARLESTON	U000752187	OROUKE STORE	HWY AB	63834	MO UST
CHARLESTON	1014769176	MFA OIL - CHARLESTON	BEASLEY PARK RD	63834	FINDS
CHARLESTON	S109683855	FLYNN COMPANY INC - CHARLESTON	S CHESTNUT ST	63834	MO AIRS
CHARLESTON	S110767282		706 CLEVELAND ST	63834	MO SPILLS, MO CDL
CHARLESTON	U001158721	BARNHILL FARM	HWY D	63834	MO UST
CHARLESTON	S109026613	CLINTON MATERIALS - DELTA	E HWY 105	63834	MO NPDES
CHARLESTON	1014759002	CLINTON MATERIALS - DELTA	E HWY 105	63834	FINDS
CHARLESTON	1000187886	PONDER CHEV & BUICK	S HWY 77	63834	RCRA NonGen / NLR, FINDS
CHARLESTON	U003980276	DELTA GROWERS ASSOCIATION	313 S HWY 105	63834	MO UST
CHARLESTON	1011821984	DELTA GROWERS ASSOCIATION	313 S HWY 105	63834	RMP
CHARLESTON	S107852228	DELTA GROWERS ASSOCIATION	313 S HWY 105	63834	MO NPDES
CHARLESTON	1011821983	DELTA GROWERS ASSOCIATION	313 S HWY 105	63834	RMP
CHARLESTON	1010322815	FITZGERALD MARINE & REPAIR INC	13600 E HWY 80	63834	RCRA NonGen / NLR
CHARLESTON	1006809134	DRINKWATER PUMPING STATION	INTER HWY AB & CORD 214	63834	RCRA-CESQG, FINDS
CHARLESTON	S110657708		295 STATE 77	63834	MO SPILLS, MO CDL
CHARLESTON	1005425242	BFS FARM SUPPLY INC	HWY UU	63834	SSTS
CLARKTON	1014742888	FRED WEBER INC - CONCRETE BATCH PL	500 BLOCK OF SOUTH CHESTNUT ST	63834	FINDS
DIEHLSTADT	1004540314	CARGILL INC - DIEHLSTADT	RT 2	63834	FINDS, US AIRS
MOUND CITY	S109092508	AMERICAN COMMERCIAL LINES	ROUTE 1 URBANDALE RAMP	62914	IL NPDES
URBANDALE	1011550610	STREET J D & CO INC	HWY 51 NORTH URBANDALE IL	62914	ICIS
URBANDALE	1000202165	STREET J D & CO INC	HWY 51 N	62914	RCRA NonGen / NLR, FINDS
URBANDALE	U004137992	ABANDONED SAFEWAY STATION	HWY 51 N	62914	IL UST
URBANDALE	S109366194	AA INVESTMENTS & HOLDINGS, INC.	USHY 51 N	62914	IL LUST
URBANDALE	S109327836	ROAD MAX, INC.	USHY 51 N	62914	IL LUST

OVERVIEW MAP - 3529749.1s



0 1/2 1 2 Miles

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- County Boundary
- Oil & Gas pipelines from USGS
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: KY12-020 - Cairo	CLIENT: Third Rock Consultants LLC
ADDRESS: KY12-020	CONTACT: Cory Bloyd
Cairo IL 62914	INQUIRY #: 3529749.1s
LAT/LONG: 37.0032 / 89.1681	DATE: February 26, 2013 3:19 pm

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KY12-020 - North East Corner
KY12-020
Mound City, IL 62963

Inquiry Number: 3529744.1s
February 26, 2013

EDR Summary Radius Map Report

Environmental Data Resources Inc

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Milford, CT 06461
Toll Free: 800.352.0050
www.edrnet.com

TABLE OF CONTENTS

SECTION	PAGE
Executive Summary	ES1
Overview Map	2
Detail Map	3
Map Findings Summary	4
Map Findings	8
Orphan Summary	27
Government Records Searched/Data Currency Tracking	GR-1

GEOCHECK ADDENDUM

Physical Setting Source Addendum	A-1
Physical Setting Source Summary	A-2
Physical Setting SSURGO Soil Map	A-5
Physical Setting Source Map	A-13
Physical Setting Source Map Findings	A-15
Physical Setting Source Records Searched	A-32

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

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EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc (EDR). The report was designed to assist parties seeking to meet the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-05) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

TARGET PROPERTY INFORMATION

ADDRESS

KY12-020
MOUND CITY, IL 62963

COORDINATES

Latitude (North):	37.0815000 - 37˚ 4' 53.40''
Longitude (West):	89.1670000 - 89˚ 10' 1.20''
Universal Tranverse Mercator:	Zone 16
UTM X (Meters):	307377.5
UTM Y (Meters):	4105907.0
Elevation:	322 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property:	TP
Source:	USGS 7.5 min quad index

AERIAL PHOTOGRAPHY IN THIS REPORT

Portions of Photo from:	2010, 2011
Source:	USDA

MAPPED SITES SUMMARY

Target Property Address:
KY12-020
MOUND CITY, IL 62963

Click on Map ID to see full detail.

MAP ID	SITE NAME	ADDRESS	DATABASE ACRONYMS	RELATIVE ELEVATION	DIST (ft.) DIRECTION
1	303 S 4TH ST	303 S 4TH ST	FINDS	Higher	177, South
A2	DEAL, BRUCE	613 WALNUT ST	FINDS	Higher	935, NW
A3	DEAL, BRUCE	613 WALNUT ST	IL SWF/LF	Higher	935, NW
B4	CUT-MART #7	201 MAIN STREET	IL UST	Higher	1139, NE
B5		201 MAIN ST	IL LUST, IL SPILLS	Higher	1139, NE
B6	MOUND CITY STP	204 MAIN STREET	IL NPDES	Lower	1263, NE
B7	MOUND CITY	204 MAIN STREET	FINDS	Lower	1263, NE
8	ADM TERMINAL SERVICE	300 ENTERPRISE ST	FINDS, US AIRS	Lower	1725, ENE
C9	SECO MANUFACTURING C	100 OHIO AVE	IL AIRS	Higher	2438, NE
C10	SECO MANUFACTURING C	100 OHIO AVE.	FINDS, US AIRS	Higher	2438, NE
D11	MOUND CITY NAT CEMET	STATE RT 37	IL UST	Higher	4085, NW
D12	MOUND CITY NATIONAL	MOUND CITY NATIONAL	IL LUST	Lower	4153, NW
13	AMERICAN COMMERCIAL	URBANDALE RAMP	RCRA NonGen / NLR, FINDS	Lower	4814, North
14	CRAIN ENTERPRISES IN	404 COMMERCIAL AVE	RCRA-CESQG, FINDS	Higher	5351, NE

EXECUTIVE SUMMARY

TARGET PROPERTY SEARCH RESULTS

The target property was not listed in any of the databases searched by EDR.

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were identified in the following databases.

Elevations have been determined from the USGS Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified. Sites with an elevation equal to or higher than the target property have been differentiated below from sites with an elevation lower than the target property.
Page numbers and map identification numbers refer to the EDR Radius Map report where detailed data on individual sites can be reviewed.

Sites listed in ***bold italics*** are in multiple databases.

Unmappable (orphan) sites are not considered in the foregoing analysis.

STANDARD ENVIRONMENTAL RECORDS

Federal RCRA generators list

RCRA-CESQG: A review of the RCRA-CESQG list, as provided by EDR, and dated 12/11/2012 has revealed that there is 1 RCRA-CESQG site within approximately 1.25 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
CRAIN ENTERPRISES IN	***404 COMMERCIAL AVE***	***NE 1 - 2 (1.013 mi.)***	***14***	***10***

State and tribal landfill and/or solid waste disposal site lists

IL SWF/LF: A review of the IL SWF/LF list, as provided by EDR, and dated 12/31/2011 has revealed that there is 1 IL SWF/LF site within approximately 1.5 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
DEAL, BRUCE	613 WALNUT ST	NW 1/8 - 1/4 (0.177 mi.)	A3	8

State and tribal leaking storage tank lists

IL LUST: A review of the IL LUST list, as provided by EDR, and dated 01/08/2013 has revealed that there are 2 IL LUST sites within approximately 1.5 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
Not reported	***201 MAIN ST***	***NE 1/8 - 1/4 (0.216 mi.)***	***B5***	***8***

Lower Elevation	Address	Direction / Distance	Map ID	Page
MOUND CITY NATIONAL	MOUND CITY NATIONAL	NW 1/2 - 1 (0.787 mi.)	D12	10

EXECUTIVE SUMMARY

State and tribal registered storage tank lists

IL UST: A review of the IL UST list, as provided by EDR, and dated 11/20/2012 has revealed that there are 2 IL UST sites within approximately 1.25 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
CUT-MART #7	201 MAIN STREET	NE 1/8 - 1/4 (0.216 mi.)	B4	8
MOUND CITY NAT CEMET	STATE RT 37	NW 1/2 - 1 (0.774 mi.)	D11	9

ADDITIONAL ENVIRONMENTAL RECORDS

Records of Emergency Release Reports

IL SPILLS: A review of the IL SPILLS list, as provided by EDR, and dated 01/28/2013 has revealed that there is 1 IL SPILLS site within approximately 1 mile of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
Not reported	***201 MAIN ST***	***NE 1/8 - 1/4 (0.216 mi.)***	***B5***	***8***

Other Ascertainable Records

RCRA NonGen / NLR: A review of the RCRA NonGen / NLR list, as provided by EDR, and dated 12/11/2012 has revealed that there is 1 RCRA NonGen / NLR site within approximately 1.25 miles of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
AMERICAN COMMERCIAL	***URBANDALE RAMP***	***N 1/2 - 1 (0.912 mi.)***	***13***	***10***

FINDS: A review of the FINDS list, as provided by EDR, and dated 10/23/2011 has revealed that there are 6 FINDS sites within approximately 1 mile of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
303 S 4TH ST	303 S 4TH ST	S 0 - 1/8 (0.034 mi.)	1	8
DEAL, BRUCE	613 WALNUT ST	NW 1/8 - 1/4 (0.177 mi.)	A2	8
SECO MANUFACTURING C	***100 OHIO AVE.***	***NE 1/4 - 1/2 (0.462 mi.)***	***C10***	***9***

Lower Elevation	Address	Direction / Distance	Map ID	Page
MOUND CITY	204 MAIN STREET	NE 1/8 - 1/4 (0.239 mi.)	B7	9
ADM TERMINAL SERVICE	***300 ENTERPRISE ST***	***ENE 1/4 - 1/2 (0.327 mi.)***	***8***	***9***
AMERICAN COMMERCIAL	***URBANDALE RAMP***	***N 1/2 - 1 (0.912 mi.)***	***13***	***10***

EXECUTIVE SUMMARY

IL NPDES: A review of the IL NPDES list, as provided by EDR, and dated 07/09/2012 has revealed that there is 1 IL NPDES site within approximately 1 mile of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
MOUND CITY STP	204 MAIN STREET	NE 1/8 - 1/4 (0.239 mi.)	B6	9

IL AIRS: A review of the IL AIRS list, as provided by EDR, and dated 12/31/2011 has revealed that there is 1 IL AIRS site within approximately 1 mile of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
SECO MANUFACTURING C	100 OHIO AVE	NE 1/4 - 1/2 (0.462 mi.)	C9	9

US AIRS: A review of the US AIRS list, as provided by EDR, and dated 11/15/2012 has revealed that there are 2 US AIRS sites within approximately 1 mile of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
SECO MANUFACTURING C	***100 OHIO AVE.***	***NE 1/4 - 1/2 (0.462 mi.)***	***C10***	***9***

Lower Elevation	Address	Direction / Distance	Map ID	Page
ADM TERMINAL SERVICE	***300 ENTERPRISE ST***	***ENE 1/4 - 1/2 (0.327 mi.)***	***8***	***9***

City	EDR ID	Site Name	Site Address	Zip	Database(s)
BARLOW	U001183181	ROLLINGS FARMS	RT 1	42024	KY UST
BARLOW	U003415696	WICKLIFFE ELEMENTARY SCHOOL	RT 1	42024	KY UST
BARLOW	U000808483	KENTUCKY UTILITIES CO STOREROOM	HWY 1105	42024	KY UST
BARLOW	S108011629	BETTY'S CORNER CAFE	HWY 60 & BROADWAY	42024	KY Financial Assurance
BARLOW	U003555005	VEACH OIL AND GAS	HWY 60	42024	KY UST, KY Financial Assurance
BARLOW	S108016216	JOHN SULLIVAN PROPERTY	HWY 60	42024	KY Financial Assurance
BARLOW	S108017216	MAC & MAC EQUIPMENT CO. INC.	HWY 60	42024	KY Financial Assurance
BARLOW	U003555012	MAC & MAC EQUIP CO	HWY 60	42024	KY UST
BARLOW	1014888265	64223 - BETTYS CORNER CAFE	BROADWAY ST & 4TH	42024	FINDS
BARLOW	S107863943	BARLOW STP	END OF SOUTH 6TH ST	42024	KY NPDES
CAIRO	1004477504	ILLINI READY MIX INC	RT 1	62914	FINDS, IL AIRS, US AIRS
CAIRO	S109092164	CAIRO, CITY OF	1ST AND OHIO ST	62914	IL NPDES
CAIRO	1006816961	CAIRO TRUCK REPAIR	RT 3 & I57	62914	RCRA-CESQG
CAIRO	S110360323	ILLINI READY MIX, INC.	14372 HWY 37	62914	IL TIER 2
CAIRO	U001132536	CAIRO MAIN STATION	42ND & OHIO STS	62914	IL UST
CAIRO	U000780931	CAIRO READY MIX	RT 51 N	62914	IL UST
CAIRO	U001132537	JD STREETT & CO INC	HWY 51 N	62914	IL UST
CAIRO	S110153362	ILLINI READY MIX, INC.	HWY 51 N	62914	IL TIER 2
CAIRO	U004137944	ROSE'S STEAKS & STUFF	RT 51 N	62914	IL UST
CAIRO	U001135769	FORT DEFIANCE STATE PARK	62 HWY 60	62914	IL UST
CAIRO	U000157843	AMOCO GAS	BOX 2 & I 57	62914	IL UST
CAIRO	S109167349	CAIRO DRY KILNS INC	2 OF CAIRO	62914	IL AIRS
CAIRO	1005636534	CAIRO DRY KILNS INC	2 OF CAIRO	62914	FINDS, US AIRS
CAIRO	1011509864	CAIRO TRUCK STOP	I-57, EXIT 1 OFF RT 3 CAIRO	62914	ICIS
CAIRO	S110704805	ILLINOIS CENTRAL RAILROAD CORP	JCT & HWY 51	62914	IL NPDES
CAIRO	1012070322	ILLINOIS AMERICAN WATER - CAIRO TR	4100 OHIO	62914	FINDS
CAIRO	1011828101	ILLINOIS AMERICAN WATER - CAIRO TR	4100 OHIO	62914	RMP
CAIRO	S110151375	CAIRO PLANT	4100 OHIO ST	62914	IL TIER 2
CAIRO	S110360328	ILLINOIS BELL - CAIRO	12737 PATIERDALE RD	62914	IL TIER 2
CAIRO	S110828658	AT&T Q43240	STHY 3 & USHY 31	62914	IL TIER 2
CAIRO	U004123171	FORMER SAVE WAY OIL CO.	USHY 51 URBANDALE N	62914	IL UST
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CAIRO	U004060400	GEORGE MOSS / FORMER GLEN'S TRUCK	USHY 51 & 1ST AVE	62914	IL UST
CAIRO	S104491157	ILLINOIS POWER TOWN GAS PLANT	WASHINGTON AVE & 1ST ST	62914	IL SRP
MOUND CITY	S109092508	AMERICAN COMMERCIAL LINES	ROUTE 1 URBANDALE RAMP	62914	IL NPDES
MOUND CITY	1008139264	CONSOLIDATED GRAIN & BARGE CO	201 N MISSOURI ST	62963	FINDS, IL AIRS, US AIRS
MOUNDS	1011624516	K&K AUTO TRUCK SHOP	RTE 1 MOUNDS IL 62964	62964	ICIS
MOUNDS	S110471750	INTER-RAIL SYSTEMS INC	200 INDUSTRIAL PARK_RD	62964	NJ MANIFEST
MOUNDS	S107744473	MOUNDS PRODUCTION CO LLC	700 INDUSTRIAL PARK RD	62964	IL NPDES, IL AIRS
MOUNDS	1005570989	MOUNDS PRODUCTION CO LLC	700 INDUSTRIAL PARK RD	62964	FINDS, US AIRS
MOUNDS	1007989592	ENVIRONMENTAL REMEDIATION	300 INDUSTRIAL PARK DR	62964	RCRA NonGen / NLR
MOUNDS	1001219017	OIL DRI CORP	700 INDUSTRIAL PARK RD	62964	RCRA-CESQG

Count: 51 records.

ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)
MOUNDS	S108111154	D & G	RR	62964	IL SWF/LF
MURPHYSBORO	S108050058		RT. 127 AT HARRISON ROAD	62996	IL CDL
URBANDALE	1011550610	STREET J D & CO INC	HWY 51 NORTH URBANDALE IL	62914	ICIS
URBANDALE	1000202165	STREET J D & CO INC	HWY 51 N	62914	RCRA NonGen / NLR, FINDS
URBANDALE	U004137992	ABANDONED SAFEWAY STATION	HWY 51 N	62914	IL UST
URBANDALE	S109366194	AA INVESTMENTS & HOLDINGS, INC.	USHY 51 N	62914	IL LUST
URBANDALE	S109327836	ROAD MAX, INC.	USHY 51 N	62914	IL LUST
VILLA RIDGE	U003310513		RT 51	62996	IL UST

OVERVIEW MAP - 3529744.1s

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites

0 1/2 1 2 Miles

- Indian Reservations BIA
- County Boundary
- Oil & Gas pipelines from USGS
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: KY12-020 - North East Corner	CLIENT: Third Rock Consultants LLC
ADDRESS: KY12-020 Mound City IL 62963	CONTACT: Cory Bloyd INQUIRY #: 3529744.1s
LAT/LONG: 37.0815 / 89.167	DATE: February 26, 2013 3:17 pm

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