Appendix C - GEOTECHNICAL OVERVIEW

MEMORANDUM

Cc:

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DATE: February 16, 2015

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SUBJECT: Washington/Nelson Counties
US 150 Improvements between Springfield and Bardstown
Item # 4-396.00
Mars # 8940001P
Preliminary Geotechnical Assessment

The Division of Planning is conducting a planning study for the subject project. This project is located in Washington and Nelson Counties, KY along US 150 from the intersection of US 150 and the Bluegrass Parkway at Bardstown to just North-West of St. Catherine College near Springfield, as depicted on the site map. The site is in the Outer Bluegrass and the Knobs Regions. This abbreviated review will discuss some general geotechnical concerns with the area.

The approximate coordinates for the site are:

Beginning: 37.796125 degrees North and -85.425186 degrees West
End: 37.729408 degrees North and -85.285155 degrees West.

The site is located in the Bardstown, Maud and Saint Catharine Quadrangles as depicted on the attached maps. Bedrock formations in the subject area are depicted on the attached maps. Shale, limestone and dolomite dominate the area. Limestone and dolomite in this area, where they can be separated from the shale, are suitable for embankment foundation construction and rock roadbed. Bedrock descriptions in the area show that most formations have varying degrees of shale in them. Visually, it appeared that there will be areas where the better rock can be isolated from the shale for use in select construction activities. Quantities of available bedrock will require an investigation.

Alluvial soils are present, according to the mapping, in the Beech Fork River and Cartwright Creek basins as well as extending up into the Parker Run Creek tributary. Alluvial soils are depositional soils that are generally unconsolidated and can sometimes cause issues with road construction.

The project could potentially encounter New Albany Shale at two locations, according to the mapping. Most notably, New Albany shale may be encountered at the beginning of the project. New Albany shale is known to produce acidic runoff and often requires remediation measures, such as encapsulation, for roadway projects and special concrete for structures.

Other difficult shales in the area, which will be encountered, are the Waldron Shale and the shales of the Osgood Formation. Both shales have been proven to be problematic for highway construction. They are highly weatherable and can become soft and slick with exposure to water. Often, sliding planes will form along the soil-shale interface for materials with these characteristics and this can lead to potential landslides. These types of shales can also weather quickly and must be accounted for in rock cut designs and footing placements. Highly weathered

shales were encountered during the site reconnaissance.

Potentially substandard rock cut (picture near m.p. 7) in the Drakes Formation (Saluda, Bardstown and Rowland Members). There is a fallen rock zone sign near the cuts end.

Interbedded limestone and shales of the Ashlock Formation are found where existing US 150 parallels Parker Run Creek. This bedrock is thinly bedded and subject to scouring during flood events. Special measures may be required to avoid issues with structures founded in this material. Numerous culverts were investigated in this stretch of road. It would appear that portions of the culverts are from the original road construction and were extended at some point during a widening. The culverts, on the outlet end, are being undermined. Wingwalls and numerous retaining walls in this area have been destroyed or are in poor shape and will need replacement. It is likely that these culverts will need to be replaced.

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Outlet of existing culvert – rock scour of thin layers and partial collapse of wing. Northwest of Mayfield Lane

Wall collapsing due to rock scour northwest of Mayfield Lane

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Masonry wing collapsing @ triple barrel culvert near Grundy Home Road

Culvert near milepost 3

Another Culvert northwest of milepost 3 - slab and wings undermined

Hillsides in the area showed a few signs of instability, such as pop-out failures. Springs will likely be present in the corridor, especially where the Osgood shale and the Waldron shale are present due to their relative impermeability.

Foundations for bridges in the study area are generally rock bearing (end bearing piles, drilled shafts or spread foundations). Smaller structures such as retaining walls and box culverts may be founded on soil or bedrock. As indicated above, some measures may be required where the bedrock is thinly bedded and considered erodible. Bedrock scour was noted on the county road bridge at Mayfield Lane.

Soils in the area are generally suitable for embankment construction. Generally embankments built from the native soils and bedrock can be constructed to a height of 60 feet with 2H:1V sideslopes if the foundation is suitable and proper compaction methods are used. Soil cuts over approximately 10 feet often require analyses to design proper sideslopes. In no case should soil cuts be steeper than 2H:1V. The use of area shales in the construction of embankment can require special construction techniques to ensure adequate long term stability.

California Bearing Ratio (CBR) values used in pavement design for soils subgrades in the area range from 2-5. The use of rock roadbed is common in the area. Chemical modification of the subgrade is sometimes used in the area.

Low lying areas may be wet and saturated, creating problems during construction. Ponds and springs may be encountered and require remediation efforts.

Some karst activity is noted in the mapping but it is fairly minimal.

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A list of previously completed Geotechnical Investigations close the study area is located in the appendix. This includes a roadway report and structure reports already produced for the portion of the study project where it passes over the Beech Fork River. The reports can be accessed through the KYTC Geotechnical Branch Database which can be accessed through the KYTC Division of Structural Designs home page (Click on Geotech and Search KYTC Completed Projects).

Site specific Geotechnical investigations are critical in this region.

Attachments:
Project Overview
GQ Site Maps
List of Previous Projects

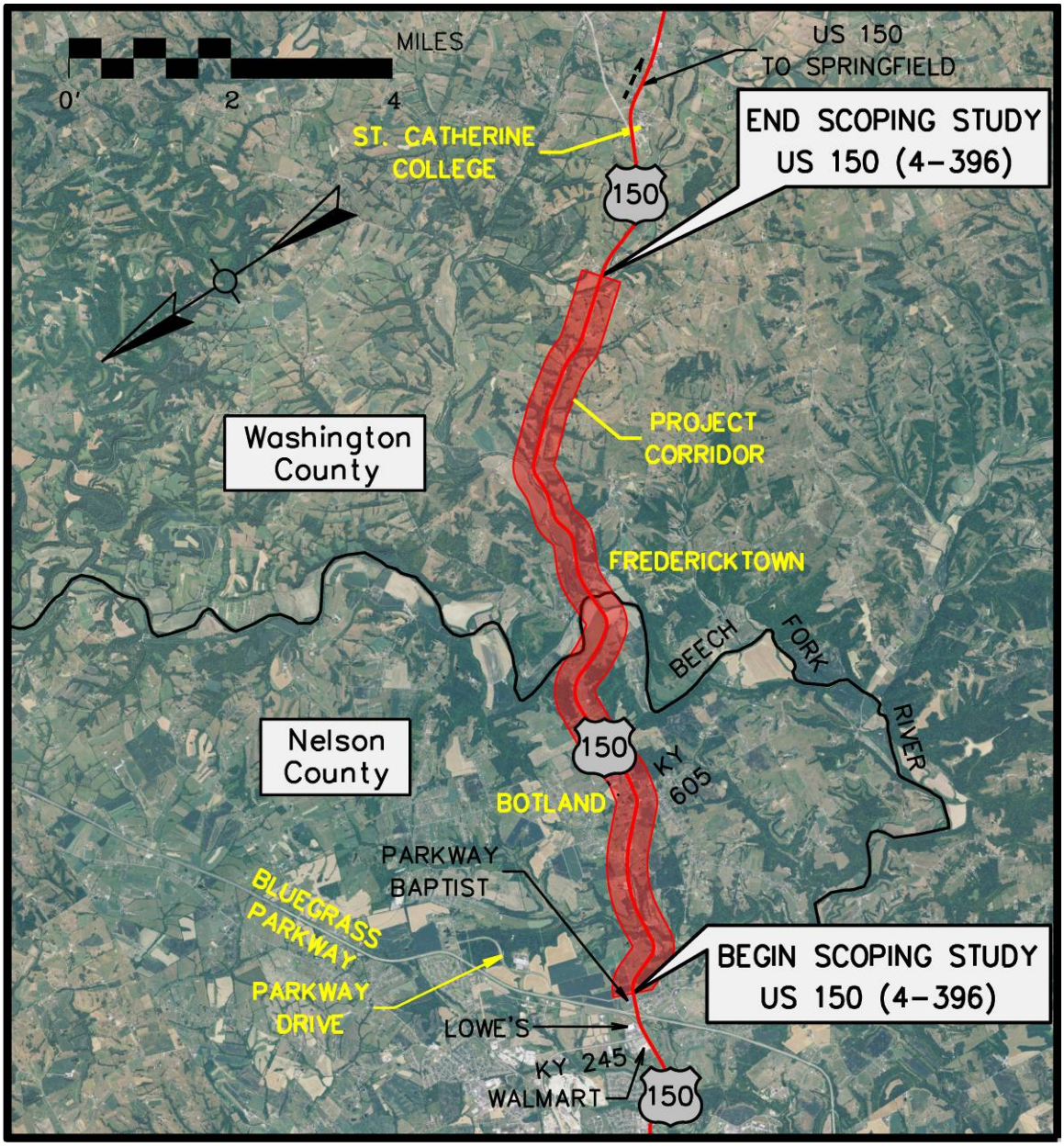


Exhibit 1: Study Area for the US 150 Scoping Study

Beginning of Study Area

245

605

150

1872

Bardstown

Maud

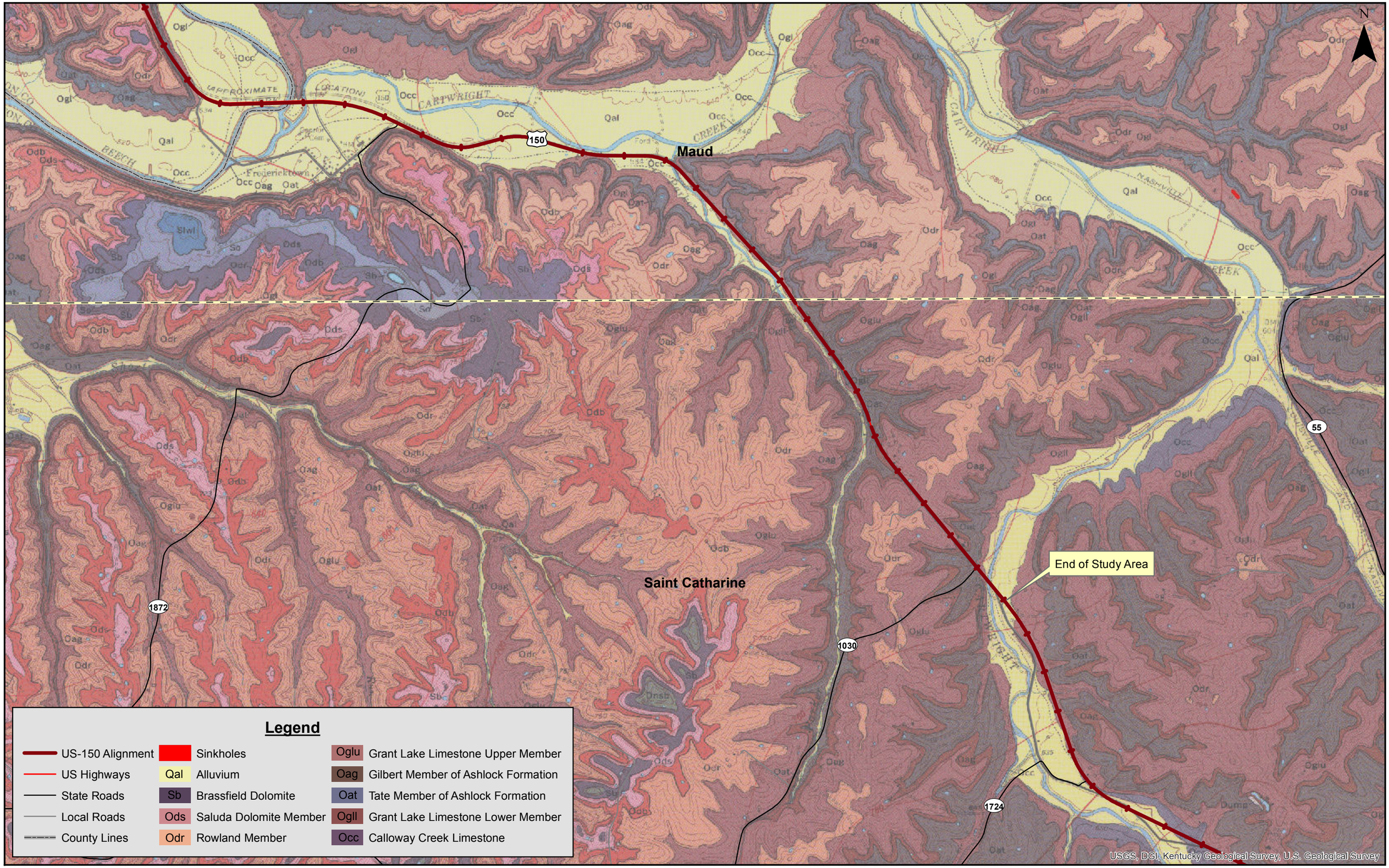
Saint Catharine

N

Legend

US-150 Alignment		Sinkholes	Ods	Saluda Dolomite Member
Parkways	Qal	Alluvium	Odb	Bardstown Member
US Highways	Dnsb	New Albany Shale and Beechwood Limestone of Selersburg Limestone	Odr	Rowland Member
State Roads	Slwl	Louisville Limestone, Waldron Shale and Laurel Dolomite	Ogl	Grant Lake Limestone
Local Roads	So	Osgood Formation	Oag	Gilbert Member of Ashlock Formation
County Lines	Sb	Brassfield Dolomite	Oat	Tate Member of Ashlock Formation

0 2,000 4,000 8,000 Feet


N
Maud
Saint Catharine
End of Study Area
150
1872
1030
1724
55
Legend
US-150 Alignment
US Highways
State Roads
Local Roads
County Lines
Sinkholes
Qal Alluvium
Sb Brassfield Dolomite
Ods Saluda Dolomite Member
Odr Rowland Member
Oglu Grant Lake Limestone Upper Member
Oag Gilbert Member of Ashlock Formation
Oat Tate Member of Ashlock Formation
Ogll Grant Lake Limestone Lower Member
Occ Calloway Creek Limestone
0
2,000
4,000
8,000 Feet
USGS, DGI, Kentucky Geological Survey, U.S. Geological Survey

Report No.	Route	Item No.	Structure Over	Project Type	Description
R-063-2013	US-150	04-8309.10		Roadway	WIDEN US-150 FROM NEAR KY-245 THROUGH THE BLUEGRASS PARKWAY INTERCHANGE TO JUST PAST LESLIE BALLARD ROAD.
S-129-2013	US-150	04-8309.10	Bluegrass Parkway	State Bridge	Bridge over Bluegrass Parkway
R-049-2011	US-150	04-1068.00		Roadway	US 150 (Bridges over Beech Fork & Cartwright Creek) to be let with 4-1069, Roadway report also covers 4-1069.
S-120-2011	US-150	04-1068.00	Beech Fork	State Bridge	US 150 (Bridges over Beech Fork & Cartwright Creek) to be let with 4-1069, Existing 14x11 triple rcbc extension at sta. 517+00
S-121-2011	US-150	04-1068.00	Cartwright Creek	State Bridge	US 150 (Bridges over Beech Fork & Cartwright Creek) to be let with 4-1069, Beech Fork 4-span bridge
S-122-2011	US-150	04-1069.00	Cartwright Creek	State Bridge	US 150 (Bridges over Beech Fork & Cartwright Creek) to be let with 4-1069, Cartwright Ceek 3-span bridge